INFANT AND TODDLER CARE AND DEVELOPMENT



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How this Book is Organized

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In the following pages, what you will find is not a textbook in the traditional sense. Instead, this book is a compilation of created and remixed resources for use in various courses supporting the care and development of infants and toddlers. This textbook is intended to be pulled apart, remixed, reshared, and redistributed in the form that best meets your individual needs. For this reason, this resource has unique characteristics not typical of other textbooks.

- Each chapter or section is stand-alone. No chapter references another or makes statements such as “as you previously read.” This intentional design choice allows you to remix every section without concern about referencing a section you did not copy over.
- The chapters were created around topics we felt should be stand-alone and therefore had different length requirements. For this reason, you will notice a chapter might be 20 pages or 2.
- Chapters contain multiple sections to remix easily and create new and unique chapters for your individual needs.
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To best use a small window of time to complete this resource, we decided to forgo many of the extra “bells and whistles” one might find in traditional textbooks. Including call-out boxes with additional resources, robust vignettes, and reflection questions. While we feel this resource contains much of the content needed for multiple infant and toddler courses, we eagerly await each improvement upon this resource the infant and toddler educator community brings forth.

Northeast Wisconsin Technical College

Infant and Toddler Care and Development

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1.1: Introduction

Care and Development of Infants and Toddlers: An Introduction

When you think about infants and toddlers, what words and images come to mind? William James imagined infants as experiencing a “blooming, buzzing confusion” (James, 1890). More recent and more accurate images consider infants and toddlers as young scientists making sense of their world as they actively engage with it (Gopnik, 2012; Gopnik, Meltzoff & Kuhl, 1999). The goal of this section is to briefly introduce you to infants and toddlers by presenting demographic information, guiding principles of infant/toddler care and education and to demonstrate why quality care and education for infants and toddlers is so important.



Figure **1.1.1**: Infant enjoying a caregivers playfullness (Image by Larry Crayton on Unsplash.)

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1.2: Who are Infants and Toddlers?

Infants and Toddlers

As a collective, the term “infants and toddlers” refers to children from birth to three years of age. More specifically, infancy refers to children between birth and one year of age, while toddlerhood refers to children between 1 and three years of age. In many texts, infants and toddlers are perceived as a homogenous group (i.e., Maguire-Fong, 2014); however, recent research highlights the importance of recognizing the individual differences between children under three years of age (Frank, Braginsky, Yurovsky & Marchman, 2021; Kidd, Donnelly & Christiansen, 2018; Pérez-Edgar, Vallorani, Buss & LoBue, 2020). It is now undeniable—one cannot consider all infants or toddlers to be developmentally similar or to have similar experiences. There are important, early forming and long-lasting individual developmental differences (Marchman & Fernald, 2008).

Infants and toddlers in the U.S. represent a diverse group demographically. The organization *Zero to Three* conducts a large annual report revealing state and national data on infants and toddlers (Keating et al., 2021). Across the years, the data have revealed a few general findings that are noteworthy when considering who infants and toddlers are and their individual differences (each year’s data may be different so this list presents average findings across the years that data has been collected so far):

- Over 50% of the nation’s children under three years of age are children of color.
- About 40% of infants and toddlers live in households where the income is less than twice the federal poverty level (about $50,000 a year for a family of four in 2018).
- Approximately 20% of infants and toddlers live with a single parent.
- Infants and toddlers have the highest rates of abuse and neglect of any age group.
- Approximately 20% infants and toddlers have already been exposed to one adverse childhood experience and about 7% have experienced two or more.
- Less than 40% of infants and toddlers are read to every day.
- There are racial/ethnic disparities across several critical domains, such as prenatal care, preterm birth rates, breastfeeding rates and crowded housing.
- There are disparities based on family income, such as maternal mental health, breastfeeding rates, neighborhood safety, adverse childhood experiences, book reading frequency, and developmental screenings.
- States differ greatly in offering positive learning experiences in child care settings and in the homes of families.

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1.3: What does Care and Education of Infants and Toddlers mean?

Care and Education of Infants and Toddlers

What does care and education of infants and toddlers even mean? Perhaps it is most clear to start by describing what it is not. Care and education of infants and toddlers is not babysitting. Babysitting, or keeping an eye on a child and making sure they are safe, is hardly even the minimum of what this means. The first three years of a child's life are a critical foundation for later development, so caregivers need to implement research-supported strategies to create secure and stimulating experiences with quality relationships in the classroom.



Figure **1.3.1**: The fun of play Image by Antoine Hawa on Unsplash

Care and education of infants and toddlers is not preschool. Although there are many different preschool pedagogical approaches, they often revolve around schedules of table top activities, circle time and indoor/outdoor play. Should this be similar for infants and toddlers? For some, infant and toddler education is just like preschool—or at least the goal is for it to be as similar to preschool as possible. The activities might differ and the allotment of time devoted to activities may be different, but many infant and toddler programs attempt to be replications of preschool curricula, using a diluted approach.

Care and education of infants and toddlers is and should be very different from preschool curriculum. The term curriculum is being used more frequently in reference to infants and toddlers, but it carries a different meaning than what is commonly considered when people think about curriculum. What do you think about when you consider the term curriculum? Do you envision a curriculum book that lays out day-by-day activities with weekly and monthly themes? This is common in many preschool settings. Curriculum for infants and toddlers is different. Curriculum for children under three years of age focuses on relationships while closely observing and reflecting upon the interactions and experiences that unfold.

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1.4: Guiding Principles of Infant and Toddler Care and Education

Principles of Care

Decades of research and theory have produced some general guiding principles that are an important starting place for understanding infant and toddler care and education. [1]

Principle #1: Children are active participants in shaping their own development.

Infants and toddlers seek out information from their environments and social partners through eye gaze, communication/language, physical touches and manual manipulations of objects. Specific types of information attract infants' attention and provide unique access into helping them understand how the world works. For example, infants prefer to listen to infant-directed language and this type of language exposure from adults helps infants acquire language (García-Sierra, Ramírez-Esparza, Wig & Robertson, 2021; Graf Estes & Hurley, 2013). A great example of how active participation shapes personal development comes from motor development. Even after toddlers begin to walk, there is still much more improvement needed to walk efficiently. In fact, toddlers take an average of 2,368 steps each hour and also fall an average of 17 times (Adolph et al., 2012). Actively engaging in the practice of walking shapes their own developmental process in walking efficiency. Additionally, actively engaging in the practice of walking is related to individual differences in language and cognitive development since walking creates new opportunities to engage with other people, holding objects while being mobile and encountering new objects and experiences (Karasik, Adolph, Tamis-LeMonda & Zuckerman, 2012; Schneider & Iverson, 2021; West & Iverson, 2021). [1]



Figure **1.4.1**: Infant and Caregiver. (Crawling Baby Image by Kevin Gent on Unsplash)

Principle #2: Relationships and experiences are the primary ways development occurs.

Infants and toddlers develop through adult-child and child-child relationships and through exploring their world, both alone and with others. Sensitive, respectful, and stable relationships with caregivers serve as the foundation for the healthy development of infants and toddlers (Bornstein et al., 2020; Li et al., 2022; Raby et al., 2019). These relationships are the starting place for language, social, emotional, and cognitive development—and these relationships are literally shaping the structure of the developing brain (Bernier, Calkins & Bell, 2016; King et al., 2021; Nelson, Zeanah & Fox, 2019). [1]

Principle #3: Development is complex and transactional.

Children and their contexts shape each other in ongoing and cyclical ways—referred to as the transactional model of development (Sameroff, 2009; Sameroff & Mackenzie, 2003). For example, each child is raised in a cultural context that shapes all aspects of development, but the child's particular familial or cultural context may also affect the larger community context over time in complex ways. The same environmental factors can affect different children and families in different ways. Likewise, different environmental factors can have a similar effect on children. For example, toddlers from lower SES homes typically are exposed to less language; however, this is not always the case as even amongst all low SES families, some toddlers are exposed to an abundance of language while others are exposed to much less (Weisleder & Fernald, 2013). Figure **1.4.2** shows how the amount of words toddlers hear in one day differs greatly amongst families. In the graph, each vertical bar represents one child's total amount

of words they are exposed to in one day. So even though all these toddlers were from low SES families, there were significant differences in the amount of language from caregivers. [1]

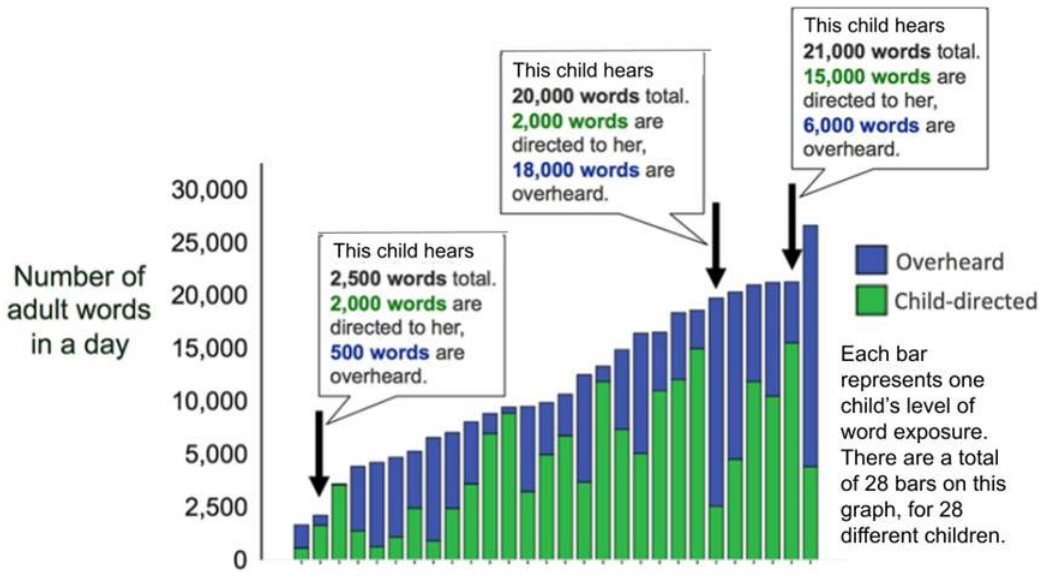


Figure **1.4.2**:

Each bar represents one child's level of word exposure. There are total of 28 bards on this graph, for 28 different children. This graph shows the number of words that different kids heard from grownups in 1 day. The bottom section/green part of each bar shows the number of words that grownups said to that kid in 1 day. The top/blue part of each bar shows the number of words that kids overheard when grownups were talking to other people. For example, kid 2 heard 2,500 words total. 2,000 words are directed to her, and 500 words are overheard. Child 23 hears 20,000 words total. 2,000 words are directed to her, 18,000 words are overheard. Child 27 hears 21,000 words total. 15,000 words are directed to her, 6,000 words are overheard.

. (Image adapted from Lew-Williams & Weisleder (2017). How Do Little Kids Learn Language? *Frontiers for Young Minds*, *5*, 45. CC by 4.0)

Principle #4: Development and learning occur in multiple systems or contexts.

Infants and toddlers develop as the result of the direct interactions they have with the people in their world (family, friends, non-parental caregivers), as well as the indirect influences, including community resources, policies in parental work settings, state child care policies, and many more physical, social, and interactional environments (Bronfenbrenner & Morris, 2006; Rowe & Weisleder, 2020). Within these multiple systems and contexts, parents are children's first and most influential caregivers and their primary sources of knowledge. The quality of these various contexts can greatly influence the developmental trajectories of infants and toddlers (Gilkerson et al., 2018; Larose et al., 2021; Shuffrey et al., 2022). [1]

Principle #5: All areas of development are interrelated.

During the infant and toddler period, the domains of development (i.e., physical development, cognitive development, and social development) are interrelated. Development in one domain influences development in other domains. For example, an infant's motor ability to sit independently is related to cognitive and language development (Oudgenoeg-Paz, Volman & Leseman, 2012; Veldman et al., 2019). As a result, developmental domains cannot be considered in isolation from each other. The dynamic interaction of all areas of development must be considered when planning for and interacting with all children, especially infants and toddlers. [1]



Figure **1.4.3**:The fun of exploration. (Baby Sitting Image by Nandhu Kumar on Unsplash)

Principle #6: There are vast individual differences in rates of development among children.

Each child has a unique rate of growth and development. Some children may have a developmental delay or disability requiring early intervention and/or adaptations to be successful in achieving a particular developmental outcome. Furthermore, early forming individual differences are important because they are often associated with positive outcome benefits. For example, achieving motor milestones earlier (sitting or walking) is related to short-term growth in language abilities (Carina, Leinweber & Ritterfeld, 2019; He, Walle & Campos, 2015). While milestone charts can provide approximates for what is considered typical development, recent research into early individual differences highlights the important role caregivers have for providing high-quality positive care and educational environments for infants and toddlers (Lopez et al., 2020; Ramírez, Lytle & Kuhl, 2020). [1]

Principle #7: Birth to age 3 is a distinct developmental period that is the foundation for later development.

Periods of rapid growth and change, such as during infancy, offer the greatest opportunities for experiences or interventions to influence the course of development (Raikes, Love, & Chazan-Cohen, 2004). The relationships and experiences that influence development from birth through age 3 can have a profound and lasting impact. For example, experiences during infancy affect the architecture of the brain or the way the brain is “wired” (Center on the Developing Child, 2007), as well as how the brain works, including how fast it thinks, how it makes connections and remembers, how it pays attention to information, and how it forms ideas, concepts, and understandings (Fernald, Perfors & Marchman, 2006; Rose, Feldman, Jankowski, & Van Rossem, 2008). Infancy and toddlerhood is characterized by rapid growth and development of concepts, attitudes, skills, and abilities that are foundational for current development, later success in school, and lifelong learning (Domond et al., 2020; Early Head Start National Resource Center, 2012; Losier et al., 2021). [1]



Figure 1.4.4:The fun of exploration (Girl with Paint Image by Senjuti Kundu on Unsplash)

[1] Horm et al., (2016). Developmental foundations of school readiness for infants and toddlers: A research to practice report. OPRE Report #2016-07, Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services. In the public domain.

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1.5: Why is Care and Education with Infants and Toddlers Important?

The rapid growth that unfolds during the first three years of a child's life is unprecedented and establishes a developmental foundation for future years to build off of. The experiences infants and toddlers have are related to short-term and long-term growth trajectories. Not only are the infant and toddler years associated with school readiness, but the first three years are also a wise investment for long-term academic and developmental outcomes.

School Readiness for Infants and Toddlers?

Until very recently, the majority of work in school readiness has focused on the preschool period. In fact, the term school readiness itself is controversial when applied to infants and toddlers. School readiness often brings about the idea of formal academics such as letters and numbers presented in ways that are not developmentally appropriate for infants and toddlers. However, as the term school readiness became more broadly defined and the research base documenting the important foundations for later learning established during the first three years expanded, families, programs serving infants and toddlers, and policymakers have increasingly accepted that school readiness begins in infancy.

Several organizations have issued guidance and developed resources for programs, practitioners, and families on how to think about and offer services to support the foundations of school readiness in infants and toddlers. For example, in 2013, the National

Association for the Education of Young Children (NAEYC) published a book entitled Developmentally Appropriate Practice: Focus on Infants and Toddlers devoted to defining and applying the concept of developmentally appropriate practice for teachers and caregivers working in infant and toddler programs (Copple, Bredekamp, Koralek, & Charner, 2013). The Office of Head Start has also provided guidance to programs through developing the Framework for Programs Serving Infants and Toddlers and Their Families and The Parent, Family, and Community Engagement (PFCE) Framework. Figure 1.5.1 presents the Framework for Programs Serving Infants and Toddlers. An important aspect of the Early Head Start framework is the relationship between the provision of high-quality services and children's growth and development. The quality of early childhood service is multidimensional and encompasses not only characteristics of staff but also the quality of the interactions and relationships among staff members and the children and parents with whom they work. States have also published expectations for infants, toddlers, and their caregivers (National Center on Child Care Quality Improvement, 2019). As of 2019, all U.S. states have developed early learning development guidelines for preschool children (3 to 5 years old), and most states, although not all, have early learning development guidelines that either include or are separate for infants and toddlers. [1] [2]

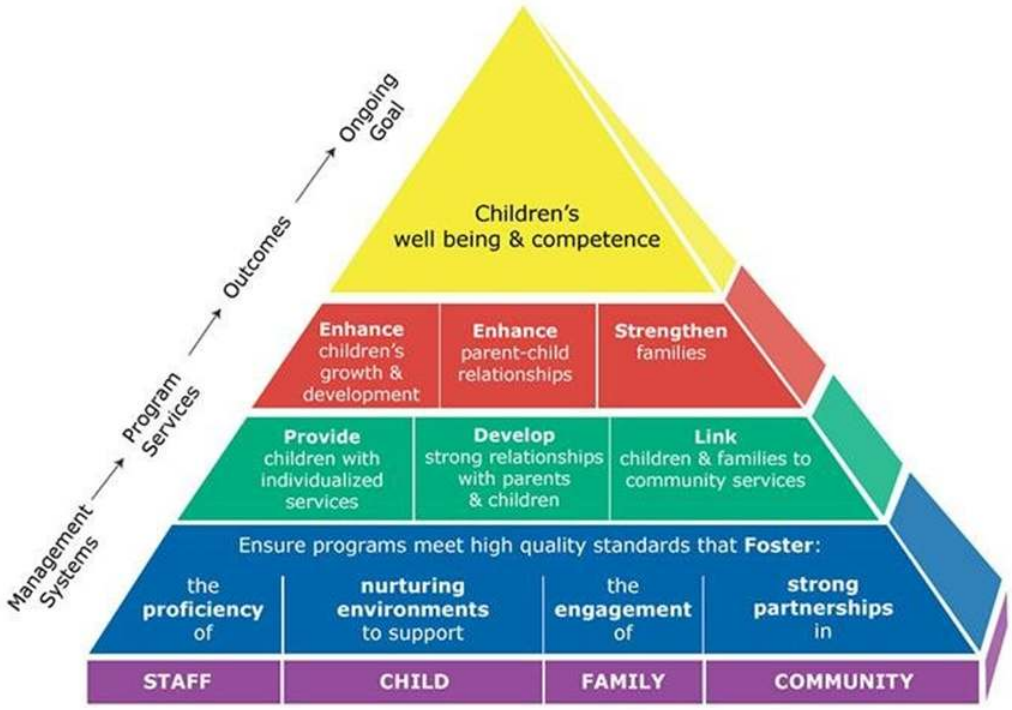


Figure 1.5.1: Children's well-being and competence enhance children's growth and development, enhance parent-child relationships, strengthen families, provide children with individualized services, develop strong relationships with parents and children, link children and families to community services. Ensure programs meet high-quality standards that Foster: the proficiency of staff, nurturing environments to support child, the engagement of family strong partnerships in the community (Image from Vogel et al., (2015). Toddlers in Early Head Start: A portrait of 2-year-olds, their families, and the programs serving them)

The infant and toddler period is an opportunity to support young children's optimal development and to set a positive path for school readiness and life-long success. It is also true that all opportunities involve risk. A risk with applying the concept of school readiness to infants and toddlers is the temptation to funnel practices developed for preschoolers to children under three years of age. To avoid this risk, attention to the unique developmental characteristics of infants and toddlers and purposeful reflection is required to ensure activities and interactions are age-appropriate. [1]

Infant and Toddler Care & Education: A Wise Investment

The experiences infants and toddlers receive during the first three years of life can have a long-lasting impact on their later development, academic achievement and income in adulthood. While there are numerous studies documenting the long-term benefits of investing into the preschool years (Bai, Ladd, Muschkin & Dodge, 2020; Deming, 2009; Fisher, Barker & Blaisdell, 2020; Joo et al., 2020; Knudsen, Heckman, Cameron & Shonkoff, 2006; Nores, Belfield, Barnett & Schweinhart, 2005), more recent studies have revealed that investing into the infant and toddler years has strong, long-lasting benefits as well.

When children attend center-based or family child care programs as infants, they are more likely to graduate high school (compared to dropping out) and less likely to be in poverty as adults (Domond et al., 2020; Gertler et al., 2014; Losier et al., 2021). Attending center-based programs, compared to informal care, such as by a family member, can have a long-lasting, positive impact on a child's social-emotional, language and cognitive development (Davies et al., 2021; Felfe & Lalive, 2014; Gomajee et al., 2018; Hansen & Hawkes, 2009; Luijk et al., 2015; Orri et al., 2019). Infants and toddlers who attended a center-based program for at least one year saw the greatest social and emotional benefits later in childhood (Gomajee et al., 2018). During the COVID-19 pandemic, infants and toddlers who attended group care programs, compared to those in informal care, had higher cognitive abilities (Davies et al., 2021). In Chile, toddlers who attended center-based care had higher cognitive and language scores, compared to toddlers in informal care (Narea, Arriagada & Allel, 2020; Narea, Toppelberg, Irarrázaval & Xu, 2020).



Figure **1.5.2**: Caregiver and an infant interacting (Image by Dragon Pan on Unsplash)

The greatest returns on investments into infancy and toddlerhood may be for the children who are most at risk (Felfe & Lalive, 2014). One risk factor for optimal child development outcomes is low socioeconomic status (SES). SES is a multidimensional construct, combining factors such as an individual's (or parent's) education, occupation, and income (McLoyd, 1998). In 2020, there were 37.2 million people in poverty in the U.S., approximately 3.3 million more than in 2019 (United States Census Bureau, 2012). Approximately 40% of infants and toddlers live in households that are low-income or in poverty (Keating et al., 2021). In California, infants and toddlers of color are more likely to be growing up in poverty (Keating et al., 2021). Figure **1.5.3** shows the percentage of children under three years of age in California, by race, who are living in poverty. Compared to only 7% of White children, 39.2% of American Indian/Alaska Native, 31.8% of Black and 22.2% of Hispanic children are growing up in poverty (Keating et al., 2021). [3] [4]

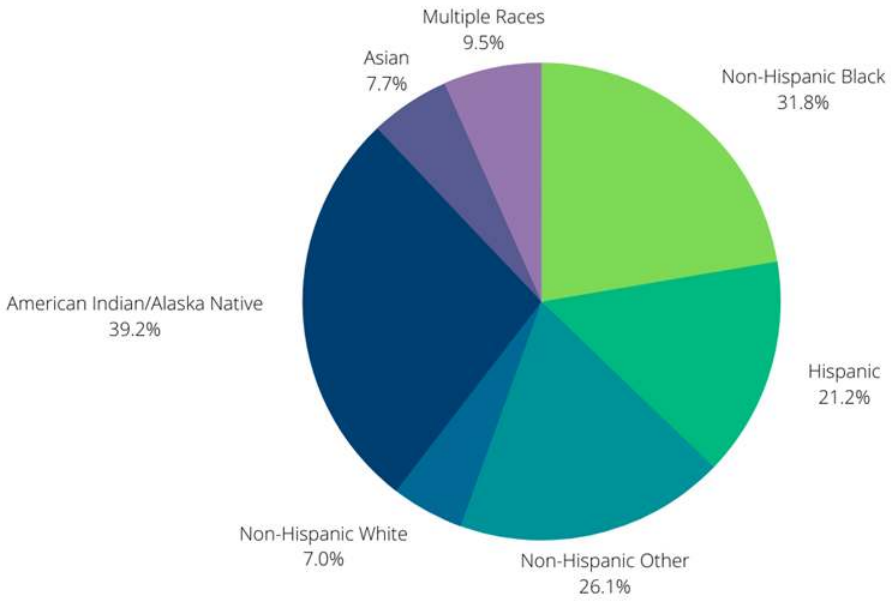


Figure **1.5.3**: Percentage of infants and toddlers in California in poverty, by race. Asian 7.7 %, Multiple Races 9.5%, Non-Hispanic Black 31.8%, Hispanic 21.2%, Non Hispanic Other 26.1%, Non-Hispanic White 7.0%, American Indian/Alaska Native 39.2% (Image by Todd LaMarr is licensed under CC by 4.0 [5]

The negative impact SES can have on childrens' development begins to show an effect during the first three years. Significant disparities in vocabulary and language processing efficiency were evident at 18 months between infants from higher and lower SES families. In fact, by 24 months, there is a six month gap between SES groups in the ability to process language (Fernald et al., 2013). Importantly, these early differences do not fade—stronger language abilities as toddlers are related to stronger language

abilities and higher cognitive abilities later in childhood (Gilkerson et al., 2018; Marchman & Fernald, 2008). Already by 21 months of age, toddlers from higher SES families have greater language and memory skills (Noble et al., 2015). [6]

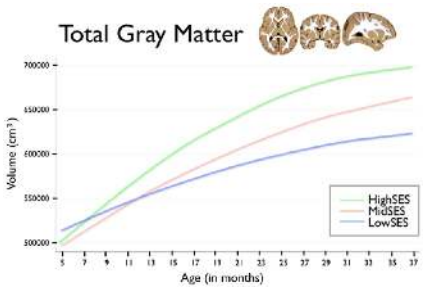


Figure **1.5.4**: Trajectory of total gray matter growth from 5 to 37 months of age. Age in months is shown on the horizontal axis, spanning from 5 to 37 months. Total gray matter volume is shown on the vertical axis. The blue line shows children from Low SES households; children from Mid SES households are shown in red. The green line shows children from High SES households. ([9]

The negative impact SES can have on childrens' development is a worldwide concern. Latin America is a region that struggles with wealth inequality. After examining young children from five Latin American countries, differences in language skills between the highest and lowest wealth groups emerged by three years of age (Schady et al., 2014). In Ecuador and Colombia, children from higher SES families score higher on language and cognitive assessments and the relationship between SES and ability only grows wider with time (Paxson & Schady, 2007; Rubio-Codina et al., 2015; Schady, 2011). By two years of age, statistically significant differences in IQ had emerged between British children of high and low SES families (Von Stumm & Plomin, 2015). A cross-country study of children from India, Indonesia, Peru and Senegal found that differences in child-development scores emerged as early as nine months of age for children in the highest and lowest SES groups (Fernald, Kariger, Hidrobo & Gertler, 2012). A study from Bangladesh found cognitive differences between SES groups in infants by seven months of age (Hamadani et al., 2014). [6]

The quality of care and education in group care programs during the first three years can be an important factor to reduce the impact SES can have on children's developmental trajectory (Felfe & Lalive, 2014; Holochwost et al., 2021). Children from low SES families score lower on academic readiness and achievement, unless the children attended a formal childcare program during their first four years of life, including during infancy and toddlerhood (Geoffroy et al., 2010). Infants and toddlers from low SES families exposed to center-based child care demonstrate better reading, writing, and mathematics scores than low-SES children never exposed to center-based programs (Laurin et al., 2015). Children from low SES families who begin center-based care by five months of age have better reading and mathematical skills than infants and toddlers who do not start until eighteen months of age or later. Toddlers who were read to everyday by caregivers had higher reading and math scores as four year olds (Lombardi, Fisk & Cook, 2021). Children who were attending infant child care programs by nine months of age, had greater cognitive abilities later as three year olds (Côté, Doyle, Petitclerc & Timmins, 2013). Although the interaction between SES and child development is complex, research suggests that center-based care is related to greater developmental outcomes due to the quantity and quality of language shared between caregivers and children along with cognitively stimulating experiences (Davis et al., 2021; Lombardi, Fisk & Cook, 2021).

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[1] "Early learning and development guidelines" from National Center on Child Care Quality Improvement is in the public domain.

[2] "Income and Poverty in the United States: 2020" from the United States Census Bureau is in the public domain.

[3] Brito & Noble (2014). Socioeconomic status and structural brain development. *Frontiers in Neuroscience*, *8*, 276. CC by 3.0

[4] "Income and Poverty in the United States: 2020" from the United States Census Bureau is in the public domain.

[5] Image by Todd LaMarr is licensed under CC by 4.0. Data is from Keating, Cole & Schneider, A. (2021). State of babies yearbook: 2021.

Washington, DC: ZERO TO THREE

[6] Reynolds (2021). Center-Based Child Care and Differential Improvements in the Child Development Outcomes of Disadvantaged Children. *Child & Youth Care Forum*. CC by 4.0

[7] Brito & Noble (2014). Socioeconomic status and structural brain development. *Frontiers in Neuroscience*, *8*, 276. CC by 3.0

[8] "Anatomy and Physiology" on OpenStax is licensed under CC by 4.0.

[9] Image from Hanson et al., (2013). Family poverty affects the rate of human infant brain growth. *PloS One*, *8*(12), e80954. CC by 4.0

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1.6: Conclusion

Care and Development: Conclusion

The development that takes place over the first three years is unlike what happens in any other period. The growth of personality, physical abilities and language are rapid and being able to witness the process of how development unfolds is truly remarkable. Nevertheless, the experiences children are exposed to during this time (both positive and negative) can have a direct impact on their developmental trajectories. Infants and toddlers are not a homogenous group—various individual differences across children are essential to recognize because they can impact a child's unique developmental trajectory. Investing into the first three years can reap long-term outcomes. To best support optimal development caregivers should engage in quality interactions and create stimulating environments that foster positive relationships and learning experiences.

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CHAPTER OVERVIEW

2: Conception, Heredity, and Prenatal Development

Learning Objectives

After this chapter, you should be able to:

1. Evaluate roles of nature and nurture in development.
2. Define genes and chromosomes.
3. Differentiate mitosis and meiosis.
4. Explain dominant and recessive patterns on inheritance.
5. List common genetic disorders and chromosomal abnormalities.
6. Describe changes that occur within each of the three periods of prenatal development.
7. Recognize the risks to prenatal development posed by exposure to teratogens.
8. Evaluate different types of prenatal assessment.

In this chapter, we will begin by examining some of the ways in which heredity helps to shape the way we are. We will look at what happens genetically during conception, and describe some known genetic and chromosomal disorders. Next we will consider what happens during prenatal development, including the impact of teratogens. We will also discuss the impact that both the mother and father have on the developing fetus.

2.1: Heredity
2.2: Prenatal Development
2.S: Summary

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2.1: Heredity

Nature and Nurture

Most scholars agree that there is a constant interplay between nature (heredity) and nurture (the environment). It is difficult to isolate the root of any single characteristic as a result solely of nature or nurture, and most scholars believe that even determining the extent to which nature or nurture impacts a human feature is difficult to answer. In fact, almost all human features are polygenic (a result of many genes) and multifactorial (a result of many factors, both genetic and environmental). It's as if one's genetic make-up sets up a range of possibilities, which may or may not be realized depending upon one's environmental experiences. For instance, a person might be genetically predisposed to develop diabetes, but the person's lifestyle may determine whether or not they actually develop the disease.

This bidirectional interplay between nature and nurture is the **epigenetic framework**, which suggests that the environment can affect the expression of genes just as genetic predispositions can impact a person's potentials. And environmental circumstances can trigger symptoms of a genetic disorder.2

Environment Correlations

Environment Correlations refer to the processes by which genetic factors contribute to variations in the environment (Plomin, DeFries, Knopik, & Neiderhiser, 2013). There are three types of genotype-environment correlations:

Passive genotype-environment correlation occurs when children passively inherit the genes and the environments their family provides. Certain behavioral characteristics, such as being athletically inclined, may run in families. The children have inherited both the genes that would enable success at these activities, and given the environmental encouragement to engage in these actions.



Figure **2.1.1**: Two skiers. (Skiers Image by Alexey Ruban on Unsplash)

Evocative genotype-environment correlation refers to how the social environment reacts to individuals based on their inherited characteristics. For example, whether one has a more outgoing or shy temperament will affect how he or she is treated by others.

Active genotype-environment correlation occurs when individuals seek out environments that support their genetic tendencies. This is also referred to as niche picking. For example, children who are musically inclined seek out music instruction and opportunities that facilitate their natural musical ability.

Conversely, **Genotype-Environment Interactions** involve genetic susceptibility to the environment. Adoption studies provide evidence for genotype-environment interactions. For example, the Early Growth and Development Study (Leve, Neiderhiser, Scaramella, & Reiss, 2010) followed 360 adopted children and their adopted and biological parents in a longitudinal study. Results have shown that children whose biological parents exhibited psychopathology, exhibited significantly fewer behavior problems when their adoptive parents used more structured parenting than unstructured. Additionally, elevated psychopathology in adoptive parents increased the risk for the children's development of behavior problems, but only when the biological parents' psychopathology was high. Consequently, the results show how environmental effects on behavior differ based on the genotype, especially stressful environments on genetically at-risk children. 4

Genes and Chromosomes

Now, let's look more closely at just nature. Nature refers to the contribution of genetics to one's development. The basic building block of the nature perspective is the gene. **Genes** are recipes for making proteins, while proteins influence the structure and

functions of cells. Genes are located on the chromosomes and there are an estimated 20,500 genes for humans, according to the Human Genome Project (NIH, 2015).

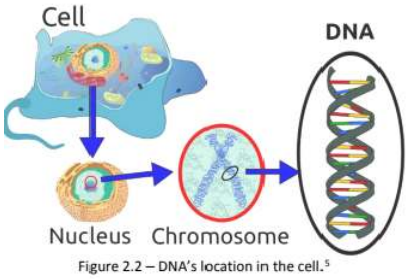


Figure 2.2 – DNA's location in the cell.[5]

Figure **2.1.2**: DNA's location in the cell. (Cell Image by Radio89 is licensed under CC BY-SA 3.0)

Normal human cells contain 46 chromosomes (or 23 pairs; one from each parent) in the nucleus of the cells. After conception, most cells of the body are created by a process called mitosis. **Mitosis** is defined as the cell's nucleus making an exact copy of all the chromosomes and splitting into two new cells.

However, the cells used in sexual reproduction, called the gametes (sperm or ova), are formed in a process called meiosis. In meiosis, the gamete's chromosomes duplicate, and then divide twice resulting in four cells containing only half the genetic material of the original gamete. Thus, each sperm and egg possesses only 23 chromosomes and combine to produce the normal 46.

Table 2.1 - Mitosis & Meiosis

Type of Cell Division	Explanation	Steps
Mitosis	All cells, except those used in sexual reproduction, are created by mitosis	Step 1. Chromosomes make a duplicate copy Step 2. Two identical cells are created
Meiosis	Cells used in sexual reproduction are created by meiosis	Step 1. Exchange of gene between the chromosomes (crossing over) Step 2. Chromosomes make a duplicate Step 3. First cell division Step 4. Second cell division

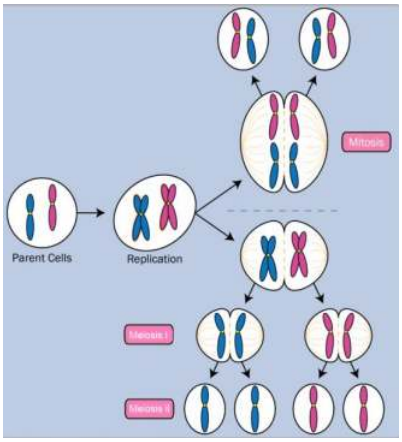


Figure **2.1.3**: Mitosis and Meiosis. (Image by Community College Consortium for Bioscience Credentials is licensed under CC BY 3.0)

Given the amount of genes present and the unpredictability of the meiosis process, the likelihood of having offspring that are genetically identical (and not twins) is one in trillions (Gould & Keeton, 1997).

Of the 23 pairs of chromosomes created at conception, 22 pairs are similar in length. These are called **autosomes**. The remaining pair, or **sex chromosomes**, may differ in length. If a child receives the combination of XY, the child will be genetically male. If the child receives the combination XX, the child will be genetically female.8

Here is an image (called a karyogram) of what the 23 pairs of chromosomes look like. Notice the differences between the sex chromosomes in female (XX) and male (XY).

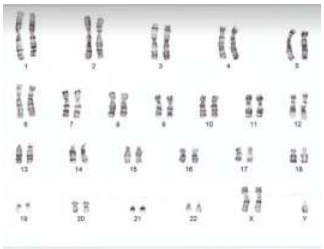


Figure **2.1.4**: The 23 pairs of chromosomes. (Image by Nami-ja is in the public domain)

Genotypes and Phenotypes & Patterns on Inheritance

The word **genotype** refers to the sum total of all the genes a person inherits. The word **phenotype** refers to the features that are actually expressed. Look in the mirror. What do you see, your genotype or your phenotype? What determines whether or not genes are expressed? Because genes are inherited in pairs on the chromosomes, we may receive either the same version of a gene from our mother and father, that is, be **homozygous** for that characteristic the gene influences. If we receive a different version of the gene from each parent, that is referred to as **heterozygous**.

In the homozygous situation we will display that characteristic. It is in the heterozygous condition that it becomes clear that not all genes are created equal. Some genes are **dominant**, meaning they express themselves in the phenotype even when paired with a different version of the gene, while their silent partner is called recessive. **Recessive** genes express themselves only when paired with a similar version gene. Geneticists refer to different versions of a gene as alleles. Some dominant traits include having facial dimples, curly hair, normal vision, and dark hair. Some recessive traits include red hair, being nearsighted, and straight hair.

Most characteristics are not the result of a single gene; they are **polygenic**, meaning they are the result of several genes. In addition, the dominant and recessive patterns described above are usually not that simple either. Sometimes the dominant gene does not completely suppress the recessive gene; this is called incomplete dominance. 10

Genetic Disorders

Most of the known **genetic disorders** are dominant gene-linked; however, the vast majority of dominant gene linked disorders are not serious or debilitating. For example, the majority of those with Tourette's Syndrome suffer only minor tics from time to time and can easily control their symptoms. When dominant-gene linked diseases are serious, they do not tend to become symptomatic until later in life. Huntington's Disease is a dominant gene linked disorder that affects the nervous system and is fatal, but does not appear until midlife.

Recessive gene disorders, such as cystic fibrosis and sickle-cell anemia, are less common but may actually claim more lives because they are less likely to be detected as people are unaware that they are carriers of the disease.

Some genetic disorders are sex-linked; the defective gene is found on the X-chromosome. Males have only one X chromosome so are at greater risk for sex-linked disorders due to a recessive gene such as hemophilia, color-blindness, and baldness. For females to be affected by recessive genetic defects, they need to inherit the recessive gene on both X-chromosomes. But if the defective gene is dominant, females are equally at risk.

Here are tables of some genetic disorders:

Recessive Disorders (Homozygous): The individual inherits a gene change from both parents. If the gene is inherited from just one parent, the person is a carrier and does not have the condition.

Table 2.2 - Recessive Disorders (Homozygous)

Disorder	Description	Cases per Birth
Sickle Cell Disease (SCD)	A condition in which the red blood cells in the body are shaped like a sickle (like the letter C) and affect the ability of the blood to transport oxygen.	1 in 500 Black births 1 in 36,000 Hispanic births
Cystic Fibrosis (CF)	A condition that affects breathing and digestion due to thick mucus building up in the body, especially the lungs and digestive system. In CF, the mucus is thicker than normal and sticky.	1 in 3500
Phenylketonuria (PKU)	A metabolic disorder in which the individual cannot metabolize phenylalanine, an amino acid. Left untreated, intellectual deficits occur. PKU is easily detected and is treated with a special diet.	1 in 10,000
Tay Sachs Disease	Caused by an enzyme deficiency resulting in the accumulation of lipids in the nerves cells of the brain. This accumulation results in progressive damage to the cells and a decrease in cognitive and physical development. Death typically occurs by age five.	1 in 4000 1 in 30 American Jews is a carrier 1 in 20 French Canadians is a carrier
Albinism	When the individual lacks melanin and processes little to no pigment in the skin, hair, and eyes. Vision problems can also occur.	Fewer than 20,000 US cases per year

Autosomal Dominant Disorders (Heterozygous): In order to have the disorder, the individual only needs to inherit the gene change from one parent.

Table 2.3 - Autosomal Dominant Disorders (Heterozygous)

Disorder	Description	Cases per Birth
Huntington's Disease	A condition that affects the individual's nervous system. Nerve cells become damaged, causing various parts of the brain to deteriorate. The disease affects movement, behavior and cognition. It is fatal, and occurs at midlife.	1 in 10,000
Tourette Syndrome	A tic disorder which results in uncontrollable motor and vocal tics as well as body jerking	1 in 250
Achondroplasia	The most common form of disproportionate short stature. The individual has abnormal bone growth resulting in short stature, disproportionately short arms and legs, short fingers, a large head, and specific facial features.	1 in 15,000-40,000

Sex-Linked Disorders: When the X chromosome carries the mutated gene, the disorder is referred to as an X-linked disorder. Males are more affected than females because they possess only one X chromosome without an additional X chromosome to counter the harmful gene.

Table 2.4 - Sex-Linked Disorders

Disorder	Description	Cases per Birth
Fragile X Syndrome	Occurs when the body cannot make enough of a protein it needs for the brain to grow and problems with learning and behavior can occur. Fragile X syndrome is caused from an abnormality in the X chromosome, which then breaks. If a female has a fragile X, her second X chromosome usually is healthy, but males with fragile X don't have a second healthy X chromosome. This is why symptoms of Fragile X usually are more serious in males.	1 in 4000 males 1 in 8000 females
Hemophilia	Occurs when there are problems in blood clotting causing both internal and external bleeding.	1 in 10,000 males
Duchenne Muscular Dystrophy	A weakening of the muscles resulting in an inability to move, wasting away, and possible death.	1 in 3500 males

Chromosomal Abnormalities: A **chromosomal abnormality** occurs when a child inherits too many or two few chromosomes. The most common cause of chromosomal abnormalities is the age of the mother. As the mother ages, the ovum is more likely to suffer abnormalities due to longer term exposure to environmental factors. Consequently, some gametes do not divide evenly when they are forming. Therefore, some cells have more than 46 chromosomes. In fact, it is believed that close to half of all zygotes have an odd number of chromosomes. Most of these zygotes fail to develop and are spontaneously aborted by the mother's body. 14

Here is a table of some autosomal chromosomal disorders:

Autosomal Chromosome Disorders: The individual inherits too many or two few chromosomes.

Table 2.5 - Autosomal Chromosomal Disorders

Disorder	Description
Down Syndrome/Trisomy 21	Caused by an extra chromosome 21 and includes a combination of birth defects. Affected individuals have some degree of intellectual disability, characteristic facial features, often heart defects, and other health problems. The severity varies greatly among affected individuals.
Trisomy 9 Mosaicism	Caused by having an extra chromosome 9 in some cells. The severity of effects relates to the proportion of cells with extra chromosomes. The effects include fetal growth restriction resulting in low birth weight and multiple anomalies, including facial, cardiac, musculoskeletal, genital, kidney, and respiratory abnormalities.
Trisomy 13	Caused by an extra chromosome 13. Affected individuals have multiple birth defects and generally die in the first weeks or months of life.
Trisomy 18	Caused by an extra chromosome 18 and the affected individual also has multiple birth defects and early death.





Figure **2.1.5**: Infant boy with Trisomy 9 Mosaicism. (Image by Ashley Onken used with permission)

Figure **2.1.6**: Girl with XXX Syndrome. (Image is in the public domain)

When the abnormality is on 23rd pair, the result is a sex-linked chromosomal abnormality. This happens when a person has less than or more than two sex chromosomes. 18

Here is a table of some sex-linked chromosomal disorders:

Table 2.6 - Sex-Linked Chromosomal Disorders

Disorder	Description
Turner Syndrome (XO)	Caused when all or part of one of the X chromosomes is lost before or soon after conception due to a random event. The resulting zygote has an XO composition. Turner Syndrome affects cognitive functioning and sexual maturation in girls. Infertility and a short stature may be noted.
Klinefelter Syndrome (XXY)	Caused when an extra X chromosome is present in the cells of a male due to a random event. The Y chromosome stimulates the growth of male genitalia, but the additional X chromosome inhibits this development. The male can have some breast development, infertility, and low levels of testosterone.
XYY Syndrome	Caused when an extra Y chromosome is present in the cells of a male. There are few symptoms. They may include being taller than average, acne, and an increased risk of learning problems. The person is generally otherwise normal, including normal fertility.
Triple X Syndrome (XXX)	Caused when an extra X chromosome is present in the cells of a female. It may result in being taller than average, learning difficulties, decreased muscle tone, seizures, and kidney problems.

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2.2: Prenatal Development

Now we turn our attention to prenatal development which is divided into three periods: The germinal period, the embryonic period, and the fetal period. The following is an overview of some of the changes that take place during each period.

The Germinal Period

The **germinal period** (about 14 days in length) lasts from **conception** to implantation of the fertilized egg in the lining of the uterus. At ejaculation, millions of sperm are released into the vagina, but only a few reach the egg and typically only one fertilizes the egg. Once a single sperm has entered the wall of the egg, the wall becomes hard and prevents other sperm from entering. After the sperm has entered the egg, the tail of the sperm breaks off and the head of the sperm, containing the genetic information from the father, unites with the nucleus of the egg. It is typically fertilized in the top section of the fallopian tube and continues its journey to the uterus. As a result, a new cell is formed. This cell, containing the combined genetic information from both parents, is referred to as a **zygote**.



Figure **2.2.1**: Sperm and ovum at conception. (Sperm Image is in the public domain)

During this time, the organism begins cell division through mitosis. After five days of mitosis, there are 100 cells, which is now called a blastocyst. The blastocyst consists of both an inner and an outer group of cells. The inner group of cells, or embryonic disk will become the embryo, while the outer group of cells, or trophoblast, becomes the support system that nourishes the developing organism. This stage ends when the blastocyst fully implants into the uterine wall (U.S. National Library of Medicine, 2015).

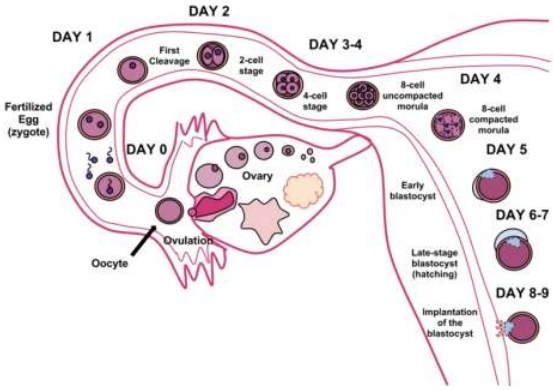


Figure **2.2.2**: The cycle of fertilization. (Image by Ttrue12 is licensed under CC BY-SA 3.0)

Mitosis is a fragile process and fewer than one half of all zygotes survive beyond the first two weeks (Hall, 2004). Some of the reasons for this include: the egg and sperm do not join properly, thus their genetic material does not combine, there is too little or damaged genetic material, the zygote does not replicate, or the blastocyst does not implant into the uterine wall. The failure rate is higher for in vitro conceptions. The figure below illustrates the journey of the ova from its release to its fertilization, cell duplication, and implantation into the uterine lining. 22

The Embryonic Period

Starting the third week, the blastocyst has implanted in the uterine wall. Upon implantation this multi-cellular organism is called an **embryo**. Now blood vessels grow forming the placenta. The **placenta** is a structure connected to the uterus that provides nourishment and oxygen from the mother to the developing embryo via the umbilical cord.

During this period, cells continue to **differentiate**. Growth during prenatal development occurs in two major directions: from head to tail called **cephalocaudal development** and from the midline outward referred to as **proximodistal development**. This means

that those structures nearest the head develop before those nearest the feet and those structures nearest the torso develop before those away from the center of the body (such as hands and fingers). You will see that this pattern continues after birth.

The head develops in the fourth week and the precursor to the heart begins to pulse. In the early stages of the embryonic period, gills and a tail are apparent. However, by the end of this stage they disappear and the organism takes on a more human appearance.



Figure **2.2.3**: A human embryo. (Image by Anatomist90 is licensed under CC BY-SA 3.0)

About 20 percent of organisms fail during the embryonic period, usually due to gross chromosomal abnormalities, often before the mother even knows that she is pregnant. It is during this stage that the major structures of the body are taking form, making the embryonic period the time when the organism is most vulnerable to the greatest amount of damage if exposed to harmful substances. Prospective mothers are not often aware of the risks they introduce to the developing embryo during this time. The embryo is approximately 1 inch in length and weighs about 4 grams at the end of eight weeks. The embryo can move and respond to touch at this time. 24

The Fetal Period

From the ninth week until birth (which is forty weeks for a full-term pregnancy), the organism is referred to as a **fetus**. During this stage, the major structures are continuing to develop. By the third month, the fetus has all its body parts including external genitalia. The fetus is about 3 inches long and weighs about 28 grams. In the following weeks, the fetus will develop hair, nails, teeth and the excretory and digestive systems will continue to develop.



Figure **2.2.4**: A human fetus. (Fetus Image by lunar caustic is licensed under CC BY-SA 2.0)

During the 4th - 6th months, the eyes become more sensitive to light and hearing develops. The respiratory system continues to develop, and reflexes such as sucking, swallowing and hiccupping, develop during the 5th month. Cycles of sleep and wakefulness are present at this time as well. The first chance of survival outside the womb, known as the age of viability is reached at about 24 weeks (Morgan, Goldenberg, & Schulkin, 2008). Many practitioners hesitate to resuscitate before 24 weeks. The majority of the neurons in the brain have developed by 24 weeks, although they are still rudimentary, and the glial or nurse cells that support neurons continue to grow. At 24 weeks the fetus can feel pain (Royal College of Obstetricians and Gynecologists, 1997).

Between the 7th - 9th months, the fetus is primarily preparing for birth. It is exercising its muscles and its lungs begin to expand and contract. The fetus gains about 5 pounds and 7 inches during this last trimester of pregnancy, and during the 8th month, a layer of fat develops under the skin. This layer of fat serves as insulation and helps the baby regulate body temperature after birth.

At around 36 weeks the fetus is almost ready for birth. It weighs about 6 pounds and is about 18.5 inches long. By week 37 all of the fetus's organ systems are developed enough that it could survive outside the mother's uterus without many of the risks associated with premature birth. The fetus continues to gain weight and grow in length until approximately 40 weeks. By then the fetus has very little room to move around and birth becomes imminent. The progression through the stages is shown in the following figure. 26



Figure **2.2.5**: The development of a fetus. (Fetus Development Image by CNX Psychology is licensed under CC BY 4.0)

Monozygotic and Dizygotic Twins

Monozygotic or identical twins occur when a fertilized egg splits apart in the first two weeks of development. The result is the creation of two separate, but genetically identical offspring. That is, they possess the same genotype and often the same phenotype. About one-third of twins are monozygotic twins.

Sometimes, however, two eggs or ova are released and fertilized by two separate sperm. The result is **dizygotic** or fraternal twins. These two individuals share the same amount of genetic material as would any two children from the same mother and father. In other words, they possess a different genotype and phenotype.

Older mothers are more likely to have dizygotic twins than are younger mothers, and couples who use fertility drugs are also more likely to give birth to dizygotic twins. 28



Figure **2.2.6**: Monozygotic Twins (Image is in the public domain)



Figure **2.2.7**: Dizygotic Twins (Image by Jennifer Paris used with permission)

Teratogens

Good prenatal care is essential to protect against maternal and fetal/infant mortality and birth complications. The embryo and fetus is most at risk for some of the most severe problems during the first three months of development. Unfortunately, this is a time at which many mothers are unaware that they are pregnant. Today, we know many of the factors that can jeopardize the health of the developing child. The study of factors that contribute to birth defects is called teratology. **Teratogens** are environmental factors that can contribute to birth defects, and include some maternal diseases, pollutants, drugs and alcohol.

Factors influencing prenatal risks: There are several considerations in determining the type and amount of damage that might result from exposure to a particular teratogen (Berger, 2005). These include:

- **The timing of the exposure:** Structures in the body are vulnerable to the most severe damage when they are forming. If a substance is introduced during a particular structure's critical period (time of development), the damage to that structure may be greater. For example, the ears and arms reach their critical periods at about 6 weeks after conception. If a mother exposes the embryo to certain substances during this period, the arms and ears may be malformed. (see figure below)
- **The amount of exposure:** Some substances are not harmful unless the amounts reach a certain level. The critical level depends in part on the size and metabolism of the mother.
- **The number of teratogens:** Fetuses exposed to multiple teratogens typically have more problems than those exposed to only one.
- **Genetics:** Genetic makeup also plays a role on the impact a particular teratogen might have on the child. This is suggested by fraternal twins exposed to the same prenatal environment, but they do not experience the same teratogenic effects. The genetic makeup of the mother can also have an effect; some mothers may be more resistant to teratogenic effects than others.
- **Being male or female:** Males are more likely to experience damage due to teratogens than are females. It is believed that the Y chromosome, which contains fewer genes than the X, may have an impact. 31

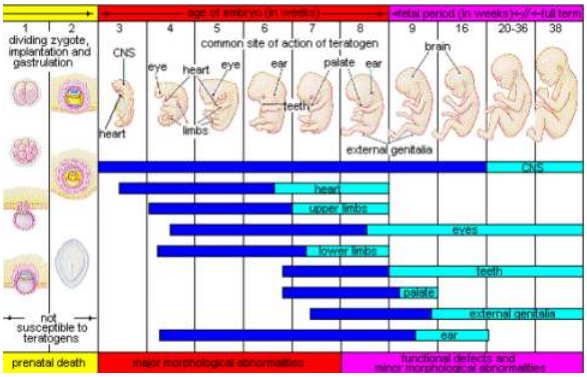


Figure **2.2.8**: The development of an embryo into a fetus. (Embryo Develepment Image by Laura Overstreet is licensed under CC BY-NC-SA 3.0)

There are four categories of teratogens:

1. **Physical teratogens:** These could be saunas, hot tubs, or infections that raise a pregnant woman's body temperature to 102 degrees Fahrenheit or higher. This is associated with neural tube defects, spontaneous abortions, and various cardiovascular abnormalities.

2. **Metabolic conditions affecting pregnant females:** Metabolic conditions are abnormalities in the chemical process of producing energy from food, and thereby affect the development and function of the body. If a pregnant woman is malnourished, then her fetus likely lacks the nutrients essential for its development. These include: malnutrition, diabetes, and thyroid disorders.
3. **Infections:** Different maternal infections, including rubella virus, herpes simplex virus, and syphilis can cause congenital abnormalities in fetuses.
4. **Drugs and chemicals:** When pregnant females ingest or absorb these, they may cause a variety of different effects based on specific agent, amount of exposure, and timing. This category includes: radiation, heavy metals (including lead), insecticides and herbicides, prescription and over the counter drugs, illicit and recreational drugs, alcohol, cigarettes, nicotine, caffeine, and even some vitamins. 33

While there are many, many potential teratogens, the following tables look at the effects of some different types of teratogens. The risks of exposure vary based on lifestyle and health. The effects may vary greatly depending on the factors mentioned previously. Protection and prevention will vary based on the method of exposure.

Table 2.7: Drugs as Teratogens

Teratogen	Potential Effects
Caffeine	Moderate amounts of caffeine (200 mg or around 12 ounces of coffee) appear to be safe during pregnancy. Some studies have shown a link between higher amounts of caffeine and miscarriage and preterm birth.34
Tobacco	Tobacco use has been associated with low birth weight, placenta previa, preterm delivery, fetal growth restriction, sudden infant death syndrome, cleft lip or palate, and later health problems (such as high blood pressure and diabetes). 35
Alcohol	There is no safe amount of alcohol a woman can drink while pregnant. Alcohol can slow down the baby's growth, affect the baby's brain, and cause birth defects, and may results in fetal alcohol spectrum disorder (FASD). The effects can be mild to severe. Children born with a severe form of FASD can have abnormal facial features, severe learning disabilities, behavioral problems, and other problems.36
Cocaine	Cocaine use has connected with low birth weight, stillbirths, spontaneous abortion, placental abruption, premature birth, miscarriage, and neonatal abstinence syndrome (fetal addiction leads the newborn to experiences withdrawal).37
Marijuana	No amount of marijuana has been proven safe to use during pregnancy. Heavy use has been associated with brain damage, premature birth, and stillbirth.38
Heroin	Using heroin during pregnancy can cause birth defects, placental abruption, premature birth, low birthweight, neonatal abstinence syndrome, still birth, and sudden infant death syndrome.39
Over-the-Counter (OTC) medication	Some OTC medications are safe to use during pregnancy and others may cause health problems during pregnancy. Pregnant women should consult their health care provider before using OTC medications.40
Prescription drugs	Some prescription drugs can cause birth defects that change the shape or function of one or more parts of the body that can affect overall health. Pregnant women should consult their health care provider before discontinuing or starting new medications.41
Herbal or dietary supplements	Except for some vitamins, little is known about using herbal or dietary supplements while pregnant. Most often there are no good studies to show if the herb can cause harm to you or your baby. Also, some herbs that are safe when used in small amounts as food might be harmful when used in large amounts as medicines.42

Table 2.8: Environmental Teratogens

Teratogen	Potential Effects
Lead	Exposure to high levels of lead before and during pregnancy can lead to high blood pressure, problems with fetal brain and nervous system development, premature birth, low birthweight, and miscarriage.43
Mercury	Exposure to mercury in the womb can cause brain damage and hearing and vision problems.44
Radiation	Exposure to radiation during pregnancy (especially between 2 and 18 weeks of pregnancy) can slow growth, cause birth defects, affect brain development, cause cancer, and cause miscarriage.45
Solvents	These chemicals include degreasers, paint thinners, stain and varnish removers, paints, and more Maternal inhalation of solvents can cause fetal exposure than may cause miscarriage, slow fetal growth, premature birth, and birth defects.46

Table 2.9: Maternal Infections as Teratogens

Teratogen	Potential Effects
Rubella	Congenital infection (becoming infected while in the womb) can damage the development of the eyes, ears, heart, and brain and result in deafness.47
Zika	Congenital infection can cause microcephaly and other severe brain abnormalities. 48
Varicella (chicken pox)	Congenital infection can cause a severe form of the infection affecting the eyes, limbs, skin, and central nervous system.49
Sexually transmitted infections	Infections such as HIV, gonorrhea, syphilis, and chlamydia can be passed from the mother during pregnancy and/or delivery.50
Listeria	Pregnant women are more susceptible to this food-borne illness. Congenital infection can cause miscarriage, stillbirth, premature labor, and neonatal sepsis. 51

Table 2.10: Teratogens from Animals/Pets

Teratogen	Potential Effects
Toxoplamosis	This parasite can be passed through cat feces and undercooked meat (especially pork, lamb, or deer meet). If the fetus is infected it can cause miscarriage, stillbirth, hydrocephalus, macro or microcephalus, vision issues, and damage to the nervous system.52
Lymphocytic choriomeningitis	This virus carried by rodents including mice, hamsters, and guinea pigs. If an infected mother passes it to her fetus it can cause issues with brain development, long-term neurological and/or visual impairment, and higher mortality rates after birth.53

Maternal Factors

There are additional factors that affect the outcome of pregnancy for both mother and child. Let's look at these next.



Figure **2.2.9**: A pregnant woman relaxing in a tub. (Pregnant Woman Image by Thomas Pompernigg is licensed under CC BY-SA 2.0)

Mothers over 35

Most women over 35 who become pregnant are in good health and have healthy pregnancies. However, according to the March of Dimes (2016d), women over age 35 are more likely to have an increased risk of:

- Fertility problems
- High blood pressure
- Diabetes
- Miscarriages
- Placenta Previa
- Cesarean section
- Premature birth
- Stillbirth
- A baby with a genetic disorder or other birth defects

Because a woman is born with all her eggs, environmental teratogens can affect the quality of the eggs as women get older. Also, a woman's reproductive system ages which can adversely affect the pregnancy. Some women over 35 choose special prenatal screening tests, such as a maternal blood screening, to determine if there are any health risks for the baby.

Although there are medical concerns associated with having a child later in life, there are also many positive consequences to being a more mature parent. Older parents are more confident, less stressed, and typically married, providing family stability. Their children perform better on math and reading tests, and they are less prone to injuries or emotional troubles (Albert, 2013). Women who choose to wait are often well educated and lead healthy lives. According to Gregory (2007), older women are more stable, demonstrate a stronger family focus, possess greater self-confidence, and have more money. Having a child later in one's career equals overall higher wages. In fact, for every year a woman delays motherhood, she makes 9% more in lifetime earnings. Lastly, women who delay having children actually live longer.

Teenage Pregnancy

A teenage mother is at a greater risk for having pregnancy complications including anemia, and high blood pressure. These risks are even greater for those under age 15. Infants born to teenage mothers have a higher risk for being premature and having low birthweight or other serious health problems. Premature and low birthweight babies may have organs that are not fully developed which can result in breathing problems, bleeding in the brain, vision loss, serious intestinal problems, and higher likelihood of dying. Reasons for these health issues include that teenagers are the least likely of all age groups to get early and regular prenatal care and they may engage in negative behaviors including eating unhealthy food, smoking, drinking alcohol, and taking drugs.

Gestational Diabetes

Seven percent of pregnant women develop **gestational diabetes** (March of Dimes, 2015b). Diabetes is a condition where the body has too much glucose in the bloodstream.



Figure 2.16: A gestational diabetes kit. (Kit Image by Jessica Merz is licensed under CC BY 2.0)

Most pregnant women have their glucose level tested between 24 to 28 weeks of pregnancy. Gestational diabetes usually goes away after the mother gives birth, but it might indicate a risk for developing diabetes later in life. If untreated, gestational diabetes can cause premature birth, stillbirth, the baby having breathing problems at birth, jaundice, or low blood sugar. Babies born to mothers with gestational diabetes can also be considerably heavier (more than 9 pounds) making the labor and birth process more difficult. For expectant mothers, untreated gestational diabetes can cause preeclampsia (high blood pressure and signs that the liver and kidneys may not be working properly) discussed later in the chapter.

Risk factors for gestational diabetes include age (being over age 25), being overweight or gaining too much weight during pregnancy, family history of diabetes, having had gestational diabetes with a prior pregnancy, and race and ethnicity (African-American, Native American, Hispanic, Asian, or Pacific Islander have a higher risk). Eating healthy and maintaining a healthy weight during pregnancy can reduce the chance of gestational diabetes. Women who already have diabetes and become pregnant need to attend all their prenatal care visits, and follow the same advice as those for women with gestational diabetes as the risk of preeclampsia, premature birth, birth defects, and stillbirth are the same.

High Blood Pressure (Hypertension)

Hypertension is a condition in which the pressure against the wall of the arteries becomes too high. There are two types of high blood pressure during pregnancy, gestational and chronic. Gestational hypertension only occurs during pregnancy and goes away after birth. Chronic high blood pressure refers to women who already had hypertension before the pregnancy or to those who developed it during pregnancy and it did not go away after birth.



Figure 2.17: A woman having her blood pressure taken. (Image by rawpixel on Unsplash)

According to the March of Dimes (2015c), about 8 in every 100 pregnant women have high blood pressure. High blood pressure during pregnancy can cause premature birth and low birth weight (under five and a half pounds), placental abruption, and mothers can develop preeclampsia.

Rh Disease

Rh is a protein found in the blood. Most people are Rh positive, meaning they have this protein. Some people are Rh negative, meaning this protein is absent. Mothers who are Rh negative are at risk of having a baby with a form of anemia called Rh disease (March of Dimes, 2009). A father who is Rh-positive and mother who is Rh-negative can conceive a baby who is Rh-positive. Some of the fetus's blood cells may get into the mother's bloodstream and her immune system is unable to recognize the Rh factor.

The immune system starts to produce antibodies to fight off what it thinks is a foreign invader. Once her body produces immunity, the antibodies can cross the placenta and start to destroy the red blood cells of the developing fetus. As this process takes time, often the first Rh positive baby is not harmed, but as the mother's body will continue to produce antibodies to the Rh factor across her lifetime, subsequent pregnancies can pose greater risk for an Rh positive baby. In the newborn, Rh disease can lead to jaundice, anemia, heart failure, brain damage and death.

Weight Gain during Pregnancy

According to March of Dimes (2016f), during pregnancy most women need only an additional 300 calories per day to aid in the growth of the fetus. Gaining too little or too much weight during pregnancy can be harmful. Women who gain too little may have a baby who is low-birth weight, while those who gain too much are likely to have a premature or large baby. There is also a greater risk for the mother developing preeclampsia and diabetes, which can cause further problems during the pregnancy.

The table below shows the healthy weight gain during pregnancy. Putting on the weight slowly is best. Mothers who are concerned about their weight gain should talk to their health care provider.

Table 2.10: Weight Gain during Pregnancy

If you were a healthy weight before pregnancy:	If you were underweight before pregnancy:	If you were overweight before pregnancy:	If you were obese before pregnancy:
• Gain 25-35 pounds • 1-4½ pounds in the 1st trimester • 1 pound per week in the 2nd and 3rd trimesters	• Gain 28-30 pounds • 1-4½ pounds in the 1st trimester • A little more than 1 pound per week thereafter	• Gain 12-25 pounds • 1-4½ pounds in the 1st trimester • A little more than ½ pound per week in 2nd and 3rd trimesters	• 11-20 pounds • 1-4½ pounds in the 1st trimester • A little more than ½ pound per week in 2nd and 3rd trimesters

Mothers of twins or higher order multiples need to gain more in each category listed above.

Stress

Feeling stressed is common during pregnancy, but high levels of stress can cause complications including having a premature baby or a low-birthweight baby. Babies born early or too small are at an increased risk for health problems. Stress-related hormones may cause these complications by affecting a woman's immune systems resulting in an infection and premature birth. Additionally, some women deal with stress by smoking, drinking alcohol, or taking drugs, which can lead to problems in the pregnancy. High levels of stress in pregnancy have also been correlated with problems in the baby's brain development and immune system functioning, as well as childhood problems such as trouble paying attention and being afraid (March of Dimes, 2012b).

Depression

Depression is a significant medical condition in which feelings of sadness, worthlessness, guilt, and fatigue interfere with one's daily functioning. Depression can occur before, during, or after pregnancy, and 1 in 7 women are treated for depression sometime between the year before pregnancy and year after pregnancy (March of Dimes, 2015a). Women who have experienced depression previously are more likely to have depression during pregnancy. Consequences of depression include the baby being born premature, having a low birthweight, being more irritable, less active, less attentive, and having fewer facial expressions.

About 13% of pregnant women take an antidepressant during pregnancy. It is important that women taking antidepressants during pregnancy discuss the medication with a health care provider as some medications can cause harm to the developing organism.

Paternal Impact

The age of fathers at the time of conception is also an important factor in health risks for children. According to Nippoldt (2015), offspring of men over 40 faces an increased risk of miscarriages, autism, birth defects, achondroplasia (bone growth disorder) and schizophrenia. These increased health risks are thought to be due to accumulated chromosomal aberrations and mutations during the maturation of sperm cells in older men (Bray, Gunnell, & Smith, 2006). However, like older women, the overall risks are small.

In addition, men are more likely than women to work in occupations where hazardous chemicals, many of which have teratogenic effects or may cause genetic mutations, are used (Cordier, 2008). These may include petrochemicals, lead, and pesticides that can cause normal sperm and lead to miscarriages or diseases. Men are also more likely to be a source of second hand smoke for their developing offspring. As noted earlier, smoking by either the mother or around the mother can hinder prenatal development. 57



Figure 2.18: A USDA employee pouring hazardous chemicals into a storage container. (Image by USDA is in the public domain)

Prenatal Assessment

A number of assessments are suggested to women as part of their routine prenatal care to find conditions that may increase the risk of complications for the mother and fetus (Eisenberg, Murkoff, & Hathaway, 1996). These can include blood and urine analyses and screening and diagnostic tests for birth defects.



Figure 2.19: A woman receiving an ultrasound. (Image by MedicalPrudens is licensed under CC0 1.0)

Ultrasound is one of the main screening tests done in combination with blood tests. The ultrasound is a test in which sound waves are used to examine the fetus. There are two general types. Transvaginal ultrasounds are used in early pregnancy, while transabdominal ultrasounds are more common and used after 10 weeks of pregnancy (typically, 16 to 20 weeks).

Ultrasounds are used to check the fetus for defects or problems. It can also find out the age of the fetus, location of the placenta, fetal position, movement, breathing and heart rate, amount of amniotic fluid in the uterus, and number of fetuses. Most women have at least one ultrasound during pregnancy, but if problems are noted, additional ultrasounds may be recommended.

When diagnosis of a birth defect is necessary, ultrasounds help guide the more invasive diagnostic tests of amniocentesis and chorionic villus sampling. **Amniocentesis** is a procedure in which a needle is used to withdraw a small amount of amniotic fluid and cells from the sac surrounding the fetus and later tested.

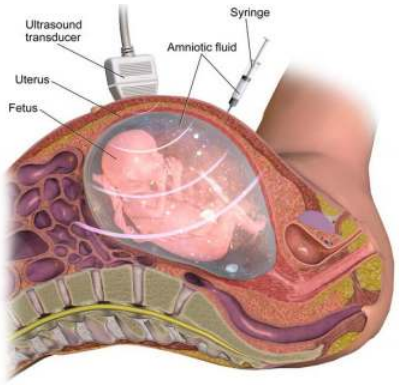


Figure 2.20: Amniocentesis. (Image by BruceBlaus is licensed under CC BY-SA 4.0)

Chorionic Villus Sampling is a procedure in which a small sample of cells is taken from the placenta and tested. Both amniocentesis and chorionic villus sampling have a risk of miscarriage, and consequently, they are not done routinely. 61

Complications of Pregnancy

There are a number of common side effects of pregnancy. Not everyone experiences all of these, nor to the same degree. And although they are considered "minor", this is not to say that these problems are not potentially very uncomfortable. These side

effects include nausea (particularly during the first 3-4 months of pregnancy as a result of higher levels of estrogen in the system), heartburn, gas, hemorrhoids, backache, leg cramps, insomnia, constipation, shortness of breath or varicose veins (as a result of carrying a heavy load on the abdomen). These are minor issues.

But there are also serious complications of pregnancy which can pose health risks to mother and child and that often require hospitalization.

Hyperemesis gravidarum is characterized by severe nausea, vomiting, weight loss, and possibly dehydration. Signs and symptoms may also include vomiting many times a day and feeling faint. The exact causes of hyperemesis gravidarum are unknown. Risk factors include the first pregnancy, multiple pregnancy, obesity, prior or family history of HG, trophoblastic disorder, and a history of eating disorders. Treatment includes drinking fluids and a bland diet. Medication, intravenous fluids, and hospitalization may be required. Hyperemesis gravidarum is estimated to affect 0.3–2.0% of pregnant women. Those affected have a low risk of miscarriage but a higher risk of premature birth.

Ectopic Pregnancy occurs when the zygote becomes attached to the fallopian tube before reaching the uterus. About 1 in 50 pregnancies in the United States are tubal pregnancies and this number has been increasing because of the higher rates of pelvic inflammatory disease and Chlamydia (Carroll, 2007). Abdominal pain, vaginal bleeding, nausea and fainting are symptoms of ectopic pregnancy.



Figure 2.21: An ectopic pregnancy. (Image by Takatakatakumi is licensed under CC BY-SA 3.0)

Spontaneous abortion is experienced in an estimated 20-40 percent of undiagnosed pregnancies and in another 10 percent of diagnosed pregnancies. Usually the body aborts due to chromosomal abnormalities, and this typically happens before the 12th week of pregnancy. Cramping and bleeding result and normal periods return after several months. Some women are more likely to have repeated miscarriages due to chromosomal, amniotic, or hormonal problems, but miscarriage can also be a result of defective sperm (Carrell et. al., 2003).

Preeclampsia, also known as **Toxemia**, is characterized by a sharp rise in blood pressure, a leakage of protein into the urine as a result of kidney problems, and swelling of the hands, feet, and face during the third trimester of pregnancy. Preeclampsia is the most common complication of pregnancy. When preeclampsia causes seizures, the condition is known as eclampsia, which is the second leading cause of maternal death in the United States. Preeclampsia is also a leading cause of fetal complications, which include low birth weight, premature birth, and stillbirth. Treatment is typically bed rest and sometimes medication. If this treatment is ineffective, labor may be induced.

Maternal Mortality: Approximately 1000 women die in childbirth around the world each day (World Health Organization, 2010). Rates are highest in Sub-Saharan Africa and South Asia, although there has been a substantial decrease in these rates. The campaign to make childbirth safe for everyone has led to the development of clinics accessible to those living in more isolated areas and training more midwives to assist in childbirth.63

Infertility and Building Families

Infertility

When a couple has failed to conceive a child in a year, they receive the diagnosis of infertility. Infertility affects about 10 to 15 percent of couples in the United States (Mayo Clinic, 2015). Male factors create infertility in about a third of the cases. For men, the most common cause is a lack of sperm production or low sperm production.

Female factors cause infertility in another third of cases. For women, one of the most common causes of infertility is the failure to ovulate. Another cause of infertility in women is Pelvic Inflammatory Disease (PID), which is an infection of a woman's reproductive organs (Carroll, 2007).

Both male and female factors contribute to the remainder of cases of infertility. 64

Options for Building Families

There are numerous options to pursue parenthood and building families. Let's briefly explore some of these.

Assisted Reproductive Technology Assisted reproductive technology (ART) is the technology used to achieve pregnancy in procedures such as fertility medication (to stimulate ovulation), surgical procedures, artificial insemination IUI), in vitro fertilization (IVF) and surrogacy. These options are available for people who are experiencing infertility or cannot conceive children naturally (which also includes single parents, and gay/lesbian couples). 65

***Intrauterine insemination*:** (IUI) as a type of artificial insemination involves the placement of sperm directly into the uterus at the time of ovulation, either in a natural menstrual cycle or following ovarian stimulation. 66

In vitro fertilization (IVF): IVF generally starts with stimulating the ovaries to increase egg production. Most fertility medications are agents that stimulate the development of follicles in the ovary. Examples are gonadotropins and gonadotropin releasing hormone. After stimulation, the physician surgically extracts one or more eggs from the ovary, and unites them with sperm in a laboratory setting, with the intent of producing one or more embryos. Fertilization takes place outside the body, and the fertilized egg is reinserted into the woman's reproductive tract, in a procedure called embryo transfer. 67



Figure 2.22: The IVF process. (Image by Manu5 is licensed under CC BY-SA 4.0)

Donor Gametes & Embryos: People can also use sperm, ova (eggs), and embryos from donors in conjunction with ART. These donations take place through agencies and donor banks or between private individuals. In the U.S., donors can be compensated for their donations.

Surrogacy: In surrogacy, one woman (surrogate mother) carries a child for another person/s (commissioning person/couple), based on a legal agreement before conception requiring the child to be relinquished to the commissioning person/couple following birth. There are different types of surrogacy which relate to whether or not the ova used to conceive the child are her own (**traditional surrogacy**) or not (**gestational surrogacy**). 69

Adoption: People can also choose to pursue **adoption** to build their families (with or without experiencing infertility). Adoption can take place through the foster care system, privately, or through agencies. Adoptions can be domestic (within the U.S.) or international. And they can be open (with differing amounts of contact between biological/birth families and adoptive families) or closed.

Family Built with Surrogacy



Figure 2.23: This same-sex couple used a surrogate. (Photo by Daryn Crawford used with permission)

Family Built through Adoption



Figure 2.24: This single mother adopted her daughter. (Photo by Michaela Szidloski used with permission)

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2.S: Summary

In this chapter we looked at:

- Heredity, including genetic disorders and chromosomal abnormalities
- Conception
- The germinal, embryonic, and fetal stages of prenatal development
- Influences on prenatal development including teratogens and maternal and paternal factors
- Complications of pregnancy
- Infertility and options for building families

Now let’s explore birth and the newborn baby.

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CHAPTER OVERVIEW

3: Birth and the Newborn

Learning Objectives

After this chapter, you should be able to:

- Compare and contrast different methods of childbirth preparation.
- Describe the stages of vaginal delivery.
- Explain why induction or Caesarean section may be necessary.
- Differentiate the common procedures for assessing the condition of the newborn.
- Examine problems newborns experience before, during, and after birth.

After around 266 days of developing inside the womb (for a full-term pregnancy), comes the arduous process of childbirth. After birth, newborns have to regulate their own body temperature, breathe for themselves, and take in all of their nutrition through feeding. Let's look at both the process of birth and some attributes of the newborn.

3.1: Preparing for Childbirth

3.2: Childbirth

3.3: The Newborn

3.S: Summary

Thumbnail: pixabay.com/photos/baby-slee...y-girl-784608/

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3.1: Preparing for Childbirth

Prepared childbirth refers to being not only in good physical condition to help provide a healthy environment for the baby to develop, but also helping individuals to prepare to accept their new roles as parents. Additionally, parents can receive information and training that will assist them for delivery and life with the baby. The more future parents can learn about childbirth and the newborn, the better prepared they will be for the adjustment they must make to a new life.

Approaches to Childbirth

There are many different approaches to childbirth that influence how expectant parents prepare. The following table describes a few of these:

Table **3.1.1**: Approaches to Childbirth (Lifespan Development: A Psychological Perspective (page 59) by Martha Lally and Suzanne Valentine-French is licensed under CC BY-NC-SA 3.0; Lifespan Development - Module 3: Prenatal Development by Lumen Learning references Psyc 200 Lifespan Psychology by Laura Overstreet, licensed under CC BY 4.0)

Method	Description
The Lamaze Method	The emphasis of this method is on teaching the woman to be in control in the process of delivery. It includes learning muscle relaxation, breathing through contractions, having a focal point (usually a picture to look at) during contractions and having a support person who goes through the training process with the mother and serves as a coach during delivery.
The Leboyer Method	This method involves giving birth in a quiet, dimly lit room and allowing the newborn to lie on the mother's stomach with the umbilical cord intact for several minutes while being given a warm bath.
Dick-Read Method / Mongan Method / Hypnobirthing	This method comes from the suggestion that the fear of childbirth increases tension and makes the process of childbearing more painful. It emphasizes the use of relaxation and proper breathing with contractions as well as family support and education.
Bradley Method	"The Bradley Method focuses on preparing the mother for a natural childbirth coached by her partner. They learn techniques to reduce the perception of pain and stay relaxed. The emphasis is on being prepared for an unassisted vaginal birth without medication." 2
Alexander Technique	This is a technique that can be used during childbirth that involves training to stop habitual reactions to pain, such as tensing muscles and increase conscious awareness and control over posture and movement. This involves being able to move freely and stay upright during labor and using body positioning that is beneficial to the labor process.3
Waterbirth	Involves immersion in warm water. Proponents believe this method is safe and provides many benefits for both mother and infant, including pain relief and a less traumatic birth experience for the baby. However, critics argue that the procedure introduces unnecessary risks to the infant such as infection and water inhalation.4
Lotus Birth	Or umbilical cord nonseverance – UCNS, is the practice of leaving the umbilical cord uncut after childbirth so that the baby is left attached to the placenta until the cord naturally separates at the umbilicus. This usually occurs within 3–10 days after birth. The practice is performed mainly for spiritual purposes of the parents, including for the perceived spiritual connection between placenta and newborn.5
Silent Birth	Sometimes known as quiet birth, is a birthing procedure advised by L. Ron Hubbard and advocated by Scientologists in which "everyone attending the birth should refrain from spoken words as much as possible." 6
Medicated Childbirth	Health care providers can provide pain relief during labor with different types of medication, including epidurals, spinal blocks, combined spinal-epidurals, and systemic and local analgesia. There are benefits and side effects of each.7



Figure **3.1.1**: Expectant parents in a childbirth preparation class. (Image by liz.schrenk is licensed under CC BY-NC-ND 2.0)

Choosing Location of Childbirth & Who Will Deliver

The vast majority of births occur in a hospital setting. However, one percent of women choose to deliver at home (Martin, Hamilton, Osterman, Curtin, & Mathews, 2015). Women who are at low risk for birth complications can successfully deliver at home. More than half (67%) of home deliveries are by certified nurse midwives. Midwives are trained and licensed to assist in delivery and are far less expensive than the cost of a hospital delivery. However, because of the potential for a complication during the birth process, most medical professionals recommend that delivery take place in a hospital. In addition to home births, one-third of out-of-hospital births occur in freestanding clinics, birthing centers, in physician's offices, or other locations.

Contributors and Attributions

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3.2: Childbirth

Onset of Labor

Childbirth typically occurs within a week of a woman's due date, unless the woman is pregnant with more than one fetus, which usually causes her to go into labor early. As a pregnancy progresses into its final weeks, several physiological changes occur in response to hormones that trigger labor.

A common sign that labor is beginning is the so-called "bloody show." During pregnancy, a plug of mucus accumulates in the cervical canal, blocking the entrance to the uterus. Approximately 1–2 days prior to the onset of true labor, this plug loosens and is expelled, along with a small amount of blood.

As labor nears, the mothers' pituitary gland produces oxytocin. This begins to stimulate stronger, more painful uterine contractions, which—in a positive feedback loop—stimulate the secretion of prostaglandins from fetal membranes. Like oxytocin, prostaglandins also enhance uterine contractile strength. The fetal pituitary gland also secretes oxytocin, which increases prostaglandins even further.

And the stretching of the cervix by a full-term fetus in the head-down position is regarded as a stimulant to uterine contractions. Combined, these stimulate true labor. 10

Stages of Birth for Vaginal Delivery

The First Stage

Uterine contractions signify that the first stage of labor has begun. These contractions may initially last about 30 seconds and be spaced 15 to 20 minutes apart. These increase in duration and frequency to more than a minute in length and about 3 to 4 minutes apart. Typically, doctors advise that they be called when contractions are coming about every 5 minutes. Some women experience false labor or Braxton-Hicks Contractions, especially with the first child. These may come and go. They tend to diminish when the mother begins walking around. Real labor pains tend to increase with walking. In one out of 8 pregnancies, the amniotic sac or water in which the fetus is suspended may break before labor begins. In such cases, the physician may induce labor with the use of medication if it does not begin on its own in order to reduce the risk of infection. Normally this sac does not rupture until the later stages of labor.

The first stage of labor is typically the longest. During this stage the cervix or opening to the uterus dilates to 10 centimeters or just under 4 inches. This may take around 12-16 hours for first children or about 6-9 hours for women who have previously given birth. Labor may also begin with a discharge of blood or amniotic fluid.

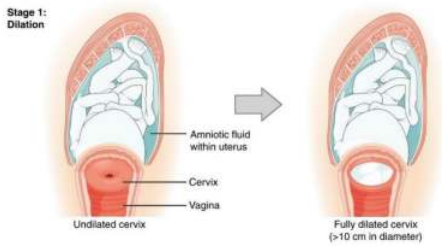


Figure **3.2.1**: Early cervical dilation. (Dilation Image by OpenStax is licensed under CC BY 3.0)

The Second Stage

The passage of the baby through the birth canal is the second stage of labor. This stage takes about 10-40 minutes. Contractions usually come about every 2-3 minutes. The mother pushes and relaxes as directed by the medical staff. Normally the head is delivered first. The baby is then rotated so that one shoulder can come through and then the other shoulder. The rest of the baby quickly passes through. At this stage, an episiotomy, or incision made in the tissue between the vaginal opening and anus, may be performed to avoid tearing the tissue of the back of the vaginal opening (Mayo Clinic, 2016). The baby's mouth and nose are suctioned out. The umbilical cord is clamped and cut. 12

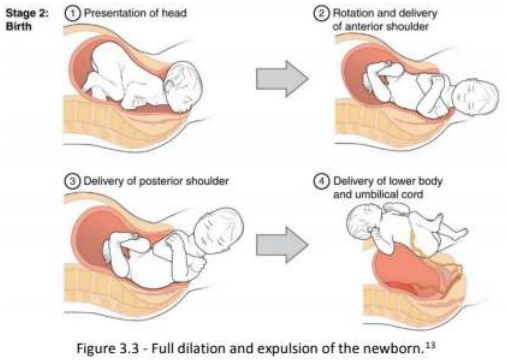


Figure 3.3 - Full dilation and expulsion of the newborn.[13]

Figure **3.2.2**: Full dilation and expulsion of the newborn. (Expulsion Image by OpenStax is licensed under CC BY 3.0)

The Third Stage

The third and final stage of labor is relatively painless. During this stage, the placenta or afterbirth is delivered. This is typically within 20 minutes after delivery. If an episiotomy was performed it is stitched up during this stage. 14

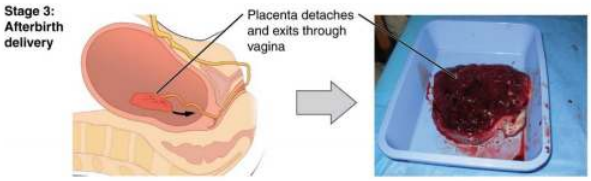


Figure **3.2.3**: delivery of the placenta and associated fetal membranes. (Placenta Image by OpenStax is licensed under CC BY 3.0)

Additional Considerations

More than 50% of women giving birth at hospitals use an epidural anesthesia during delivery (American Pregnancy Association, 2015). An epidural block is a regional analgesic that can be used during labor and alleviates most pain in the lower body without slowing labor. The epidural block can be used throughout labor and has little to no effect on the baby. Medication is injected into a small space outside the spinal cord in the lower back. It takes 10 to 20 minutes for the medication to take effect. An epidural block with stronger medications, such as anesthetics, can be used shortly before a Cesarean Section or if a vaginal birth requires the use of forceps or vacuum extraction. 16

Women giving birth can also receive other pain medications (although medications given through injection can have negative side effects on the baby). In emergency situations (such as the need for a C-section), women may be given general anesthesia. They can also choose not to utilize any pain medications. That is often referred to as **natural childbirth**.



Figure **3.2.4**: Natural childbirth. (Childbirth Image by U.S. Army Alaska is licensed under CC BY 2.0)

Women can also use alternate positions (including standing, squatting, being on hands and knees, and using a birthing stool) and laboring, and even delivering in tubs of warm water to help relieve the pain of childbirth.

Medical Interventions in Childbirth

Sometimes women cannot go into labor on their own and/or deliver vaginally. Let's look at induction of labor and Cesarean Sections.

Sometimes a baby's arrival may need to be induced before labor begins naturally. **Induction of labor** may be recommended for a variety of reasons when there is concern for the health of the mother or baby. For example:

- The mother is approaching two weeks beyond her due date and labor has not started naturally
- The mother's water has broken, but contractions have not begun
- There is an infection in the mother's uterus
- The baby has stopped growing at the expected pace
- There is not enough amniotic fluid surrounding the baby
- The placenta peels away, either partially or completely, from the inner wall of the uterus before delivery
- The mother has a medical condition that might put her or her baby at risk, such as high blood pressure or diabetes (Mayo Clinic, 2014).

A Cesarean Section (C-section) is surgery to deliver the baby by being removed through the mother's abdomen. In the United States, about one in three women have their babies delivered this way (Martin et al., 2015). Most C-sections are done when problems occur during delivery unexpectedly. These can include:

- Health problems in the mother
- Signs of distress in the baby
- Not enough room for the baby to go through the vagina
- The position of the baby, such as a breech presentation where the head is not in the downward position.



Figure **3.2.5**: A woman receiving a C-section. (Image by Tammra M is licensed under CC BY 2.0)



Figure **3.2.6**: A baby being delivered by C-section. (C-section Image by Patricia Prudente on Unsplash)

C-sections are also more common among women carrying more than one baby. Although the surgery is relatively safe for mother and baby, it is considered major surgery and carries health risks. Additionally, it also takes longer to recover from a C-section than from vaginal birth. After healing, the incision may leave a weak spot in the wall of the uterus. This could cause problems with an attempted vaginal birth later. In the past, doctors were hesitant to allow a vaginal birth after a C-section. However, now more than half of women who have a C-section go on to have a vaginal birth later. 20 This is referred to as a **Vaginal Birth After Cesarean (VBAC)**.

Contributors and Attributions

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3.3: The Newborn



Figure **3.3.1**: A new mother holding her newborn. (Mom Holding Newborn Image by the U.S. Air Force Nellis Base is in the public domain)

Assessing the Newborn

The **Apgar assessment** is conducted one minute and five minutes after birth. This is a very quick way to assess the newborn's overall condition. Five measures are assessed: Heart rate, respiration, muscle tone (assessed by touching the baby's palm), reflex response (the Babinski reflex is tested), and color. A score of 0 to 2 is given on each feature examined. An Apgar of 5 or less is cause for concern. The second Apgar should indicate improvement with a higher score. 22

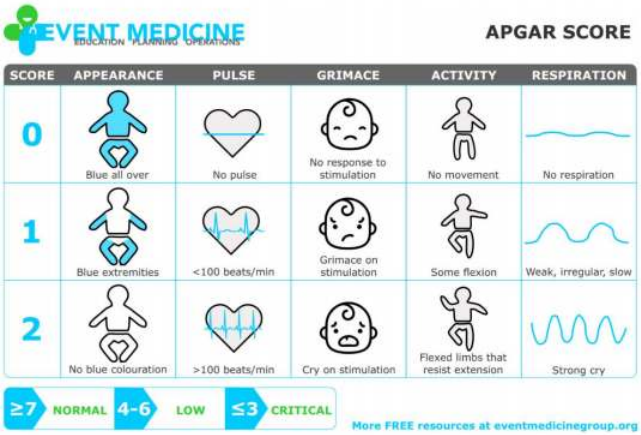


Figure **3.3.2**: The Apgar assessment. (Apgar Image by Event Medicine Group)

Another way to assess the condition of the newborn is the Neonatal Behavioral Assessment Scale (NBAS). The baby's motor development, muscle tone, and stress response are assessed. This tool has been used around the world to further assess the newborn, especially those with low Apgar scores, and to make comparisons of infants in different cultures (Brazelton & Nugent, 1995).

Newborns are also routinely screened for different conditions. Within the first 24 to 48 hours after birth, babies born in hospitals undergo a simple heel stick and a few drops of blood are collected on a special paper card. Providers test those dried blood spots for a variety of different congenital disorders, or conditions that are present when the baby is born. In California, newborns are now screened for 80 different genetic and congenital disorders.



Figure **3.3.3**: A medical professional performing the heel stick test. (Image by the U.S. Air Force is in the public domain)

Newborns are also screened for hearing disorders and certain serious heart problems using methods other than dried blood spots. 25

Problems of the Newborn

Anoxia

Anoxia is a temporary lack of oxygen to the brain. Difficulty during delivery may lead to anoxia which can result in brain damage or in severe cases, death. Babies who suffer both low birth weight and anoxia are more likely to suffer learning disabilities later in life as well.

Low Birth Weight

A child is considered low birth weight if he or she weighs less than 5 pounds 8 ounces (2500 grams). About 8.2 percent of babies born in the United States are of low birth weight (Center for Disease Control, 2015a). Sixty-seven percent of these babies are also preterm.

A low birth weight baby has difficulty maintaining adequate body temperature because it lacks the fat that would otherwise provide insulation. Such a baby is also at more risk for infection. Very low birth weight babies (2 pounds or less) have an increased risk of developing cerebral palsy. Many causes of low birth weight are preventable with proper prenatal care.

Preterm

A newborn might also have a **low birth weight** if it is born at less than 37 weeks gestation, which qualifies it as a **preterm baby** (CDC, 2015c). Early birth can be triggered by anything that disrupts the mother's system. For instance, vaginal infections can lead to premature birth because such infection causes the mother to release anti-inflammatory chemicals which, in turn, can trigger contractions. Smoking and the use of other teratogens can lead to preterm birth. A significant consequence of preterm birth includes respiratory distress syndrome, which is characterized by weak and irregular breathing (see the image below). Premature babies often cannot yet regulate their own temperature or feed by nursing or bottle. They may struggle to regulate their heart rate effectively and may experience jaundice. They often require care in the Neonatal Intensive Care Unit (NICU) until they are as healthy as a full-term baby.



Figure **3.3.4**: a premature baby on CPAP in the NICU. (Photo by Jennifer Paris used with permission)

Small-for-Date Infants

Infants that have birth weights that are below expectation based on their gestational age are referred to as **small-for-date**. These infants may be full term or preterm (see image below), but still weigh less than 90% of all babies of the same gestational age. This is a very serious situation for newborns as their growth was adversely affected. Regev et al. (2003) found that small-for-date infants died at rates more than four times higher than other infants.



Figure **3.3.5**: This baby was born at 32 weeks and only weighed 2 pounds and 15 ounces. (Photo by Jennifer Paris used with permission)

Postmature

When babies are not born by 42 weeks gestation, or two weeks after their due date, they are considered overdue or **postmature**. There are some concerns about how long the placenta can function and most doctors will consider induction for overdue babies.

Stillborn

When a fetus (unborn baby) dies while still inside the mother (after 20-24 weeks gestation) or dies during delivery (childbirth). It is said that the delivered baby is stillborn. The causes of many stillbirths are unknown, even when special tests are done to learn the cause. Possible causes include: nicotine, alcohol, or drugs taken by the mother during pregnancy, physical trauma, radiation poisoning, Rh disease, and umbilical cord problems. The number of stillbirths in the United States is about 1 in 115 births, which is about 26,000 a year, or one every 20 minutes. 28

Characteristics of Newborns

Size

The average newborn in the United States weighs about 7.5 pounds and is about 20 inches in length. For the first few days of life, infants typically lose about 5 percent of their body weight as they eliminate waste and get used to feeding. This often goes unnoticed by most parents, but can be cause for concern for those who have a smaller infant. This weight loss is temporary, however, and is followed by a rapid period of growth.



Figure **3.3.6**: A newborn being weighed. (Newborn on Scale Image by Trei Brundrett is licensed under CC BY-SA 2.0)

Body Proportions

The head initially makes up about 50 percent of our entire length when we are developing in the womb. At birth, the head makes up about 25 percent of our length (think about how much of your length would be head if the proportions were still the same!).

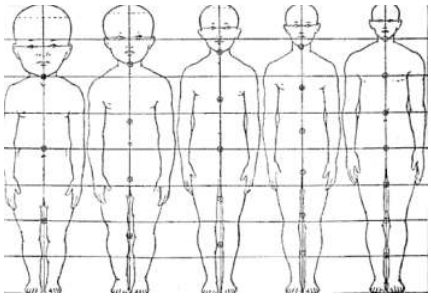


Figure **3.3.7**: Body proportions from infancy to adulthood. (Image is in the public domain)

Brain Development

Some of the most dramatic physical change that occurs during this period is in the brain. At birth, the brain is about 25 percent its adult weight and this is not true for any other part of the body. While most of the brain's 100 to 200 billion neurons are present at birth, they are not fully mature. During the next several years dendrites or connections between neurons will undergo a period of transient exuberance or temporary dramatic growth. 31

Appearance at Birth

During labor and birth, the infant's skull changes shape to fit through the birth canal, sometimes causing the child to be born with a misshapen or elongated head. It will usually return to normal on its own within a few days or weeks.

Some newborns have a fine, downy body hair called lanugo. It may be particularly noticeable on the back, shoulders, forehead, ears and face of premature infants. Lanugo disappears within a few weeks. Likewise, not all infants are born with lush heads of hair. Some may be nearly bald while others may have very fine, almost invisible hair. Some babies are even born with a full head of hair. Amongst fair-skinned parents, this fine hair may be blond, even if the parents are not. The picture on the left shows lanugo on the shoulders of newborn twins.



Figure **3.3.8**: Lanugo on the shoulder and back of twin girls. (Image is in the public domain)



Figure **3.3.9**: A newborn baby covered in vernix. (Vernix Image by Upsilon Andromedae is licensed under CC BY 2.0)

Immediately after birth, a newborn's skin is often grayish to dusky blue in color. As soon as the newborn begins to breathe, usually within a minute or two, the skin's color returns to its normal tone. Newborns are wet, covered in streaks of blood, and coated with a white substance known as **vernix**, which is thought to act as an antibacterial barrier, seen in the picture on the right.

The scalp may also be temporarily bruised or swollen, especially in hairless newborns, and the area around the eyes may be puffy.

The newborn may also have Mongolian spots (blue or blue black birthmark on the lower back), various other birthmarks, or peeling skin, particularly on the wrists, hands, ankles, and feet. 34

A newborn's genitals are enlarged and reddened, with male infants having an unusually large scrotum. The breasts may also be enlarged, even in male infants. This is caused by naturally-occurring maternal hormones and is a temporary condition.

The umbilical cord of a newborn is bluish-white in color. After birth, the umbilical cord is normally cut, leaving a 1–2 inch stub. The umbilical stub will dry out, shrivel, darken, and spontaneously fall off within about 3 weeks. Occasionally, hospitals may apply triple dye to the umbilical stub to prevent infection, which may temporarily color the stub and surrounding skin purple.



Figure **3.3.10**: The clamping and cutting of a newborn's umbilical cord. (Umbilical Cord Image by NNethala is licensed under CC BY-SA 3.0)

Newborns lose many of the above physical characteristics quickly. Thus older babies look very different. While older babies are considered "cute," newborns can be "unattractive" by the same criteria and first time parents may need to be educated in this regard. 36

Sleep

A newborn typically sleeps approximately 16.5 hours per 24-hour period. The infant sleeps in several periods throughout the day and night, which means they wake often throughout the day and night. (Salkind, 2005). 37



Figure **3.3.11**: An older newborn baby. (Sleeping Baby Image by brytny.com on Unsplash)

Reflexes

Newborns are equipped with a number of **reflexes**, which are involuntary movements in response to stimulation. Some of the more common reflexes, such as the sucking reflex and rooting reflex, are important to feeding. The grasping and stepping reflexes are eventually replaced by more voluntary behaviors. Within the first few months of life these reflexes disappear, while other reflexes, such as the eye-blink, swallowing, sneezing, gagging, and withdrawal reflex stay with us as they continue to serve important functions. 39

Sensory Capacities

Throughout much of history, the newborn was considered a passive, disorganized being who possessed minimal abilities. However, current research techniques have demonstrated just how developed the newborn is with especially organized sensory and perceptual abilities.

Vision

The womb is a dark environment void of visual stimulation. Consequently, vision is the most poorly developed sense at birth and time is needed to build those neural pathways between the eye and the brain. Newborns typically cannot see further than 8 to 16 inches away from their faces, and their visual acuity is about 20/400, which means that an infant can see something at 20 feet that an adult with normal vision could see at 400 feet. Thus, the world probably looks blurry to young infants.



Figure **3.3.12**: A newborn gazing up at a parent. (Newborn Gazing Image is in the public domain)

Hearing

The infant's sense of hearing is very keen at birth, and the ability to hear is evidenced as soon as the 7th month of prenatal development. In fact, an infant can distinguish between very similar sounds as early as one month after birth and can distinguish between a familiar and unfamiliar voice even earlier. Infants are especially sensitive to the frequencies of sounds in human speech and prefer the exaggeration of infant-directed speech, which will be discussed later. Newborns also prefer their mother's voices over another female when speaking the same material (DeCasper & Fifer, 1980). Additionally, they will register in utero specific information heard from their mother's voice. 41

Early Hearing

DeCasper and Spence (1986) tested 16 infants whose mothers had previously read to them prenatally. The mothers read several passages to their fetuses, including the first 28 paragraphs of The Cat in the Hat, beginning when they were 7 months pregnant. The fetuses had been exposed to the stories on average of 67 times or 3.5 hours.

During the testing, the infants were able to choose between recordings of two stories, one of which was a story their mothers read to them while in the womb, based on how fast they sucked on their pacifiers. They showed a preference for the stories that their mothers read to them while in the womb. 42



Figure **3.3.13**: A collection of children's books. (Image by kamiel79 on pixabay)

Touch and Pain

Immediately after birth, a newborn is sensitive to touch and temperature, and is also highly sensitive to pain, responding with crying and cardiovascular responses (Balaban & Reisenauer, 2013). Newborns who are circumcised, which is the surgical removal of the foreskin of the penis, without anesthesia experience pain as demonstrated by increased blood pressure, increased heart rate, decreased oxygen in the blood, and a surge of stress hormones (United States National Library of Medicine, 2016). Research has demonstrated that infants who were circumcised without anesthesia experienced more pain and fear during routine childhood vaccines. Fortunately, many circumcisions are now done with the use of local anesthetics.

Taste and Smell

Studies of taste and smell demonstrate that babies respond with different facial expressions, suggesting that certain preferences are innate. Newborns can distinguish between sour, bitter, sweet, and salty flavors and show a preference for sweet flavors. Newborns also prefer the smell of their mothers. An infant only 6 days old is significantly more likely to turn toward its own mother's breast pad than to the breast pad of another baby's mother (Porter, Makin, Davis, & Christensen, 1992), and within hours of birth an infant also shows a preference for the face of its own mother (Bushnell, 2001; Bushnell, Sai, & Mullin, 1989).

Infants seem to be born with the ability to perceive the world in an intermodal way; that is, through stimulation from more than one sensory modality. For example, infants who sucked on a pacifier with a smooth surface preferred looking at visual models of a pacifier with a smooth surface. But those that were given a pacifier with a textured surface preferred to look at a visual model of a pacifier with a textured surface. 44



Figure **3.3.14**: A baby sucking on a pacifier. (Image by Beeki is licensed under CC0 1.0)

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3.S: Summary

In this chapter we looked at:

- methods of childbirth preparation
- the process of childbirth (for both vaginal and Cesarean deliveries)
- assessing newborn health
- problems for the newborn
- characteristics of newborns (including appearance, reflexes, and perceptual abilities)

In the next three chapters we will explore the first three years of life more. Many rapid changes occur during these foundational years.

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CHAPTER OVERVIEW

4: Overview of Physical Development

4.1: Introduction
4.2: Growth in Body Weight
4.3: Growth in Body Length/Height
4.4: Growth in Head Circumference
4.5: Worldwide Variation in Human Growth
4.6: Conclusion
4.7: References

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4.1: Introduction

Introduction to Physical Development

Infants and toddlers go through tremendous physical growth during the first three years. From the increases in weight and height that support their motor development to the increases in head circumference that represent their rapid brain growth. Figure **4.1.1** depicts the physical changes within the first three months and Figure **4.1.2** depicts the physical changes from 12 to 36 months. This section will explain the weight, length/height and head circumference growth of infants and toddlers, examining important patterns and differences.



Figure **4.1.1**: Children at different ages within the first year. (Images adapted from Unsplash)



Figure **4.1.2**: Children at different ages between one to three years of age. (Images adapted from Unsplash)

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4.2: Growth in Body Weight

Overview of Growth in Body Weight

The average newborn weighs approximately 7.5 pounds, although a healthy birth weight for a full-term baby is considered to be between 5 pounds, 8 ounces (2,500 grams) and 8 pounds, 13 ounces (4,000 grams). For the first few days of life, infants typically lose about 5 percent of their body weight as they eliminate waste and become accustomed to feeding. This weight loss is temporary, and is followed by a rapid period of growth. By the time infants are 4 months old, their birth weight has usually doubled, and by one year their weight has tripled. By age two, their weight has quadrupled. Figure **4.2.1**shows this rapid growth in weight for females from birth through 24 months of age

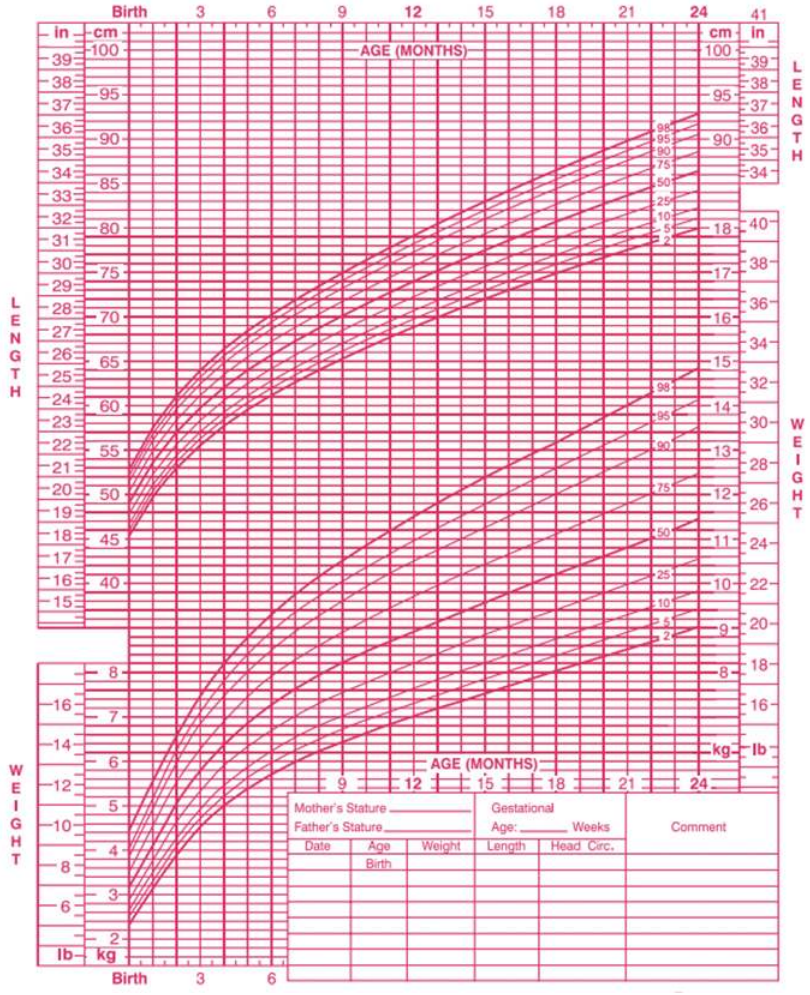


Figure **4.2.1**: Length and weight percentiles for girls 0 to 24 months. See Growth Chart Data tables for a breakdown of all numbers represented on graph. (Image from CDC is in the public domain.)

Low Birth Weight

Birth weights vary, but a birth weight too low can negatively impact the development of the child. Low birthweight (LBW) is defined as a birthweight below 2,500 grams or 5 pounds, 8 ounces regardless of gestational age. Very low birth weight (VLBW) is less than 1,500 grams or 3 pounds, 5 ounces and extremely low birth weight (ELBW) is less than 1,000 grams or 2 pounds, 3 ounces (World Health Organization, 2004). LBW is a critical topic as the percentage of children with a LBW varies greatly between countries and between racial/ethnic groups within the same country, and is related to potential long term developmental challenges.

In the U.S. the percentage of infants born with a LBW was 8.31% for 2019, a non-significant increase from 2018 (8.28%) with Black (14.15%) and Hispanic/Latinx (7.55%) women more likely to have children with a LBW compared to white (6.89%) women (Martin et al., 2021). Globally, it is estimated that 14–20% of all births, or over 20 million newborns annually, are LBW. Figure **4.2.1** shows national and regional estimates of the low birth weight prevalence in 2015. The specific study this data is derived from estimated the global prevalence of LBW at 14.6% (Blencowe et al, 2019). The data from this study also finds important differences between countries. An estimated 5.4% of infants are born LBW in Eastern Asia, 14% in Sub-Saharan Africa, and up to 26% in Southern Asia. Low and middle income countries account for a disproportionate number of LBW newborns, as over 95% of the world's LBW infants are born in low and middle income countries. Figure **4.2.2** shows the percentage of change in LBW from 2000 to 2015. Worldwide and across different regions, the percentage of LBW is trending downward. For example, in Southern Asia, the percentage of LBW infants in 2000 was 32.3%, but it dropped to 26.4% in 2015. [2]

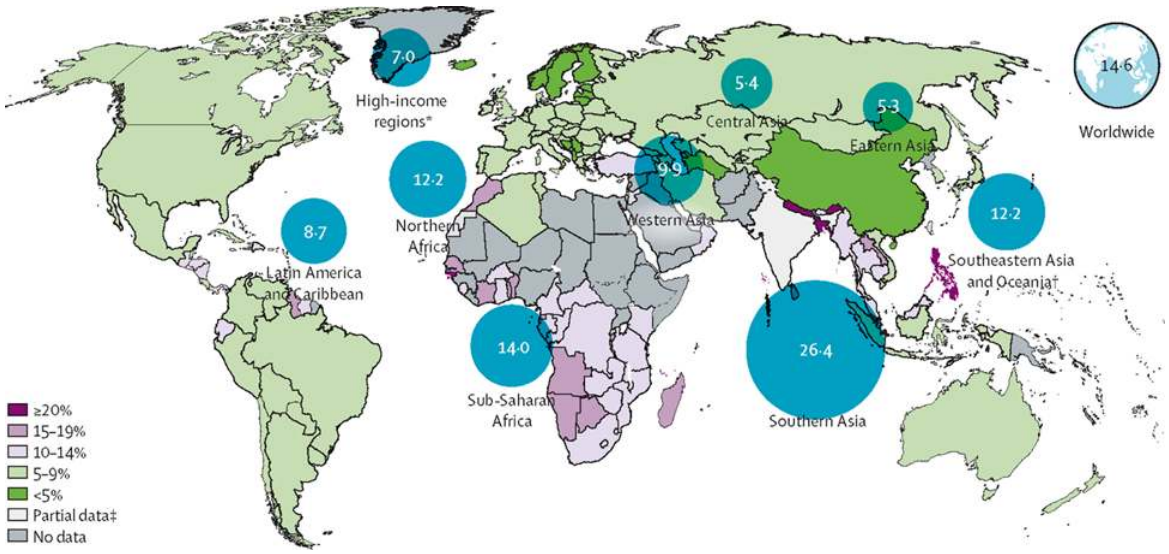


Figure **4.2.2**: National and regional estimates of low birthweight prevalence, 2015. Latin America and Caribbean 8.7, High-income regions 7.0, Northern Africa 12.2, Sub-Sahara Africa 14.0, Western Asia 9.9, Central Asia 5.4, Southern Asia 26.4, Easter Asia 5.3, Southeastern Asia Oceania 12.2, Worldwide 14.6 ([3])

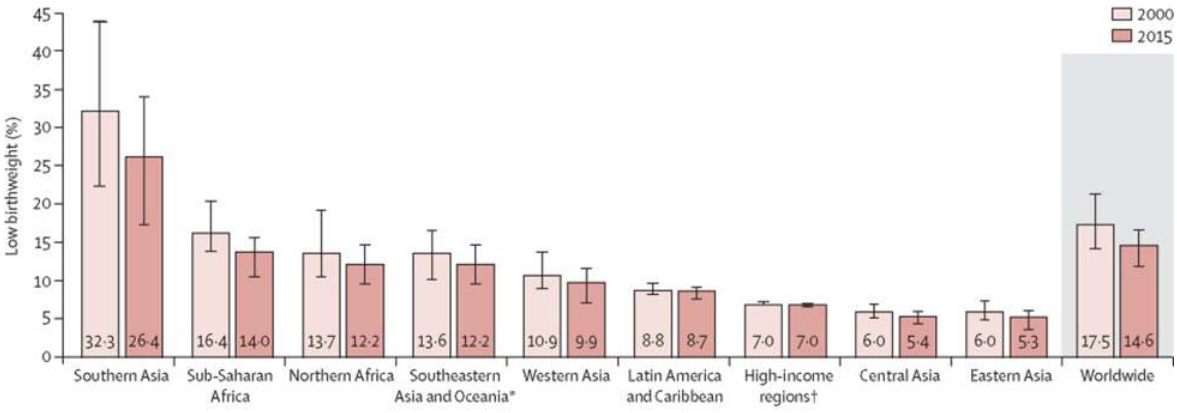


Figure **4.2.3**:

Percentage of change in LBW from 2000 to 2015, worldwide and across different regions. Southern Asia: 2000 32.3%, 2015 26.4, Sub-Saharan Africa: 2000 16.4% 2015 14.0%, Northern Africa: 2000 13.7% 2015 12.2%, Southeastern Asia and Oceania: 2000 13.6% 2015 12.2%, Western Asia: 2000 10.9% 2015 9.9%, Latin America: 2000 8.8% 2015 8.7%, High-income regions: 2000 7.0% 2015 7.0%, Central Asia: 2000 6.0% 2015 5.4%, Eastern Asia: 2000 6.0% 2015 5.3%, Worldwide: 2000 17.5% 2015 14.6% [4]

While there is a global downward trend for infants born with a LBW, some countries have experienced an increase. Mexico is a country in the southern part of North America that is made up of 32 states. The incidence of LBW in Mexico, at the national level,

increased from 6.2% in 2008 to 7.1% in 2017. As Figure **4.2.4** shows, at the state level, Mexico City reported the highest incidence followed by Southeastern and Central states (Mexico State, Aguascalientes and Yucatan); however, the states with the highest increase are located in the north of the country (Baja California Sur, Nuevo León, and Zacatecas).[5]



ID	State	ID	State	ID	State	ID	State	ID	State	ID	State	ID	State	ID	State
01	Aguascalientes	05	Coahuila	09	Ciudad de México	13	Hidalgo	17	Morelos	21	Puebla	25	Sinaloa	29	Tlaxcala
02	Baja California	06	Colima	10	Durango	14	Jalisco	18	Nayarit	22	Querétaro	26	Sonora	30	Veracruz
03	Baja California Sur	07	Chiapas	11	Guanajuato	15	México	19	Nuevo León	23	Quintana Roo	27	Tabasco	31	Yucatán
04	Campeche	08	Chihuahua	12	Guerrero	16	Michoacán	20	Oaxaca	24	San Luis Potosí	28	Tamaulipas	32	Zacatecas

Figure **4.2.4**: Percentage of infants with a LBW in 2017 across 32 states in Mexico for both males and females. Count of states and their percentage of Low Birthwate infants by gender: Under 5% - 0 Males 1 Females, 5.01%-6.00% -5 Males 10 Females, 6.01%-7.00% - 13 Males 6 Females, 7.01% - 8.00% - 8 Males 9 Females, Over 8.01% - 3 Males 3 Females ([6])

LBW is a substantial public health challenge in every country, associated with a range of potential developmental challenges (Evensen et al., 2020; Longo et al., 2021; Van de Pol & Allegaert, 2020). More than 80% of neonatal deaths are in LBW newborns (Blencowe et al., 2012; Katz et al., 2013; Lee et al., 2013). LBW newborns also have a higher risk of stunting in childhood, and long-term developmental and physical health challenges (Blencowe et al., 2013; Christian et al., 2013). Approximately 5–10% of all VLBW infants show major motor challenges, while 25–50% have cognitive, behavioral and/or attention challenges. Additionally, LBW, especially ELBW, is associated with long-term cognitive, language, executive function and learning difficulties (Aarnoudse-Moens et al., 2009; Barre et al., 2011; Blasco et al., 2020; Grunau, Whitfield & Davis, 2002; Marchman et al., 2019; Squarza et al., 2016; Zerbeto, Cortelo & Filho, 2015).[7] [8]

LBW is a critical topic for infant and toddler caregivers to be aware of because the experiences LBW children have during the first three years can potentially reduce the severity of developmental challenges. For example, when LBW infants experience high levels of sensitive caregiving, they improve their executive function abilities faster and catch up to non-LBW peers in executive function abilities by five years of age (Camerota et al., 2015). In contrast, when LBW infants experience lower than average sensitive caregiving, they continue to show lower executive function skills throughout the first five years. Caregiver sensitivity refers to the timing of a caregiver's response to a child and the ability to respond appropriately to the child's needs. In addition to sensitivity, responsiveness is also an important characteristic. Responsive caregiving, or interactions in which caregivers give appropriate responses to a child's signals, leads to stronger language abilities in LBW toddlers (Madigan et al., 2015). Language development in LBW infants is enhanced when caregivers are responsive and sensitive in their caregiving and elaborate in their communication (Loi et al., 2017; Spencer-Smith et al., 2019).[9]



Figure **4.2.5**. [1]

[1] "Physical Growth and Development in Newborns and Toddlers" by: Tera Jones from Lumen Learning.

[2] Cutland et al., (2017). Low birth weight: Case definition & guidelines for data collection, analysis, and presentation of maternal immunization safety data. *Vaccine*, *35*(48Part A), 6492.

[3] Image from Blencowe et al., (2019). National, regional, and worldwide estimates of low birthweight in 2015, with trends from 2000: A systematic analysis. *The Lancet Global Health*, *7*(7), e849-e860. CC by 4.0

[4] Image from Blencowe et al., (2019). National, regional, and worldwide estimates of low birthweight in 2015, with trends from 2000: A systematic analysis. *The Lancet Global Health*, *7*(7), e849-e860. CC by 4.0

[5] Ancira-Moreno et al., (2021). Incidence of low birth weight in Mexico: A descriptive retrospective study from 2008–2017. *Plos one*, *16*(9), e0256518. CC by 4.0

[6] Image from Ancira-Moreno et al., (2021). Incidence of low birth weight in Mexico: A descriptive retrospective study from 2008–2017. *Plos one*, *16*(9), e0256518. CC by 4.0

[7] Blencowe et al., (2019). National, regional, and worldwide estimates of low birthweight in 2015, with trends from 2000: A systematic analysis. *The Lancet Global Health*, *7*(7), e849-e860. CC by 4.0

[8] Longo, et al., (2021). Neurodevelopmental outcome of preterm very low birth weight infants admitted to an Italian tertiary center over an 11-year period. *Scientific Reports*, *11*(1), 1-10.

[9] Scherer et al., (2019). The relationship between responsive caregiving and child outcomes: evidence from direct observations of mother-child dyads in Pakistan. *BMC Public Health*, *19*(1), 1-10. CC by 4.0

[10] Image by __ drz __ on Unsplash.

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4.3: Growth in Body Length/Height

Growth in Body, Length, and Height

The average length of a newborn is 19.5 inches, increasing to 29.5 inches by 12 months and 34.4 inches by 2 years old (WHO Multicentre Growth Reference Study Group, 2006). The average length at 12 months (one-year-old) typically ranges from 28.5 to 30.5 inches. The average length at 24 months (two years old) is around 33.2 to 35.4 inches (CDC, 2010). Figure **4.3.1** shows this rapid growth in length/height for males from birth through 24 months of age.

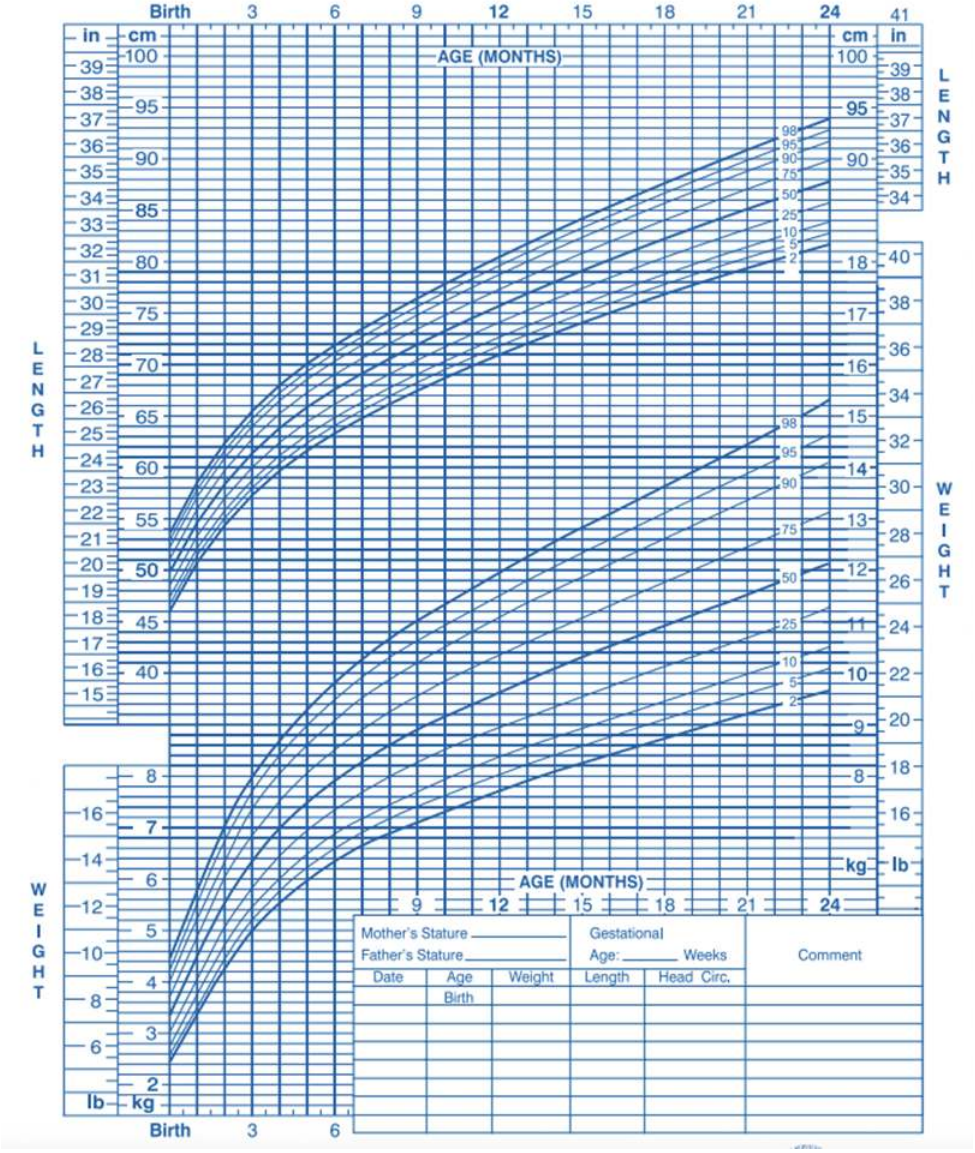


Figure **4.3.1**: Length and weight percentiles for boys 0 to 24 months. See Data Table of Infant Length-for-age Charts for a full breakdown of chart numbers [1]

Stunted Growth

Infant and toddler length/height can vary, but a length/height too low can be a worrisome sign of stunted growth. Stunted growth is characterized by a height of more than two standard deviations below the World Health Organization (WHO) age-specific growth reference standard (WHO Multicentre Growth Reference Study Group, 2007). In simpler terms, stunted growth is when children are significantly shorter in length/height than what would be expected for their age. Children with stunted growth have a mortality rate that is three times higher than their peers (McDonald et al., 2013; Victora et al., 2021) and are at a higher risk of displaying cognitive challenges later in life (Prendergast & Humphrey, 2014; Sanou et al., 2018; Walker et al., 2021).

In the U.S. the prevalence of stunting is estimated to be about 3.2% (World Health Organization, 2021). While the global prevalence has declined over the years, childhood stunting continues to be a great concern worldwide. Figure **4.3.2** shows the global and regional change in the number of children showing stunted growth from 1990 to 2019. In 1990, 252.8 million children under five years of age exhibited stunted growth; by 2019, this number dropped to 144 million children. The prevalence of stunting differs greatly by country. Figure **4.3.3** shows the longitudinal trajectory of the prevalence of stunting in thirteen countries from 1985 to 2019. While all thirteen countries show a decline, there are still significant differences between countries. Even after 2015, Malawi, Ethiopia, Nepal and Bangladesh each had a prevalence between 30% to 40%, while Morocco, Peru and Kyrgyzstan each had a prevalence between 10% to 20%.

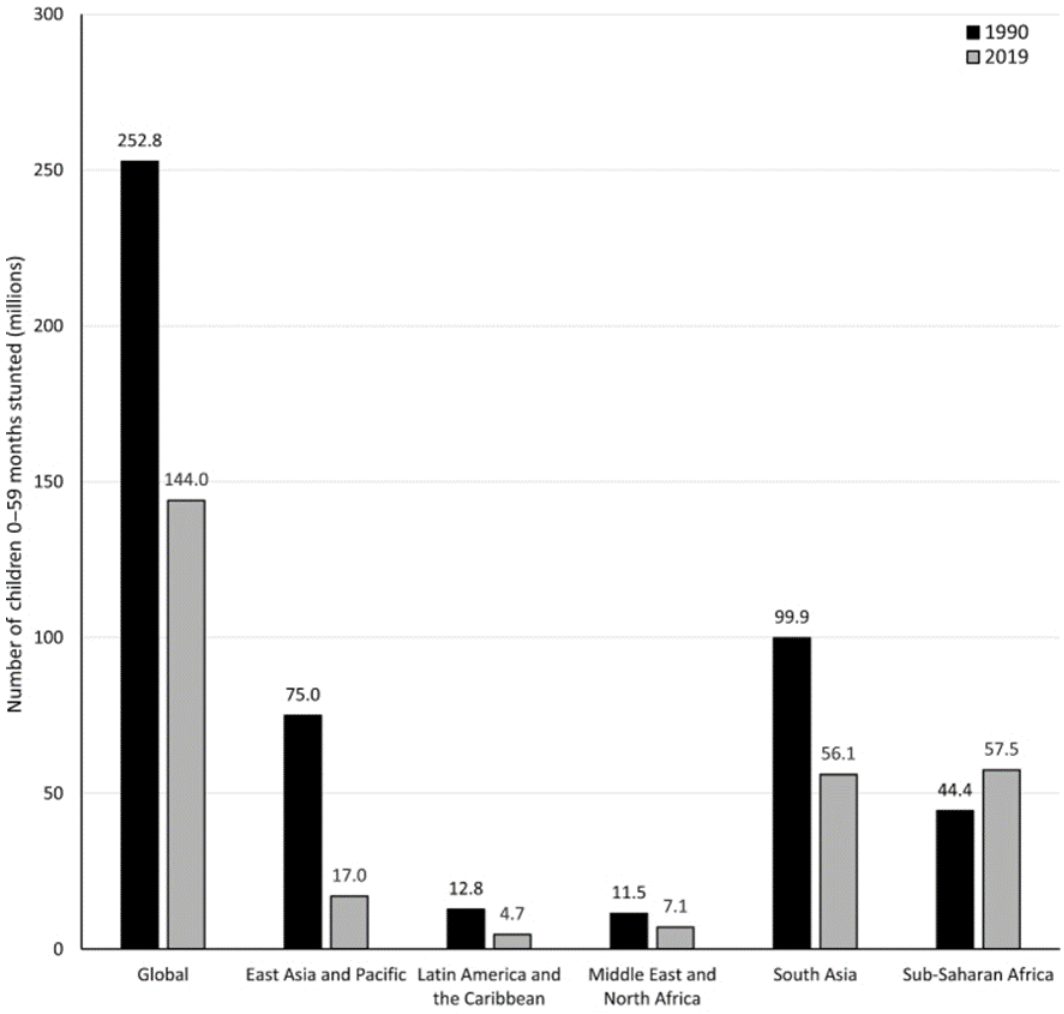


Figure **4.3.2**: Global and regional change of stunted growth from 1990 to 2019. Global: 1990 252.8 2019 144, East Asia and Pacific: 1990 12.8 2019 4.7, Middle East and North Africa: 1990 11.5 2019 7.1, South Asia: 1990 99.9 2019 56.1, Sub-Saharan Africa: 1990 44.4 2019 57.5. [2]

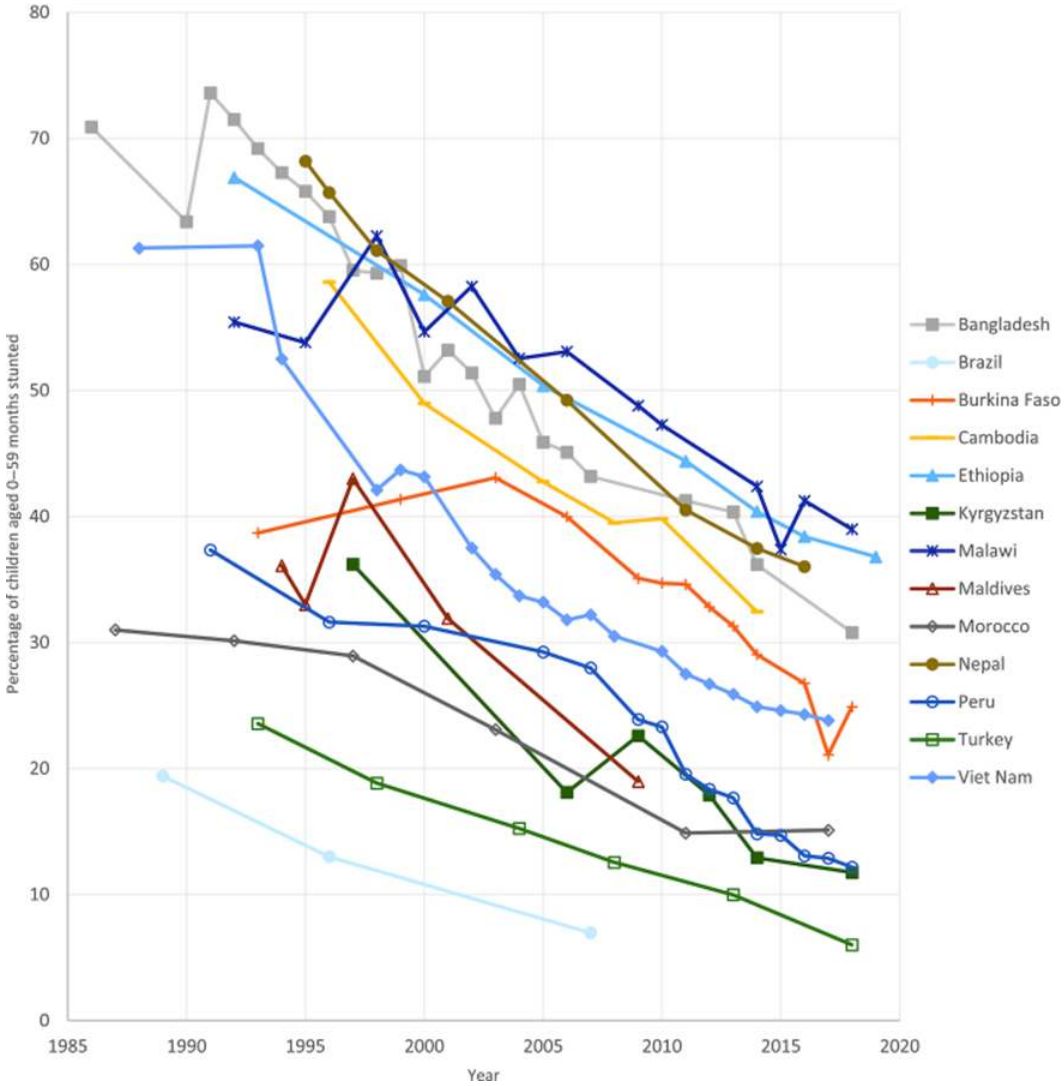


Figure **4.3.3**: Prevalence of childhood stunting by country.Bangladesh 71% 1995 down to 31% in 2019, Brazil had a downward trend 19% in 1988 down to 7% in 2008, Burkina Faso 38% in 1993 down to 25% in 2016 after some up and down fluctuations between those two dates, Cambodia was a downward trend from 58% in 1999 to 33% in 2014. Ethiopia was a downward trend from 66% down to 38% in 2019. Kyrgyzstan had an overall downward trend with some upward fluctuations, from 36% in 1997 to 12% in 2019. Malawi begin at 55% in 1992 with a sharp upward tick to 63% in 1999 and then a downward trend to 38% in 2018. Maldives 35% in 1993 with a sharp upward tick to 43% in 1993 and then downward to 19% in 2009. Morocco had significant up and down numbers between 1986 and 2020, however an overall downward trend from 72% in 1986 to 31% in 2018%. Nepal was a downward trend from 68% in 1995 to 38% in 2016. Peru an overall downward trend from 37% in 1992 down to 12% in 2017. Turkey overall downward trend from 23% in 1993 to 7% in 2017. Viet Nam downward trend from 68% in 1992 down to 38% in 2018. All dates and percentages are approximate. [3]

[1] Image from CDC is in the public domain.

[2] Image from Vaivada et al., 2020). Stunting in childhood: An overview of global burden, trends, determinants, and drivers of decline. *The American Journal of Clinical Nutrition*, *112*, 777S-791S. CC by 4.0

[3] Image from Vaivada et al., (2020). Stunting in childhood: An overview of global burden, trends, determinants, and drivers of decline. *The American Journal of Clinical Nutrition*, *112*, 777S-791S. CC by 4.0

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4.4: Growth in Head Circumference

Head Circumference

Head circumference trajectories are important as they are commonly used as a measure of neurological development in infancy and early childhood. As seen in Figure **4.4.1** and Figure **4.4.2**, On average, head circumference increases by 2 centimeters per month during the first three months and 1 centimeter per month from 3 to 6 months of age. From six to twelve months, head circumference increases by 0.5 centimeters per month. During the first year of life, there is a 12 centimeter average increase in head circumference. After one year of age, only 1 centimeter gain occurs per 6 months in head circumference until three years of age and only 1 centimeter every year between 3 to 5 years of age. An average of five centimeters total is gained in head circumference between 1 to 5 years of age. The rate of head circumference growth during the first three years of life can vary and is influenced by numerous factors, including, but not limited to, an Autism Spectrum Disorder diagnosis (Regev et al., 2021; Webb et al., 2007), family socioeconomic status (Bouthoorn et al., 2012) and premature birth and/or low birth weight (Jaekel et al., 2018). For example, infants of mothers with higher educational levels have infants with larger head circumferences, but this difference was only found during the first six months of life (Bouthoorn et al., 2012). [1] [2]

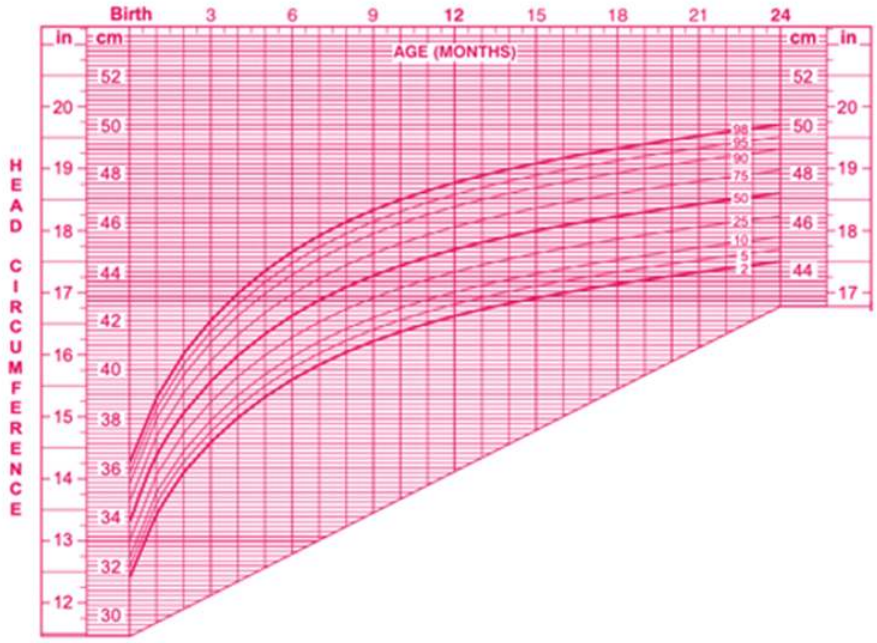


Figure **4.4.1**: See Data Table of Infant Head Circumference-for-age Charts for all numbers represented in the chart. [3]

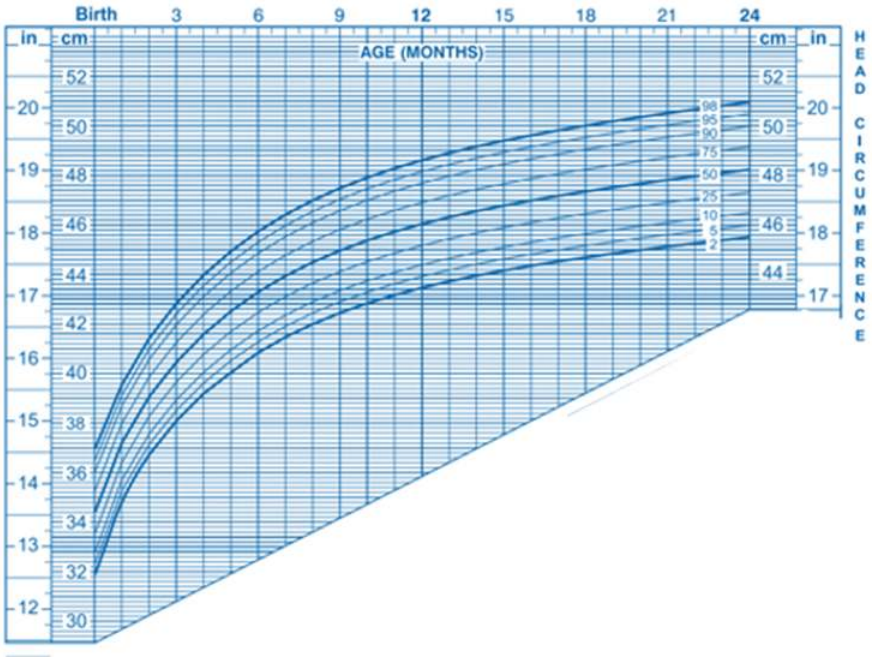


Figure **4.4.2**: See Data Table of Infant Head Circumference-for-age Charts for all numbers represented in the chart. [4]

Head circumference is an important reflection of growth and development of the brain, especially in early childhood (Bartholomeusz, Courchesne & Karns, 2002). Some studies have found smaller head circumference to be associated with a lower overall intelligence and lower cognitive abilities (Bach et al., 2020; Jaekel et al., 2019; Kirkegaard et al., 2020; Koshy et al., 2021). Large deviations from the norm in head circumference can indicate microcephaly (a baby's head is smaller than expected when compared to babies of the same sex and age) or macrocephaly (a baby's head is larger than expected when compared to babies of the same sex and age).[5]

Microcephaly was in world news headlines in 2015 with the outbreak of the Zika Virus. Congenital Zika syndrome is a unique pattern of birth defects and disabilities found among fetuses and babies infected with Zika virus during pregnancy. Zika primarily spreads through infected mosquito bites and can be passed from an infected pregnant mother to her fetus. A common symptom of prenatal infection is an infant with decreased brain tissue and microcephaly (Satterfield-Nash et al., 2017).[5]



Figure **4.4.3**: Typical head size, compared to babies with microcephaly. bay with microcephaly has significant decrease in size, baby with severe microcephaly has an even greater decrease in overall head size.[6]

[1] Jones & Samanta (2020). *Macrocephaly*. StatPearls. CC by 4.0

[2] Treit et al., (2016). Relationships between head circumference, brain volume and cognition in children with prenatal alcohol exposure. *PloS One*, *11*(2), e0150370. CC by 4.0

[3] Image from CDC is in the public domain.

[4] Image from CDC is in the public domain.

[5] “Facts about Microcephaly” by the CDC is in the public domain.

[6] Image adapted from “Facts about Microcephaly” by the CDC.

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4.5: Worldwide Variation in Human Growth

Human Growth Variations

The growth charts from the World Health Organization (WHO) and the Center for Disease Control and Prevention (CDC) are widely used in the U.S. to describe the physical growth of children. For children in the U.S. the CDC recommends that the WHO growth charts be used to monitor growth for all children from birth up to 2 years of age and then to use the CDC charts for children two years of age and older. [1]

Despite widespread use of the WHO charts, there are many important limitations. First of all, data participants came from single cities in only six countries (Brazil, Ghana, India, Norway, Oman and the USA). Second, the WHO growth charts use the growth of breastfed infants as the norm for growth, which may not represent the feeding experiences of all infants. Third, the WHO notes that any deviations from its standards should be considered as evidence of 'abnormal growth' (World Health Organization, 2006). [2]

One study compared the data from the WHO's Multicentre Growth Reference Study (MGRS) to data from 55 different countries to see if the growth charts from the WHO can accurately be used with children outside of the six countries the WHO studied (Natale & Rajagopalan, 2014). Results showed that many countries had physical growth outside of what the WHO considers standard, especially for head circumference. Figure **4.5.1** shows the mean weight of two year old males across thirty countries compared to the MGRS mean score and within 0.5 standard deviations. While most of the countries fell within 0.5 standard deviations of the MGRS mean, many countries did not, suggesting that WHO's growth chart for weight may not be the best reference chart for all children.

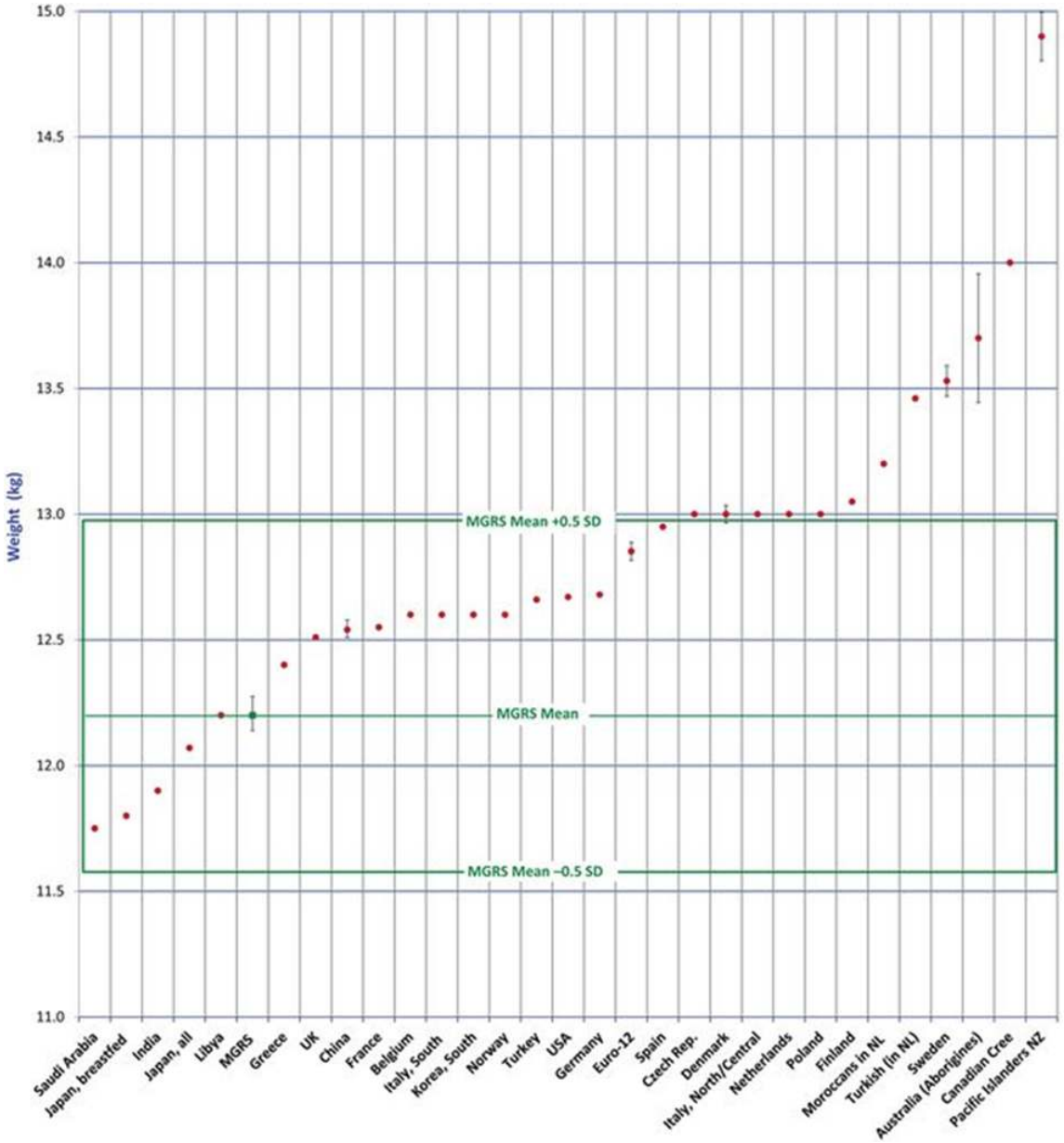


Figure 4.5.1: **Weight at 2 years: 30 countries versus Multicentre Growth Reference Study (MGRS). The green box delimits the area within 0.5 SD of the MGRS mean. The green line within the box shows the MGRS mean. (A) Boys; MGRS mean: 12.2 kg; SD up: 1.55 kg, down: 1.25 kg. (B) Girls; MGRS mean: 11.5 kg; SD up: 1.65 kg, down: 1.25 kg. Error bars show 1 SE.**. [3])

Figure **4.5.2** shows the mean head circumference of two year old females across twenty-six countries compared to the MGRS mean score and within 0.5 of the standard deviations. Interestingly, head circumference was the growth measurement that varied the most. The majority of the countries fell outside of 0.5 standard deviations of the MGRS mean, suggesting that the WHO's growth chart for head circumference may only be an accurate reference chart for a select few countries.

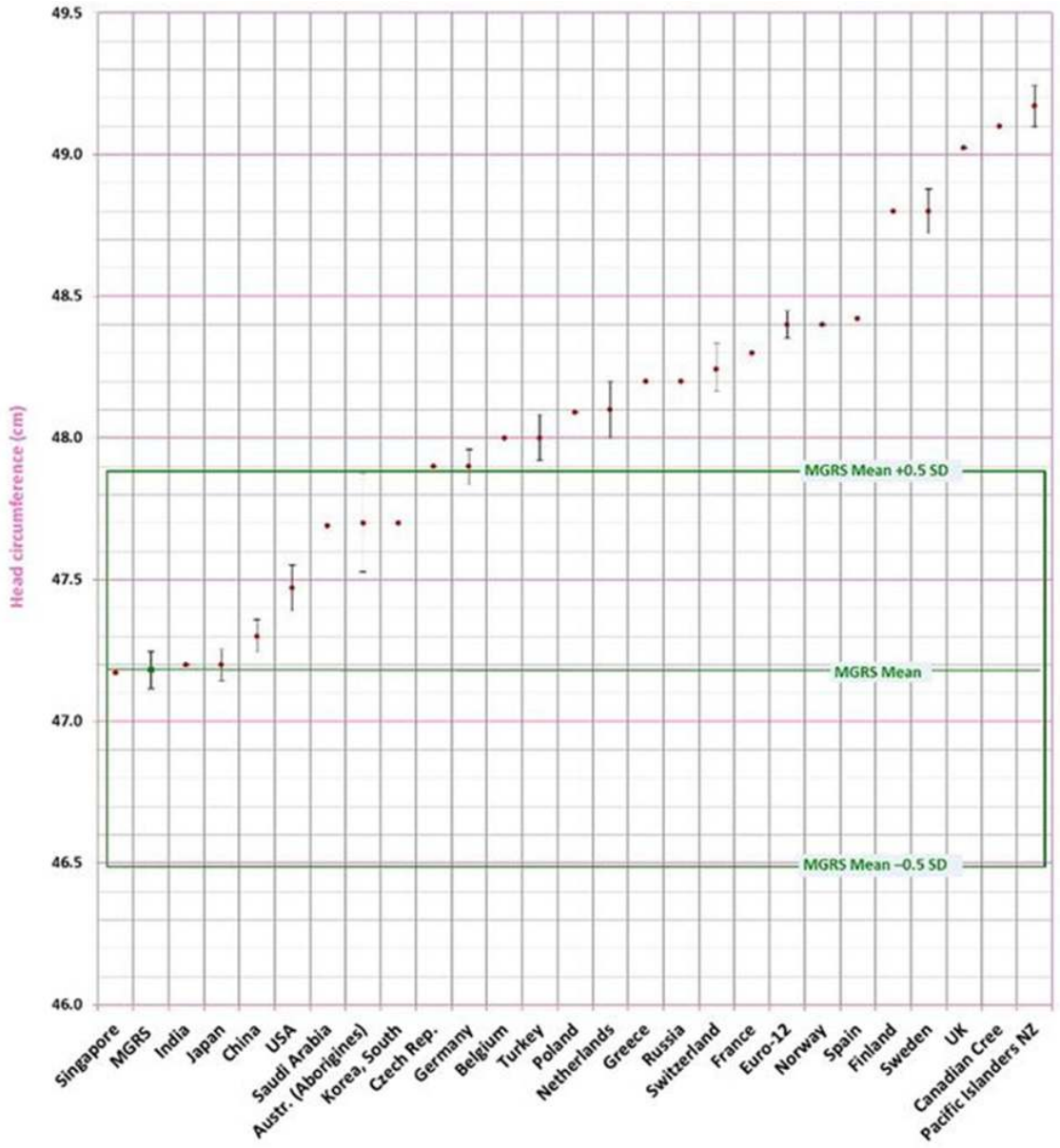


Figure **4.5.2**: Head circumference at 2 years for females: 26 countries versus Multicentre Growth Reference Study (MGRS). ([4])

The data from this study suggest that the WHO growth charts may not be appropriate for all children around the world, especially for monitoring the growth of head circumference. The study acknowledges important differences in the physical development of infants and toddlers exist across countries. Growth patterns and reference charts for children from specific countries are becoming more available (Bonthuis et al., 2012; Cole, & Mori, 2018; Zhang et al., 2019). If caregivers monitor the physical growth of children, they should search for charts that best represent the demographics of the children they serve and not assume commonly used reference charts are accurate for all infants and toddlers.

What is the take away message for infant and toddler caregivers?

- Physical development is important because when children measure below average growth, they are at risk of long term developmental challenges.
- Physical growth is commonly measured with birth weight, height/length and head circumference.
- The percentage of infants and toddlers who are at risk due to lower than average physical growth varies by country, state and racial/ethinic group, among other factors.

- Knowledge of the regional percentage of infants and toddlers measuring lower than average for birth weight, height/length and head circumference could be important information for caregivers as they prepare to meet the needs of the individual children they serve.
- Quality caregiving is essential for all children, but is especially important for children who are at a developmental risk, such as children with a LBW, children who have experienced stunting and children with a lower than average head circumference.
- Caregiving characteristics such as providing sensitive and responsive care as well as practices that increase the quantity and quality of language exposure support the optimal development of all children, especially children who are at long term developmental risk due to lower than average scores on physical development.
- If caregivers monitor the physical growth of infants and toddlers, they should search for charts that best represent the demographics of the children they serve as commonly used charts from the WHO and the CDC do not accurately represent the physical growth of all children.

[1] "Growth Charts" from the CDC is in the public domain.

[2] Natale & Rajagopalan (2014). Worldwide variation in human growth and the World Health Organization growth standards: A systematic review. *BMJ Open*, *4*(1), e003735. CC by NC 3.0

[3] Image adapted from Natale & Rajagopalan (2014). Worldwide variation in human growth and the World Health Organization growth standards: A systematic review. *BMJ Open*, *4*(1), e003735. CC by NC 3.0

[4] Image adapted from Natale & Rajagopalan (2014). Worldwide variation in human growth and the World Health Organization growth standards: A systematic review. *BMJ Open*, *4*(1), e003735. CC by NC 3.0

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4.6: Conclusion

Conclusion of Physical Development Overview

The physical development of infants and toddlers is rapid and consistent. Physical growth is often measured with charts tracking weight, height/length and head circumference, showing increases in all three measurements every month during the first three years! It is important to know that while growth charts provide standards to monitor growth, there are many limitations to these charts. Research has found significant differences in the growth of children's weight, height and head circumference across countries; therefore, caregivers should be cautious when applying growth charts to all children. Some children may fall significantly low on growth charts and are at risk of various development challenges, such as children born with a low birth weight. For these infants and toddlers, quality caregiving practices are especially important to improve developmental abilities.

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CHAPTER OVERVIEW

5: Health and Nutrition

5.1: Introduction
5.2: Breast Milk- Composition, Benefits and Rates
5.3: Complementary Foods
5.4: Concerns for Underconsumption and Overconsumption
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5.1: Introduction

Introduction to Health and Nutrition

The first three years of life are a critically important period for growth and development. To best support this growth and development, infants and toddlers need nutrient-dense food that is developmentally appropriate, high quantity and quality of sleep, and physical activity. This section will explain the recommended intake of food and nutrition during the first three years and provide strategies for caregivers to support safe sleep and physical activity.

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5.2: Breast Milk- Composition, Benefits and Rates

Overview of Breast Milk and Breastfeeding

Feeding an infant breast milk is one of the best ways to start them off on the path of lifelong health. Breast milk consists of 87% water, 1% protein, 4% lipids, and 7% carbohydrate, displayed in Figure **5.2.1** (Boquien, 2018; Martin, Ling & Blackburn, 2016). It also contains many vitamins and minerals. Another unique aspect of human milk is the high proportion of fatty acids, including the two essential fatty acids linoleic acid and alpha-linolenic acid. These fatty acids are important for infant brain development. In addition to nutrients, human milk includes bioactive substances and immunologic properties that support infant health and development (Le Doare, Holder, Bassett & Pannaraj, 2018). [1] [2]

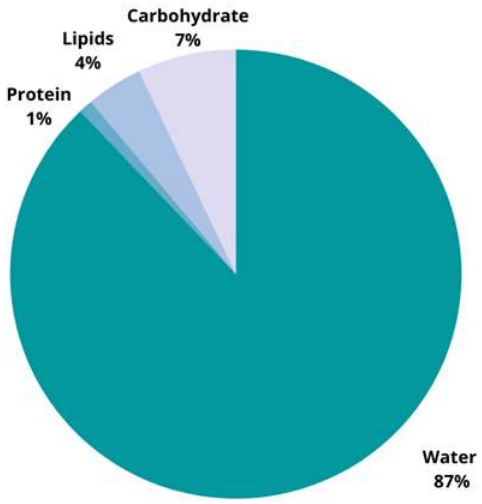


Figure **5.2.1**: Breast milk composition ([3])

In the initial week after pregnancy, the mother secretes colostrum, a thick yellow liquid. From days 7 to 14, the mother secretes transitional milk, a combination of colostrum and mature milk. After two weeks, the mature milk is formed and produced (Ballard & Morrow, 2013). The breast milk can be divided into the bluish-gray foremilk, present at the beginning of a feed which contains less fat, and the creamy white hindmilk secreted towards the end of a feed that is rich in fat. The composition of breast milk can differ depending on maternal health and diet, environmental exposure, and gestational age, amongst other factors (Martin, Ling & Blackburn, 2016). [4]

Breast milk can support an infant's nutrient needs for about the first 6 months of life, with the exception of vitamin D and potentially iron. The World Health Organization (WHO) recommends infants be exclusively breastfed for the first 6 months of life and encourages the continuation of breast milk in combination with complementary feeding of solid foods for 2 years and beyond (World Health Organization, 2003). Exclusive breast milk feeding refers to an infant consuming only human milk, and not in combination with infant formula and/or complementary foods or beverages (including water), except for medications or vitamin and mineral supplementation. [5] [6]



Figure 5.2.2: Benefits of breastfeeding. ([1])

A newborn may require breastfeeding every 1 to 3 hours for 10 to 20 minutes on average; however, the frequency and duration of breastfeeding sessions decrease as the child gets older and they can receive more milk in less time. On the third day after birth, the amount of breastmilk taken by the infant is about 300 to 400 milliliters each 24 hours, and on the fifth day 500 to 800 milliliters. Infant milk consumption averages about 800 milliliters each day during the first 6 months. [8]

While breast milk is encouraged, not all families are able to provide it for their infants for various reasons. For example, a family may choose not to breastfeed, a child may be adopted, or the mother may be unable to produce a full milk supply or may be unable to pump and store milk safely due to family or workplace conditions. If human milk is unavailable, infants should be fed an iron-fortified commercial infant formula (i.e., labeled “with iron”) regulated by the U.S. Food and Drug Administration (FDA), which is based on standards that ensure nutrient content and safety. Infant formulas are designed to meet the nutritional needs of infants and are not needed beyond 12 months. It is important to take precautions to ensure that expressed human milk and prepared infant formula are handled and stored safely. [9]

Despite the benefits of breast milk, breastfeeding rates remain low in many countries. Globally, only 37% of infants between 0 to 6 months of age are exclusively breastfed, with the highest percentage (47%) among infants in South-East Asia (World Health Organization, 2014). In Malaysia, while 94.7% of infants were breastfed at least once, only 14.5% practiced exclusive breastfeeding for the first six months (Fatimah et al., 2010). In Lebanon only 38% of infants are exclusively breastfed during the first month of life and around 2% are breastfeeding at 6 months of age (Hamade et al., 2013). Breastfeeding, both initiation and duration, has been increasing steadily among high-income countries since the late 1970’s (Lubold, 2019; Wolf, 2003); however, in some countries, breastfeeding rates have increased at a much faster rate than in others. For example, Figure 5.2.3 shows the proportion of women who initiated breastfeeding in Ireland, Sweden, and the US from 1984 to 2015. While Sweden has consistently had higher rates, both Ireland and the U.S. have seen a positive increase in breastfeeding initiation rates over time. [10] [11] [12]

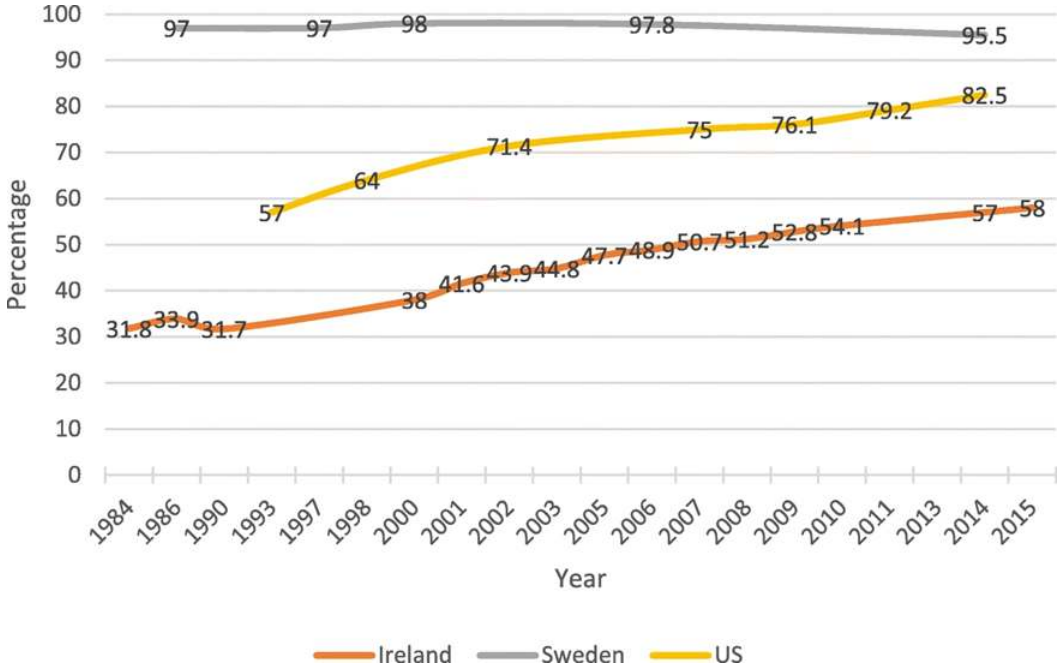


Figure **5.2.3**: Proportion of women who initiated breastfeeding in Ireland, Sweden, and the U.S. from 1984 to 2015. Sweden ranged from 97% in 1993 to 95.5% in 2014. US ranged from 57% in 1993 to 82.5%in 2014. Ireland ranged from 31.8% in 1984 to 58% in 2015. ([13])

Figure **5.2.4** shows the rate of any amount of breastfeeding during the first twelve months for children born in 2018 in the U.S. Younger infants are more likely to be breastfed as approximately 80% of one month old infants receive some amount of breastfeeding compared to under 60% at six months and under 40% at twelve months. Figure **5.2.4** also shows the rate of exclusive breastfeeding for the first six months in 2018. While nearly 60% of infants are exclusively breastfed at one month of age, less than 30% are at six months of age. Rates of breastfeeding initiation and duration differ by state. In California in 2017, 90.3% of newborns were breastfed at least once, 67.1% were still breastfeeding at six months and 43.3% were still breastfeeding at twelve months; however, only 50.1% were exclusively breastfed for the first three months and only 28.2% were exclusively breastfed for the first six months. Louisiana had the lowest percentage of infants who ever breastfed (66.2%) while Minnesota had the highest at 95.3%. At six months, the national average for infants still breastfeeding was 58.3%, which dropped to 35.3% at twelve months. Furthermore, there is a racial disparity in both the initiation and duration of breastfeeding in the U.S. (Beauregard et al., 2019). Black infants had a significantly lower rate of having ever been breastfed at 3 months (58.0%) than did white infants (72.7%); at 6 months, the rates were 44.7% among Black infants and 62.0% among white infants. [14] [15] [16] [17]

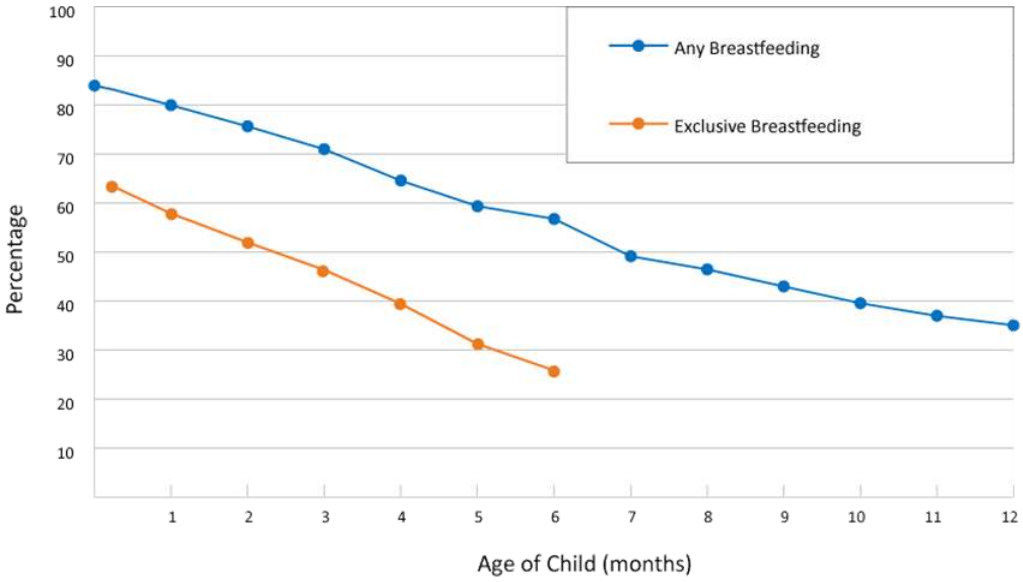


Figure **5.2.4**: Rates of any and exclusive breastfeeding by age among infants born in 2018. Any breastfeeding went from 84% at birth to 35% at 12 months of age. Exclusive breastfeeding went from 62% at birth to a little over 6 months. ([18])

The rate of exclusive breastfeeding is lower among working mothers (Chen, Wu & Chie, 2006; Kimbro, 2006; Tan, 2011). In a survey comprising 228,000 new mothers of varying employment status in the United States, the breastfeeding rate at six months was statistically lower among mothers employed full time (26.1%), as compared with part-time (36.6%) and non-working mothers (35.0%) (Ryan, Zhou & Arensberg, 2006). Returning to work, time costs, and unconducive workplaces are common reasons for early breastfeeding cessation among working mothers (Brown et al., 2014; Ong, Yap, Li & Choo, 2005; Smith & Forrester, 2013). [19]

Child care centers can play a crucial role in supporting breastfeeding mothers (Lundquist, McBride, Donovan & Kieffer, 2019; Marhefka et al., 2019). Lundquist et al. (2019) highlighted the importance of educating child care center staff about breastfeeding as well as creating supportive policies and practices in childcare centers. Furthermore, Marhefka et al. (2019) concluded that breastfeeding-friendly child care centers could contribute to creating a cultural shift towards breastfeeding continuation. [20]

While child care centers can play an important role, they still have much progress to make in supporting breastfeeding mothers and their children. For example, Mattar et al. (2019) showed very low rates of breastfeeding among children in Lebanese daycare centers. Studies from the U.S. have found lower rates of breastfeeding in center-based programs, compared to home-based programs and an overall lack of supportive policies and practices in center-based care programs (Dieterich, Caplan, Yang & Demirci, 2020; Machado, 2015). [21]



Figure **5.2.5**:Breastfeeding mother ([22])

Studies on breastfeeding worldwide indicate the importance of policy recommendations and support at the national and local levels (Gomez-Pomar & Blubaugh, 2018; Horton & Victoria, 2013; World Health Organization, 1998). Research in the United States and Australia showed that encouragement, written policies, resource/materials distribution, and training for breastfeeding were significantly higher in Australia, despite similar rates of availability of facilities such as places to breastfeed and refrigerators for storage in childcare facilities (Cameron et al., 2012). In Japan, there is a lack of understanding of breastfeeding in the workplace and there are perceived challenges such as the burden of breastfeeding management in childcare facilities (Yabe et al., 2021) [23]

To support breastfeeding, child care centers can create spaces where mothers can comfortably breastfeed their children and/or pump breastmilk. Additionally, centers can have a devoted space and organized system for storing pumped breastmilk and a specific space for cleaning the pumping parts. All child care programs can lower a breastfeeding mother's anxiety by allowing her to feed her infant on-site, having a posted breastfeeding policy that is routinely communicated, making sure procedures for storing and handling breast milk and feeding breastfed infants are in place, and making sure staff members are well-trained in these procedures. Data from the Infant Feeding Practices Study II, a longitudinal study that followed mothers from the third trimester until children were age 1 year, found that breastfeeding at 6 months was significantly associated with support from child care providers to feed expressed breast milk to infants and allow mothers to breastfeed on-site before or after work (Fein, Grummer-Strawn & Raju, 2008; Fein, Mandal & Roe, 2008). [24]

Many mothers need to leave their babies at a child care facility to work. The longer the mother is at work, the longer the baby will spend time with the childcare worker. Hence, childcare workers and settings can be primary sources of support for working mothers who want to breastfeed by helping to store, handle and feed the baby with breastmilk while the mother is at work (Cameron et al., 2012). In studies examining child care providers' support of breastfeeding, Javanparast et al. (2012) and Batan & Scanlon (2013) found that by helping to feed expressed breastmilk and allowing mothers to breastfeed before or after work, childcare providers helped mothers maintain breastfeeding at six months postpartum. Nevertheless, Lucas et al. (2013) found some knowledge deficit among childcare providers in the area of health benefits and proper handling of breastmilk, indicating the need for adequate support and training for them to help working mothers. [25]

Childcare administrators are well aware of the benefits of breastmilk, but express perceived risk with the handling and feeding of breast milk (Schafer et al., 2021). This is reinforced by the fact that previous studies have also reported that the lack of literacy regarding breastfeeding and the perceived risk of handling breast milk among childcare facility administrators were barriers (Lucas et al., 2013; Marhefka et al., 2019; Schafer et al., 2021). [26]



Figure 5.2.6:Bottle feeding ([27])

To support the use of breast milk in childcare centers, caregivers and staff must be knowledgeable of proper handling and storage of both breastmilk and infant formula: [28]

- Before handling breast milk wash your hands well with soap and water.
- Refrigerate freshly expressed breast milk within 4 hours for up to 4 days. Previously frozen and thawed breast milk should be used within 24 hours. Thawed breast milk should never be refrozen. Refrigerate prepared infant formula for up to 24 hours.
- If preparing powdered infant formula, use a safe water source and follow instructions on the label.
- Do not store breast milk in the door of the refrigerator or freezer. This will help protect the breast milk from temperature changes from the door opening and closing.
- Do not use a microwave to warm breast milk or infant formula. Microwaving can destroy nutrients in breast milk and create hot spots, which can burn a baby's mouth. Warm safely by placing the sealed container of breast milk or infant formula in a bowl of warm water or under warm, running tap water.
- Once it has been offered to the infant, use or discard leftovers quickly (within 2 hours for breast milk or 1 hour for infant formula).
- Thoroughly wash all infant feeding items, such as bottles and nipples.
- Consider sanitizing feeding items for infants younger than 3 months of age, infants born prematurely, or infants with a compromised immune system.
- Freshly expressed or pumped milk can be stored:
  - At room temperature (77°F or colder) for up to 4 hours.
  - In the refrigerator for up to 4 days.
  - In the freezer for about 6 months is best; up to 12 months is acceptable. Although freezing keeps food safe almost indefinitely, recommended storage times are important to follow for the best quality.

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[1] "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

[2] Boquien (2018). Human milk: An ideal food for nutrition of preterm newborn. *Frontiers in Pediatrics*, *6*, 295. CC by 4.0

[3] Image by Todd LaMarr is licensed under CC by 4.0

[4] Shah et al., (2019). Physiology, Breast Milk. CC by 4.0

[5] Abou Jaoude et al., (2021). Factors related to breastfeeding support in Lebanese daycare centers: A qualitative study among daycare directors and employees. *International Journal of Environmental Research and Public Health*, *18*(12), 6205.

[6] "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

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[8] Shah et al., (2019). Physiology, Breast Milk. CC by 4.0

[9] "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

[10] Suan et al., (2016). Childcare workers' experiences of supporting exclusive breastfeeding in Kuala Muda District, Malaysia: A qualitative study. International Breastfeeding Journal, 12(1), 1-8. CC by 4.0

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[12] Lubold (2019). Historical-qualitative analysis of breastfeeding trends in three OECD countries. *International Breastfeeding Journal*, *14*(1), 1-12. CC by 4.0

[13] Image from Lubold (2019). Historical-qualitative analysis of breastfeeding trends in three OECD countries. *International Breastfeeding Journal*, *14*(1), 1-12. CC by 4.0

[14] Abou Jaoude et al., (2021). Factors related to breastfeeding support in Lebanese daycare centers: A qualitative study among daycare directors and employees. *International Journal of Environmental Research and Public Health*, *18*(12), 6205.

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[16] "Breastfeeding Report Card" from the CDC is in the public domain.

[17] Beauregard et al., (2019). Racial disparities in breastfeeding initiation and duration among US infants born in 2015. *Morbidity and Mortality Weekly Report*, *68*(34), 745. Public domain.

[18] Image from the CDC is in the public domain.

[19] Suan et al., (2016). Childcare workers' experiences of supporting exclusive breastfeeding in Kuala Muda District, Malaysia: a qualitative study. *International Breastfeeding Journal*, *12*(1), 1-8. CC by 4.0

[20] Abou Jaoude et al., (2021). Factors related to breastfeeding support in Lebanese daycare centers: A qualitative study among daycare directors and employees. *International Journal of Environmental Research and Public Health*, *18*(12), 6205.

[21] Abou Jaoude et al., (2021). Factors related to breastfeeding support in Lebanese daycare centers: A qualitative study among daycare directors and employees. *International Journal of Environmental Research and Public Health*, *18*(12), 6205.

[22] Image from Luiza Braun on Unsplash.

[23] Yabe et al., (2021). Perception and handling of breastmilk by childcare staff: A qualitative study of childcare facilities in Japan. *Journal of General and Family Medicine*. CC by NC 4.0

[24] "Support for Breastfeeding in Early Care and Education" from the CDC is in the public domain.

[25] Suan et al., (2016). Childcare workers' experiences of supporting exclusive breastfeeding in Kuala Muda District, Malaysia: a qualitative study. *International Breastfeeding Journal*, *12*(1), 1-8. CC by 4.0

[26] Yabe et al., (2021). Perception and handling of breastmilk by childcare staff: A qualitative study of childcare facilities in Japan. *Journal of General and Family Medicine*. CC by NC 4.0

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5.3: Complementary Foods

Foods to Supplement Breast milk and Formula

At about six months of age, infants should be introduced to nutrient-dense, developmentally appropriate foods to complement breast milk or infant formula. Some infants may show developmental signs of readiness before the age of six months, but introducing complementary foods before age four months is not recommended. Waiting until after six months to introduce foods is also not recommended because starting around six months, complementary foods are necessary to ensure adequate nutrition and exposure to flavors, textures, and different types of foods. Infants should be given developmentally appropriate foods to help prevent choking. It is also important to introduce potentially allergenic foods along with other complementary foods. [1]

For infants fed breast milk, it is particularly important to include complementary foods that are rich in iron as breast milk is not a good source of these nutrients.About one-third (32%) of infants in the United States are introduced to complementary foods and beverages before four months of age, highlighting the importance of providing guidance and support to caregivers on the timing of complementary foods. Early introduction of complementary foods and beverages is higher among infants receiving infant formula (42%) or a combination of infant formula and breast milk (32%) than among infants exclusively fed breast milk (19%). [2]

Food Allergies

Food allergies are a growing food safety and public health concern that affect an estimated 8% of children in the United States (Gupta et al., 2018). That's 1 in 13 children, or about 2 students per classroom. A food allergy occurs when the body has a specific and reproducible immune response to certain foods (Boyce et al., 2011). The body's immune response can be severe and life-threatening, such as anaphylaxis. Eight foods or food groups account for most serious allergic reactions in the United States: milk, eggs, fish, crustacean shellfish, wheat, soy, peanuts, and tree nuts (Boyce et al., 2011). [3]

There is no cure for food allergies. Strict avoidance of the food allergen is the only way to prevent a reaction. However, because it is not always easy or possible to avoid certain foods, staff in early care and education programs should develop plans for preventing an allergic reaction and responding to a food allergy emergency, including anaphylaxis. Early and quick recognition and treatment can prevent serious health problems or death. The symptoms and severity of allergic reactions to food can be different between individuals and can also be different for one person over time. Anaphylaxis is a sudden and severe allergic reaction that may cause death, but not all allergic reactions will develop into anaphylaxis (Sampson et al., 2006). [4]

Developmental Readiness for Beginning To Eat Solid Foods

The age at which infants reach different developmental stages will vary. Typically between 4 to 6 months of age, infants develop the gross motor, oral, and fine motor skills necessary to begin to eat complementary foods. As an infant's oral skills develop, the thickness and texture of foods can gradually be varied. Signs that an infant is ready for complementary foods include: [5]

- Being able to control their head and neck.
- Sitting up alone or with support.
- Bringing objects to the mouth.
- Trying to grasp small objects, such as toys or food.
- Swallowing food rather than pushing it back out onto the chin.



Figure 5.3.1: Enjoying food. ([6])

Infants and young children should be given developmentally appropriate foods to help prevent choking. Foods such as hot dogs, candy, nuts and seeds, raw carrots, grapes, popcorn, and chunks of peanut butter are some of the foods that can be a choking risk for young children. Caregivers can take steps to decrease choking risks, including [7]

- Offering foods in the appropriate size, consistency, and shape will allow an infant or toddler child to eat and swallow easily.
- Making sure the infant or young child is sitting up in a chair or other safe, supervised place.
- Ensuring an adult is supervising feeding during mealtimes.
- Not putting infant cereal or other solid foods in an infant's bottle. This could increase the risk of choking and will not make the infant sleep longer.

[1] "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

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[4] "Food Allergies" from the CDC is in the public domain.

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5.4: Concerns for Underconsumption and Overconsumption

Over and Under Consumption

In the United States, some dietary components are of public health concern for infants and toddlers. Iron is a dietary component of concern among older infants ages 6 through 11 months who are fed primarily breast milk and consume inadequate iron from complementary foods. Older infants who are fed primarily breast milk also under-consume zinc and protein from complementary foods, and vitamin D, choline, and potassium are notably under-consumed by all older infants. During the second year of life, the dietary components of public health concern for underconsumption are vitamin D, fiber, and potassium and concern for overconsumption include added sugars and sodium. [1]

Introduce Iron-rich Foods Starting at about Six Months

Iron-rich foods are important components of the infant's diet from age 6 through 11 months to maintain adequate iron status, which supports brain development and immune function. Infants are typically born with body stores of iron adequate for about the first 6 months of life, depending on gestational age, maternal iron status, and timing of umbilical cord clamping. By age 6 months, however, infants require an external source of iron apart from breast milk. [1]

A complementary food source of iron beginning at about 6 months is particularly important for infants fed breast milk because the iron content of breast milk is low and maternal iron intake during lactation does not increase its iron content. In the United States, an estimated 77% of infants fed breast milk have inadequate iron intake during the second half of infancy, highlighting the importance of introducing iron-rich foods starting at age 6 months. [1]

Infants receiving most of their milk feeds as iron fortified infant formula are likely to need less iron from complementary foods beginning at 6 months of age. After age 12 months, children have a lower iron requirement, but good food sources of iron are still needed to maintain adequate iron status and prevent deficiency. [1]

Iron found in foods comes in two forms: heme and non-heme iron. Heme iron is commonly found in animal products and is more easily absorbed by the body. Sources of heme iron include: [2]

- Red meat (for example, beef, pork, lamb, goat, or venison)
- Seafood (for example, fatty fish)
- Poultry (for example, chicken or turkey)
- Eggs

Non-heme iron can be found in plants and iron-fortified products. This type of iron is less easily absorbed by the body and will require careful planning to get enough iron for your baby. Sources of non-heme iron include: [2]

- Iron-fortified infant cereals
- Tofu
- Beans and lentils
- Dark green leafy vegetables

Pairing non-heme iron sources with foods high in vitamin C can help with iron absorption. Vitamin C-rich fruits and vegetables include: [2]

- Citrus fruits like oranges
- Berries
- Papaya
- Tomatoes
- Sweet potatoes
- Broccoli
- Cabbage
- Dark green leafy vegetables



Figure **5.4.1**: Infant enjoying a delicious strawberry. ([3])

Introduce Zinc-rich Foods Starting at about Six Months

Zinc-rich complementary foods are important from age 6 months onwards for adequate zinc status, which supports growth and immune function. Although the zinc content of breast milk is initially high and efficiently absorbed, the concentration declines over the first 6 months of lactation and is not affected by maternal zinc intake. During the second half of infancy, approximately half (54%) of U.S. infants fed breast milk have inadequate zinc intake. Prioritizing zinc-rich foods starting at 6 months of age to complement breast milk feedings can help infants meet their requirement for zinc. [1]

Encourage a Variety of Food

To support nutrient adequacy, foster acceptance of healthy foods, and set intakes on a path toward a healthy pattern, it is important to encourage foods from all food groups. Because very young children are being exposed to new textures and flavors for the first time, it may take

up to 8 to 10 exposures for an infant to accept a new type of food. Repeated offering of foods such as fruits and vegetables increases the likelihood of an infant accepting them (Nicklaus, 2016). Several studies have shown that a food is consumed more and is judged as more liked by the infant after several offerings. For example, an increase in acceptance of a new green vegetable was observed after 10 exposures (Sullivan & Birch, 1994), and an increase in intake of a new fruit or vegetable was shown after eight exposures (Birch, Gunder, Grimm-Thomas & Laing, 1998). The effect of repeated exposure is great enough to increase the acceptance of foods which had been previously identified by the mother as being refused by her infant, which were most often green vegetables and pumpkin (Maier et al., 2007). However, despite the documented success after multiple offerings, foods are most often only presented a limited number of times (often less than five times) before the parent(s) decide that the infant dislikes this food (Carruth, Ziegler, Gordon & Barr, 2004). [1] [3]

A nutrient-dense, diverse diet from 6 months through toddlerhood includes a variety of food sources from each food group. Protein foods, including meats, poultry, eggs, seafood, nuts, seeds, and soy products, are important sources of iron, zinc, protein, choline, and long chain polyunsaturated fatty acids. The long-chain polyunsaturated fatty acids, specifically the essential omega-3 and omega-6 fatty acids supplied through seafood, nuts, seeds, and oils, influence the infant's fatty acid status and are among the key nutrients needed for the rapid brain development that occurs through the infant's first 2 years of life. Some types of fish such as salmon and trout are also natural sources of vitamin D. [4]



Figure 5.4.2:A variety of colorful vegetables to enjoy. ([5])

Vegetables and fruits, especially those rich in potassium, vitamin A, and vitamin C, should be offered to infants and toddlers starting at age 6 through toddlerhood. The vegetable subgroup of beans, peas, and lentils also provides a good source of protein and dietary fiber. [1]

For dairy, families can introduce yogurt and cheese, including soy-based yogurt, before 12 months. However, infants should not consume cow milk, as a beverage, or fortified soy beverage, before 12 months as a replacement for breast milk or infant formula. In the second year of life, when calcium requirements increase, dairy products, including milk, yogurt, cheese, and fortified soy beverages and soy yogurt provide a good source of calcium. Vitamin D-fortified milk and soy beverages also provide a good source of vitamin D. For those younger than the age of 2, offer dairy products without added sugar. [1]

Grains, including iron-fortified infant cereal, play an important role in meeting nutrient needs during this life stage. Infant cereals fortified with iron include oat, barley, multigrain, and rice cereals. Rice cereal fortified with iron is a good source of nutrients for infants, but rice cereal shouldn't be the only type of cereal given to infants. Offering young children whole grains more frequently than refined grains will increase dietary fiber as well as potassium intake during the second year of life and help young children establish healthy dietary practices. [1]

Dietary Components to Limit

While encouraging intake from each food group, some dietary components should be limited. Infants and young children have virtually no room in their diet for added sugars. This is because the nutrient requirements for infants and young children are quite high relative to their size, but the amount of complementary foods they consume is small. Complementary foods need to be nutrient-dense and not contain additional calories from added sugars. In addition, low- and no-calorie sweeteners are not recommended for children younger than age two. Taste preferences are being formed during this time period, and infants and young children may develop preferences for overly sweet foods if introduced to very sweet foods during this timeframe. [1]



Figure 5.4.3:The delights of a cake all to yourself. ([6])

Sodium is found in a number of foods, including some salty snacks, commercial toddler foods, and processed meats. In addition to keeping sodium intake within limits for toddlers, another reason to avoid high-sodium foods is that taste preferences for salty food may be established early in life. Choose fresh or low-sodium frozen foods, when available, and low-sodium canned foods to minimize sodium content. [1]

Infants should not be given any foods containing raw or cooked honey. Honey can contain the Clostridium botulinum organism that could cause serious illness or death among infants. Infants and young children also should not be given any unpasteurized foods or beverages, such as unpasteurized juices, milk, yogurt, or cheeses, as they could contain harmful bacteria. [1]

Due to the relatively high nutrient needs of toddlers, a healthy dietary pattern has virtually no room for added sugars. Toddlers consume an average of more than 100 calories from added sugars each day, ranging from 40 to 250 calories a day (about 2.5 to 16 teaspoons). Sugar-sweetened beverages, particularly fruit drinks, contribute more than 25 percent of total added sugars intakes and sweet bakery products contribute about 15 percent. Other food category sources contribute a smaller proportion of total added sugars on their own, but the wide variety of sources, which include yogurts, ready-to-eat cereals, candy, fruits, flavored milk, milk substitutes, baby food products, and breads, points to the need to make careful choices across all foods. [1]

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[1] "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

[2] "Iron" from the CDC is in the public domain

[3] Image by Stewardesign on Pixabay.

[4] Nicklaus (2016). Complementary feeding strategies to facilitate acceptance of fruits and vegetables: A narrative review of the literature. *International Journal of Environmental Research and Public Health*, *13*(11), 1160. CC by 4.0

[5] Image by Marisol Benitez on Unsplash.

[6] Image by Henley Design Studio on Unsplash.

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5.5: Beverages

Infants and Beverages

For healthy infants with adequate intake of breast milk or infant formula, supplemental water is typically not needed in the first 6 months. Small amounts (up to 4 to 8 ounces per day) of plain, fluoridated drinking water can be given to infants with the introduction of complementary foods. Plain, fluoridated drinking water intake can slowly be increased after age 1 to meet hydration and fluoride needs. [1]

Infants should not consume cow milk or fortified soy beverages before age 12 months to replace breast milk or infant formula. Cow milk does not have the correct amount of nutrients for infants, and its higher protein and mineral content are hard for an infant's kidneys and digestive system to process. Plain cow milk (whole milk) or fortified unsweetened soy beverage can be offered beginning around 12 months of age to help meet calcium, potassium, vitamin D, and protein needs. Flavored milks for children aged 12 through 23 months should be avoided because they contain added sugars. [1]

Plant-based milk alternatives include beverages made from plants, such as soy, oat, rice, coconut, and almond. These beverages should not be used in the first year of life to replace breast milk or infant formula. They may come in different flavors and some forms have added sugars. Unsweetened versions of these beverages may be accommodated in small amounts in the diet during the second year of life, but most have significantly less protein than cow milk and are not always fortified with calcium and vitamin D. Among plant-based milk alternatives, only fortified soy beverage is currently considered a dairy equivalent. Thus, consuming other plant-based beverages does not contribute to meeting dairy recommendations. [1]

Before twelve months, 100% fruit or vegetable juices should not be given to infants. In the second year of life, fruit juice is not necessary, and most fruit intake should come from eating whole fruit. If 100% fruit juice is provided, up to 4 ounces per day can fit in a healthy dietary pattern. Juices that contain added sugars should be avoided. [1]

Sugar-sweetened beverages (e.g., regular soda, juice drinks (not 100% fruit juice), sports drinks, and flavored water with sugar) should not be given to children younger than age 2. Drinks labeled as fruit drinks or fruit-flavored drinks are not the same as 100% fruit juice and contain added sugars. These beverages displace nutrient-dense beverages and foods in the diet of young children. Infants and toddlers do not have room in their diets for the additional calories from added sugars found in these beverages. In addition, sugar-sweetened beverage intake in infancy and early childhood may predispose children to consume more of these beverages later in life. [1]

Concerns exist about potential negative health effects of caffeine for young children, and no safe limits of caffeine have been established for this age group. Caffeine is a stimulant that can occur naturally in foods and beverages or as an additive. Major sources of caffeine for Americans include beverages such as soft drinks, tea, coffee, and sports drinks. Beverages containing caffeine should be avoided for infants and toddlers. [1]

[1] "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

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5.6: Healthy Dietary Patterns During a Toddler's Second Year of Life

Dietary Patterns

In the second year of life, toddlers consume less breast milk, and infant formula is not recommended. Calories and nutrients should predominantly be met from a healthy dietary pattern of age-appropriate foods and beverages. [1]

The table below displays a healthy dietary pattern for toddlers ages 12 through 23 months who are no longer receiving breast milk or infant formula. The pattern is provided at calorie levels ranging from 700 to 1,000 calories per day, which are appropriate for most toddlers ages 12 through 23 months. A healthy dietary pattern includes a variety of nutrient-dense fruits, vegetables, grains, protein foods (including lean meats, poultry, eggs, seafood, nuts, and seeds), dairy (including milk, yogurt, and cheese), and oils.

Vegetable Subgroups in Weekly Amounts

CALORIE LEVEL OF PATTERN a	700	800	900	1,000
Vegetables: Total (cup eq/day)	⅔	¾	1	1
Dark-Green Vegetables (cup eq/wk)	1	⅓	½	½
Red and Orange Vegetables (cup eq/wk)	1	1 ¾	2 ½	2 ½
Beans, Peas, Lentils (cup eq/wk)	¾	⅓	½	½
Starchy Vegetables (cup eq/wk)	1	1 ½	2	2
Other Vegetables (cup eq/wk)	¾	1 ¼	1 ½	1 ½
Fruits (cup eq/day)	½	¾	1	1
Grains (ounce eq/day)	1 ¾	2 ¼	2 ½	3
Whole Grains (ounce eq/day)	1 ½	2	2	2
Refined Grains (ounce eq/day)	¼	¼	½	1
Dairy (cup eq/day)	1 ⅔	1 ¾	2	2
Protein Foods (ounce eq/day)	2	2	2	2

Protein Foods Subgroups in Weekly Amounts

CALORIE LEVEL OF PATTERN a	700	800	900	1,000
Meats, Poultry (ounce eq/wk)	8 ¾	7	7	7 ¾
Eggs (ounce eq/wk)	2	2 ¾	2 ¼	2 ¼
Seafood (ounce eq/wk)e	2-3	2-3	2-3	2-3
Nuts, Seeds, Soy Products (ounce eq/wk)	1	1	1 ¼	1 ¼
Oils (grams/day)	**9**	**9**	**8**	**13**

After food group and subgroup recommendations are met, a small number of calories are allocated to oils. The recommendation to limit saturated fat to less than 10 percent of calories per day does not apply to those younger than age 2, and the inclusion of higher fat versions of dairy is a notable difference in the pattern for toddlers ages 12 through 23 months compared to patterns for ages 2 and older. However, no calories remain in the pattern for additional saturated fat or for added sugars. This dietary pattern requires careful choices of foods and beverages but does not require inclusion of fortified products specifically formulated for infants or toddlers to meet nutrient recommendations. [1]

Based on the FDA's and EPA's joint "Advice About Eating Fish," young children should eat seafood lowest in methylmercury, and certain species of seafood should be avoided. If consuming up to 2 ounces of seafood per week, children should only be fed cooked varieties from the "Best Choices" listed in Figure **5.6.1**. If consuming up to 3 ounces of seafood per week, children should only be fed cooked varieties from the "Best Choices" list that contain even lower methylmercury: flatfish (e.g., flounder), salmon, tilapia, shrimp, catfish, crab, trout, haddock, oysters, sardines, squid, pollock, anchovies, crawfish, mullet, scallops, whiting, clams, shad, and Atlantic mackerel. If consuming up to 3 ounces of seafood per week, many commonly consumed varieties of seafood should be avoided because they cannot be consumed at 3 ounces per week by children without the potential of exceeding safe methylmercury limits; examples that should not be consumed include: canned light tuna or white (albacore) tuna, cod, perch, black sea bass. [1]



Figure **5.6.1**: Fish sorted by level of mercury risk. ([3]) View Text Version

Figure **5.6.2** displays the dietary intakes of toddlers during the second year of life, in other words, what toddlers are actually eating. Average intakes of the food groups are compared to the range of recommended intakes. Average intakes of dairy foods, most of which is consumed as milk, generally exceeds recommended amounts in toddlers. In fact, the difference between the diary recommendation and the actual intake is the greatest of all the food groups. Intakes of yogurt and cheese account for about 10% of dairy intakes. Plant-based beverages and flavored milks each make up about 2% of dairy intakes among toddlers. Approximately 60% of toddlers meet or exceed recommended intakes for fruit. A majority of fruit is consumed as whole fruit (fresh, canned, puréed, frozen) or as 100% fruit juice. Average intake of total vegetables is below the range of recommended amounts, with nearly 90% of toddlers falling short of recommendations. About one-half of vegetables are consumed on their own, one-quarter are consumed as part of a mixed dish, and nearly 5 percent are consumed as savory snacks (e.g., potato chips). [1]



Figure **5.6.2**: Average daily food group intakes compared to recommended intake ranges. Recommended intake for: Total vegetables=.5-1cup, Total Fruits=.5-1, Total Grains=1.75-3, Total Dairy=1.75-2, Total Protein Foods=2. Average intakes for: Total vegetables=.75, Total Fruits=1.25, Total grains=3, Total Dairy=2.5, Total Protein Foods=2 ([4])

While the average overall intake of total vegetables is below the range of recommended amounts, consumption of specific types of vegetables is lower than others. Figure **5.6.3** shows the average intake of different types of vegetables (dark green, red and orange, beans, peas and lentils, starchy and other) compared to the recommended range. Of all the types of vegetables, the difference between the recommended range for dark green vegetables and the actual intake is the greatest of all the food groups. Toddlers should be eating more dark green vegetables. For all of the other types of vegetables, average intake falls toward the lower end of what is recommended. For example, while the average intake of red and orange vegetables is between 1 to 1.5 cups each week, the recommended intake range is between 1 to 2.5 cups each week.

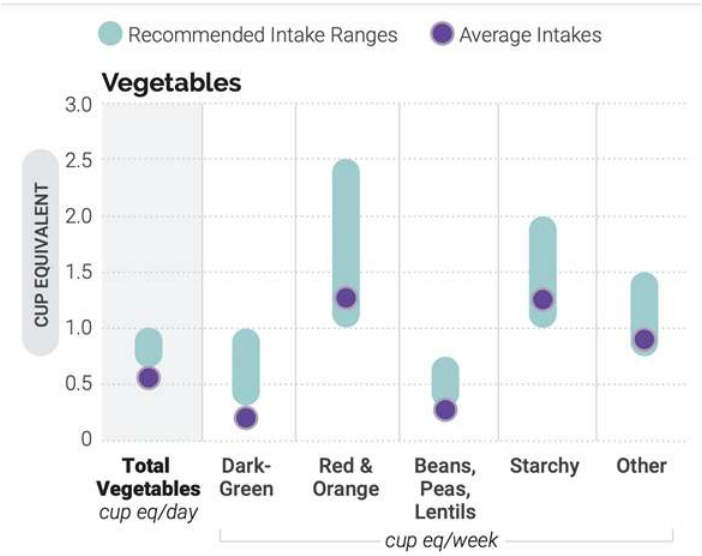


Figure **5.6.3**: Average intake of vegetables compared to recommended intake ranges: ages 12 through 23 months. Recommended Intake Ranges Vegetables Dark-Green=.25-1, Red and Orange=1-2.5, Beans, Peas, and Lentils=.25-.75, Starchy=1-2,Other=.75-1.5. Average Intake Vegetables Dark Green=.25, Red & Orange=1.25, Beans,Peas,Lentils=.25,Starchy= 1.25,Other=.75([4])

Figure 5.6.4 shows the average intake of grains compared to recommended intake ranges: ages 12 through 23 months. Total grains, particularly refined grains, are consumed in amounts that exceed recommendations. Conversely, intakes of whole grains fall short of recommended amounts for more than 95% of toddlers. A majority of grains are consumed through breads, rolls, tortillas, or other bread products or as part of a mixed dish. Ten percent of grains come from sweet bakery products and approximately 15 percent come from crackers and savory snacks. Many of these categories are top sources of sodium or added sugars in this age group. [1]

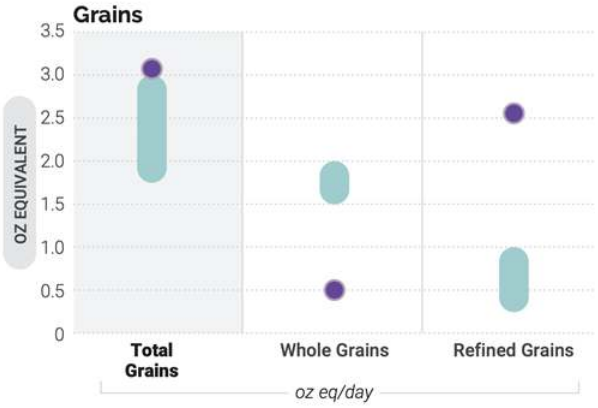


Figure 5.6.4: Average intake of grains compared to recommended intake ranges: ages 12 through 23 months. Recommended:Total Grains Reccommended= 1.75-3, Whole Grains=1.5-2, Refined Grains=.75-1. Average Intakes: Total Grains=3, Whole Grains=.5, Refined Grains=2.5 ([1])

Figure 5.6.5 shows the average intake of protein compared to recommended intake ranges for toddlers between 12 through 23 months. Protein food intake falls within the recommended range, on average. Intakes of meats, poultry, and eggs make up the majority of protein food intake, however seafood intake in toddlers is low. Children in this age group can reduce sodium intake by eating less cured or processed meats including hot dogs, deli meats, and sausages. [1]

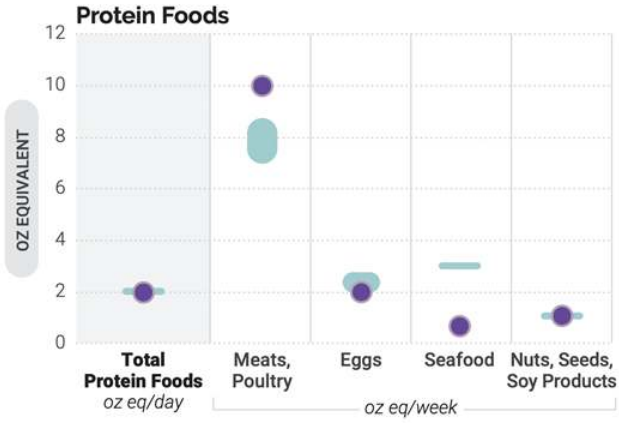


Figure 5.6.5: Average intake of protein compared to recommended intake ranges: ages 12 through 23 months. Protein Foods Recommended Intake Ranges in ounces: Total Protein Foods = 2, Meats, Poultry=7-9, Eggs=3, Seafood=3, Nuts, Seeds, Soy Products=3. Average Intakes: Total Protein Foods: 2, Meats, Poultry=10, Eggs=2, Seafood=1,Nuts,Seeds,Soy Products=.5. ([1])

[1] "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

[2] Image from "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

[3] "Advice about eating fish" from the FDA is in the public domain.

[4] Image from "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

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5.7: Supporting Healthy Eating

Healthy Eating

In addition to “what” to feed children, “how” to feed young children also is critical. Repeated exposure to foods can increase acceptance of new foods. Another important concept is responsive feeding, a feeding style that emphasizes recognizing and responding to the hunger or fullness cues of an infant or young child.

Even before a child can talk, they will show signs of hunger or fullness by using sounds and body movements. Crying is often a late sign of hunger. Understanding a child’s signs is important to help you know when and how often to feed a child. Responsive feeding is a term used to describe a feeding style that emphasizes recognizing and responding to the hunger or fullness cues of an infant or young child. Furthermore, responsive feeding helps young children learn how to self-regulate their intake. [1]

Between birth through 5 months a child may be hungry if they: [1]

- Put their hands to their mouth.
- Turn their head toward the breast or bottle.
- Pucker, smack, or lick their lips.



Figure **5.7.1**: Displaying signs of hunger. ([2])

Between birth through 5 months a child may be full if they: [1]

- Close their mouth.
- Turn their head away from the breast or bottle.
- Relax their hands.

Between 6 to 23 months a child may be hungry if they: [1]

- Reach for or point to food.
- Open their mouth when offered a spoon or food.
- Get excited when they see food.
- Use hand motions or make sounds to let you know they are still hungry.



Figure **5.7.2**: Toddler enjoying food. ([3]

Between 6 to 23 months a child may be full if they: [1]

- Push food away.
- Close their mouth when food is offered.
- Turn their head away from food.
- Use hand motions or make sounds to let you know they are full.



Figure 5.7.3: Toddler giving signs of being full ([1])

Accessing a Healthy Dietary Pattern

Many resources exist to support healthy growth and development during infancy and toddlerhood. These include the following government programs that aim to support a healthy dietary pattern for infants and toddlers living in households with limited incomes: [1]

- **The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)** supports infant and early childhood nutrition through supplementing the diets of women who are pregnant or lactating and by providing breastfeeding support and iron-fortified infant formula when breast milk is unavailable or fed only partially. WIC accommodates the transition to solid foods by providing nutrient-dense foods in the supplemental food packages offered to older infants and toddlers. Nutrition education and counseling and referrals to healthcare and social services are other important resources offered to income-eligible WIC participants.
- **The Child and Adult Care Food Program (CACFP)** provides reimbursement for nutrient-dense meals and snacks served to infants and toddlers in participating child care centers, including at Head Start programs, and day care homes where infants and toddlers also have access to health screenings and families can be connected to health services to support their overall well-being.
- **The Supplemental Nutrition Assistance Program (SNAP)** is the largest food assistance program in the United States. SNAP helps meet the nutritional needs of infants and toddlers living in low-income households by providing temporary monthly benefits that can be used to access a healthy dietary pattern. These government nutrition programs are especially important for the 14% of families with children who experience food insecurity and may struggle to access the foods needed to support a healthy dietary pattern. Professionals can use these, and additional Government and non-Government resources that exist within communities, to support healthy eating during infancy and toddlerhood.

[1] "Signs Your Child is Hungry or Full" from the CDC is in the public domain.

[2] Image from the CDC

[3] Image from the CDC is in the public domain.

[1] Image from the CDC is in the public domain.

[1] "Dietary Guidelines for Americans, 2020-2025" by U.S. Department of Agriculture and U.S. Department of Health and Human Services is in the public domain.

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5.8: Sleep

Importance of Sleep

Along with food and nutrition, sleep is critical during the first three years to promote healthy development. Sleep develops rapidly during the first few years of life and is a highly dynamic process with many changes during the first three years. At birth, infants do not have an established circadian rhythm to regulate their sleep–wake cycle and therefore sleep across multiple intervals throughout the day and night in short bouts, which may also be due to infants' feeding needs (Davis, Parker & Montgomery, 2004). At about 10 to 12 weeks of age, the first signs of a circadian rhythm begin to develop, marked by an increase in sleeping through the night (Mirmiran, Baldwin & Ariagno, 2003). The change in total sleep duration over 24 hours decreases from 16 to 17 hours in newborns, to 14 to 15 hours at 16 weeks of age, and then decreases further to 13 to 14 hours by 6 months of age (Adams, Jones, Esmail & Mitchell, 2004; Galland, Taylor, Elder & Herbison, 2012). While the need for day sleep decreases, night sleep duration increases through the first year of life, resulting in a shift towards a more nocturnal pattern of sleep (Bruni et al., 2014; Iglowstein, Jenni, Molinari & Largo, 2003; Sadeh, Mindell, Luedtke & Wiegand, 2009). [1]



Figure **5.8.1**: Sleeping comfortable with a trusted caregiver. ([2])

Concerns that children are not getting enough sleep have been around for over one hundred years, with recommendations of ideal sleep duration for children being provided as early as 1897 (Matricciani et al., 2012). The National Sleep Foundation (NSF) recommends a daily sleep duration of 14 to 17 hours each day from birth to 3 months, 12 to 15 hours each day from 4 to 11 months, 11 to 14 hours each day for infants aged 1 to 2 years, and 10 to 13 hours each day for preschoolers aged 3 to 5 years (Hirshkowitz et al., 2015). However, many infants and toddlers sleep less than the recommended amount (Matricciani et al., 2012). Figure **5.8.2** shows sleep duration data across ages. As can be seen in the figure, the total amount of hours varies the most during infancy, followed by slightly less variability during toddlerhood. From the preschool years to later childhood, there is little variability as children's sleep duration stabilizes and the total amount of hours they sleep becomes consistent. Short sleep duration is particularly prevalent in predominantly Asian countries. A study conducted on caregivers of 29,287 children between the ages of 0 and 36 months from seventeen countries reported that total sleep duration in children from predominantly Asian countries is significantly lower than children from predominantly Caucasian countries (Mindell et al., 2010). Moreover, regardless of age group, children from predominantly Asian countries consistently sleep less. [1]

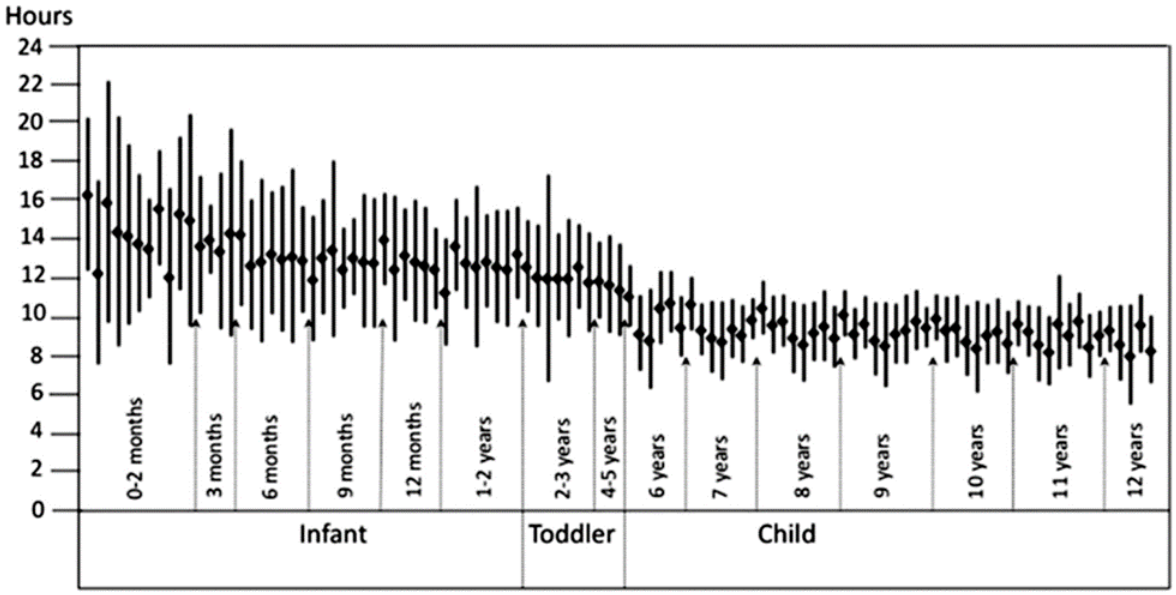


Figure **5.8.2**: Sleep duration data across ages. Mean number of hours in for infants 0-2 yrs with significant ranging between 22-8 hrs for infants 0-2, typically the numbers of hours is 16-14 hrs, toddler 2-5 dips down 13-14 average hours, a child 6-12 has significant variation between 6-12 hrs but the average is still around 10 hrs. ([3])

Sleep is important for infants and toddlers because sleep plays a significant role in memory consolidation, language acquisition and cognitive development (Tham, Schneider & Broekman, 2017). Memory consolidation is a process whereby a memory becomes more stable and resistant to being forgotten (Rasch & Born, 2013; Stickgold & Walker, 2007). For example, six and twelve month old infants who napped for at least 30 minutes after learning a set of object–action pairings from a puppet toy recalled significantly more target actions when tested after a 24-hour delay compared to infants in the no-nap group (Seehagen, Konrad, Herbert & Schneider, 2015). This study suggests that napping during infancy can help in the consolidation of memories, like learning new actions. [4]

After learning an artificial language, 15 month old infants who napped for at least 30 minutes, compared to those who did not nap at all, were able to abstract grammatical relations among words at a later test session that occurred 4 hours after learning (Gómez, Bootzin & Nadel, 2006). In a follow-up study, the benefits of napping for language learning persisted even after 24 hours (Hupbach, Gomez, Bootzin & Nadel, 2009). Sixteen month old infants who napped after learning sets of new object–word associations spent more time looking at the correct associative pairing at the 2-hour delayed test session, whereas infants who remained awake did not display any differences in looking between the learning and delayed test sessions (Horváth, Myers, Foster & Plunkett, 2015). These studies suggest that napping can enhance aspects of language learning. [4]



Figure **5.8.3**: Infant sleeping. ([5])

While taking naps and greater overall sleep can benefit cognitive and language development, less quality sleep and less overall sleep is negatively related to developmental outcomes. Greater movements or activity during sleep and greater number of awakenings after sleep onset were negatively correlated with scores on the Bayley Scales of Infant and Toddler Development

Mental Development Index (BSID-MDI) amongst 10 month old infants (Scher, 2005). In contrast, greater sleep efficiency (i.e. spending a larger percentage of time asleep between sleep onset and wakefulness) was positively correlated with BSID-MDI scores in the same group of infants. Besides sleep efficiency, longer proportions of sleep at night were also associated with better cognitive problem-solving skills (Gibson, Elder & Gander, 2012). Higher percentages of parent-reported night sleep (out of total sleep duration) at 12 and 18 months of age were significantly associated with better executive functioning performance at 26 months of age, especially performance related to impulse-control tasks (Bernier, Carlson, Bordeleau & Carrier, 2010). The benefits of higher percentages of sleep duration at night extend beyond toddlerhood. Findings from a follow-up study report that 12 month old infants with higher proportions of night sleep displayed better executive functioning performance at 4 years (Bernier et al., 2013). [4]

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[1] Tham et al., (2017). Infant sleep and its relation with cognition and growth: A narrative review. *Nature and Science of Sleep*, *9*, 135.

[2] Image by AMIT RANJAN is on Unsplash.

[1] Rudzik, A. E., & Ball, H. L. (2021). Biologically normal sleep in the mother-infant dyad. American journal of human biology, e23589. CC by 4.0

[4] Tham et al., (2017). Infant sleep and its relation with cognition and growth: A narrative review. *Nature and Science of Sleep*, *9*, 135.

[1] Image by adiretoriaeventos on Pixabay.

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5.9: Sudden Unexpected Infant Death (SUID)

SUID

To support optimal sleep for infants and toddlers, caregivers must be knowledgeable of safe sleep practices. Sudden unexpected infant death (SUID) is a term used to describe the sudden and unexpected death of an infant less than 1 year old in which the cause was not obvious before investigation. These deaths often happen during sleep or in the infant's sleep area. In the United States about 3,400 infants die suddenly and unexpectedly each year. Sudden unexpected infant deaths include sudden infant death syndrome (SIDS), accidental suffocation in a sleeping environment, and other deaths from unknown causes. Figure **5.9.1** shows the trends in sudden unexpected infant death (SUID) rates in the United States from 1990 through 2019. The SUID rate declined considerably beginning in 1990 following the release of The American Academy of Pediatrics safe sleep recommendations in 1992 and the initiation of the Back to Sleep (now known as Safe to Sleep) campaign that began in 1994. Since 1999, declines have slowed and plateaued. In 2019, the SUID rate was 90.1 deaths per 100,000 live births.

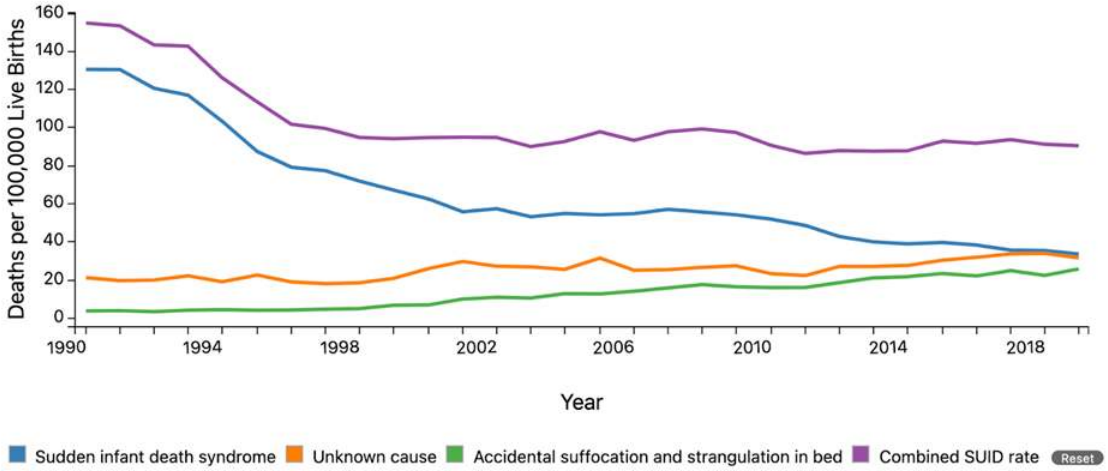


Figure **5.9.1**: Trends in Sudden Unexpected Infant Death by Cause, 1990–2019. Causes of deaths per 100,000 live births. The highest trend line was combined SUID rate. Begins at 160 in 1990 and trends downward to 100 in 2018. 2nd highest Sudden infant death syndrome downward trend starting at 160 in 1990 and ending at 100 after 2018. Unknown causes 3rd highest has a gradual upward trend from 22 in 1990 to 30 after 2018, upward trend for accidental death at 5 in 1990 to 20 in 2018. ([1])

In 2019, there were about 1,250 deaths due to SIDS, about 1,180 deaths due to unknown causes, and about 960 deaths due to accidental suffocation and strangulation in bed.

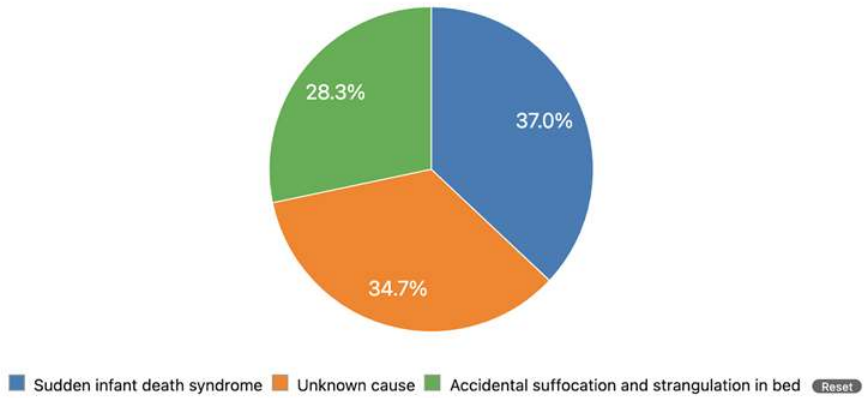


Figure **5.9.2**: Breakdown of Sudden Unexpected Infant Deaths by Cause in 2019. SUID = 37%, Unknown cause = 34.7%, Accidental suffocation and strangulation in bed = 28.3%. ([2]

Figure **5.9.3** is a map showing how sudden unexpected infant death (SUID) rates varied by state from 2015 through 2019 among the 50 U.S. states and the District of Columbia. Vermont, Massachusetts, California, New Hampshire, and New York had the lowest SUID rates.

Mississippi, Alabama, Arkansas, Louisiana, and South Dakota, had the highest SUID rates.

The SUID rate in Mississippi (184.7 per 100,000 live births) was almost 4 times the SUID rate in Vermont (46.3 per 100,000 live births).

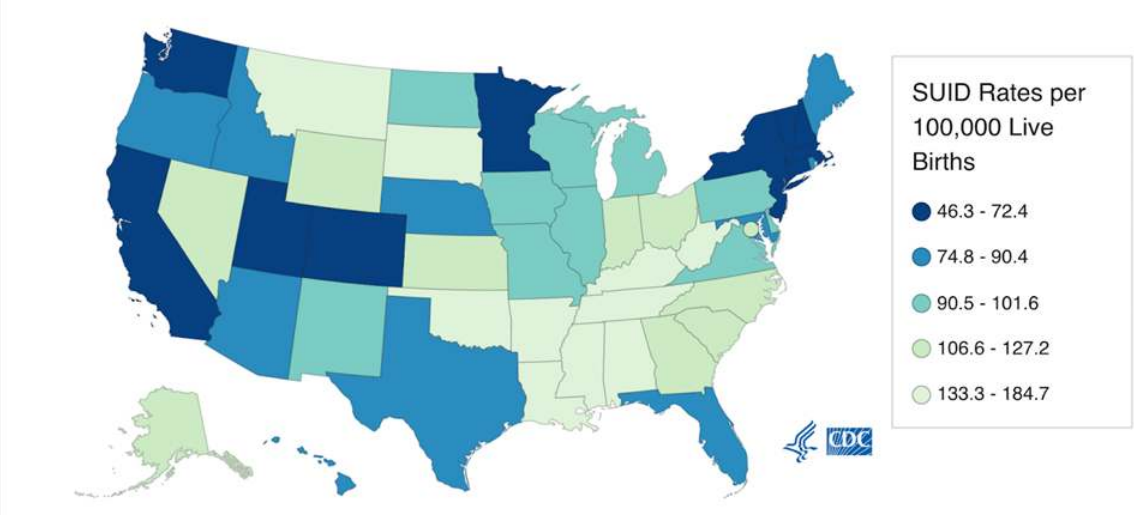


Figure **5.9.3**: SUID Rates by State, 2015–2019. Alabama 175.8, Alaska 126.8, Arizona 83.3, Arkansas 172.6, California 51.2 Colorado 60, Connecticut 61.4, Delaware 94.1, District of Columbia 122.7, Florida 88.7, Georgia 127.2, Hawaii 79.8, Idaho 74.8, Illinois 90.5, Indiana 106.6, Iowa 96, Kansas 111.1, Kentucky 133.3, Louisiana 157.4, Maine 85.9, Maryland 89.8, Massachusetts 48.9, Michigan 99.8, Minnesota 58.3, Mississippi 184.7, Missouri 101.6, Montana 140.1, Nebraska 88.1,Nevada 116.7, New Hampshire 56.1, New Jersey 61.6, New Mexico 97.3, New York 57.2, North Carolina 113.6, North Dakota 97.2, Ohio 110.3, Oklahoma 151.4, Oregon 88.2, Pennsylvania 92.4, Rhonde Island 88.5, South Carolina 116, South Dakota 154.8, Tennessee 148.7, Texas 90.4, Utah 57.8, Vermont 46.3, Virginia 100.7, Washington 72.4, West Virginia 149, Wisconsin 91.4, Wyoming 108 ([3])

Although the SUID rate has declined since the 1990s, significant racial and ethnic differences continue. Figure# is a stacked bar chart showing sudden unexpected infant death (SUID) rates by cause and by race/ethnicity in the United States from 2014 through 2018. SUID rates per 100,000 live births for American Indian/Alaska Native (212.1) and non-Hispanic Black infants (186.9) were more than twice those of non-Hispanic White infants (84.9). SUID rates per 100,000 live births were lowest among Hispanic (54.1) and Asian/Pacific Islander infants (34.4). Deaths due to SIDS accounted for the largest proportion of SUID for non-Hispanic Black infants (39%), Asian/Pacific Islander infants (40%), American Indian/Alaska Native infants (42%), and non-Hispanic White infants (43%). Deaths due to unknown causes accounted for the largest proportion of SUID for Hispanic infants (41%). ASSB accounted for the smallest proportion of SUID for all racial groups, ranging from 21% of SUID among Hispanic infants to 26% of SUID among non-Hispanic Black and non-Hispanic White infants.

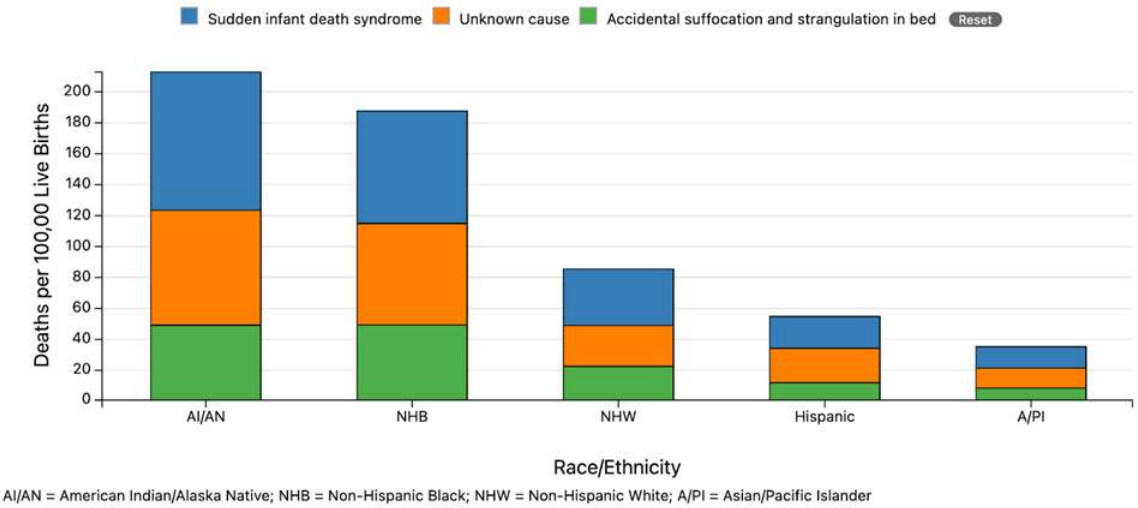


Figure **5.9.4**: Sudden Unexpected Infant Death by Race/Ethnicity, 2014–2018. Sudden infant death syndrome Sudden infant death syndrome AI/AN=89.5, NHB=72.7, NHW=36.7, Hispanic=20.7 A/PI=13.8, Unknown cause AI/AN=74.3,NHB=65.7, NHW=26.4, Hispanic=22.3,A/PI=13,Accidental suffocation and strangulation in bed AI/AN=48.4,NHB=48.5, NHW=21.8, Hispanic=11.1,A/PI=7.7([4])

Despite campaigns and the spreading awareness to reduce SIDS by creating safer sleeping environments, caregivers continue to not fully follow the guidelines. For example, Figure **5.9.5** shows the positions caregivers in Sweden place infants to sleep in. While most infants were placed to sleep in a supine position, as recommended, the data revealed that there were still some infants placed to sleep in the prone position (face down) (Wennergren, Strömberg-Celind, Goksör & Alm, 2021). Furthermore, the number of infants placed to sleep in the prone position increased from 2.3% at three months to 3.5% at six months of age.

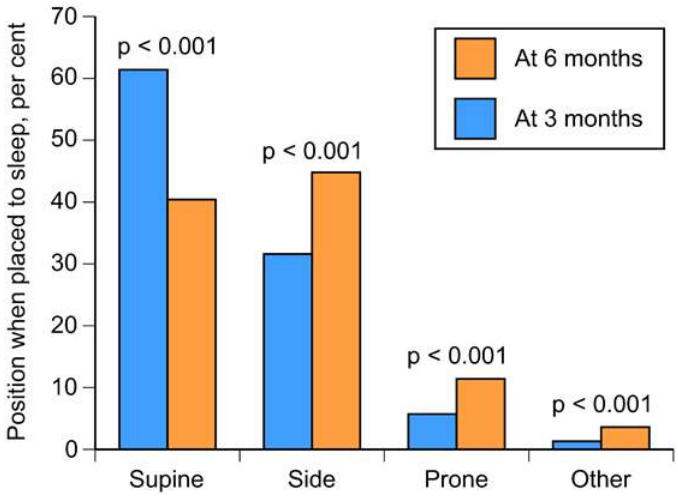


Figure **5.9.5**: Sleeping position of infants when placed to sleep. The position the infants were usually placed in when they were put down to sleep at three and six months of age. Side relates to the combination of side only and alternative use of the side or supine position, while prone relates to the combination of prone only and alternative use of the side or prone, or supine or prone, position. The figure is based on 3,566 (99.3%) responses for three months and 3,579 (99.7%) responses for six months. ([5])

In the U.S, 22% of mothers reported not placing their baby on their back to sleep, as recommended (see Figure **5.9.6**). The percentage was highest in Black mothers (38%) and young mothers under twenty years of age (30%).

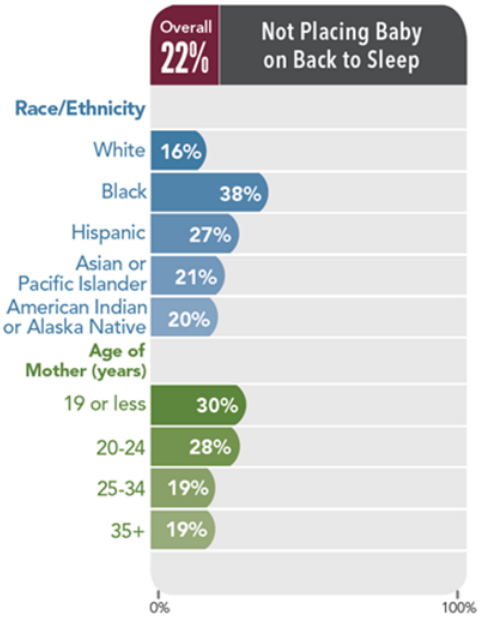


Figure 5.9.6: Percentage of mothers placing infants to sleep on their back. Not Placing Baby on Back to Sleep: Overall 22%, White 16%, Black 38%, Hispanic 27%, Asian or Pacific Islander 21%, American Indian or Alaska Native 20%, Age of Mother (years) 19 or less 30, 20-24 28, 25-34 19, 35+ 19 ([6])

Health care providers and researchers don't know the exact causes of sudden infant death syndrome (SIDS). However, research shows that caregivers can help reduce the risk of SIDS and other sleep-related infant deaths by doing the following:

- Place infants on their back for all sleep times—naps and at night.
- Use a firm, flat sleep surface, such as a mattress in a safety-approved crib, covered by a fitted sheet.
- Keep soft bedding such as blankets, pillows, bumper pads, and soft toys out of the sleep area.
- Do not cover an infant's head or allow them to get too hot. Signs an infant may be getting too hot include sweating or if their chest feels hot.

[1] Image from the CDC is in the public domain.

[2] Image from the CDC is in the public domain.

[3] Image from the CDC is in the public domain.

[4] Image from the CDC is in the public domain.

[5] Wennergren, G., Strömberg Celind, F., Goksör, E., & Alm, B. (2021). Swedish survey of infant sleep practices showed increased bed-sharing and positive associations with breastfeeding. Acta Paediatrica, 110(6), 1835-1841. CC by NC 4.0

[6] Image from "Safe Sleep for Babies" from the CDC is in the public domain.

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5.10: Physical Activity

Guidance on Physical Activity

The World Health Organization's (WHO) guidelines on physical activity, sedentary behavior and sleep for children under 5 years of age provides recommendations on the amount of time in a 24-hour day that young children should spend being physically active or sleeping for their health and wellbeing. The guidelines from the WHO are similar to those from various countries, including Australia, Canada and South Africa (Draper et al., 2020; Okely et al., 2017; Tremblay et al., 2017). For infants and toddlers, the WHO guidelines recommend the following: [1]

Infants (less than 1 year) should:

- Be physically active several times a day in a variety of ways, particularly through interactive floor-based play; more is better. For those not yet mobile, this includes at least 30 minutes in prone position (tummy time) spread throughout the day while awake.
- Not be restrained for more than 1 hour at a time (e.g. prams/strollers, high chairs, or strapped on a caregiver's back). Screen time is not recommended. When sedentary, engaging in reading and storytelling with a caregiver is encouraged.
- Have 14–17 hours (0–3 months of age) or 12–16 hours (4–11 months of age) of good quality sleep, including naps.

Children 1–2 years of age should:

- Spend at least 180 minutes in a variety of types of physical activities at any intensity, including moderate-to vigorous-intensity physical activity, spread throughout the day; more is better.
- Not be restrained for more than 1 hour at a time (e.g. prams/strollers, high chairs, or strapped on a caregiver's back) or sit for extended periods of time.
- When sedentary, engaging in reading and storytelling with a caregiver is encouraged.
- Have 11–14 hours of good quality sleep, including naps, with regular sleep and wake-up times.



Figure **5.10.1**: Typical Outdoor play yard for toddlers. ([2])

Unfortunately, many young children attending childcare centers do not meet the recommended amount of minutes for physical activity (Tandon, Saelens & Christakis, 2015). Although indoor and outdoor space and budgets can be restrictive for group care programs, there are strategies caregivers can implement to support the physical activity level of infants and toddlers. Previous studies have found that the size of the play area (Gubbels et al. 2012; Olesen, Kristensen, Korsholm & Froberg, 2013), having an indoor recreation room (Barbosa et al. 2016; Sando, 2019) and using indoor space for motor activities (Sugiyama, Okely, Masters & Moore, 2010) are positively associated with physical activity. Caregivers can create safe, open and age-appropriate spaces for mobile infants who are crawling and walking. Structures should allow infants the ability to safely practice developing motor

abilities without the frequent intervention of adult caregivers. Low structures can help infants to stand up and offer support while standing and walking. [3]

Indoors, children are more active when more space is available for playing. Tables, especially adult-sized tables, are related to a reduced level of physical activity (Nordtømme 2016; Sando, 2019). The arrangement of tables and the other furniture signal to children that they are expected to be seated at the tables and that physical and active play is not encouraged. Toddlers are significantly more active when jumping equipment is present, as well as when a fixed track was marked on the playground (Gubbels, Van Kann & Jansen, 2012). Just as indoor environments have marked areas for different activities, multicolor playground markings can increase children's activity levels (Ridgers, Stratton, Fairclough & Twisk, 2007) by encouraging different physical activities. [4] [5]



Figure **5.10.2**: A paved bike path helps create different opportunities for movement. ([6])

[1] "The WHO guidelines on physical activity, sedentary behaviour and sleep for children under 5 years" from the World Health Organization is licensed under CC by NC SA 3.0.

[2] Image by Todd LaMarr is licensed under CC by 4.0

[3] Sando (2019). The physical indoor environment in ECEC settings: Children's well-being and physical activity. *European Early Childhood Education Research Journal*, *27*(4), 506-519. CC by 4.0

[4] Sando (2019). The physical indoor environment in ECEC settings: Children's well-being and physical activity. *European Early Childhood Education Research Journal*, *27*(4), 506-519. CC by 4.0

[5] Gubbels et al., (2012). Play equipment, physical activity opportunities, and children's activity levels at childcare. *Journal of Environmental and Public Health*. CC by 3.0

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5.11: Conclusion

Conclusion of Health and Nutrition

To support the optimal health of infants and toddlers, it is critical for caregivers to be aware of current guidelines and best practices concerning food, nutrition, sleep and physical activity. Children grow rapidly during the first three years of life and optimal health can best support these critical years in growth and development. Caregivers play an essential role in providing nutritious food that is developmentally appropriate and ensuring infants and toddlers are engaging in enough sleep and physical activity in safe and supportive environments.

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CHAPTER OVERVIEW

6: Overview of Brain Development

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6.2: Brain Development- Volume Growth
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6.4: Lobes of the Brain
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6.1: Introduction

Introduction to Brain Development

As a caregiver of infants and toddlers, close observation allows you to experience, first hand, the developmental growth of language, cognition and social-emotional abilities. We know that the brain is also experiencing a rapid period of growth during these first three years of life, but brain development is not as easy to directly observe. The goal of this section is to provide an overview of some of the major brain structures and processes and importantly, explain how these structures and processes develop during infancy and toddlerhood.

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6.2: Brain Development- Volume Growth

Volume Growth

The brain begins developing a few weeks after conception and continues developing throughout the time in the womb. Once a baby is born, the major structures of the brain are formed and ready for the many new experiences of infancy. The explosive growth and function of the brain in infancy is unparalleled by any other postnatal developmental period. After birth, the brain continues to grow at a remarkable pace with its total volume doubled in the first year, followed by another 15% increase during the second year (Knickmeyer et al., 2008). The brain quadruples in size during the preschool period, reaching approximately 90% of adult volume by age 6 (Courchesne et al. 2000; Iwasaki et al. 1997; Kennedy et al. 2002; Lenroot & Giedd 2006; Paus et al. 2001; Reiss et al. 1996). Figure **6.2.1** shows the growth trajectory for brain volume from 0 to 18 years of age. The blue lines represent the growth for males and the red lines represent the growth for females. The yellow segment highlights the significant difference of growth between the two sexes. Notice how steep the trajectory rises in the first three years--representing this explosive brain growth! [1] [2]

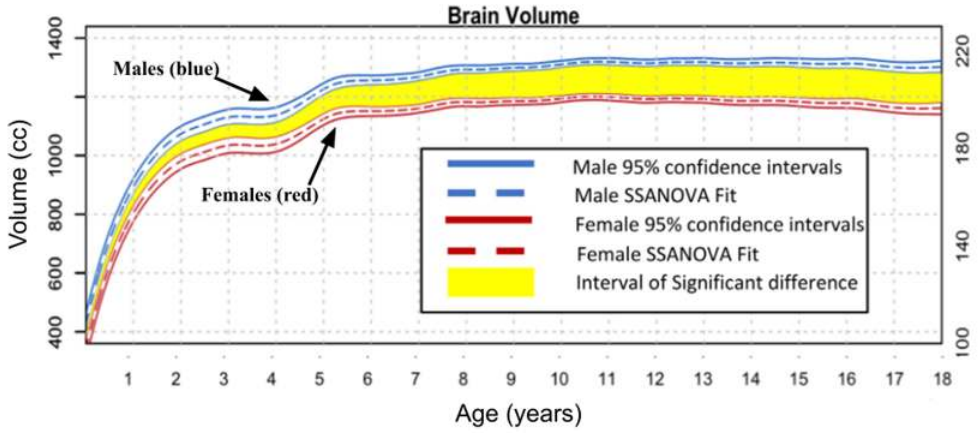


Figure **6.2.1**: Brain volume growth 0 to 18 years. Male volume increases significantly and sharply from 0-3 years plateauing at 1200 CC's around 3 years of age and then increasing again from 3-6 before plateauing again at around 1500 CC. Female volume increases significantly and sharply from 0-3 years plateauing at 1000 CC's around 3 years of age and then increasing again from 3-6 before plateauing again at around 1200 CC. . ([3])

Let's now zoom in and focus on the month-by-month brain growth during just the first two years. Figure **6.2.2** and Figure **6.2.3** chart the normative growth in brain volume for female and male children, respectively, between 0 to 24 months of age. Just as there are normative growth charts for infant and toddler height, weight and head circumference, Peterson et al., (2021) have published the first ever normative percentile curves for brain volume growth during childhood, with special attention towards infancy and toddlerhood. Each chart displays the 3rd, 15th, 50th, 85th, and 97th percentiles of normal brain volume growth during the first two years. Percentile curves allow a child to be compared to other children of the same sex and age, determining whether a child measures below or above the average. In these charts for example, if a child measures at the 50th percentile, this suggests that, at any specific age, 50% of the children will have larger brain volumes and 50% will have smaller brain volumes. If a child's brain volume is in the 15th percentile, this means 15% of children have smaller brain volumes and 85% have larger brain volumes than this child.

Compare and contrast Figure **6.2.2** and Figure **6.2.3**. What stands out to you? What do you notice is similar or different between the two charts? Notice the steady increase in brain volume each month, with the largest increases in the earlier months, primarily during the first twelve months. Comparing the two charts, males have a larger brain volume than females, a difference that appears early in infancy. Also, the percentile curves highlight the fact that there are early appearing individual differences in brain volume between children of the same sex, already by the first few months of life. In other words, by two months of age, some infants are at, below or above the 50th percentile. Brain volume during infancy and toddlerhood does not predict cognitive ability during these ages; however, sex and age-normalized brain volume for children between 6-18 years of age is related to cognitive performance (Peterson et al., 2021).

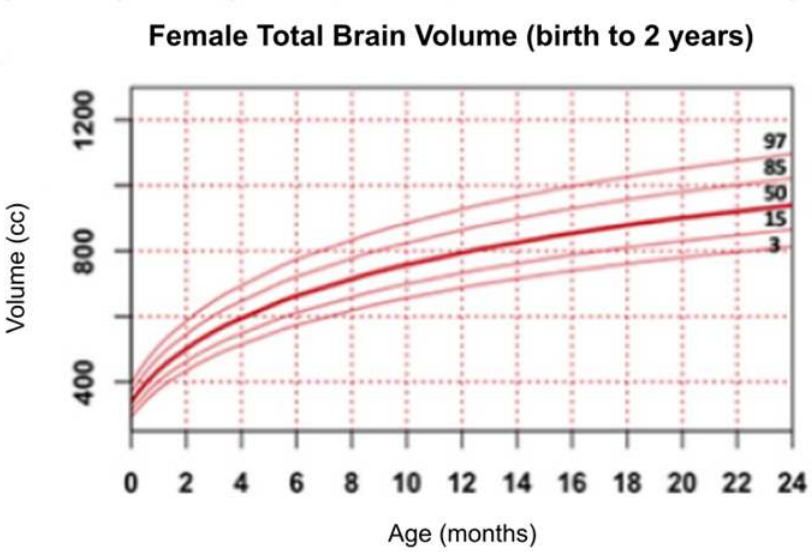


Figure **6.2.2**: Copy and Female Total Brain Volume (birth to 2 years) showing percentiles from 0-24 yrs. 3rd maxes at 800, 15th maxes at 850 cc, 50th maxes at 900, 85th maxes at 1000, and 97th maxes 1100 at percentiles of normal brain volume growth in females. ([4]

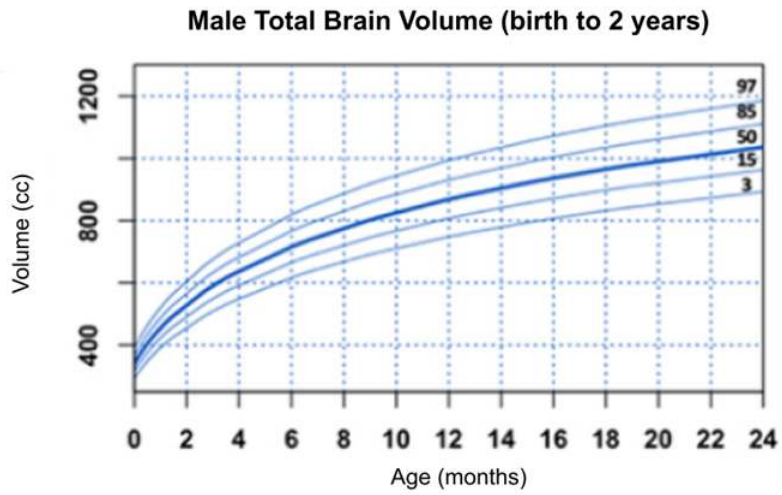


Figure **6.2.3**: Male Total Brain Volume (birth to 2 years) showing the percentiles of normal brain volume growth in males. 3rd maxed 850, 15th at 1000, 50th maxed at 1100, 85th maxed at 1150, and 97th maxed at 1200 ([5])

[1] Gao et al., (2017). Functional connectivity of the infant human brain: Plastic and modifiable. *The Neuroscientist, 23*(2), 169-184. CC by NC 3.0

[2] Stiles & Jernigan (2010). The basics of brain development. *Neuropsychology Review, 20*(4), 327-348. CC by 2.0

[3] Image adapted from Peterson et al., (2021). Normal childhood brain growth and a universal sex and anthropomorphic relationship to cerebrospinal fluid. *Journal of Neurosurgery: Pediatrics*. Used with permission.

[4] Image adapted from Peterson et al., (2021). Normal childhood brain growth and a universal sex and anthropomorphic relationship to cerebrospinal fluid. *Journal of Neurosurgery: Pediatrics*. Used with permission.

[5] Image adapted from Peterson et al., (2021). Normal childhood brain growth and a universal sex and anthropomorphic relationship to cerebrospinal fluid. *Journal of Neurosurgery: Pediatrics*. Used with permission.

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6.3: Structures of the brain

Brain Structures

The surface of the brain, known as the **cerebral cortex**, is very uneven, characterized by a distinctive pattern of folds or bumps, known as gyri (singular: gyrus), and grooves, known as sulci (singular: sulcus), shown in Figure **6.3.1**. These gyri and sulci form important landmarks that allow us to separate the brain into functional centers. The most prominent sulcus, known as the **longitudinal fissure**, is the deep groove that separates the brain into two halves or hemispheres: the left hemisphere and the right hemisphere.[1]

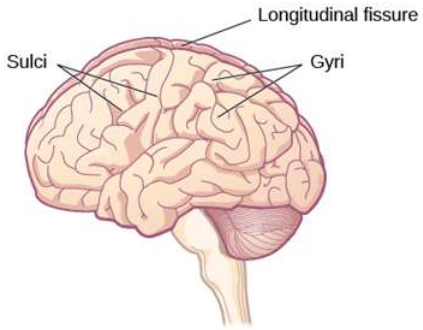


Figure **6.3.1**: The surface of the brain. ([1])

The two hemispheres are connected by a thick band of neural fibers known as the **corpus callosum**, consisting of about 200 million axons. The corpus callosum allows the two hemispheres to communicate with each other and allows for information being processed on one side of the brain to be shared with the other side.[1]

The two hemispheres of the cerebral cortex are part of the forebrain (see Figure **6.3.2**), which is the largest part of the brain. The forebrain contains the cerebral cortex and a number of other structures that lie beneath the cortex (subcortical structures): the thalamus, the hypothalamus, the pituitary gland, and the limbic system. The cerebral cortex, which is the outer surface of the brain, is associated with higher-level processes such as consciousness, thought, emotion, reasoning, language, and memory. Each cerebral hemisphere can be subdivided into four lobes, each associated with different functions.[1]

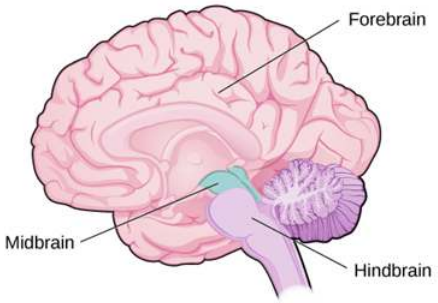


Figure **6.3.2**: The brain and its parts can be divided into three main categories. ([3])

[1] "The Brain and Spinal Cord" on OpenStax is licensed under CC by 4.0

[2] "The Brain and Spinal Cord" on OpenStax is licensed under CC by 4.0

[3] Image from "The Forebrain Structures" on OpenStax is licensed under CC by 4.0

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6.4: Lobes of the Brain

The Four Lobes

The four lobes of the brain are the frontal, parietal, temporal, and occipital lobes (see Figure **6.4.1**). The **frontal lobe** is located in the forward part of the brain, located behind your forehead. The frontal lobe is involved in reasoning, motor control, emotion, and language. It contains the motor cortex, which is involved in planning and coordinating movement; the prefrontal cortex, which is responsible for higher-level cognitive functioning; and Broca's area, which is essential for language production. [1]

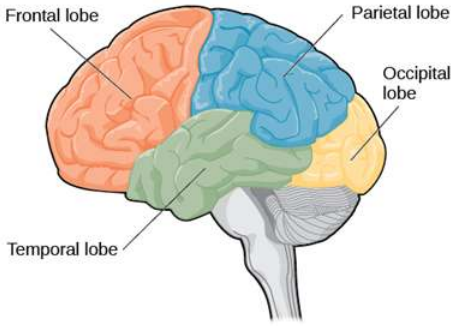


Figure **6.4.1**: The four lobes of the brain. ([2])

The brain's **parietal lobe** is located immediately behind the frontal lobe, and is involved in processing information from the body's senses. It contains the somatosensory cortex, which is essential for processing sensory information from across the body, such as touch, temperature, and pain. [3]

The **temporal lobe** is located on the side of the head (temporal means "near the temples"), and is associated with hearing, memory, emotion, and some aspects of language. The auditory cortex, the main area responsible for processing auditory information, is located within the temporal lobe. Wernicke's area, important for speech comprehension, is also located here. Whereas individuals with damage to Broca's area have difficulty producing language, those with damage to Wernicke's area can produce sensible language, but they are unable to understand it (see Figure **6.4.2**). [1]

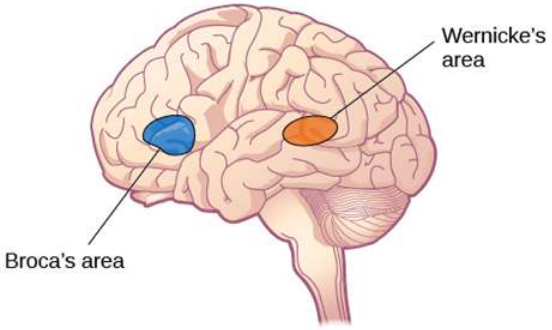


Figure **6.4.2**:Location of Broca's area and Wernicke's area in the brain. Broca's area is located in the frontal lobe and Wernicke's located in the parietal lobe
. ([4])

The **occipital lobe** is located at the very back of the brain, and contains the primary visual cortex, which is responsible for interpreting incoming visual information.

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[2] "The Lobes of the Brain" on OpenStax is licensed under CC by 4.0

[3] "The Brain and Spinal Cord" on OpenStax is licensed under CC by 4.0

[4] "Broca's and Wernicke's area" on OpenStax is licensed under CC by 4.0

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6.5: Other Areas of the Forebrain

Additional Forebrain Areas

Other areas of the forebrain, located beneath the cerebral cortex, include the thalamus and the limbic system. The thalamus is a sensory relay for the brain. All of our senses, with the exception of smell, are routed through the thalamus before being directed to other areas of the brain for processing (Figure **6.5.1**).

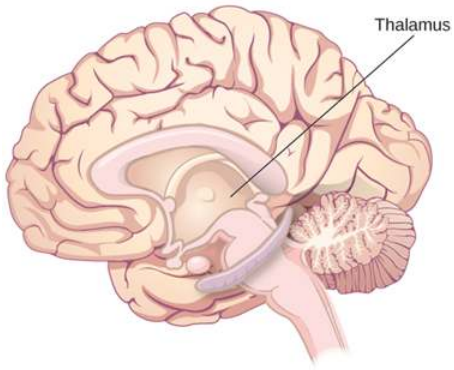


Figure **6.5.1**:Thalamus. The thalamus serves as the relay center of the brain where most senses are routed for processing. (Copyright; [1])

The **limbic system** is involved in processing both emotion and memory. Interestingly, the sense of smell projects directly to the limbic system; therefore, not surprisingly, smell can evoke emotional responses in ways that other sensory modalities cannot. The limbic system is made up of a number of different structures, but three of the most important are the hippocampus, the amygdala, and the hypothalamus (see Figure **6.5.2**). The hippocampus is an essential structure for learning and memory. The amygdala is involved in our experience of emotion and in tying emotional meaning to our memories. The hypothalamus regulates a number of homeostatic processes, including the regulation of body temperature, appetite, and blood pressure. The hypothalamus also serves as an interface between the nervous system and the endocrine system and in the regulation of sexual motivation and behavior. [2]

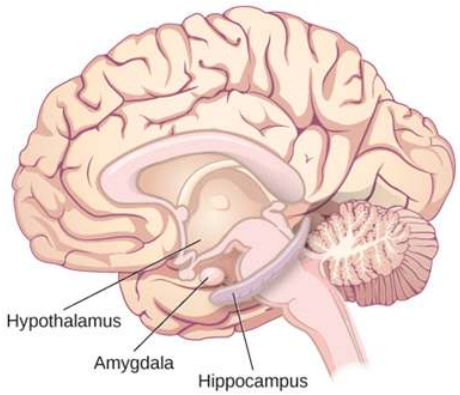


Figure **6.5.2**: The limbic system.. ([3])

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[2] "The Brain and Spinal Cord" on OpenStax is licensed under CC by 4.0

[3] The Limbic System from "The Brain and Spinal Cord" on OpenStax is licensed under CC by 4.0

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6.6: Cerebral Lateralization

The second year of life marks a period of dramatic advances in childrens' expressive and receptive language abilities. How does the developing brain support this explosive language growth? Cerebral lateralization refers to the functional specialization of the two cerebral hemispheres. In other words, each hemisphere becomes dominant in primarily processing specific types of information. A common example of cerebral lateralization is language processing. Most adults predominantly process language in the left hemisphere (Lust et al., 2011; Whitehouse & Bishop, 2009); however, lateralization of language to the left hemisphere is not present at birth, but rather develops over the first three years. [1]

Across the first three years of life, neuroscience has discovered changes in brain activity, especially shifts in cerebral specialization, related to children's language experience. As Figure **6.6.1** shows, between 13 to 17 months of age, brain activity is bilateral (activated across both hemispheres). However, just a few months later, by 20 months of age, brain activity is predominantly lateralized to the left hemisphere (Mills, Coffey-Corina & Neville, 1997: Mills et al., 2004). This pattern of results has been supported by studies of word processing in 19 to 22-month-old simultaneous bilingual children (Conboy and Mills, 2006), in late talkers up to age 30 months (Mills et al., 2005a), and in 18 to 30-month-old children with autism spectrum disorder and typically developing controls (Kuhl et al., 2013). These data indicate that left lateralization of brain activity is not present at birth and the timing from bilateral to left lateralization is strongly related to experience with language, specifically word familiarity, rather than chronological age (Mills et al., 2005). [2]

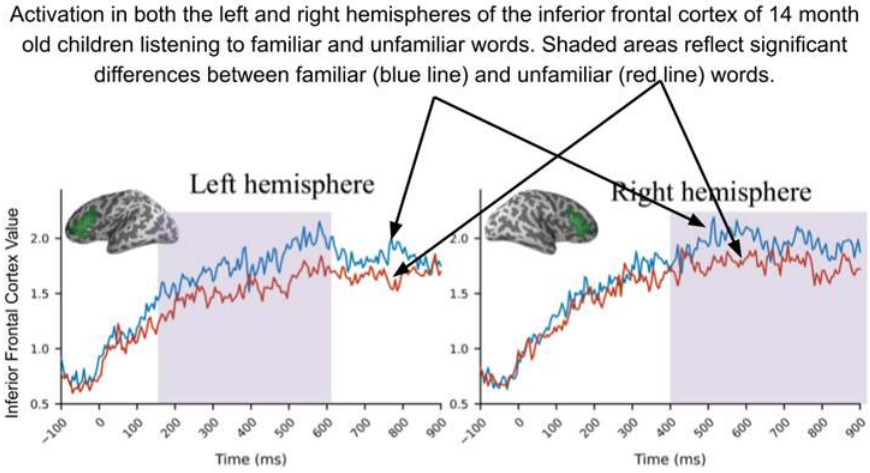


Figure **6.6.1**: Activation in both the left and right hemispheres of the inferior frontal cortex of 14-month-old children listening to familiar and unfamiliar words. Shaded areas reflect significant differences between familiar (blue line) and unfamiliar (red line) words. ([3])

[1] Groen et al., (2012). Does cerebral lateralization develop? A study using functional transcranial Doppler ultrasound assessing lateralization for language production and visuospatial memory. *Brain and Behavior, 2*(3), 256-269. CC by NC 3.0

[2] Bosseler et al., (2021). Using magnetoencephalography to examine word recognition, lateralization, and future language skills in 14-month-old infants. *Developmental Cognitive Neuroscience*, *47*, 100901. CC by 4.0

[3] Image from Bosseler et al., (2021). Using magnetoencephalography to examine word recognition, lateralization, and future language skills in 14-month-old infants. *Developmental Cognitive Neuroscience*, *47*, 100901. CC by 4.0

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6.7: Neurons- Structure and Function

The Structure of Neurons

The human brain is arguably the most complex of all biological systems. The adult brain is composed of more than 100 billion neurons (Pakkenberg and Gundersen 1997). Neurons are the information processing cells in the brain (see Figure **6.7.1**). There are many different kinds of neurons that vary in their size and shape as well as in their function. Neurons make connections with other neurons to form the information processing networks that are responsible for all of our thoughts, sensations, feelings and actions. Since each neuron can make connections with more than 1,000 other neurons, the adult brain is estimated to have more than 60 trillion neuronal connections! [1]

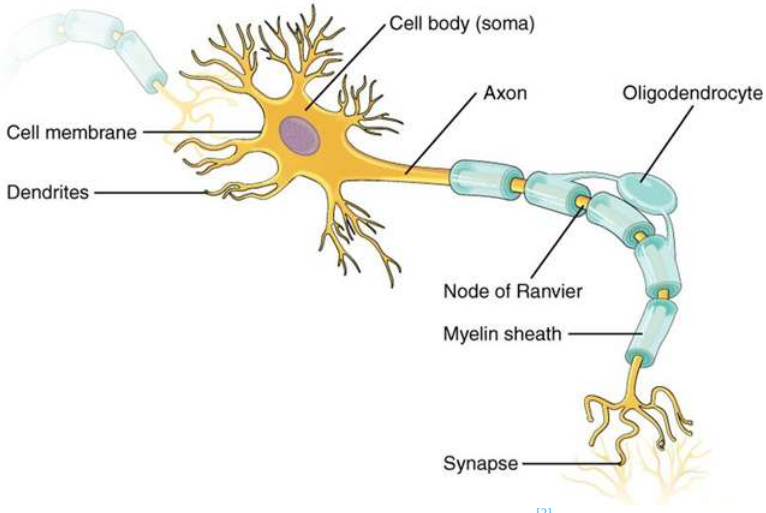


Figure **6.7.1**: Structure of a neuron. ([2])

Populations of neurons are connected to one another by fibers that extend from cell bodies of the individual neurons. There are two kinds of connecting fibers, dendrites and axons. Dendrites are arrays of short fibers that look like the branches of a tree. They extend only a short distance away from the neuron cell body. Their main function is to receive the electrochemical input signals from other neurons. Axons are long connecting fibers that extend over long distances and make connections with other neurons, often at the dendrites. Axons act a little like telephone wires in that they are responsible for sending electrochemical signals to neurons located in distant locations. Bundles of individual axons from many different neurons within one region of the brain form fiber tracts that extend to, and make connections with, groups of neurons in other regions of the brain forming the information processing networks. Axons are wrapped in a fatty substance called myelin that, like insulation on a telephone wire, makes the transmission of electrochemical signals between regions efficient. Myelin is white in appearance, thus fiber pathways of the brain are often referred to as “white matter”, or “white matter pathways”. [3]

Neurons communicate with each other through “chemical signaling,” a process in which they exchange chemicals called “neurotransmitters. This is how it happens: an action potential is an electrical impulse that travels through a neuron, triggering it to release neurotransmitters into a small gap found in between two neurons, called a synapse. Then, the dendrites of the neuron on the other side of the synapse takes up the neurotransmitters, which then generates an action potential that travels along the axon of this second neuron. This process continues in several neurons that are connected to each other. [5]

While most of the brain’s 100 to 200 billion neurons are present at birth, they are not fully mature during infancy and toddlerhood. As they mature, neurons establish connections between each other. Synapses, the connections between neurons, undergo a period of transient exuberance or temporary dramatic growth. There is a proliferation of these synapses during the first two years so that by age 2, a single neuron might have thousands of connections. Figure **6.7.2** shows neurons and their connections from an area within the frontal lobe of the cortex. Image A (on the left of Figure **6.7.2**) is from the brain of a one month old infant and image B is from the brain of a six year old. As we are born with most of the neurons we will ever have, the difference between these two images is not a difference in the quantity of neurons, rather the difference between them is the quantity and quality of connections.

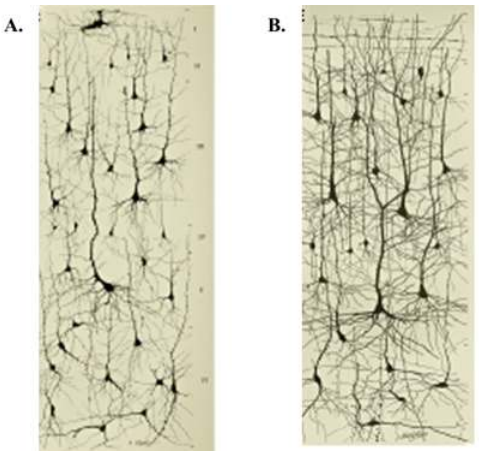


Figure **6.7.2**:Change in neuronal connections from 1 year old to 6 years old.[6]

After the dramatic increase in synapses, the neural pathways that are not used will be eliminated thereby making those that are used much stronger. This process of elimination is called pruning. Experience will shape which of these connections are maintained and which of these are pruned. Ultimately, about 40 percent of the early connections will be lost (Webb, Monk, and Nelson, 2001). This activity is occurring primarily in the cortex or the thin outer covering of the brain involved in voluntary activity and thinking. The prefrontal cortex, located behind our forehead, continues to grow and mature throughout childhood and experiences an additional growth spurt during

adolescence. It is the last part of the brain to mature and will eventually comprise 85 percent of the brain's weight. As the prefrontal cortex matures, the child is increasingly able to regulate or control emotions, to think hypothetically, strategize, and have better judgment. Of course, this is not fully accomplished in infancy and toddlerhood, but continues throughout childhood and into adulthood (Uytun, 2018). [7]

Myelination

Another significant change occurring in the central nervous system is the development of myelin, a coating of fatty tissues around the axon of the neuron. Myelin helps insulate the nerve cell and speed the rate of transmission of impulses from one cell to another. This increase enhances the building of neural pathways and improves coordination and control of movement and thought processes. During infancy, myelination progresses rapidly, with increasing numbers of axons acquiring myelin sheaths. This corresponds with the development of cognitive and motor skills, including language comprehension, speech acquisition, sensory processing, reaching/grasping and crawling/walking. The development of myelin continues into adolescence but is most dramatic during the first several years of life. [8] [9]

[1] Stiles & Jernigan (2010). The basics of brain development. *Neuropsychology review, 20*(4), 327-348. CC by 2.0

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[5] Kaur et al., (2019). Using magnets to stimulate the brain helps people with depression. *Frontiers for Young Minds*, *7*, 1-8. CC by 4.0

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6.8: Development of brain networks

Brain Networks

How does the brain retain so much information while also having the ability to quickly and efficiently process new information during infancy and toddlerhood? The adult brain is a highly organized network consisting of billions of interconnected neurons (Herculano-Houzel, 2009). Fast and efficient communication throughout the brain is necessary for nearly all cognitive processes. One theory suggests that the brain has sets of networks. Each network is composed of hubs that represent distinct brain regions, with pathways connecting these regions. Fransson et al. (2010) were the first to investigate the functional architecture of the infant brain. They reported that functional networks are already present, even if in basic form, in the newborn brain and are predominantly located in the sensory and motor regions of the brain--supporting early infant sensorimotor development.

Figure **6.8.1** illustrates the developmental changes in brain networks between 1 month olds, 1 year olds and 2 year olds. Compare the images for each age group, what similarities and differences do you notice? In 1 month olds, the network hubs are located in the anterior (near the front) and posterior (near the back) areas of the brain with limited connections between anterior and posterior hubs. In comparison, in one year olds, the network hubs are located more toward the center of the brain with more connections linking all the hubs together. Finally, in two year olds, the locations of hubs become more spatially distributed, with hubs located across the brain and connections linking all the network hubs together. In summary, this research shows that children are born with brain networks ready to process the many sensory and motor experiences of early infancy and within the first two years, these networks experience major transformations as they continue to support the rapidly developing child.

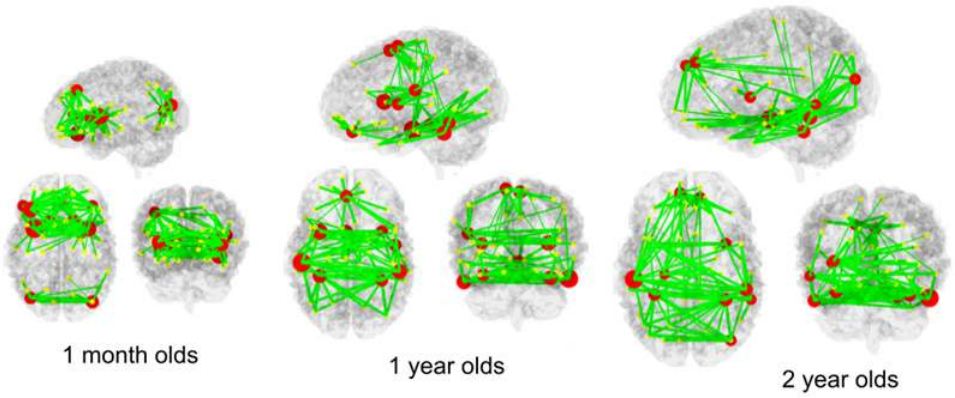


Figure **6.8.1**: Location and connections between the top ten brain network hubs. In 1 month olds, the network hubs are located in the anterior (near the front) and posterior (near the back) areas of the brain with limited connections between anterior and posterior hubs. In comparison, in one year olds, the network hubs are located more toward the center of the brain with more connections linking all the hubs together. Finally, in two year olds, the locations of hubs become more spatially distributed, with hubs located across the brain and connections linking all the network hubs together ([1])

[1] Image from Gao et al., (2011). Temporal and spatial evolution of brain network topology during the first two years of life. *PloS One*, *6*(9), e25278. CC by 4.0

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6.9: Growth Patterns of Brain Matter

Brain Matter

Looking at the tissue in the brain, there are regions that predominantly contain neuron cell bodies and dendrites and regions that are largely composed of just axons. These two regions are often referred to as **gray matter** (the regions with many cell bodies and dendrites) or **white matter** (the regions with many myelinated axons). Figure **6.9.1** demonstrates the appearance of these regions in the brain and spinal cord. The colors ascribed to these regions are what would be seen in "fresh," or unstained, brain tissue. Gray matter is not necessarily gray. It can be pinkish because of blood content, or even slightly tan, depending on how long the tissue has been preserved. But white matter is white because axons are insulated by a lipid-rich substance called myelin. Lipids can appear as white ("fatty") material, much like the fat on a raw piece of chicken or beef.

Actually, gray matter may have that color ascribed to it because next to the white matter, it is just darker—hence, gray. [1]

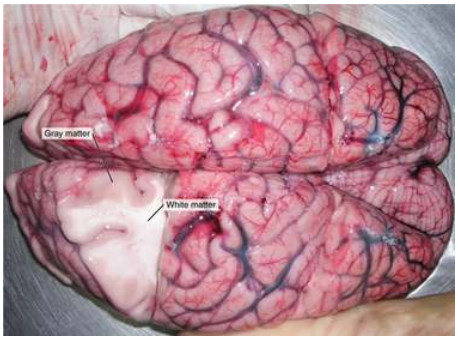


Figure **6.9.1**: Gray Matter and White Matter of an exposed brain. ([2])

There is a rapid growth of total brain volume in the first three years, but the rate of growth is different for gray and white matter. Figure **6.9.2** depicts the pattern of average total brain volume growth across the first 547 days (approximately 18 months) of development as well as the individual growth trajectories of white and gray matter. Figure **6.9.2** illustrates the relatively faster growing trend of gray matter compared with white matter growth suggesting that early brain volume growth is dominated primarily by increases in gray matter. [3] Figure **6.9.3** and Figure **6.9.4** show the growth of gray and white matter for females and males separately, across the first three years and for each year after that, until eighteen years of age. These graphs further emphasize the rapid growth of brain volume, for both white and gray matter, during infancy and toddlerhood.

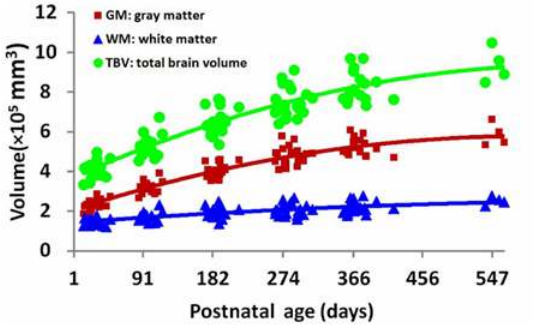


Figure **6.9.2**: Depicts the pattern of average total brain volume growth across the first 547 days (approximately 18 months) of development as well as the individual growth trajectories of white and gray matter. Postnatal age and Volume ($x10^5$ mm^3) Total brain Volume (TBV): 1 day =1 progressively increasing to 547 days=2, Gray matter(GM): 2 days - 2 increasing to 5 at 547 days, Total White matter (WM): 1 day = 4 progressively to 10 at 547 days. ([4])

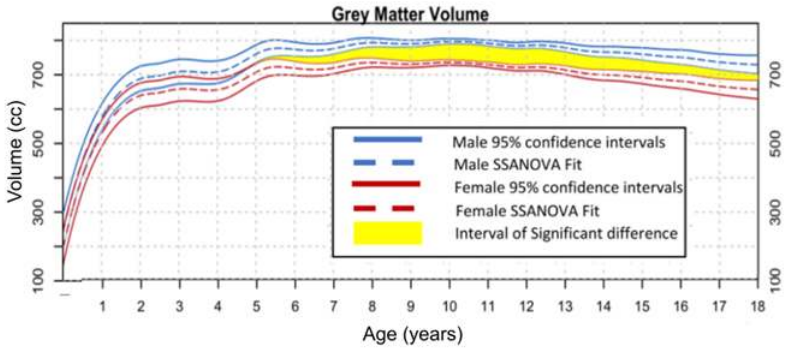


Figure **6.9.3**: illustrates the relatively faster growing trend of gray matter compared with white matter growth suggesting that early brain volume growth is dominated primarily by increases in gray matter. Figure **6.9.3** and Figure **6.9.4** show the growth of gray and white matter for females and males separately, across the first three years and for each year after that, until eighteen years of age. ([5])

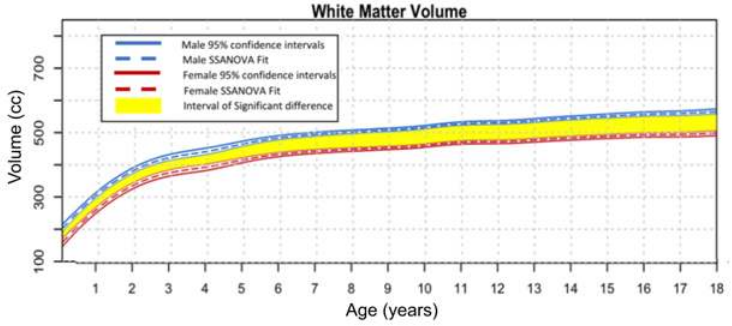


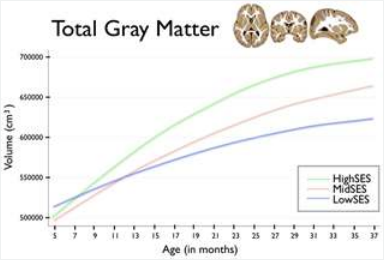
Figure **6.9.4**: Growth trajectories of white matter. Figure **6.9.3** and Figure **6.9.4** show the growth of gray and white matter for females and males separately, across the first three years and for each year after that, until eighteen years of age ([6])

Social Justice Insight:

Family Income Affects the Rate of Infant & Toddler Brain Growth.

Hanson et al., (2013) analyzed repeated measures of brain development of children between five months and four years of age from economically diverse backgrounds. The data suggest that low socioeconomic status (SES) environments influence the rate of human infant brain development. As Figure# shows, infants and toddlers from lower income families began their lives with similar gray matter brain volumes but by toddlerhood, they had lower total gray matter compared with those from middle and high-income households.

Growth trajectories of gray matter by SES group. [7]



As infants aged—and presumably had increased exposure to the effects of their environments— the differences in brain volume between children from lower SES homes and those from higher SES homes widened. Furthermore, smaller volumes in this brain tissue were related to greater behavior problems in the preschool years.

Questions to consider:

- What are the different environmental factors between high versus low SES families that may be mainly driving this data?
- Are group care facilities that primarily serve high or low SES families different? In which ways?
- In what ways may infant and toddler care facilities be biased toward serving a particular SES population?
- What policies and practices can we better implement in an attempt to improve the environments for infants and toddler in group care?

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[3] Wang et al., (2012). 4D multi-modality tissue segmentation of serial infant images. CC by 4.0

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[6] Image adapted from Peterson et al., (2021). Normal childhood brain growth and a universal sex and anthropomorphic relationship to cerebrospinal fluid. *Journal of Neurosurgery: Pediatrics*. Used with permission.

[1] Image from Hanson et al., (2013). Family poverty affects the rate of human infant brain growth. *PloS One*, *8*(12), e80954. CC by 3.0

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6.10: Brain Systems Underlying Development

Supporting Brain Development

During the first two years of life, the brain undergoes dramatic growth while supporting the development of various behavioral and cognitive abilities. As a caregiver, you cannot directly observe this brain growth, but you are able to witness the many developmental milestones infants and toddlers rapidly progress through. Neuroscience has shown that many developmental achievements are supported by specific underlying brain systems.

The type of secure attachment young children develop is related to the relationships they have with caregivers. In six month old infants, caregiver sensitivity and brain functional connectivity were related between the hippocampus and brain regions important to emotion regulation, cognitive flexibility and social communication (Rifkin-Graboi et al., 2015). Between 6-8 months of age, infant brains are able to distinguish between the sounds of any language, but by around one year of age, they neurally commit and become more efficient at processing their native language and less proficient at distinguishing between sounds not found in their native language (Kuhl et al., 2006; Rivera-Gaxiola, Silva-Pereyra & Kuhl, 2005). At twelve months of age, the achievement of walking is correlated with functional brain connectivity of motor networks in the infant brain (Marrus et al., 2018). Joint attention, the coordinated focus of two people on an object, emerges over the first 2 years of life and supports social-communicative functioning related to the healthy development of language, empathy, and theory of mind. The functional organization of the brain is related to the emergence of joint attention in infants and toddlers (Eggebrecht et al., 2017). The accelerated vocabulary development after 18 months that many children experience is related to a rapid myelination phase in language-related temporal and frontal brain regions (Pujol et al., 2006). As these studies demonstrate, not only is the brain experiencing overall growth in volume and functionality, specific brain systems are supporting childrens' evolving abilities, many of which we, as caregivers, observe in their behaviors. [1]

[1] Eggebrecht et al., (2017). Joint attention and brain functional connectivity in infants and toddlers. *Cerebral Cortex, 27*(3), 1709-1720. CC by NC 4.0

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6.11: Conclusion

Conclusion to Overview of Brain Development

As caregivers, we have the wonderful opportunity to witness the remarkable development that takes place from infancy through toddlerhood. During these first three years, the brain is also experiencing dramatic developmental change. This section presented an overview of some of the basics of brain physiology with special attention given to the transformative changes that take place during the first three years of life as the brain continues to support the many discoveries and experiences of infants and toddlers.

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6.12: References

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CHAPTER OVERVIEW

7: Infant and Toddler Mental Health

7.1: Introduction
7.2: Mental Health in Infancy and Toddlerhood
7.3: Adverse Childhood Experiences
7.4: Adversity and Toxic Stress
7.5: Resilience
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7.1: Introduction

Introduction to Infant and Toddler Mental Health

Across the world, 10% to 20% of children and adolescents suffer from mental health disorders (Bethell et al., 2022; Kessler et al., 2007) that can have a severe, negative impact on children's development and their long-term capacity to live healthy, productive and fulfilling lives (Lyons-Ruth et al., 2017). Mental health disorders have a profound impact on all aspects of health, happiness and productivity. As mental health difficulties early in life have a significant impact on the future health trajectory of an individual, it is essential to build the foundations of good mental health during the critical period of infancy and toddlerhood (Lewis et al., 2014; Moore et al., 2017). This section will discuss mental health and adverse childhood experiences during infancy and toddlerhood and the role of caregivers in supporting the development of optimal mental health.[1]

[1] Izett et al., (2021). Prevention of mental health difficulties for children aged 0–3 years: A review. *Frontiers in Psychology, 2794*. CC by 4.0

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7.2: Mental Health in Infancy and Toddlerhood

Mental Health

While it is widely accepted that we are in the midst of a mental health crisis for young people, what is often missed is that the precursors of mental health challenges can begin as early as the perinatal period and also in early infancy (Robinson et al., 2008). This makes the infant and early childhood period a crucial window for intervention, with the goal of promoting good mental health for infants and young children (Robinson et al., 2008). [1]

Good mental health in infancy and toddlerhood refers to healthy social and emotional development. It includes a child's ability to experience, regulate and express emotions, to develop close and secure interpersonal relationships, and to explore the environment and learn (Clinton, Feller & Williams, 2016). All of these capacities develop best within the context of a caregiving environment that includes family, community, and cultural expectations for young children (Parlakian & Seibel, 2002). [1]



Figure 7.2.1: Happy hugs. ([2])

Research has established that infants and toddlers can suffer from mental health disorders that require treatment in their own right (Warner & Pottick, 2006; Zero to Three, 2012). Difficulties in infancy include regulatory disturbances such as excessive crying, sleeping or feeding difficulties and attachment difficulties (Postert et al., 2012; Zero to Three, 2016). Early childhood mental health problems include externalizing behaviors such as aggression and oppositional defiance (Egger & Angold, 2006; Loeber et al., 2009), and internalizing problems such as anxiety and depression (Bayer et al., 2011; Costello, Egger & Angold, 2005; Rapee, Schniering & Hudson, 2009). [1]

Several epidemiological studies have determined the prevalence of mental health disorders in infants and young children, indicating a 16% to 18% prevalence of mental health disorders amongst children between 1 to 5 years of age, with approximately half of these children being severely impacted (von Klitzing, Döhnert, Kroll & Grube, 2015). One study found that almost 35% of children between 12 to 18 months of age scored high on the Problem Scale of the Brief Infant Toddler Social Emotional Assessment (BITSEA) (Horwitz et al., 2013), while another study found that by 18 months of age, 16% to 18% of children met criteria for one or more diagnoses of a mental health or developmental disorder (Skovgaard et al., 2007). Similar results were reported by an Australian study, which found that by 2 years of age, 12% of children had clinically significant emotional, behavioral, or social problems in the context of caregiver-child relationship disturbance (Bayer et al., 2011). In addition to this, a different Australian study found that by age five, 20% of the children studied had clinically significant behavioral problems (Robinson et al., 2008). It is important to recognize that most recent epidemiological studies have been conducted in developed, economically stable, peaceful countries (Lyons-Ruth et al., 2017). Evidence suggests that rates of mental health difficulties may be much higher in countries where extreme poverty, war, family displacement and trauma exist (Tomlinson et al., 2014). [1]



Figure 7.2.2:Toddler experiencing emotion ([1])

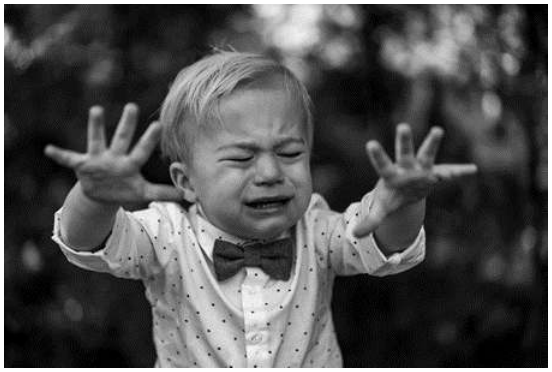


Figure 7.2.3: Toddler experiencing a negative emotion. ([4])

If not treated, mental health difficulties that begin early in life can become more serious over time (Briggs-Gowan et al., 2006; Clinton et al., 2016; Lavigne et al., 1998; Shaw, Gilliom Ingoldsby & Nagin, 2003; Slemming et al., 2010; Suveg, Southam-Gerow, Goodman & Kendall, 2007), and can persist into adolescence and adulthood (Bayer et al., 2011; Bor, McGee & Fagan, 2004; National Scientific Council on the Developing Child, 2008). Children with mental health problems are at higher risk for later difficulties at school, difficulties with peers, difficulty participating in employment, drug and alcohol problems, relationship breakdown, family violence, criminal activity, juvenile delinquency and suicide (Bayer et al., 2008; National Scientific Council on the Developing Child, 2008). [1]

Risk Factors for Infant and Toddler Mental Health Problems

There is international consensus that the first 1,000 days of life—the period of development from conception to age two—represent a crucial period of rapid physical, psychological and neurological growth (Darling, Bamidis, Burberry & Rudolf, 2020; Moore et al., 2017). During this time there is an increased likelihood that detrimental experiences such as early trauma or deprivation will be especially harmful and greatly impact future development, with adverse effects potentially developing into lifelong consequences (Lyons-Ruth et al., 2017; Moore et al., 2017; Shonkoff et al., 2012). [1]

Researchers have identified several risk factors for poor mental health in infants, taking into account the interaction between the individual child's genetics, temperament and environment (McLuckie et al., 2019). Risks in the child include the presence of physical health difficulties, a difficult temperament, and insecure and disorganized attachment patterns (Bosquet & Egeland, 2006; Edwards et al., 2010; Miner & Clarke-Stewart, 2008; Van Zeijl et al., 2006; Wlodarczyk et al., 2017). Family based risk factors include parenting interactions that are insensitive, lack warmth, or are controlling, as well as caregiver interactions that are over involved or over protective. Other factors include overly harsh discipline, caregiver mental health difficulties or stress, parental substance abuse, family violence, limited parental education, and parental conflict or separation/divorce (Ashford et al., 2008; Bayer et al., 2011; Bayer, Sanson & Hemphill, 2006; Dwyer et al., 2003; Edwards et al., 2010; McCarty, Zimmerman, Digiuseppe & Christakis, 2005; Miner & Clarke-Stewart, 2008; Pike et al., 2006; Van Zeijl et al., 2006; Wlodarczyk et al., 2017). [1]

Infant & Toddler Mental Health: Protective Factors

Attachment theory asserts that the relationship between the infant and their primary caregivers has an important influence on the development of the capacity for emotional and behavioral regulation (Ainsworth et al., 1978; Bowlby, 1969). A large body of

evidence has identified that an infant's developing brain is shaped by the quality of the caregiving environment provided by their primary caregivers (Kerns & Brumariu, 2014; Lally & Mangione, 2017). Secure primary attachment relationships, although not a guarantee against future mental health difficulties, are influential protective factors for infant and young children's mental health. A secure attachment relationship allows the infant's developing brain to develop capacities in building and maintaining relationships, emotional regulation, attention and self-control and sets a strong foundation for the later development of resilience, confidence and adaptability (Balbernie, 2013; Benoit, 2004). Researchers have consistently found that securely attached children experience stronger relationships with their caregivers as well as enhanced problem solving abilities, improved peer relationships and longer lasting friendships (Abraham & Kerns, 2013; Guild et al., 2017; Schneider, Atkinson & Tardif, 2001). These children may also have better sibling relationships, more positive self-esteem, an increased sense of hopefulness, greater trust in people and relationships, and heightened optimism about their future compared to children with insecure attachment styles. In contrast, insecure and disorganized attachment styles in infancy have been associated with elevated rates of emotional, social and behavioral disturbances in infancy, toddlerhood, preschool and beyond (Berlin, 2008; Fearon et al., 2010; Granot & Mayseless, 2001; Madigan, Atkinson, Laurin & Benoit, 2013; Sroufe, 2005; Van Ijzendoorn, Schuengel & Bakermans–Kranenburg, 1999). A 30-year prospective study of infants with insecure attachment styles at 8 months of age, found insecure attachment to be associated with a higher risk of mental health concerns later in adulthood at 30 years of age (Fan et al., 2014). Disorganized attachment in infancy is associated with the highest risk of later social and cognitive difficulties and psychopathology with an association found between disorganized infant attachment and childhood behavior problems (Van Ijzendoorn et al., 1999), externalizing and internalizing problems in early school years, aggression and oppositional defiant disorder (Fearon et al., 2010; Green & Goldwyn, 2002), and personality disorder (Steele & Siever, 2010). Studies have found disorganized attachment is significantly correlated with psychopathology in adolescence (Carlson et al., 1998), borderline personality disorder symptoms in adulthood (Carlson et al., 2009), dissociation (Lyons-Ruth, 2003); and post-traumatic stress disorder (PTSD) (Macdonald et al., 2008). [1]



Figure 7.2.4: Caregiver holding an infant. [5]

Ideally, caregivers are able to tune into their baby's cues, interpret their meaning, and respond to them in a contingent, consistent and competent way, which has been termed sensitive parenting (Ensink et al., 2016; Petch et al., 2012). Caregivers who provide care in this way allow their infant to develop optimal early social-emotional skills, secure infant-caregiver relationships and cognitive ability (The National Health and Medical Research Council, 2017).

Infant & Toddler Mental Health: Prevention & Early Intervention

Research highlights the importance of childhood experiences across the lifespan, starting in infancy and toddlerhood, emphasizing the importance of addressing risk factors early in life (Felitti et al., 1998; Jones, Nurius, Song & Fleming, 2018). The cost of mental health disorders on individuals and society demands a response that focuses on early investment, health promotion and early intervention in an effort to positively impact future health (Jenkins et al., 2002). The World Health Organization has asserted that prevention is the only sustainable approach for reducing the health burden associated with mental health disorders (World Health Organization, 2004). It is well established that early detection, assessment and intervention of mental health problems in infancy and early childhood is more successful and cost effective than treatment when symptoms become more severe (Davis et al., 2010; Huberty, 2012; The National Health and Medical Research Council, 2017). [1]

This shift in focus toward the prevention of mental illness means that we must consider the mental health and wellbeing of infants, young children, and their parents (Guy, Furber, Leach & Segal, 2016). While the period of infancy and early childhood is a time when mental health difficulties can develop, it is also an enormously influential developmental stage with the potential to modify or prevent these same difficulties (Karevold, Røysamb, Ystrom & Mathiesen, 2009; Lewis et al., 2014; Moore et al., 2017). Since many disorders can be prevented through developmentally appropriate, high quality programs and services, it is becoming increasingly acknowledged that it is not enough to merely treat mental health disorders as they emerge (Andrews & Wilkinson, 2002; Waddell et al., 2007). Instead, research suggests that efforts should focus on the prevention of mental health difficulties before they arise, particularly during the earliest stages of life when there is the greatest capacity to effect change (Bayer et al., 2010; Maldonado-Duran, Lartigue & Feintuch, 2000; The National Health and Medical Research Council, 2017). [1]

To support optimal mental health in infants and toddlers, caregivers can:

- Continue to learn and stay informed about the epidemiology (incidence and possible causes) of mental health in children under three years of age.
- Establish secure relationships with infants and toddlers, with a focus on children who show early signs of an insecure attachment.
- Engage in sensitive caregiving by tuning into a child's unique cues, interpreting their meaning, and responding to them in a contingent, consistent and competent way.
- Create safe physical and social environments where children can practice regulating and expressing their emotions.
- Share knowledge of positive caregiving practices and awareness of infant and toddler mental health with families.

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[1] Izett et al., (2021). Prevention of mental health difficulties for children aged 0–3 years: A review. *Frontiers in Psychology, 2794*. CC by 4.0

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[3] Image by Alexander Dummer on Unsplash.

[4] Image by Zachary Kadolph on Unsplash.

[5] Image by Katie Emslie on Unsplash.

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7.3: Adverse Childhood Experiences

Childhood Experiences

Throughout our lives, from childhood into adulthood, we will likely encounter adverse experiences—unfavorable experiences that have the potential to hold us back from success or development. Specific types of adverse experiences that occur during childhood are especially concerning because they can decrease the likelihood that children will develop optimally (Bethell, Simpson & Solloway, 2017; Shonkoff, 2010) by threatening the development of positive social, emotional, and cognitive growth in children (Belsky, 1984; Bradley & Corwyn, 2002). Adverse Childhood Experiences, or ACEs, are potentially traumatic events that occur in childhood (0 to 17 years) such as experiencing violence, abuse, or neglect; witnessing violence in the home; and having a family member attempt or die by suicide (Felitti et al., 1998). [1] [2]

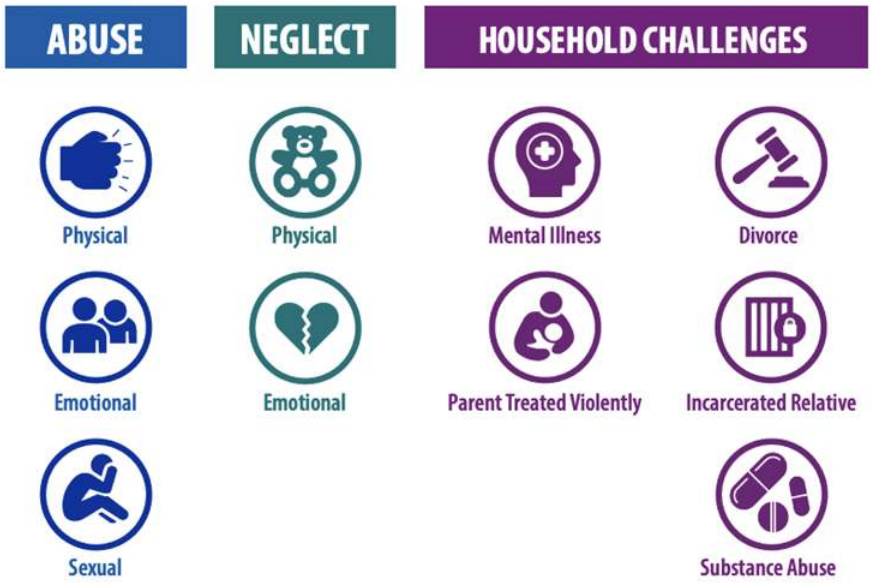


Figure **7.3.1**: The ten ACE indicators. ([1])

The ACE index (Anda et al. 2006; CDC, 2022; Felitti 1993) includes the ten indicators listed in Figure **7.3.1**. Half of the indicators assess child maltreatment, including physical, sexual, and emotional abuse and physical and emotional neglect. The remaining five indicators are characteristics of the caregiver or home environment. These include living with a family member with a mental illness, a substance use problem, a history of incarceration, living in a home with domestic violence, or living in a home with parents who have separated or divorced. The Centers for Disease Control reported 61% of adults across twenty-five U.S. states have experienced exposure to one or more ACEs and 16% have experienced four or more ACEs. National Survey of Children's Health data suggests 33.3% of children aged birth to 17 in the U.S. have experienced at least one family adversity (Health Resources and Services Administration 2019). [1] [2]

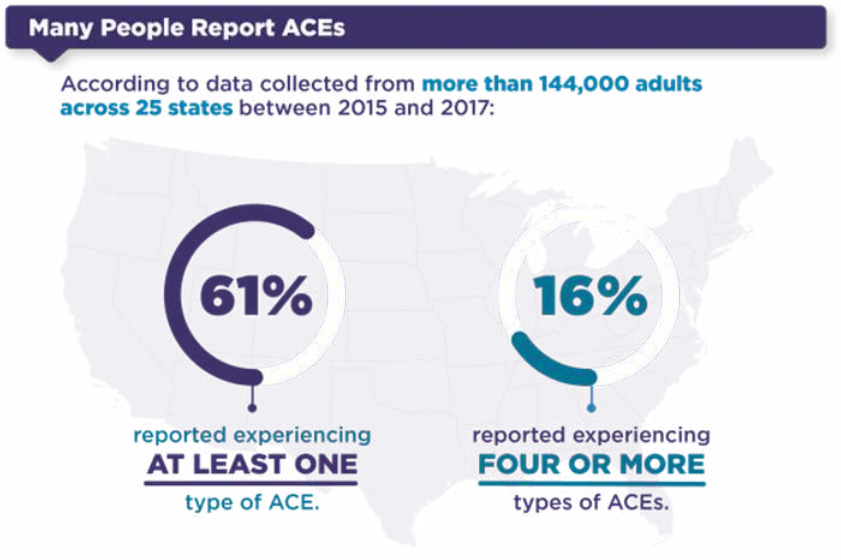


Figure **7.3.2**: Prevalence of ACEs in the U.S. ([6])

The ACEs study documented a set of specific events in childhood that were linked to chronic diseases and even early mortality later in adulthood (Anda et al. 2006; Felitti et al. 1998; Oh et al., 2018). The ACEs study found relationships between developmental outcomes and the number of early ACEs. As the number of ACEs increased, the likelihood of less optimal outcomes also increased. Anda et al. (2006) reported that individuals with the highest number of ACEs experienced nearly three times the number of comorbid outcomes compared with those with no ACEs exposure. A growing body of research has since further confirmed that childhood adversity is associated with chronic disease and early death (Brown et al., 2009; Campbell, Walker & Egede, 2016; Gilbert et al., 2015; Kalmakis & Chandler, 2015). [1] [7]

The Center for Youth Wellness analyzed ACEs data specific to California (Center for Youth Wellness, 2014). In California, 61.7% of adults have experienced at least one ACE and 16.7% have experienced four or more, very similar to the national averages reported by the CDC. The three most common types of ACES were emotional abuse or verbal abuse (34.9%), parental separation or divorce (26.7%) and substance abuse by a household member (26.1%). The prevalence of ACEs differed by county. Butte county had the highest prevalence of four or more ACEs at 30.3%, while San Francisco had the lowest prevalence of four or more ACEs at only 9%. Importantly, ACEs were associated with health outcomes. Individuals with four or more ACEs were five times more likely to suffer from depression and were more likely to smoke and binge drink.

ACEs are a global concern with high rates of prevalence worldwide. Approximately 61% of women living in Mexico reported at least one ACE and 14% reported four or more (Flores-Torres et al., 2020). In Malawi, 72% of adolescents (aged 10 to 16 years) reported four or more ACEs (Kidman, Piccolo & Kohler, 2020). About 63.9 % of adults in Singapore have experienced at least one ACE (Subramaniam et al., 2020). In Canada, 61.6% reported at least one ACE and 35.6% reported at least two ACEs (Joshi et al., 2021).



Figure **7.3.3**: Caregiver experiencing negative emotions while holding an infant. ([8])

Awareness of ACEs and their potential negative impact on the health and wellness of individuals is increasing. For example, in 2019, California appointed its first ever Surgeon General, Nadine Burke Harris. Dr. Burke Harris is a pediatrician and her research and interests include ACEs as a top concern (Harris, 2018). Nadine helped establish the ACEs Aware Initiative and corresponding website which offers free information, training and ACEs screening tools.



Figure **7.3.4**: Nadine Burke Harris. ([9])

Most ACEs research is conducted by asking adults to reflect upon their childhood. This approach is limited because many adults are not able to remember most events that occur before the age of three (Hayne, 2004). As the first three years are so critical for establishing a strong foundation of health and development, it is important to know how prevalent ACEs are in the lives of infants and toddlers.

Evidence suggests that many children are at risk of experiencing ACEs during the first three years. While most children under three years of age have not experienced any ACEs, 20% had experienced one ACE and 8% had experienced two or more ACEs (Novoa & Morrissey, 2020). Toddlers were twice as likely to experience at least one ACE (11%), compared to infants (5%). Infants and toddlers of color disproportionately experience ACEs, especially multiple ACEs. For example, compared to only 7% of white children, 15% of Black children under three years of age had experienced multiple ACEs. There were differences in the level of ACEs in infants and toddlers across states in the U.S. Oregon and Oklahoma had the highest percentage of children who had only experienced one ACE, both at 26%, compared to Maryland that had the lowest percentage at 15%. For children experiencing two or more ACEs, the highest percentage was in Oklahoma at 21%, while Maryland and Massachusetts had the lowest percentage, both at 3%. In California, 23% of infants and toddlers had experienced one ACE and 5% had experienced two or more ACEs.

One study examined ACEs in 2,361 fourteen month old toddlers by asking parents to complete an ACEs questionnaire (McKelvey, Whiteside-Mansell, Zhang & Selig, 2020). Their data identified three different patterns. One pattern was for infants exposed to relatively low incidences of ACEs (they called this group ‘low-ACEs’). Two groups of higher ACE exposures were also identified:

an ‘ACEs-parent maltreatment’ group who experienced moderate level of overall ACEs, mainly related to forms of maltreatment and an ‘ACEs-household dysfunction’ group with the highest overall ACE scores who mainly experienced multiple forms of family and household dysfunction.[1]

Figure **7.3.5** shows the prevalence of each of the three groups for each of the ten ACEs indicators. The low-ACEs group shows relatively low levels of ACE exposure with some elevation on physical neglect (27%) and parent separation (17%). For example, only 1% of this group exhibited emotional abuse compared with 37% and 14% in the other groups. The ACEs-parent maltreatment group has the highest levels of exposure to emotional abuse (37%), physical abuse (23%), and physical neglect (57%) compared with rates of 1%, 6%, and 27% respectively in the low-ACEs group and 14%, 15% and 42% respectively in the ACEs-household dysfunction group. The ACEs-household dysfunction group has the highest levels of exposure for parent separation (36%), domestic violence (53%), substance abuse (55%), mental illness (48%), and jailed family members (68%).[1]

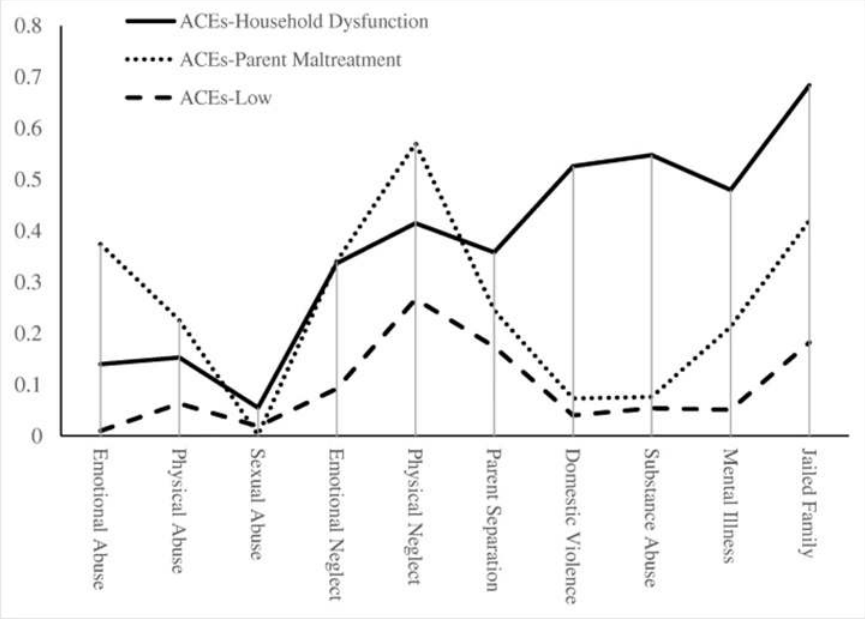


Figure **7.3.5**: Figure shows the proportion of each of the three groups having each of the ten ACEs. The first of the three groups (ACEs-low, $N = 1431$, $M = 0.84$, SD = 0.77, 60.6%) shows relatively low levels of ACE exposure with some elevation on physical neglect (27%) and parent separation (17%). For example, only 1% of this group exhibited emotional abuse compared with 37% and 14% in the other groups. The second ACE exposure group (ACEs-parent maltreatment, $N = 636$, $M = 2.91$, SD = 1.06, 26.9%) has the highest levels of exposure to emotional abuse (37%), physical abuse (23%), and physical neglect (57%) compared with rates of 1%, 6%, and 27% respectively in the ACEs-low group and 14%, 15% and 42% respectively in the ACEs-household dysfunction group. The third group (ACEs-household dysfunction, $N = 294$, $M = 3.94$, $SD = 1.30$, 12.5%) has the highest levels of exposure for parent separation (36%), domestic violence (53%), substance abuse (55%), mental illness (48%), and jailed family (68%) compared with rates of 17%, 4%, 5%, 5%, and 18% respectively in the ACEs-low group and 25%, 7%, 8%, 21%, and 42% respectively in ACEs-parent maltreatment group.[10]

The groups were significantly different in level of maternal education with the lowest educated mothers being more likely to be in the ACEs-parent maltreatment group and higher educated mothers being more likely in the ACEs-household dysfunction group. The groups also differed by race, such that Black mothers were more likely to be in the ACEs-parent maltreatment group, and Hispanic mothers were more likely to be in the low-ACEs group relative to other groups. For maternal age, the low-ACEs group had the oldest mothers and the ACEs-parent maltreatment group were the youngest.[1]

While the findings of ACEs prevalence are robust, there are potential weaknesses in the tools used to collect the data. One concern is that each of the ACE risks is weighted equally. This is a concern because some risks are more likely to predict difficult outcomes than others. For example, ACEs include sexual abuse and parental divorce/separation. Both are associated with less optimal outcomes, but research suggests that sexual abuse is a more robust predictor of negative developmental outcomes. Furthermore, the stress response to an ACE may differ amongst individuals–we do not all respond in the same way to adverse events. Therefore, to truly understand the potential negative impact ACEs can have, we must understand the relationship between adversity and stress.[1]

[1] McKelvey et al., (2020). Adverse childhood experiences in infancy: a latent class approach exploring interrelatedness of risks. *Adversity and Resilience Science*, 1-13. CC by 4.0

[2] Centers for Disease Control and Prevention (2019). *Preventing adverse childhood experiences: Leveraging the best available evidence*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. Public domain.

[3] Image from the Centers for Disease Control and Prevention (2019). *Preventing adverse childhood experiences: Leveraging the best available evidence*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. Public domain.

[4] McKelvey et al., (2020). Adverse childhood experiences in infancy: a latent class approach exploring interrelatedness of risks. *Adversity and Resilience Science*, 1-13. CC by 4.0

[5] "Preventing Adverse Childhood Experiences" from the CDC is in the public domain.

[6] Image from the Centers for Disease Control and Prevention (2019). *Preventing adverse childhood experiences: Leveraging the best available evidence*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. Public domain.

[7] Oh et al., (2018). Systematic review of pediatric health outcomes associated with childhood adversity. *BMC Pediatrics, 18*(1), 1-19. CC by 4.0

[8] Image by Sharon McCutcheon on Unsplash.

[9] Image by Christopher Michel on Wikipedia is licensed under CC by 2.0

[10] Figure 1 from McKelvey et al., (2020). Adverse childhood experiences in infancy: a latent class approach exploring interrelatedness of risks. *Adversity and Resilience Science*, 1-13. CC by 4.0

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7.4: Adversity and Toxic Stress

Overview of Impacts of Adversity and Toxic Stress

Stress is a term commonly used to describe the response to the demands encountered on a daily basis throughout one's lifetime, and it is related to both positive experiences and negative experiences. Stressors are agents that produce stress. Stressors may be physical, emotional, environmental or theoretical, and all may equally affect the body's stress response. The stress response, also known as the "fight or flight" response comprises the physiologic changes that occur with any encounter of stress or perceived stress to the individual (Cannon, 2013; Selye, 1976). This stress response is a result of stimulation of the sympathetic nervous system resulting in a cascade of neuro-endocrine-immune responses that include an increase in respirations, heart rate, blood pressure, and overall oxygen consumption (Chrousos & Gold, 1992; Dusek & Benson, 2009). As Figure# shows, the sympathetic nervous system is composed of many pathways that perform a variety of functions on various organ systems. The main overall end effect of the sympathetic nervous system is to prepare the body for physical activity—a whole-body reaction affecting many organ systems throughout the body (McCorry, 2007). In most situations, the physiologic changes associated with the stress response are short lived, with the body returning to its baseline state when the stressor is removed. [1] [2]

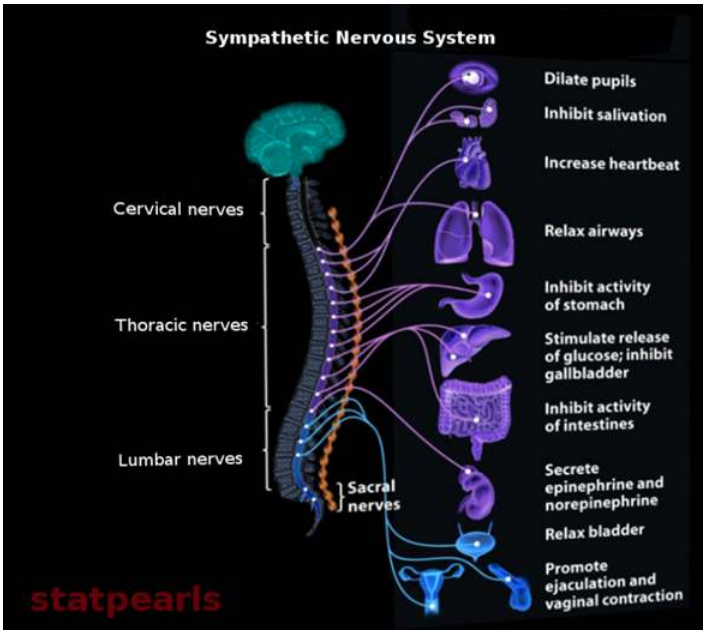


Figure **7.4.1**: The sympathetic nervous system ([3])

While some degree of stress and adversity is normal and an essential part of human development, exposure to frequent and prolonged adversity, especially in the absence of protective factors, can result in toxic stress. Childhood toxic stress is severe, prolonged, or repetitive adversity with a lack of the necessary nurturance or support of a caregiver to prevent an abnormal stress response (National Scientific Council on the Developing Child, 2014). This abnormal stress response consists of a derangement of the neuro-endocrine-immune response resulting in prolonged cortisol activation and a persistent inflammatory state, with failure of the body to normalize these changes after the stressor is removed (Johnson, Riley, Granger & Riis, 2013; Wolf, Miller & Chen, 2008). Children who experience early life toxic stress are at risk of long-term adverse health effects that may not manifest until adulthood. These adverse health effects include maladaptive coping skills, poor stress management, unhealthy lifestyles, mental illness and physical disease (Boyce et al., 2021; Garner et al., 2012; Johnson, Riley, Granger & Riis, 2013). [4] [5]

There are three general types of responses to stress: [5]

- **Positive stress response**. A positive stress response is a normal stress response and is essential for the growth and development of a child. Positive stress responses are infrequent, short-lived, and mild. The child is supported through this stressful event with strong social and emotional buffers such as reassurance and parental protection. The child gains motivation and resilience from every positive stress response, and the biochemical reactions that occur with such a stressful event return to baseline (National Scientific Council on the Developing Child, 2014). Examples include meeting new people or learning a new task.

- **Tolerable stress response**. Tolerable stress responses are more severe, frequent or sustained. The body responds to a greater degree compared to the positive stress response, and these biochemical responses have the potential to negatively affect brain architecture. Examples include divorce or the death of a loved one. In tolerable stress responses, once the adversity has passed, the brain and organs can recover fully if the child is protected with responsive relationships and strong social and emotional support. Therefore, an important feature of the tolerable stress response is the role of caregivers. The risks for short-term and long-term psychological impact can be reduced if children have protective relationships that support them to cope with these events (Shonkoff & Levitt, 2010). [6]
- **Toxic stress response**. Toxic stress results in prolonged activation of the stress response, with a failure of the body to recover fully. It differs from a normal stress response in that there is a lack of caregiver support, reassurance, or emotional attachments. The insufficient caretaker support prevents the buffering of the stress response or the return of the body to baseline function. Examples of toxic stress include abuse, neglect, extreme poverty, violence, household dysfunction, and food scarcity. Caretakers with substance abuse or mental health conditions also predispose a child to a toxic stress response. Exposure to less severe yet chronic, ongoing daily stressors can also be toxic to children (Yates, 2007). Early life toxic stressors increase one's vulnerability to maladaptive health outcomes such as an unhealthy lifestyle, socioeconomic inequity, and poor health; however, these stressors do not solely predict or determine an adult's behavior or health (Odgers & Jaffee, 2013; Shonkoff, Boyce & McEwen, 2009).

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[1] Franke (2014). Toxic stress: effects, prevention and treatment. *Children*, *1*(3), 390-402. CC by 4.0

[2] Alshak & Das (2021). Neuroanatomy, sympathetic nervous system. *StatPearls*. CC by 4.0

[3] Image from Alshak & Das (2021). Neuroanatomy, sympathetic nervous system. *StatPearls*. CC by 4.0

[4] Centers for Disease Control and Prevention. (2021). *Adverse childhood experiences prevention strategy*. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

[5] Franke (2014). Toxic stress: effects, prevention and treatment. *Children*, *1*(3), 390-402. CC by 4.0

[2] Branco & Linhares (2018). The toxic stress and its impact on development in the Shonkoff's Ecobiodevelopmental Theoretical approach. *Estudos de Psicologia*, *35*, 89-98. CC by 4.0

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7.5: Resilience

Concept of Resilience

Resilience is the ability to properly adapt to adversity despite the conditions. It is dynamic and plays a large role in a toxic stress response. Not all individuals who experience repeated childhood adversity experience poor health, and resilience may provide a buffer. Resilience factors are numerous and change over time in an individual. Children with resilience have been identified as having the following characteristics: higher IQ, easy temperament, a perception of self-competence, a positive self concept, a realistic sense of control of the situation, empathy, and social problem solving skills (Cadamuro et al., 2021; Cowen, Wyman & Work, 1996; Miller-Lewis et al., 2013; Zolkoski & Bullock, 2012). Factors that predict resilience in children experiencing adversity include a solid relationship between the child and parent as well as a high quality relationship between the child and teacher (Miller-Lewis et al., 2013). Additional resilience factors identified include adequate social support, parental marriage quality, parental physical and mental health, and the parent's sense of efficacy. Focus on early childhood interventions to strengthen resilience factors may help to minimize a toxic stress response (Garner, 2013). [1]



Figure **7.5.1**: Resiliency. ([2])

Childcare attendance can be a protective factor against early ACEs. For infants and toddlers who experience adverse experiences, being cared for by their parents is associated with lower cognitive abilities, but attending childcare during the first three years was associated with higher cognitive abilities (Larose et al., 2020). To promote resilience in all infants and toddlers, and especially those who have experienced ACEs, caregivers can:

- Create secure attachments that provide children with a sense of dependency and safety. Children with a stronger connection to their caregiver are more likely to have greater self-regulation skills—a key component of resilience (Bethell et al., 2022).
- Implement program policies purported by the Program for Infant and Toddler Care (PITC) such as primary care, individualized care and continuity of care.
- Respond to infants' and toddlers' social and emotional needs in a respectful and sensitive way.
- Help infants and toddlers to learn how to regulate their own emotions in a positive and secure way. Research has revealed that when caregivers help children to regulate their own emotions, it promotes resilience in the children (Humphreys, King, Guyon-Harris & Zeanah, 2021).
- Label emotions and openly discuss them with children.
- Provide safe opportunities for children to take risks such as engaging with new people and physical challenges with climbing equipment.

[1] Franke (2014). Toxic stress: Effects, prevention and treatment. *Children*, *1*(3), 390-402. CC by 4.0

[2] Image by Wokandapix on Pixabay.

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7.6: Trauma-informed Care

Trauma and Care

Toxic stresses in general are strongly linked to poor health outcomes across the lifespan and trauma-informed care is one approach to caregiving based on the recognition of this relationship. Caregivers of trauma-informed care strive to understand children's behavior in light of previous traumas they have experienced, such as ACEs. Thus, trauma-informed care for infants and toddlers begins with first recognizing the prevalence and potential impact toxic stress and ACEs can have during the first three years. Caregivers also provide supportive care that enhances children's feelings of safety and security, to prevent their re-traumatization in a current situation that may potentially overwhelm their coping skills. [1]

Several key concepts of trauma-informed care applied to infants and toddlers include: [1]

- realizing the impact that trauma can have on infants and toddlers, and that reactions to a past trauma may inform the child's current response to a potentially traumatic situation;
- recognizing the signs and symptoms of trauma in infants and toddlers and the staff caring for them; and
- resisting re-traumatization, to prevent a situation that represents a tolerable stress from evolving into a toxic stress (Substance Abuse and Mental Health Services Administration, 2014).



Figure **7.6.1** : Six guiding principles to a trauma-informed approach. ([2])

Adopting a trauma-informed approach is not accomplished through any single particular technique or checklist. It requires constant attention, caring awareness, sensitivity, and possibly a cultural change at an organizational level. A trauma-informed approach reflects adherence to six key principles rather than a prescribed set of practices or procedures. The six key principles fundamental to a trauma-informed approach include: [3] [4]

1. **Safety**. Children feel physically and psychologically safe. The physical setting is safe and the interpersonal interactions infants and toddlers have with caregivers promote a sense of safety. This principle supports the belief from experts that positive relationships are at the heart of infant and toddler care and education (Lally & Mangione, 2017) and the critical importance of program policies such as primary caregiving, continuity of care and small groups in establishing and fostering such positive and secure relationships (De Schipper, Riksen-Walraven & Geurts, 2006; McMullen, 2018; Ogren & Johnson, 2021).
2. **Trustworthiness and transparency**. Organizational operations and classroom practices are conducted with transparency and the goal of building and maintaining trust with children, families, among staff and others involved in the organization. This principle emphasizes open communication between a childcare program and enrolled families about foundational policies and practices as well as everyday routines and daily child updates.
3. **Peer support**. The term "peers" refers to individuals with lived experiences of trauma, or in the case of infants and toddlers, this can be family members of children who have experienced traumatic events. Peer support is a key vehicle for establishing safety and hope, building trust, enhancing collaboration and utilizing their stories and lived experiences to promote recovery and healing. This principle can mean a child care program explicitly creates a culture of respect and support and invites families of enrolled children and community members, especially those with lived experiences of trauma, into an open dialogue about how best to support children and families who have experienced trauma.
4. **Collaboration and mutuality**. Importance is placed on partnering because healing happens in relationships and in the meaningful sharing of power and decision-making. The organization recognizes that everyone has a role to play in a trauma-informed approach. For a child care program to become more trauma-informed may mean reaching out to other organizations or

individuals for information, assistance and resources. National organizations such as the National Association for the Education of Young Children (NAEYC) and Zero to Three both have information and resources about trauma-informed care, but local organizations can be a great resource as well.

5. **Empowerment, voice and choice**. Throughout the organization and the families served, children's strengths and experiences are recognized and built upon. The organization fosters a belief in resilience and in the ability of caregivers and communities to heal and promote recovery from trauma. Child care programs can provide training specially on infant and toddler mental health and trauma-informed care, emphasizing the significant role of relationships between caregivers and children. Staff are empowered to do their work as well as possible with adequate organizational support—staff need to feel safe as well. Recognition of caregivers' personal trauma and its potential impact on children is also necessary. One study found that 73% of early childhood educators had experienced at least one ACE, 22% had experienced four or more ACEs and educators who reported higher numbers of ACEs contributed to lower social and emotional climate scores in classrooms (Hubel et al., 2020).
6. **Cultural, historical and gender issues**. The organization actively moves past cultural stereotypes and biases (e.g., based on race, ethnicity, sexual orientation, age, religion, gender-identity, etc.,); incorporates policies, protocols and processes that are responsive to the racial, ethnic and cultural needs of the children and families and recognizes and addresses historical trauma. This principle requires child care programs to actively take steps to recognize the prevalence of trauma and its role in providing trauma-informed care to infants and toddlers and their families, as well as employed caregivers and staff. Institutional policies and protocols need to be established and supported, as well as everyday practices and processes between children, caregivers and families.

[1] Sanders & Hall (2018). Trauma-informed care in the newborn intensive care unit: Promoting safety, security and connectedness. *Journal of Perinatology*, *38*(1), 3-10. CC by NC SA 4.0

[2] 6 Guiding Principles from a trauma-informed approach from the CDC is in the public domain.

[3] "Infographic: 6 Guiding Principles To A Trauma-Informed Approach" from the CDC is in the public domain.

[4] Substance Abuse and Mental Health Services Administration (2014). SAMHSA's concept of trauma and guidance for a trauma-informed approach. HHS Publication. Located in the public domain.

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7.7: Conclusion

Conclusion of Infant and Toddler Mental Health

The high prevalence of mental health difficulties and adverse childhood experiences, even in children under three years of age, is a growing concern; however, the first three years are also the optimal time to establish a positive and healthy social and emotional foundation in children's lives. Therefore, it is critical that caregivers are knowledgeable of the research, risks and preventative strategies to best support the mental health of infants and toddlers. To address the mental health of infants and toddlers, trauma-informed care recognizes the prevalence and potential impact of trauma and offers principles that child care programs can strive toward implementing. The most important step we can take to encourage the healthy mental health of infants and toddlers is to create positive and secure relationships between caregivers and children.

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7.8: References

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CHAPTER OVERVIEW

8: Motor Development

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8.1: Introduction

Introduction to Motor Development

Motor development may not initially seem like the most interesting topic, especially compared to language and cognitive development. In fact, motor development has been considered the “Cinderella of developmental science”, central to children's experiences, but rarely in the spotlight (Adolph et al., 2010; Rosenbaum, 2005). Historically, a maturational approach to motor skills was predominant in the early twentieth century, which mainly argued that motor development unfolds via predetermined biological changes, with little to no influence from environmental or cognitive domains (Gesell & Amatruda, 1945). Isolation of motor skills resulted in very little research focusing on the role of motor skills on other domains of development. However, recent research is embracing the possibility of cross domain interactions resulting in cascading developmental changes (Gibson, 1988; Masten & Cicchetti, 2010; Spencer et al., 2011; Thelen & Smith, 2006). Furthermore, motor development is about more than just milestones—because motor development can be easily observed by caregivers, it reveals the inner workings of an infant’s mind and introduces the child to new experiences that enrich cognitive and language growth. [1]

This section will introduce you to the early motor development of infants and toddlers with special attention to the role the physical environment and caregivers have in supporting and encouraging optimal motor development.

[1] Gonzalez et al., (2019). Do gross and fine motor skills differentially contribute to language outcomes? A systematic review. *Frontiers in Psychology*, *10*, 2670

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8.2: Reflexes

Infant Reflexes

Before infants produce self-initiated movements, they exhibit inborn reflexes. Infants are born with a number of reflexes which are involuntary movements in response to stimulation controlled by the brain stem. These include the sucking reflex (infants suck on objects that touch their lips automatically), the rooting reflex (which involves turning toward any object that touches the cheek), the palmar grasp demonstrated in Figure **8.2.1** (the infant will tightly grasp any object placed in its palm), and the dancing reflex (evident when the infant is held in a standing position and moves its feet up and down alternately as if dancing). These movements occur automatically and are signals that the infant is functioning well neurologically. [1]



Figure **8.2.1**: The palmer grasp reflex in an infant. ([2])

Over the first few months of life these reflexes are replaced with voluntary movements. For example, the grasping reflex develops by 28 weeks gestation and disappears by six months of age (Schott & Rossor, 2003; Zafeiriou, 2004). The asymmetrical tonic neck reflex is performed by manual rotation of the infant's head to one side. The infant will extend its arm to the side of the rotated face and flex the contralateral arm (see Figure# for a picture of this reflex). The asymmetrical tonic neck reflex develops by 35 weeks gestation and disappears by three months of age (Zafeiriou, 2004). These inborn reflexes fade within predictable timeframes and can be a sign of concern if they remain longer (Futagi, Toribe & Suzuki, 2012). Children with reflexes that persist for longer than expected, show lower motor abilities, learning difficulties in school and are linked to attention-deficit and hyperactivity disorder (ADHD) symptoms (Bilbilaj, Gjipali & Shkurti, 2017; Konicarova, Bob & Raboch, 2013; Pecuch et al., 2021). [1] [3]



Figure **8.2.2**: The asymmetrical tonic neck reflex in a two-week-old infant. ([4])

[1] Lifespan Development - Module 4: Infancy by Lumen Learning references Psyc 200 Lifespan Psychology by Laura Overstreet, licensed under CC BY 4.0

[2] Image by jarmoluk on Pixabay.

[3] Modrell & Tadi (2021). Primitive reflexes. In *StatPearls*. Treasure Island (FL): StatPearls Publishing. CC by 4.0

[4] Image from Yan Ots on Unsplash.

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8.3: Developing a Sense of Peripersonal Space

Peripersonal Space

Throughout the first few months, infants move their limbs frequently (driven initially by reflexes and later by self-initiation) and as they do, they come into contact with their body and various objects and people around them. While these early movements may not seem important, they are actually a way for infants to begin to learn about themselves and the world around them.

Developing a sense of our body is an essential prerequisite for our interactions with the world. Sensing our body entails knowing where our limbs are in space and time, being aware of how fast or how far our limbs can move, or even knowing how much space our body occupies in our environment. Peripersonal space is defined as the space surrounding the body where we can reach or be reached by external entities, including objects or other individuals. Knowing the limits and extent of our peripersonal space is fundamental for navigating our social and physical world, and for situating and orienting ourselves in everyday activities. [1] [2]



Figure 8.3.1: An infant exploring peripersonal space. ([3])

With every touch of their body and surrounding areas, infants are receiving feedback that informs them about their posture, any changes in limb position and about contact with themselves or other surfaces, thereby allowing them to discover knowledge of not only their limbs and their range of motion, but also an understanding of their peripersonal space. These self-generated movements, as infants move their limbs freely, provide a foundation for exploratory behavior and build a basic understanding of body representation and of the world (Hoffmann, 2017). Touches to the body in particular provide information about the limb posture in space, the part of the limb making contact with the body, and the body area being touched (Rochat & Hespos, 1997). [1]

Research that has studied young infants exploring peripersonal space through touch have found that infants produce nearly 200 contacts on their bodies and the surrounding surface area in a 10 minute time period and touch as many as 18 different areas, mainly their upper body and the floor (DiMercurio, Connell, Clark & Corbetta, 2018). Infants also spent about 50% of that time moving their arms in the air, going from one place of contact to another. Figure 8.3.2 maps the frequency of touches to various areas of the body and surrounding surface area from one infant. The blue dots are contacts performed by the infant's right hand, the red dots are contacts performed by the infant's left hand. Such touching is fundamental for developing an early sense of the body and for discovering the boundaries of the peripersonal space in which future developing goal-directed actions will take place. In fact, other research has found that greater arm movement in early infancy is related to larger increases in language and cognitive abilities (Shida-Tokeshi et al., 2018). Together, this research suggests that infants are active explorers of their peripersonal space and that these early self-generated sensorimotor experiences form the critical foundation from which future motor behaviors and knowledge of the world develop. [1]

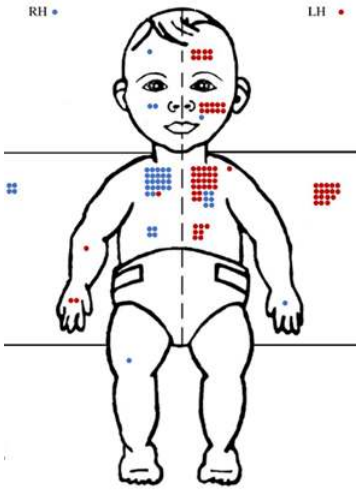


Figure **8.3.2**: Frequency of touches by area for one infant. ([4])

To support the exploration of peripersonal space, infants need time and space to freely move and explore with their limbs. Caregivers can ensure that infants have ample time lying comfortably on their backs on floors to support limb movement. Young infants also need space without the consistent overcrowding of play objects or frequently being placed in an activity gym device. Additionally, infant swings, car seats and many other devices limit limb movement and therefore restrict exploration of peripersonal space. To freely move their limbs, infants need clothes that allow for full-range reaching (compared to clothes or swaddles that reduce limb movement). Realizing how important it is for infants to explore their peripersonal space, caregivers should be cognizant of the significance of providing the time and space for infants to move their limbs as they learn about their bodies and the surrounding surface areas.

[1] DiMercurio et al., (2018). A naturalistic observation of spontaneous touches to the body and environment in the first 2 months of life. *Frontiers in Psychology, 9,* 2613. CC by 4.0

[2] Rabellino et al., (2020). Peripersonal space and bodily self-consciousness: Implications for psychological trauma-related disorders. *Frontiers in Neuroscience, 14,* 1256. CC by 4.0

[3] Image from Alex Bodini on Unsplash.

[4] Image adapted from DiMercurio et al., (2018). A naturalistic observation of spontaneous touches to the body and environment in the first 2 months of life. *Frontiers in Psychology, 9,* 2613. CC by 4.0

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8.4: Pikler and Gerber

Emmi Pikler and Magda Gerber

The research on the importance of peripersonal space supports some of the methods Emmi Pikler and Magda Gerber touted; however, their influence on the field of early childhood education goes much further and continues to inform current practices in infant and toddler care and development, especially motor development.

Pikler was born in 1902 and spent her early childhood in Vienna. She obtained her medical degree in 1927 and became a pediatrician. Later she founded the Pikler Institute in Budapest in 1946, which she headed until 1979. Pikler believed that infants should be put on their backs until they can themselves move into different positions. By being on their back, she argued infants learn about their bodies and how to move their bodies as they reach, bend and touch while playing with various movements (Gonzalez-Mena, 2014). Importantly, an infant's movements are driven by their own internal motivation to move. Pikler advised caregivers to not place infants on their stomachs until they move themselves into that position (Tardos, 2010). Her observations and years of work with children informed her belief in allowing children the freedom of self-initiated movement. [1]

Although Pikler's work provides various principles to learn from (Chahin & Tardos, 2017; Gonzalez-Mena, Chahin & Briley, 2005; Tardos, 2010) here are four core principles: [2]

- Deep respect for the child and their individuality, recognizing them as an individual with rights rather than as an object.
- Promotion of the child's autonomous activity, based on their own initiatives.
- The importance of the bond between the adult caregiver and the child, based on a respectful and affective relationship in quality moments of care.
- Respect for the child's freedom of movement, for playing and exploring their peripersonal space and surroundings.



Figure 8.4.1: Emmi Pikler. ([3])

Magda Gerber was born in Budapest, Hungary in 1910. Inspired by Pikler, Gerber earned a Master's degree in early childhood education in Budapest and in 1945 she began working with Pikler at the Pikler Institute. Overtime, Pikler became Gerber's mentor and friend. In 1978, Gerber and Thomas Forrest co-founded the non-profit organization Resources for Infant Educarers (RIE) in Los Angeles to further their work with families and child care professionals. At RIE, Gerber taught caregivers to observe infants and toddlers as they played, while a facilitator modeled how and when to intervene. [4]

The basic principles of the RIE approach are (Gerber & Johnson, 1998): [4]

- Basic trust in the child to be an initiator, an explorer, and a self-learner.
- An environment for the child that is physically safe, cognitively challenging and emotionally nurturing.
- Time for uninterrupted play.
- Freedom to explore and interact with other infants.
- Involvement of the child in all care-giving activities to allow the child to be an active participant rather than a passive recipient.
- Sensitive observation of the child in order to understand her needs.
- Consistency and clearly defined limits and expectations to develop discipline.

RIE's mission is to improve the lives of infants and young children through respectful care. Gerber believed that infants and toddlers are whole, competent beings from birth and should be treated as such. Gerber wrote "We not only respect babies, we demonstrate our respect every time we interact with them. Respecting a child means treating even the youngest infant as a unique human being, not as an object" (Gerber, 2002). [4]

As you reflect on the ideas and principles from Pikler and Gerber, consider these questions:

- Do you agree or disagree with their ideas and principles?
- How do their ideas and principles challenge common advice and caregiving practices about supporting infant and toddler motor development?
- In your experience working with infants and toddlers, have you seen their ideas and principles implemented?
- What does respecting an infant and toddler look like?
- What are the benefits and challenges caregivers and group care programs could experience when implementing their ideas and principles?

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[1] "Emmi Pikler" on Wikipedia is licensed under CC by SA 4.0

[2] Dalledone & Coutinho (2020). As contribuições da abordagem Pikler-Lóczy para a constituição de uma pedagogia para os bebês: Uma análise dos princípios orientadores. *Zero-a-seis, 22*(41), 47-72. CC by 4.0

[3] Photo by lucia vichi is licensed under CC by SA 4.0

[4] "Magda Gerber" on Wikipedia is licensed under CC by SA 4.0

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8.5: Motor Development Trends

Trends

The physical bodies of infants and toddlers show common growth trends and these trends relate to motor development. There are two important trends: cephalocaudal and proximodistal. The cephalocaudal trend acknowledges a top-down growth trend. For example, infants may use their upper limbs before their lower limbs. The proximodistal trend, on the other hand, acknowledges growth from the center of the body outwards. For example, infants use their arms before they can use their fingers effectively.



Figure 8.5.1: Infant using both feet to interact with a book. . ([1])

Resources on infant and toddler development sometimes mistakenly reference cephalocaudal and proximodistal trends as principles (i.e., Gonzalez-Mena, 2014). The reason they are trends and not principles is that they only describe what typically happens (a trend) as not all infants show motor development that exactly follows these trends. For example, research has shown that some infants will reach for and interact with objects using their feet before they are able to do so with their hands (Galloway & Thelen, 2004; Heathcock & Galloway, 2009), which does not follow the cephalocaudal trend. Figure# is a picture of an infant using both feet to interact with a book while being read to by a caregiver. [2]

[1] Image by Todd LaMarr is licensed under CC by NC 4.0.

[2] "Cephalocaudal trend" from Wikipedia is licensed under CC by SA 4.0.

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8.6: Gross and Fine Motor Development

Two Types of Motor Development

Motor skills are often broadly divided into gross motor and fine motor skills. Gross motor skills pertain to skills involving large muscle movements, such as independent sitting, crawling or walking. Fine motor skills involve use of smaller muscles, such as grasping, object manipulation, or drawing. [1]



Figure **8.6.1**: Infant in a seated position. ([2])

Motor Milestones

Infants and toddlers are constantly learning about the world as they experience it and actively engage with it during the first three years of life. Milestones represent what most children (75% or more) can do by specific ages. This chart represents the new and improved milestone charts provided by the CDC in 2022 with substantial evidence-based updates. These milestone charts are meant to prompt surveillance and conversation and, if needed, identification and early intervention. The CDC adopts a proactive stance—we should take action early when developmental concerns arise rather than the perspective of waiting to see if a child "catches up". While children do develop at individual paces, being proactive during these critical early years is essential (Morgan et al., 2021; Noritz et al., 2013). The chart below lists milestones that, if children are not achieving by specific ages, caregivers should encourage parents to communicate with their family's pediatrician. Most caregivers are not professionally trained to officially assess the developmental abilities of children; however, caregivers have the ability to track developmental progress and are often the first to notice developmental concerns. Here is a table of some of the motor milestones for infants and toddlers.

Motor Milestones

Age	What Most Children Can Do By Each Age [3]
2 months	● Hold their head up when on their tummy. ● Move both arms and both legs. ● Open hands briefly.
4 months	● Hold their head steady without support while being held. ● Hold a toy when placed in their hand. ● Use their arms to swing at toys. ● Bring their hands to their mouth. ● Push up onto their elbows/forearms when on their tummy.
6 months	● Roll from tummy to back. ● Push up with straight arms when on their tummy. ● Lean on their hands for support when sitting.
9 months	● Stand while holding on for support. ● Can get into a sitting position. ● Sit without support. ● Pull up into a standing position. ● Crawl.
12 months	● Pull up to stand. ● Walk, holding on to furniture. ● Drink from a cup without a lid, as you hold it. ● Pick things up between thumb and pointer finger, like small bits of food.
15 months	● Take a few steps independently. ● Use fingers to feed themselves some food.
18 months	● Walk without holding on to anyone or anything. ● Scribble. ● Drink from a cup without a lid and may spill sometimes. ● Feed themselves with their fingers. ● Try to use a spoon. ● Climb on and off a couch or chair without help.
24 months	● Kick a ball. ● Run. ● Walk (not climb) up a few stairs with or without help. ● Eat with a spoon.
30 months	● Use their hands to twist things, like turning door knobs or unscrewing lids. ● Take some clothes off independently, like loose pants or an open jacket. ● Jump off the ground with both feet. ● Turn book pages, one at a time, when you read with them.
36 months	● String items together, like large beads or macaroni. ● Put on some clothes independently, like loose pants or a jacket. ● Use a fork.

Motor Development Concerns

The motor milestones from the CDC are based on data from infants and toddlers in the U.S., which may not accurately represent the motor development of children from other countries (Karasik, Tamis-LeMonda, Adolph & Bornstein, 2015). Figure 6.6.2 is based on research conducted by the World Health Organization (WHO Multicentre Growth Reference Study Group, & de Onis, 2006). It presents windows of achievement for six gross motor development milestones based on infants and toddlers from five

countries: Ghana, India, Norway, Oman and the USA. The six milestones in the chart are sitting without support, standing with assistance, hand and knees crawling, walking with assistance, standing alone and walking alone.

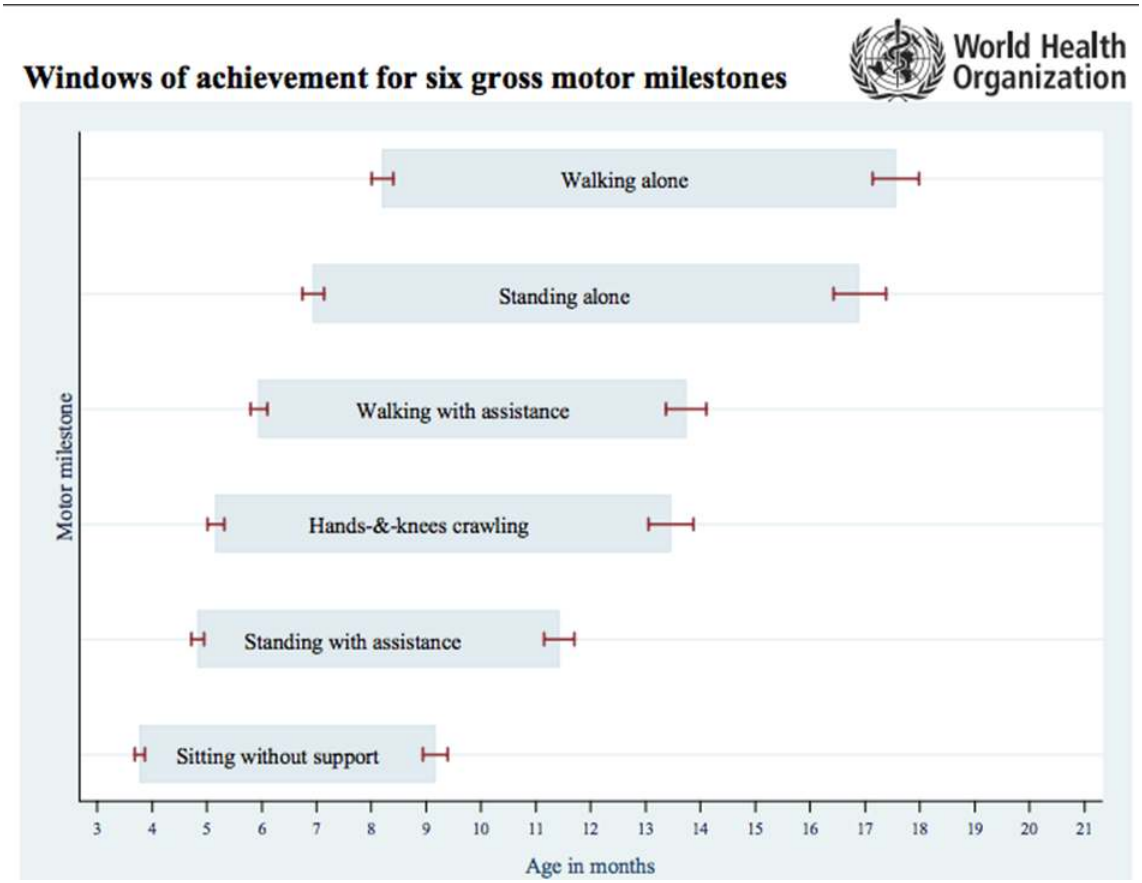


Figure 8.6.2: Windows of achievement for six gross motor milestones. The chart is based on research conducted by the World Health Organization (WHO Multicentre Growth Reference Study Group, & de Onis, 2006). It presents windows of achievement for six gross motor development milestones based on infants and toddlers from five countries: Ghana, India, Norway, Oman and the USA. The six milestones in the chart are sitting without support, standing with assistance, hand and knees crawling, walking with assistance, standing alone and walking alone. ([4])

Based on the research, there are a few findings worth noting:

- In general, there is a common order in achieving these milestones. First children are able to sit without support, then achieve standing with assistance, followed by walking with assistance which then leads to standing alone and lastly walking alone.
- The one milestone that did not always follow the general order was hand-and-knees crawling. Sometimes children would crawl on their hands and knees before being able to stand with assistance.
- 4.3% of infants did not exhibit hand-and-knees crawling at all—they skipped this milestone and went straight into walking.
- The windows of achievement overlap—Figure 8.6.2 clearly depicts this. The start of each window of achievement for every milestone does not begin near the end of the previous milestone window, but rather begins near the beginning of the previous milestone window. This overlap acknowledges the wide age variability of infants and toddlers achieving these milestones.
- The length of each milestone window varies across the motor skills. Walking alone and standing alone have the longest achievement window, suggesting that these two abilities have the most variability in age of achievement. For example, some children began walking alone around eight months of age, while others did not achieve this milestone until after seventeen months of age. On the other hand, sitting without support and standing with assistance showed the two most narrow windows of achievement, suggesting that these two abilities have the least variability in age of achievement.

Motor Milestone Chart Limitations

Gross motor milestone charts, while important, do not capture the complex developments that lead up to achieving specific milestones. Take for example the process to be able to sit independently. The ability to maintain balance in the sitting posture

gradually emerges between 2 and 9 months of age (Butler et al., 2010). When infants are 5 to 6 months old, they are able to 'prop sit' or sit independently for short periods (Shumway-Cook & Woollacott, 2003). At 6 months, hip joint mobility increases, allowing the thighs to rest on the contact surface and the infant is able to sit with their legs in a ring position (Bly, 1994), i.e., symmetrically flexed, abducted with externally rotated hips and flexed knees. Between 8 to 9 months, the trunk and pelvis muscles stabilize the sitting position, allowing the infant to narrow the support base for balanced independent sitting (Harbourne, Lobo, Karst & Galloway, 2013; van der Fits et al., 1999). After being able to sit independently, infants learn to perform a coordinated action between upper limbs, trunk and lower limbs as they are able to use their lower body to balance as they reach with their upper limbs (Rochat & Goubet, 1995). Thus, unlike milestone charts that simply show sitting to occur, sitting without support is a process that takes place over many months and involves a complex interplay between various muscles that prepare for the eventual achievement of sitting. [5]



Figure **8.6.3**: Infant in a sitting posture. ([6])

Another limitation of motor milestones is that they convey the idea that once an infant performs a motor milestone, like walking, that the infant has fully achieved this milestone. The reality is that motor development involves numerous bouts of successes and failures with each milestone ability. An infant that successfully walks once, may fall the very next attempt. Karen Adolph and her colleagues (2012) have documented the number of steps and falls toddlers have as they learn to walk. Toddlers between 12 to 18 months of age take an average of 2,368 steps in just one hour and cover a distance of 701 meters—the length of almost eight football fields! This is just one hour; multiplying these numbers by the total number of hours toddlers are awake is even more eye-opening. In six hours, a toddler could accumulate around 14,000 total steps and cover the distance of 46 football fields! Despite these infants clearly being able to walk, they also continue to fall. In fact, the average toddler fell seventeen times each hour, one toddler even fell sixty-nine times in one hour.



Figure **8.6.4**: A caregiver supporting an infant learning to walk ([7])

Every day, infants are practicing various motor skills and body positions. For example, Figure **8.6.5** provides insight into the various motor behaviors and body positions from one 10 month old infant. While the majority of time was spent in a seated position (40.5%), the infant was consistently practicing various other positions, frequently rotating between them.

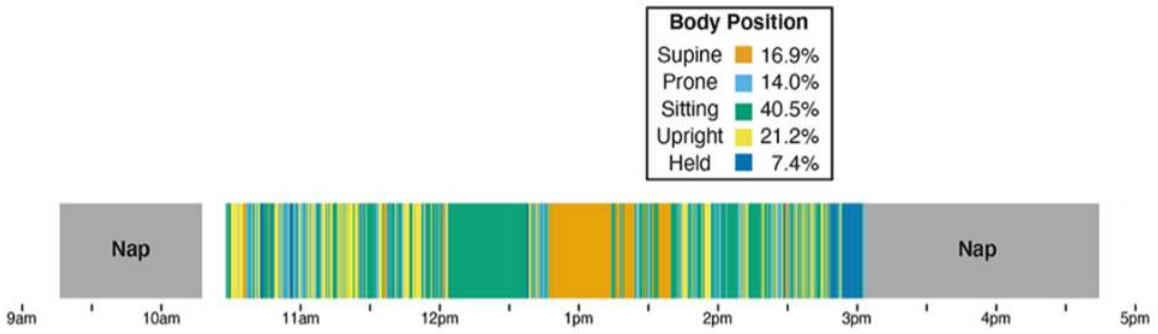


Figure **8.6.5**: Frequency of body positions during one day from one 10-month-old infant. ([8])

Gross Motor Development

In the process of gross motor development, the first mobility that infants usually acquire is crawling. There are different types of infant crawling (see Figure **8.6.6** for a depiction) such as belly crawling and hands-and-knees crawling (Patrick, Noah & Yang, 2012). Belly crawling is the action in which infants move by pulling the body along the ground on the abdomen. Hands-and-knees crawling means moving by lifting the abdomen up on both arms and knees. Some infants experience both belly crawling and hands-and-knees crawling, others experience only hands-and-knees crawling (Kalmar, 2017). Previous studies have explored a relationship between belly crawling and hands-and-knees crawling: infants who formerly belly-crawled showed more proficient hands-and-knees crawling than those who skipped the belly crawling period (Adolph, Vereijken & Denny, 1998). Infants who spend a greater amount of awake time in the prone position (abdomen on ground, such as during tummy time) achieve hands-and-knees crawling at an earlier age (Davis, Moon, Sachs & Ottolini, 1998). [9]

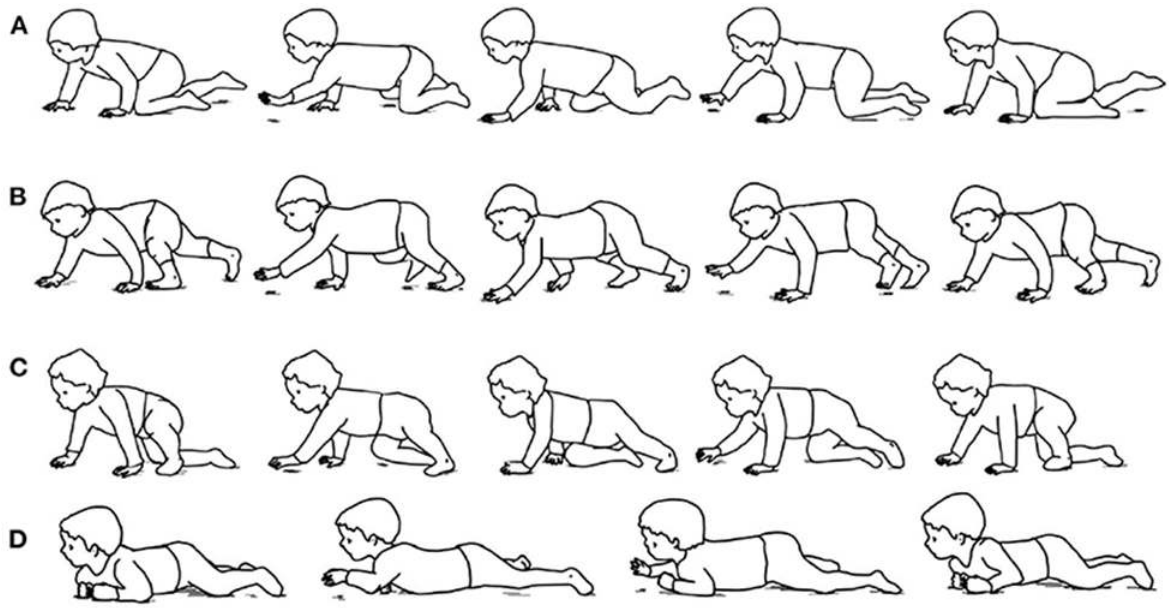


Figure **8.6.6**: Examples of various infant crawling styles: (A) Hands-and-knees crawling. (B) hands-and-feet crawling. (C) Step–crawl mix, using foot and right knee. (D) Belly crawling ([10])

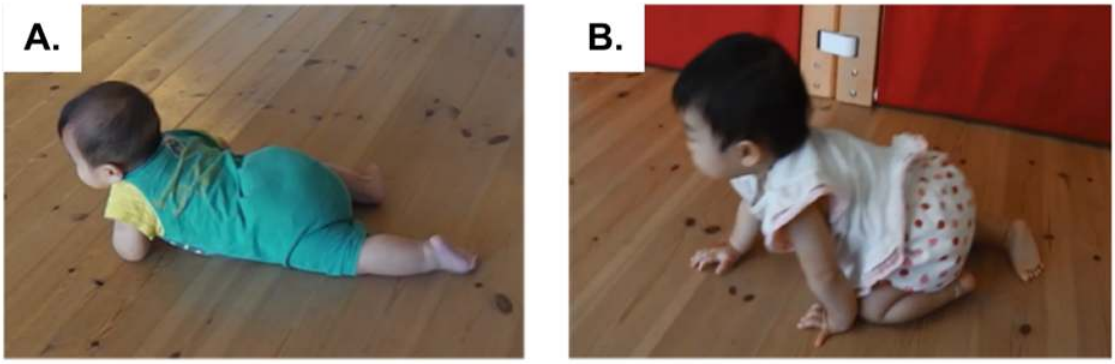


Figure 8.6.7: An infant belly crawling (A.) and an infant hands-and-knees crawling (B.). . ([11])

Tummy Time.

Tummy time describes the times when a caregiver places an infant on their stomach while the infant is awake and someone is watching. Tummy time is not only an important way to prevent flat spots on a baby's head, it is also an important part of a baby's normal growth. In fact, tummy time is positively related to overall gross motor development (Buchanan et al., 2021; Carson et al., 2022; Hewitt et al., 2020). Tummy time is especially important for infants who are at risk of motor delays and/or who have a motor-related disability (Uzark et al., 2021; Wentz, 2017). While tummy time is supported by many professionals and well-respected organizations, there are arguments against the necessity of the practice (see Gerber & Johnson, 1998). [1]



Figure 8.6.8:Infant practicing tummy time. ([13])

Tummy time is important for many reasons:[12]

- Tummy time helps prevent flat spots on the back of an infant’s head.
- Makes neck and shoulder muscles stronger so infants can start to sit up, crawl, and walk.
- Improves infant motor skills.

Infants benefit from 2 to 3 tummy time sessions each day for a short period of time (3 to 5 minutes). As they grow and show enjoyment of tummy time, the length of the sessions can be increased. As infants grow older, more tummy time helps build strength for sitting up, rolling over, crawling, and walking. [12]

Tummy Time Tips: [12]

These suggestions can help make tummy time more enjoyable:

- Spread out a blanket in a clear area of the floor for tummy time.
- Try short tummy time sessions after a diaper change or after an infant wakes from a nap.
- Put a toy or toys within an infant's reach during tummy time to help them learn to play and interact with their surroundings.
- Have an adult be in the infant’s field of view during tummy time to encourage interaction and bonding.
- As an infant gets older, tummy time sessions can last longer, and can take place more often throughout the day.

Gross Motor Development: Postural Affordances

Postures—the particular body and limb configurations used at any moment—mediate motor development in meaningful ways (Rochat & Bullinger, 1994). For example, the acquisition of each new posture provides a unique lens through which infants can view the world as they accrue a range of motor possibilities for moving about and physically interacting with the environment (e.g., Adolph, 2008; Thurman & Corbetta, 2019). [14]

Depending on the motor skill level and posture used, physical interactions with objects can be facilitated or reduced. For example, when sitting, infants' hands are free allowing them to manually manipulate and explore objects in sophisticated ways (Lobo & Galloway, 2013; Lobo et al., 2014; Rochat, 1989; Soska & Adolph, 2014; Soska, Adolph & Johnson, 2010). When in a prone position (lying abdomen down), however, infants are limited to using one hand to lift their torso up off the ground, while using the other to reach out for an object, which greatly reduces the range of actions (Rocha & Tudella, 2008). In older infants, crawling and walking positions have different affordances. During crawling, infants are less likely than walking infants to carry objects (Karasik et al., 2012). In comparison, when walking, infants' hands are free to interact with objects in complex ways and the change of position opens up a new field of view for further exploration. Thus, each posture provides unique affordances on how the body can be used (Adolph, 2008). Consider Figure **8.6.9** which shows an image of an infant holding an object with one hand while using the other hand for balance. In which ways does the infant's current crawling posture afford and restrict how the infant can explore the object? If the infant transitioned into a standing or walking position, how would the affordances and restrictions change? [14]



Figure **8.6.9**: Infant holding an object with one hand while using the other hand for balance. ([15])

Postures can also alter the stability of the body, the demand of attentional resources, and what can be perceived in the surroundings (Franchak, Kretch & Adolph, 2018; Kretch, Franchak & Adolph, 2014). Certain postures and their relative stability can even influence the use of the limbs and hands. For example, transitioning from sitting to crawling, and from crawling to walking affects the way infants use their arms for reaching and retrieving objects (Corbetta & Bojczyk, 2002; Corbetta & Thelen, 2002). Unstable postures often require more of the infants' effort for balance such as when the hands are needed to hold onto surfaces during cruising (Berger, Chan & Adolph, 2014), or when the hands may be needed to balance the body when standing is a new motor skill still being learned (Ledebt, 2000). When the hands are used for balance, they are less likely to be used for holding and exploring objects. [14]

Thus, research has shown that postural progression and postural control can influence infants' experiences with objects, people, and their wider environments. Infants' expanding repertoire of postural skills as they acquire locomotor skills, affects their manipulatory behaviors and interactive activities with objects in their surroundings. [14]

Gross Motor Development: Environmental Affordances

Think about the physical environment where you live, how does the furniture influence where and how people stand and sit, where eating takes place, the posture and arrangement people are in when socializing, how objects like televisions, windows or fireplaces influence the structure and positioning of furniture which results in how and where people sit and orient in the room, etc. Just as the physical environment is important for considering how adults sit, stand and move about in a space, the physical environment for infants and toddlers affords various physical movement possibilities.



Figure 8.6.10: Infant using a structure for support while standing. ([16])

The theory of affordance (Gibson, 1950; 2014) represents an important theoretical framework for considering the environment's role in supporting and encouraging physical development in infants and toddlers. In this theory, the physical environment is believed to afford or allow the child possibilities and actions. The characteristics and features of the indoor environment can therefore be hypothesized to influence children's gross motor development. The affordances of the physical environment are what the environment offers the child. For example, a toddler's classroom's affordances are the physical size of the classroom, the toys and materials available, the number of peers for potential play partners, and adults who set up the play environment, ensure its overall safety, manage the day-to-day operations, and interact with the children. [17] [18]



Figure 8.6.11: Structure supporting gross motor development inside a toddler classroom. ([1])

Let's look again at the gross motor windows of achievement for six gross motor milestones chart again (Figure 8.6.12). The six milestones in the chart are sitting without support, standing with assistance, hand and knees crawling, walking with assistance, standing alone and walking alone.

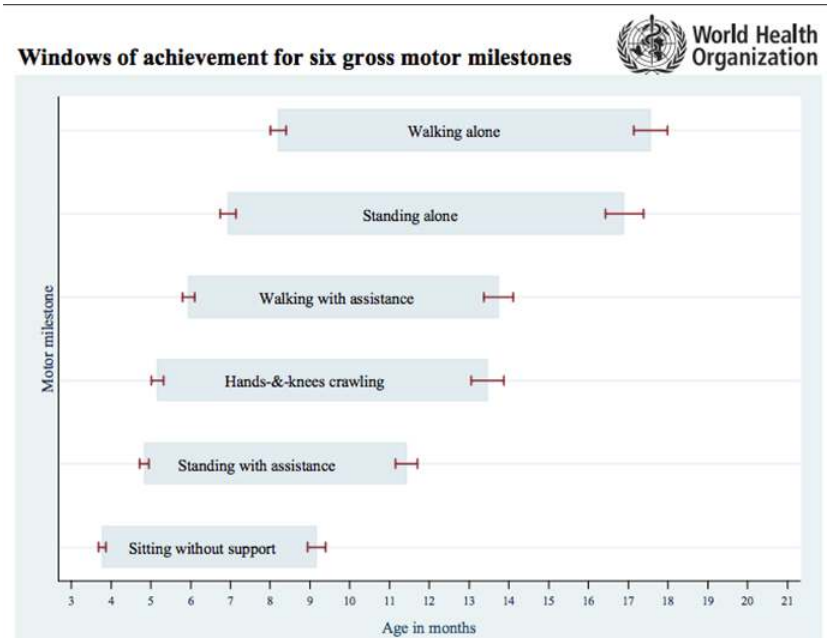


Figure **8.6.12**: Windows of achievement for six gross motor milestones. Sitting without support 3.8 - 9.4, Standing with assistance 4.8-11.7 months, Hands-&-knees crawling 5.2-13.9 months, Walking with assistance 6.0 - 14.1 months, Standing alone 6.9 - 17.4 months, Walking alone 8.2 - 18.0 months

([20])

For each milestone, how could the physical environment support and encourage the infant or toddler as they progress toward achieving a specific milestone? For example, consider the milestone of standing with assistance, what role could the environment have? As the child is not yet able to stand independently, they are taking advantage of structures in the environment that afford assistance in getting into a standing position and remaining upright. Therefore, structures that allow a child to hold onto and pull up are important, as are structures that can be used for support to remain standing. When an environment includes structures at a low height, it supports a child's progress toward achieving this milestone. If an environment only has high structures built for adults, the motor and movement possibilities for a child are more limited.

Caregivers should consider how both the indoor and outdoors environments afford infants and toddlers the opportunity to practice and challenge their current motor skills safely. As caregivers observe and reflect upon the motor development progress of infants and toddlers they should consider how to modify the environment to continue to support and encourage motor development. For example, for infants practicing standing with support, caregivers should ensure there are structures that can be used to help infants pull themselves up and offer continual support at an appropriate height. Outside, is the play equipment age-appropriate and supportive of gross motor development? Figure **8.6.13** shows two angles of the same play structure geared for toddlers. Considering the construction of it, what elements are there that can support the developmental progression of toddlers' gross motor skills? While parts of the structure may be challenging for some toddlers, what elements are built in to support toddlers as their gross motor skills improve?



Figure 8.6.13: Outside structure supporting toddler gross motor development. . ([21])

Fine Motor Development

Fine motor skills involve more exact movements of the feet, toes, hands, and fingers. While fine motor skills are slower to develop (in accordance with the proximodistal trend), remarkable progress is made in fine motor development during the first two years. In just the first few years of life, children go from having no intentional fine motor control to being able to manipulate objects to play and learn, as well as beginning to take care of themselves. [22]

Just as with gross motor milestones, there are complex developments that lead up to achieving specific fine motor milestones. Take for example the fine motor milestone of grasping an object. Reaching to grasp an object, which could be perceived as a relatively simple action, requires a complex compilation of smaller abilities working synchronously together. Successful reaching to a stimulus, whether it is located on the body or in external space, typically involves the coordination of at least two different action systems: reaching and grasping (Jeannerod, 1996). Effective reaching requires individuals not only to extend their hands to the location of an object, but to also open and orient the hand to prepare to grasp the specific object. Developmentally, research indicates that the reaching system develops before grasping (Piaget, 1952; Bruner, 1973), reflecting a proximodistal sequence in the development of grasping (Lockman & Ashmead, 1983). For example, before 4 months, infants develop the ability to extend their hand to the location of an object (Bruner & Koslowski, 1972; Piaget, 1952), but during this period the hand is often fisted when it contacts the object. By 4 months, however, infants begin to open the hand in advance of contacting the object. Likewise, with regard to self-touch, closed hand contacts prevail in the first 2 or 3 months, and open hand contacts begin to increase in frequency between 3 and 5 months (Thomas, Karl & Whishaw, 2015). [23]

Even after infants achieve the ability to reach for and grasp an object, there is still further development in this milestone that occurs. There is an improvement in reaching kinematics as 6 month-old infants develop a straight arm trajectory accompanied by fewer movements (Von Hofsten, 1991). During this phase of reaching development, there are many factors that influence arm trajectory; however, the development of postural control for maintaining stability during reaching is one of the most significant (Bertenthal & Von Hofsten, 1998). Since reaching requires “whole body engagement” (Rochat & Goubet, 1995), its achievement is highly dependent on posture. At about 3 months, when arm extensions are being replaced by goal directed reaches but upright sitting is not mastered, infant reaching is better with external support. As infants generate the ability to sit independently, reaching becomes more coordinated and they can use their body to balance as they reach outward. [24]



Figure **8.6.14**:Nine month old infant using the pincer grasp. ([25])

Development of Grasping

The development of grasping is an important part of fine motor development. As infants and toddlers develop, they progress through different types of grasps. Children are born with a palmar reflex grasp. It is an involuntary reflexive response present in newborns, but begins to appear around 16 weeks gestation (Sherer, 1993). To elicit the reflex, a caregiver can use their finger to stroke the palm of the infant. The palmar grasp reflex comprises two phases: finger closure and clinging. The infant's fingers undergo flexion to enclose the examiner's finger and the pressure applied to the palm produces traction on the fingers' tendons, leading to the clinging action. The thumb is not involved in this reflex. The palmar grasp reflex disappears typically by six months of age, signifying healthy brain maturation and is replaced by the development of voluntary grasping (Schott & Rossor, 2003). The palmar reflex probably serves to create a basic motor pattern that lays the foundation for obtaining later grasping ability. Additionally, it creates interaction and bonding between the infant and the caregiver. [26]

The palmar reflex grasp is replaced by the ulnar grasp, which is a “clumsy motion in which an infant’s fingers close against the palm” (Berk & Meyers, 2016). The ulnar grasp typically develops around 3 to 4 months of age and increases infants’ ability to explore objects. As infants learn to sit independently, both hands are freed up to explore objects; therefore around 4 to 5 months of age infants are able to transfer objects between their hands. The pincer grasp is when the pointer finger and the thumb squeeze together to grasp an object. Infants are usually able to perform a pincer grasp by the age of 9 to 10 months (Sgandurra et al., 2012). With each change in grasping ability, infants are able to interact with different objects and in new ways. For example, the ulnar grasp only allows for larger objects to be held onto while the pincer grasp permits an infant to pick up smaller objects.

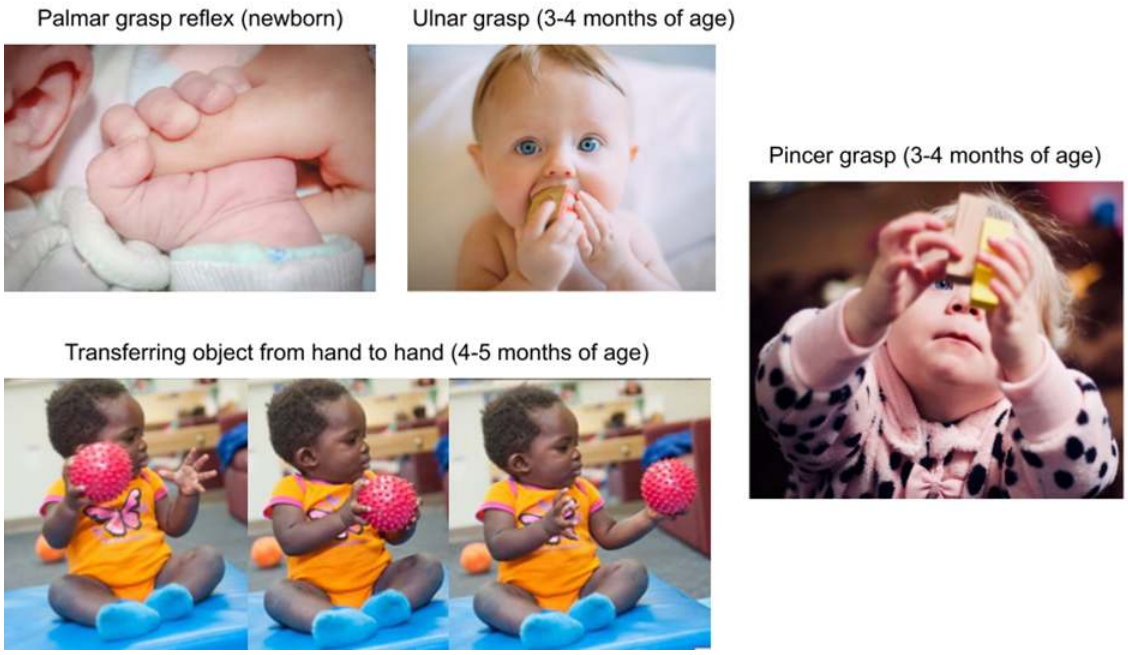


Figure **8.6.15**: Development of grasping during infancy. ([27])

To support infants, caregivers should carefully observe infants' grasping progression and provide materials that can easily be manipulated based on their current grasping techniques. Active object exploration emerges around 3 to 6 months of age with the onset of reaching and grasping (Lobo & Galloway, 2008; Rochat, 1989; Ruff, 1984). At 6 months of age, infants spend the majority of their time mouthing and grasping objects and this sharply declined with concurrent improvements in complex manual exploratory behaviors such as fingering, transferring, and rotating objects (Belsky & Most, 1981; Ruff, 1984). As a result, caregivers should provide young infants with materials that they can easily grasp onto and that are safe for mouthing. Once infants begin to sit and develop more complex grasping techniques, such as the ulnar grasp, caregivers should provide materials that are more complex in design characteristics, but still light, easy to hold in one hand, easy to transfer between hands and safe for mouthing. [28]



Figure **8.6.16**: Assortment of wooden objects. ([29])

Infant exploratory behaviors are influenced by object properties including size, shape, texture, and weight of objects. Infants change their grasping patterns depending on object size—smaller objects are grasped unimanually and larger objects are grasped bimanually. Research has demonstrated variations in infants' grasping patterns based on object structure, such as two-handed grasps for larger objects and pincer grips for smaller and softer objects (Newell et al., 1989; Newman et al., 2001). Additionally, 12 to 14 month old infants showed appropriate, anticipatory changes in grasp formation based on object shape and size (Barrett, Traupman & Needham, 2008; Fagard, 2000). Nine to twelve month old infants explored object properties such as shape, size, and texture by rotating, fingering, and transferring objects, whereas they explored properties such as weight, sound, and rigidity by

banging and shaking objects (Ruff, 1984). This research suggests that with older infants, caregivers should provide materials that are more complex in design and diverse in characteristics such as size, shape, texture and weight. As older infants use their developing grasping abilities to explore materials, caregivers can continue to observe how they interact with the materials, and provide materials based on what characteristics infants seem most interested in exploring. [28]

Figure **8.6.17** shows various manipulative objects: A) cardboard tube; B) wood clothes pin; C) metal jar lid; D) plastic bottle lid; E) cork; F) plastic hair curlers; G) wood ring. As you look over the objects, consider which objects would best support the different grasping abilities of infants? For infants using a ulnar grasp, which objects would be best to share with them? For infants using a pincer grasp, which objects would be best to share with them? How might the physical properties of each object change how the infants explore them?

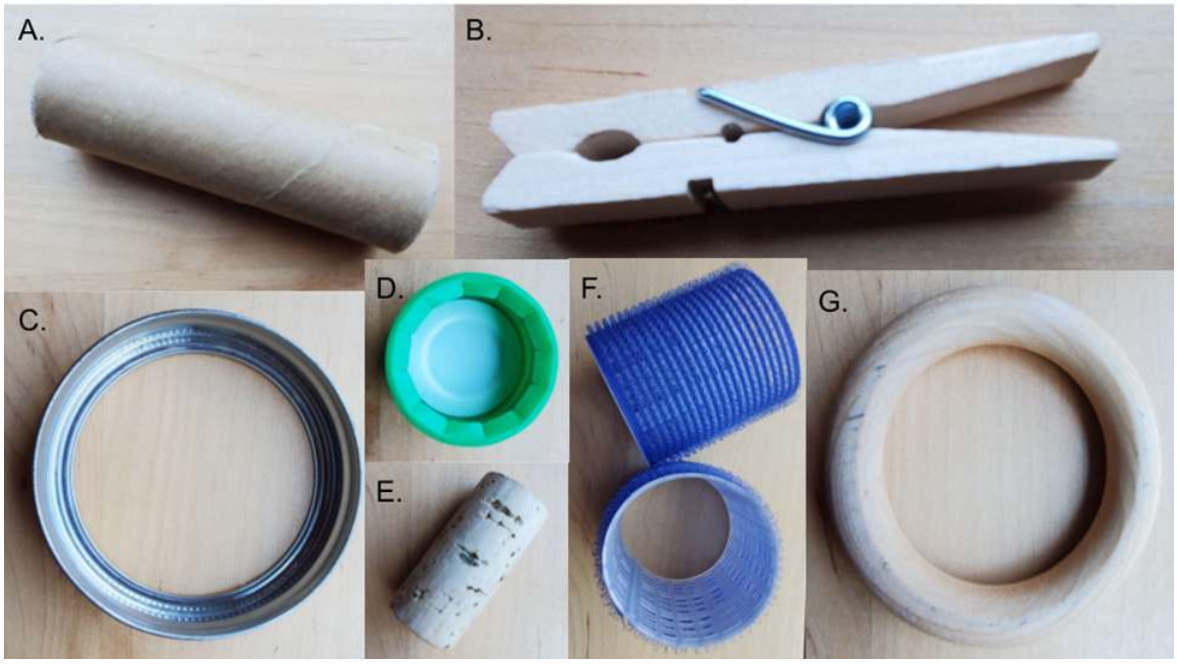


Figure **8.6.17**: Various manipulative objects. ([30])

[1] Gonzalez et al., (2019). Do gross and fine motor skills differentially contribute to language outcomes? A systematic review. *Frontiers in Psychology, 10*, 2670. CC by 4.0

[2] Image by krakenimages on Unsplash.

[3] CDC's Developmental Milestones by the Centers for Disease Control and Prevention is in the public domain.

[4] Image from the WHO is in the public domain.

[5] Sato & Tudella (2018). Influence of sitting positions and level of trunk control during reaching movements in late preterm and full-term infants. *Frontiers in Pediatrics*, *6*, 185. CC by 4.0

[6] Image from Juan Encalada on Unsplash.

[7] Image from julio andres rosario ortiz on Unsplash

[8] Image adapted from Franchak et al., (2021). A contactless method for measuring full-day, naturalistic motor behavior using wearable inertial sensors. *Frontiers in Psychology*, 4632. CC by 4.0

[9] Yamamoto et al., (2021). The applied ability in infant crawling and the importance of prone motor experience for subsequent development. Preprint. CC by 4.0

[10] Image from Xiong et al., (2021). Measurement and analysis of human infant crawling for rehabilitation: A narrative review. *Frontiers in Neurology, 1747*. CC by 4.0

[11] Image adapted from Yamamoto et al., (2021).The applied ability in infant crawling and the importance of prone motor experience for subsequent development. Preprint. CC by 4.0

[12] "Babies need tummy time!" from NICHD is in the public domain.

[13] Image from Minnie Zhou is on Unsplash.

[14] Thurman & Corbetta (2019). Changes in posture and interactive behaviors as infants progress from sitting to walking: a longitudinal study. *Frontiers in Psychology, 10*, 822. CC by 4.0

[15] Image by Minnie Zhou on Unsplash.

[16] Image from Jen Theodore on Unsplash.

[17] Sando (2019). The physical indoor environment in ECEC settings: Children's well-being and physical activity. *European Early Childhood Education Research Journal, 27*(4), 506-519. CC by 4.0

[18] Stanton-Chapman & Schmidt (2021). How do the children play? The influence of playground type on children's play styles. *Frontiers in Psychology*, 4337. CC by 4.0

[19] Image by Todd LaMarr is licensed under CC by 4.0

[20] Image from the WHO is in the public domain.

[21] Image by Todd LaMarr is licensed under CC by 4.0

[22] "Child Growth and Development" by College of the Canyons, Jennifer Paris, Antoinette Ricardo, and Dawn Rymond is used under CC BY 4.0.

[23] Chinn et al., (2019). Development of infant reaching strategies to tactile targets on the face. *Frontiers in Psychology, 10*, 9. CC by 4.0

[24] Rachwani et al., (2015). The development of trunk control and its relation to reaching in infancy: A longitudinal study. *Frontiers in Human Neuroscience, 9*, 94. CC by 4.0

[25] Image from the CDC is in the public domain.

[26] Anekar & Bordoni (2020). Palmar grasp reflex. *StatPearls*. CC by 4.0

[27] Images adapted from Unsplash, Pixabay and the CDC all are in the public domain.

[28] Kaur et al., (2015). Atypical object exploration in infants at-risk for autism during the first year of life. *Frontiers in Psychology, 6*, 798. CC by 4.0

[29] Assortment of wooden objects by Todd LaMarr is licensed under CC by 4.0

[30] Various manipulative objects by Todd LaMarr is licensed under CC by 4.0

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8.7: Individual Differences- The Role of Cultural Childcare Practices

Culture and Childcare Practices

Despite a common sequence of motor skill acquisition, there are individual differences in age for the acquisition of motor skills, highlighting the importance of the physical environment and caregiver practices. Ever since milestone charts attempted to document what “normal” ages to achieve motor milestones are, variation in type and timing of motor development have been reported (Karasik et al., 2015). For example, motor development in non-Western countries was found to differ from Western norms and these differences were related to differences in caregiving practices (Adolph et al., 2010; Cintas, 1995; Karasik et al., 2015). Even within the ‘Western world’, there is cultural variability in the timing of motor milestone attainment (e.g., De Kegel et al., 2013; Steenis et al., 2015; WHO Multicentre Growth Reference Study Group and de Onis, 2006). [1]



Figure 8.7.1: Caregiver supporting an infant’s walking practice. ([2])

Differences in cultural beliefs and caregiving practices lead to differences in when children achieve motor milestones (Oudgenoeg-Paz, Atun-Einy & van Schaik, 2020). For example, there are differences between Dutch and Israeli caregivers in their beliefs about motor development (Van Schaik et al., 2018), such that Israeli caregivers attribute more importance to encouraging motor development in the “right” order and obtaining expert advice. Dutch caregivers, on the other hand, attribute greater importance to letting children follow their own pace in motor development (Van Schaik et al., 2018). Studies show that motor development of Dutch children is delayed compared to children in other western countries, including Israel (Shapira & Harel, 1983; Steenis et al., 2015). [3]



Figure 8.7.1: Mother from Sierra Leone in West Africa wearing an infant on her back. ([4])

The body of cross-cultural research further supports the perspective that motor development is not a universal process—the social and physical environment has a significant role. For example, practicing standing and sitting, and applying massage or stretching of

the limbs is common in African and Caribbean cultures but less common in Western cultures (Adolph et al., 2010; Super & Harkness, 2015). [5]

In Tajikistan and other parts of Central Asia a traditional caregiving practice involves “gahvora” cradling. Children from birth to 20 months of age are bound on their backs in a tightly wrapped swaddle with arms extended along the sides of the torso and legs straightened and tied together for more than 20 hours per day for some children (Karasik et al., 2018). Infants are not unwrapped for feeding because mothers lean over the cradle to breastfeed and they are not removed for toileting because infants urinate through an external catheter and defecate through a hole in the bottom of the cradle. [6]

According to the prevailing view among pediatricians and psychologists, severe movement restriction in infancy could have deleterious effects, especially across the first two years of ife, a critical period in children’s health and development (Cunha, Leite & Almeida, 2015). For example, the extended and abducted position of the legs, especially in the first few months, could lead to hip dysplasia or pigeon-toed gait (Clarke, 2014; Van Sleuwen et al., 2007). Extended time in the supine position could lead to brachycephaly (flattening of the back of the head (Graham et al., 2005; van Vlimmeren et al., 2017). Restricted movement—especially in older infants—could delay development of postural and locomotor skills (Adolph & Robinson, 2015). [6]



Figure **8.7.1**: (A) Gahvora with intricately carved details, fancy bindings, and coverings. (B) Plain-looking gahvora from a less affluent household ([7])

As Figure# shows, younger infants spent more hours in a gahvora than older toddlers; however, twenty percent of older infants (12 to 24 month olds) continued to be cradled for more than 15 hours per day. It is important to note that in Tajik families, children are prized and the center of family life. Tajik caregivers responded immediately to vocalizations from their cradled infants by feeding them, rocking them, or singing to them. Mothers, grandmothers, aunts, neighbors, and older siblings were available, interchangeable, and responsive and Tajik children of all ages, including siblings and village children, surrounded the gahvora and interacted with the infant. [5] [6]

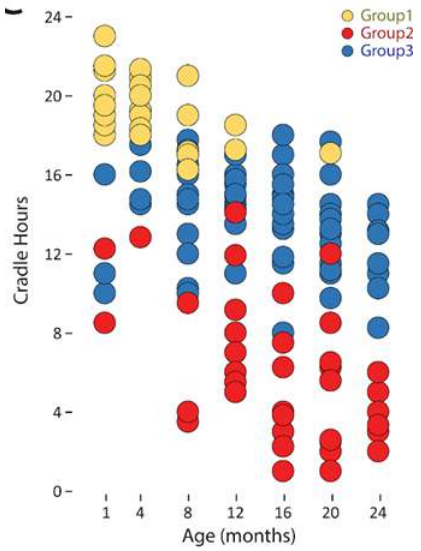


Figure 8.7.1: Number of hours children spent in the gahvora cradle at different ages. The 27 infants in Group 1 (yellow dots) spent long periods in the gahvora, accumulating *M* = 19.13 hours, distributed across the 24 hours. Indeed, 10 Group 1 infants spent ≥ 20 hours in the cradle. For the 44 infants in Group 2 (red dots) time in the gahvora occurred in short bursts, primarily between 10 a.m. and 10 p.m *M* = 6.09. To our surprise, Group 2 infants were out of the gahvora at night. The 76 infants in Group 3 (blue dots) spent most of their time in the gahvora between 9 p.m. and 7 a.m., accumulating *M* = 13.82 hours/day ([7])

One value of a cultural approach is the discovery of new phenomena that challenge widespread assumptions about caregiving practices and the "natural" course of child development. Cultural beliefs, customs, and practices, geography, climate, and village resources compel caregivers to find ways to keep their children healthy and safe. Gahvora cradling is a widespread cultural practice throughout Tajikistan and presumably other parts of Central Asia. Yet, the practice flies in the face of Western norms, theories, and even WHO standards. As caregivers of infants and toddlers, it is essential to be aware of and respect cultural differences in caregiving practices.[6]

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[1] Oudgenoeg-Paz, Atun-Einy & van Schaik (2020). Two cultural models on infant motor development: Middle class parents in Israel and the Netherlands. *Frontiers in Psychology, 11*, 119. CC by 4.0

[2] Image from Nathan Dumlao is on Unsplash.

[3] Oudgenoeg-Paz, Atun-Einy & van Schaik (2020). Two cultural models on infant motor development: Middle class parents in Israel and the Netherlands. *Frontiers in Psychology, 11*, 119. CC by 4.0

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[5] Oudgenoeg-Paz, Atun-Einy & van Schaik (2020). Two cultural models on infant motor development: Middle class parents in Israel and the Netherlands. *Frontiers in Psychology, 11*, 119. CC by 4.0

[6] Karasik et al., (2018). The ties that bind: Cradling in Tajikistan. *PloS One, 13*(10), e0204428. CC by 4.0

[7] Cradle Hours and Infant Age from Karasiket al., (2018). The ties that bind: Cradling in Tajikistan. *PloS One, 13*(10), e0204428. CC by 4.0

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8.8: Motor Development- Relation with Other Areas of Development

Mother Development and Other Developmental Domains

While motor development is often presented as an individual chapter separate from other developmental domains (e.g., language, social-emotional, cognition) the reality is that children's motor abilities are developing alongside these other domains and growth in one domain often influences the other domains. Motor skills are at the core of infants' and toddlers' everyday actions and interactions and consequently affect subsequent perceptual, cognitive, and language development (Bushnell & Boudreau, 1993; Gibson, 1988). Piaget (1952) suggested a relation between motor and cognitive development and noted that infants' own actions and resulting sensorimotor experiences are critical for their learning about the environment and the objects within it. Since Piaget's original observations, several studies have reported evidence for relations between motor skills and development in seemingly unrelated domains. [1]

Growing evidence suggests that acquiring more advanced control over body position affords infants' opportunities for learning and exploration (Franchak, 2020; Gibson, 1988; Libertus & Hauf, 2017). For example, infants' visual experiences differ according to body position: while prone, infants' field of view is dominated by the ground surface and objects near the body, whereas upright infants have a more expansive view of their surroundings that includes distant objects and faces (Franchak et al., 2011, 2018; Luo & Franchak, 2020; Kretch et al., 2014). Sitting facilitates visual and manual exploration of objects compared with laying prone or supine (Luo & Franchak, 2020; Soska & Adolph, 2014). Upright locomotion (walking) compared with prone locomotion (crawling) allows infants to travel farther, more easily carry objects, and elicits different social responses from caregivers (Adolph & Tamis-LeMonda, 2014; Gibson, 1988; Karasik et al., 2014). Accordingly, learning to sit and walk is linked with downstream improvements in language learning and spatial cognition (He et al., 2015; Moore et al., 2019; Oudgenoeg-Paz et al., 2012, 2015; Soska et al., 2010; Walle, 2016; Walle & Campos, 2014; West et al., 2019). Presumably, these facilitative effects result from infants spending more time sitting, standing, and walking. For example, mastering the ability to sit independently nearly doubled the amount of time that 6 month olds spent sitting (both independent and supported sitting) in daily life compared with 6 month old not yet sitting (Franchak, 2019) and infants who spend more time sitting have increased opportunities to explore objects with both hands. [2]

Developmental Cascades Theory

The developmental cascades hypothesis emphasizes the consequences following achievement of new motor skills as a driving force during development. Developmental cascades refer to the cumulative consequences of advances in one domain (e.g., motor skills) on later behaviors or abilities (Fry & Hale, 1996; Gottlieb, 1991; Masten & Cicchetti, 2010). Gaining a new skill leads to significant and long lasting changes in the child's everyday experience by altering what kind of information is accessible and how others respond to the child. According to the developmental cascades theory, the onset of a new motor skill may provide infants with access to new learning opportunities associated with that motor skill. For example, being able to sit without support frees the hands for manual exploration of objects and enables learning about object features such as weight, texture, and function (Lederman & Klatzky, 2009; Rochat & Goubet, 1995). Sitting also frees the hands for the production of communicative gestures, which have been found to support language development (Iverson & Goldin-Meadow, 2005). Further, sitting changes the infants' point-of-view, providing novel perceptual experiences and encouraging face-to-face exchanges with their caregivers. And finally, parents react to changes in infants' abilities and adjust how they respond to the child (e.g., Karasik et al., 2014). [1]

Relationship Between Motor Skills and Language Development

While motor and language development may seem like two very different developmental areas, research has shown, within the first three years of life, that these two areas are strongly related (Schneider & Iverson, 2021). Infants and toddlers who achieve motor milestones earlier show greater language abilities. For example, in a large group of children between 10 to 14 months of age, some will be walking while others will not yet be able to walk. Children who begin to walk earlier have larger receptive and productive vocabularies than those who are not yet able to walk (Carina, Leinweber & Ritterfeld, 2019; He, Walle & Campos, 2015; Walle & Campos, 2014). The onset of independent sitting and walking have both been found to predict later productive vocabulary sizes between 16 and 28 months (Oudgenoeg-Paz, Volman & Leseman, 2012). This relationship between motor development and language development actually begins even earlier. Infants, between 3 to 5 months of age, who can independently sit earlier than

others, show greater language abilities as toddlers (Libertus & Violi, 2016). A large study of 62,944 children found that motor skills at 18 months were predictive of subsequent language skills at 36 months of age (Wang, Lekhal, Aarø & Schjølberg, 2014). In addition to gross motor skills, fine motor skills between 12 and 18 months of age have been found to predict expressive language at 36 months in infants at a high genetic risk for ASD (LeBarton & Iverson, 2013). [1]

Why is there a relationship between motor abilities and later language abilities? It is unlikely that the acquisition of walking per se causes infants to develop language, just as it is unlikely that infant language causes the onset of walking. Rather, the onset of walking increases the infant's visual field (Kretch et al., 2014) and permits greater flexibility with which to view the environment (Frank et al., 2013). These physical changes may promote infant following of adult attentional cues, and thereby facilitate language learning. Engaging in joint attention behavior is essential for the development of language (Tomasello, 1988, 1995). Such episodes of joint engagement occur when one individual directs the attention of another to a shared referent, such as an object or event. Multiple studies have found that infant following of adult attentional cues is related to language development (Brooks & Meltzoff, 2005; Morales et al., 1998; Mundy et al., 1995; Smith et al., 1988; Tomasello & Todd, 1983). Likewise, infant initiation of joint engagement, such as pointing, is associated with later language development (Brooks & Meltzoff, 2008; LeBarton et al., 2015). Perhaps not surprisingly, infant joint attention, particularly following adult gaze, also develops markedly following the infant's first birthday (Morales et al., 2000; Morissette et al., 1995), when infants typically begin to walk. [3]

Furthermore, infant walking also has a significant impact on how the infant engages with the caregiver. Walking infants have been observed to be more likely to access objects located further away than crawling infants (Clearfield, 2011; Karasik et al., 2011). Additionally, engaging in mobile bids for the parent's attention, such as carrying an object to the parent, elicits more interactive, and verbally rich responses by the parent and such bids are more frequent by walking than crawling infants (Karasik et al., 2014). Walking infants have also been found to direct the parent's attention to objects using vocalizations and gestures more than crawling infants (Clearfield et al., 2008; Clearfield, 2011; Karasik et al., 2011). These findings indicate that not only may the walking infant be more attuned to follow adult attentional cues, but they also help to generate social contexts in which they themselves elicit parent attention. The onset of walking affords infants new ways to communicate (freeing the hands for gesture and by being able to carry move objects) and share their interests which results in richer language from caregivers (West & Iverson, 2021). [3]

Relationship between Motor Skills and Developmental Delays and Disabilities

As motor development can be tracked early on in infancy and toddlerhood, motor skills can be used as a potential early marker for later outcomes in children at-risk of a delay or disability (Bhat et al., 2012; Flanagan et al., 2012; Lebarton & Iverson, 2013; Libertus et al., 2014). Research has found that delays in motor development are linked to diagnoses such as Autism Spectrum Disorder (ASD) and developmental language disorders (Leonard & Hill, 2014; West, 2018). Infants at high familial risk for ASD (infants, who have an older sibling with an ASD diagnosis) and who receive an ASD diagnosis later in childhood, show reduced fine motor and grasping skills (Choi, Leech, Tager-Flusberg & Nelson, 2018; Libertus et al., 2014) and delayed development of posture skills (i.e., sitting and standing) (Nickel et al., 2013). More children with a developmental language disorder are late in reaching gross and particularly fine motor milestones, than children without a developmental language disorder (Diepeveen et al, 2018). Motor delays are also commonly reported in children with Down syndrome (Vicari, 2006), Williams syndrome (Masataka, 2001) and in children born preterm (Cameron et al., 2021; Caravale et al., 2005; van Haastert et al., 2006). [1] [4]

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[1] Libertus & Violi (2016). Sit to talk: relation between motor skills and language development in infancy. *Frontiers in Psychology*, *7*, 475. CC by 4.0

[2] Franchak et al., (2021). A contactless method for measuring full-day, naturalistic motor behavior using wearable inertial sensors. *Frontiers in Psychology*, 4632. CC by 4.0

[3] Walle (2016). Infant social development across the transition from crawling to walking. *Frontiers in Psychology, 7*, 960. CC by 4.0

[2] Libertus & Landa (2014). Scaffolded reaching experiences encourage grasping activity in infants at high risk for autism. *Frontiers in Psychology, 5*, 1071. CC by 4.0

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8.9: Conclusion

Conclusion of Motor Development

Motor development is an amazing domain to learn about because growth in motor abilities can be easily observed by caregivers and provides unique insight into children's developing understanding of the world. As motor abilities progress, caregivers have an important role in supporting children by providing materials and creative physical environments that both support and challenge developing skills.

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8.10: References

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CHAPTER OVERVIEW

9: Sensory and Perceptual Development

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9.1: Introduction

Introduction to Sensory and Perceptual Development

Sensory and perceptual development is a crucial aspect of development that often gets overlooked. Our sensory system begins to form in utero and continues to develop through adulthood. It is important to note that genetic, environmental, and stress factors can affect the sensory system. We have the eyes (sight), ears (sound), nose (smell), tongue (taste), touch (skin), and two other less well-known but equally important ones, vestibular (inner ear) and proprioceptive (large muscle groups).

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9.2: What is Perception?

Perception

Perception refers to the process of taking in, organizing, and interpreting sensory information. Perception is multimodal, with multiple sensory inputs contributing to motor responses (Bertenthal, 1996). An infant's turning his head in response to the visual and auditory cues of the sight of a face and the sound of a voice exemplifies this type of perception, "the fact that the senses provide overlapping information . . . is a cornerstone of perceptual development" (Bahrick, Lickliter, & Flom 2004).[1]

As infants develop increasing motor competence, they use perceptual information to decide which motor actions to take (Adolph & Joh, 2007). For example, they may adjust their crawling or walking in response to the rigidity, slipperiness, or slant of surfaces (Adolph, 1997). Motor movements, including movements of the eyes, arms, legs, and hands, provide most of the perceptual information infants receive (Adolph and Berger 2006). Young children's bodies undergo remarkable changes in the early childhood years. In describing this development, Adolph and Avolio (2000, p.1148) state, "Newborns are extremely top-heavy with large heads and torsos and short, weak legs. As infants grow, their body fat and muscle mass redistribute.[1]

In contrast to newborns, toddlers' bodies have a more cylindrical shape, and they have a larger ratio of muscle mass to body fat, especially in the legs." These changes in weight, size, percentage of body fat, and muscle strength provide perceptual/motor challenges to infants as they practice a variety of actions (Adolph & Berger, 2006). This dramatic physical development occurs within the broad context of overall growth. As infants master each challenge, their perceptual and motor behavior reflects their social environment.[1]

The extent and variety of infant perceptual and motor behavior are remarkable. Infants and toddlers spend a significant part of their days engaged in motor behavior of one type or another. By three and a half months of age, infants have made between three and six million eye movements during their waking hours (Haith, Hazen, & Goodman, 1988). Infants who crawl and walk have spent roughly half of their waking hours involved in motor behavior, approximately five to six hours per day (Adolph & Joh, 2007, p.11). Daily infants who are walking ". . . take more than 9,000 steps and travel the distance of more than 29 football fields. They travel over nearly a dozen different indoor and outdoor surfaces varying in friction, rigidity, and texture. They visit nearly every room in their homes, and they engage in balance and locomotion in the context of varied activities" (Adolph & Berger, 2006, p. 181).

Early research in motor development involved detailed observational studies that documented the progression of infant motor skills and presented an understanding of infant motor behavior as a sequence of universal, biologically programmed steps (Adolph & Berger, 2006; Bertenthal & Boker, 1997; Bushnell & Boudreau, 1993; Pick, 1989). In comparison, current research in motor development often emphasizes action in the context of behavior and development in the perceptual, cognitive, and social domains (Pick, 1989). In particular, contemporary accounts of infant motor development address (1) the strong relationship between perception and action (Bertenthal 1996; Gibson 1988; Thelen 1995), (2) the relationship between actions and the environment (Gibson 1988; Thelen 1995), and (3) the importance of motives in motor behavior, notably social and explorative motives (von Hofsten 2007). How these developing behaviors and abilities play a role in the social/emotional aspects of the child's life and functioning, such as forming early relationships and building an understanding of others, is noteworthy.[1]

The current view suggests that thinking about perceptual/motor development includes infants and toddlers with disabilities or other special needs. Children whose disabilities affect their perceptual or motor development still want to explore and interact with the people and environment around them. Although the perceptual and motor development of children with disabilities or other special needs may follow a pathway that differs from typical developmental trajectories, sensitive and responsive caregivers can provide alternative ways in which to engage children's drive to explore, building on their interests and strengths and supporting their overall physical and psychological health.[1]

For years, researchers, educators, and early childhood professionals have emphasized the interrelatedness of the developmental domains. Current research supports an even greater understanding of the relatedness and dependence of factors, domains, and processes in development (Diamond 2007). The developmental domains are linked with factors such as culture, social relationships, experience, physical health, mental health, and brain functioning (Diamond 2007). In the case of perceptual and motor behavior, Diamond (2007) has observed that perception, motor behavior, and cognition occur in the context of culture, emotion, social relationships, and experience, which influences physical and mental health and overall health brain functioning. Bertenthal (1996) has proposed that perception and motor action are interrelated rather than autonomous processes. They may be

best viewed as different components of a system. Common behaviors such as reaching and turning the head for visual tracking illustrate the interrelatedness of infant development's motor, perceptual, cognitive, and social-emotional domains. Even as very young infants, children are highly motivated to explore, gain information, attend, and engage in their physical and social environments (Gibson 1987). As Gibson (1988, pg. 5) explains, We don't simply see, we look. "Research by Berthier (1996, 811) indicates that "infant reaching is not simply a neural program that is triggered by the presence of a goal object, but that infants match the kinematics of their reaches to the task and their goals."

Perception and motor action play a key role in children's experiences and psychological processes (Thelen 1995). They also contribute to human psychological development since, ultimately, "behavior is movement" (Adolph and Berger 2005,p 223), and psychology can be defined as the study of human behavior. It has been proposed that infants' use of social information to guide their motor behavior in physically challenging or unfamiliar situations provides an excellent means to study infant social cognition (Tamis-LeMonda and Adolph 2005).[1]

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9.3: Sensory Development

Overview of Sensory Development

As infants and children grow, their senses play a vital role in encouraging and stimulating the mind and in helping them observe their surroundings. Two terms are essential to understand when learning about the senses. The first is **sensation**, or the interaction of information with the sensory receptors. The second is **perception** or the process of interpreting what is sensed. Someone can sense something without perceiving it. Gradually, infants become more adept at perceiving with their senses, making them more aware of their environment and presenting more affordances or opportunities to interact with objects.[1]

Vision

What can young infants see, hear, and smell? Newborn infants' sensory abilities are significant, but their senses are not yet fully developed. Many of a newborn's innate preferences facilitate interaction with caregivers and other humans. The womb is a dark environment void of visual stimulation. Consequently, vision is the most poorly developed sense at birth. Newborns typically cannot see further than 8 to 16 inches away from their faces, have difficulty keeping a moving object within their gaze, and can detect contrast more than color differences. If you have ever seen a newborn struggle to see, you can appreciate the cognitive efforts being made to take in visual stimulation and build those neural pathways between the eye and the brain.

Although vision is their least developed sense, newborns already prefer faces. When you glance at a person, where do you look? Chances are you look into their eyes. If so, why? It is probably because there is more information there than in other parts of the face. Newborns do not scan objects this way; rather, they tend to look at the chin or another less detailed part of the face. However, by 2 or 3 months, they will seek more detail when visually exploring an object and begin showing preferences for unusual images over familiar ones, for patterns over solids, faces over patterns, and three-dimensional objects over flat images. Newborns have difficulty distinguishing between colors, but within a few months, are able to distinguish between colors as well as adults. Infants can also sense depth as binocular vision develops at about 2 months. By 6 months, the infant can perceive depth in pictures (Sen, Yonas, & Knill, 2001). Infants who have experience crawling and exploring will pay greater attention to visual cues of depth and modify their actions accordingly (Berk, 2007).[1]

Hearing

The infant's sense of hearing is very keen at birth. The ability to hear is evidenced as soon as the 5th month of prenatal development. An infant can distinguish between very similar sounds as early as one month after birth and can differentiate between a familiar and non-familiar voice even earlier. Babies who are just a few days old prefer human voices, they will listen to voices longer than sounds that do not involve speech (Vouloumanos & Werker, 2004), and they seem to prefer their mother's voice over a stranger's voice (Mills & Melhuish, 1974). In an interesting experiment, 3-week-old babies were given pacifiers that played a recording of the infant's mother's voice and of a stranger's voice. When the infants heard their mother's voice, they sucked more strongly at the pacifier (Mills & Melhuish, 1974). Some of this ability will be lost by 7 or 8 months as a child becomes familiar with the sounds of a particular language and less sensitive to sounds that are part of an unfamiliar language.[1]

Pain and Touch

Immediately after birth, a newborn is sensitive to touch and temperature and is also sensitive to pain, responding with crying and cardiovascular responses. Newborns who are **circumcised** (the surgical removal of the foreskin of the penis) without anesthesia experience pain, as demonstrated by increased blood pressure, increased heart rate, decreased oxygen in the blood, and a surge of stress hormones (United States National Library of Medicine, 2016). According to the American Academy of Pediatrics (AAP), there are medical benefits and risks to circumcision. They do not recommend routine circumcision; however, they stated that because of the possible benefits (including prevention of urinary tract infections, penile cancer, and some STDs), parents should have the option to circumcise their sons if they want to (AAP, 2012)[1]

The sense of touch is acute in infants and is essential to a baby's growth of physical abilities, language and cognitive skills, and socio-emotional competency. Touch impacts not only short-term development during infancy and early childhood but also has long-term effects, suggesting the power of positive, gentle touch from birth. Through touch, infants learn about their world, bond with their caregivers, and communicate their needs and wants. Research emphasizes the great benefits of touch for premature

babies, but the presence of such contact has been shown to benefit all children (Stack, D. M. (2010). In an extreme example, some children in Romania were reared in orphanages in which a single care worker may have had as many as 10 infants to care for at one time. These infants were not often helped or given toys with which to play. As a result, many of them were developmentally delayed (Nelson, Fox, & Zeanah, 2014). [1]

Taste and Smell

Not only are infants sensitive to touch, but newborns can also distinguish between sour, bitter, sweet, and salty flavors and show a preference for sweet flavors. They can distinguish between their mother's scent and that of others and prefer the smell of their mothers. A newborn placed on the mother's chest will inch up to the mother's breast, as it is a potent source of the maternal odor. Even on the first day of life, infants orient to their mother's odor and are soothed when crying by their mother's odor (Sullivan et al., 2011).[1]

Other Senses

[1] Psyc 200 Lifespan Psychology. **Authored by**: Laura Overstreet. ***CC BY: Attribution***

[2] The Brain in the First Two Years. **Provided by**: Lumen Learning, Lifespan Development ***CC BY: Attribution***

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9.4: Perceptual Development

Introduction to Perceptual Development

Infants' perceptual skills are at work during every waking moment. For example, those skills can be observed when an infant gazes into a caregiver's eyes or distinguishes between familiar and unfamiliar people. Infants use perception to distinguish environment features, such as height, depth, and color. "The human infant is recognized today as 'perceptually competent'; determining just how the senses function in infancy helps to specify the perceptual world of babies" (Bornstein 2005, p 284). Infants explore objects differently depending upon object features such as weight, texture, sound, or rigidity (Palmer 1989). Parents and professionals may have observed young children exploring a slope, such as a slide, by touching it with their hands or feet before deciding whether to slide down it. Research by Adolph, Eppler, and Gibson (1993) suggests that learning plays a part in young children's decision-making in physically risky situations, such as navigating slopes, and that exploratory behavior may be a means to this learning. Perception is also strongly related to the social-emotional domain, such as when young children perceive the differences between various facial expressions and come to understand what they may mean.[1]

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9.5: Perception and Action

Cycle of Perception and Action

A diagram with an arrow pointing both ways best describes the relationship between perception and action. Perception selects targets for action and helps us correct errors as we execute actions. Broadly speaking, there are 2 kinds of actions: navigation (moving around our environment) and reaching/grabbing.[1]

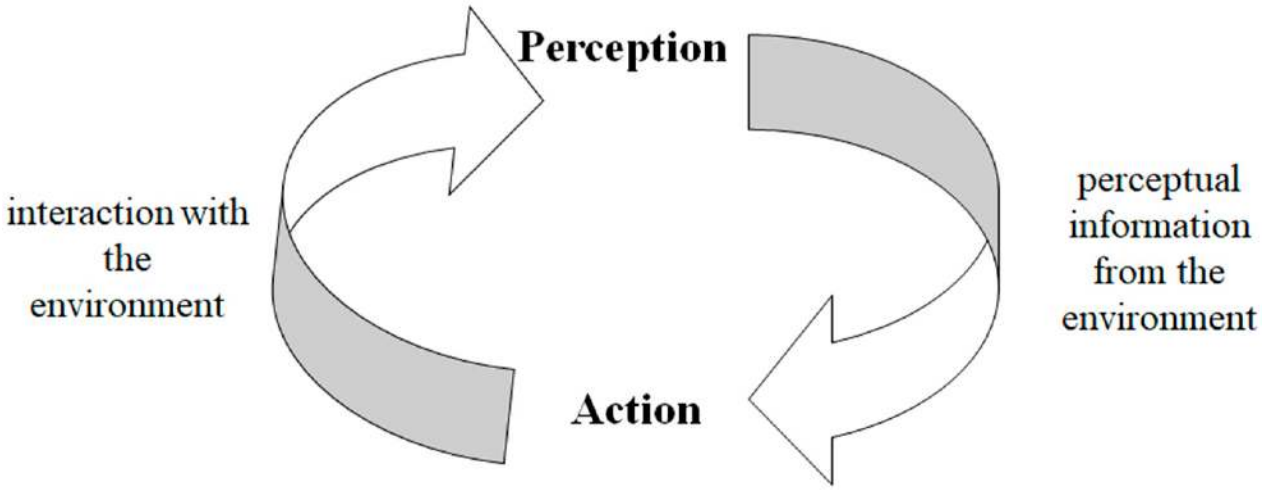


Figure 9.5.1: shows the relationship between perception and action, described as a cycle or arrows pointing back and forth. An example of this cycle is when you reach out for a bottle sitting on a slanted surface: Banks et al (2000) showed that your sense of touch updates your visual estimates of the surface slang.). ([1])

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9.6: Studying Sensory Development

The Study of Sensory Development

There continues to be ongoing discussion and debate as to whether the development of multisensory processes is innate (though undoubtedly also tuned by environmental experiences) or instead develops after the child has several months of experiences with the sensory world (Dionne-Dostie et al. 2015). While objective and quantitative studies in very young children are challenging, a study by (Lewkowicz and Turkewitz 1980) measured 3–4 week-old infants' heart rates. It showed that these children could associate light and sound intensities. More recent results have shown that newborn infants can match numerosity across the senses (Izard et al. 2009) and that 4-month-old infants are sensitive to the spatial congruence of auditory-tactile events (Thomas et al. 2018). However, one constraint of most studies on infants and young children is that they are typically based on child-appropriate behavioral measures, such as preferential looking. Consequently, they provide limited insights into the putative neurobiological mechanisms and maturation of multisensory processes.[1]

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[1] Maitre, N.L., Key, A.P., Slaughter, J.C. *et al.* Neonatal Multisensory Processing in Preterm and Term Infants Predicts Sensory Reactivity and Internalizing Tendencies in Early Childhood. *CC BY*

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9.7: Sensory Processing Differences

Understanding Sensory Processing Differences

Sensory processing and integration are complex neurodevelopmental functions that allow children to regulate, perceive, discriminate, and use sensory input experienced from the environment and their bodies to respond, learn, and adapt daily effectively. Sensory processing disorder (SPD) has been described as a distinct neurodevelopmental disorder in the literature (Schoen et al., 2009; Jorquera-Cabrera et al., 2017; Crasta et al., 2020). It now has been recognized in the most recent version of the diagnostic classification of mental and developmental disorders of infancy and early childhood-revised (DC: 0–5, zero to three). Sensory processing abilities develop naturally and play essential roles in child learning, behavior and emotional regulation, motor development, and task performance. Sensory processing disorder has been defined as the brain's inability to organize sensory input for appropriate use. As stated in the DC: 0–5, zero to three-manual, SPD is diagnosed based on difficulties in detecting, modulating, interpreting, or organizing sensory stimuli to the extent that these deficits impair daily functioning and participation. However, the question of whether deficits in sensory processing represent the symptoms of another disorder, such as autism spectrum disorder (ASD), developmental coordination disorder (DCD), or SPD is its distinct condition remains (Borkowska and Sklodowska, 2017).[1]

The American Academy of Pediatrics [AAP], 2012 recommended that SPD generally should not be diagnosed citing that there is no universally accepted framework for the SPD diagnosis. Although sensory processing problems were recognized as important to identify and address, the AAP stated that there lacked evidence to solidly demonstrate that children presenting with sensory-based problems have an actual "disorder" of the brain's sensory pathways. They concluded sensory processing deficits were likely associated with other developmental and behavioral disorders. This view, however, does not account for children who present with sensory processing deficits affecting their daily life who do not meet the diagnostic criteria for any other disorder[1].

Experts in the field characterized tSPD as having three main types: [1]

- **sensory modulation disorder (SMD):** Sensory modulation refers to the ability to notice and react to, regulate, adapt to, and grade responses that are appropriate to the sensory situations experienced in daily life.
- **Sensory discrimination disorder (SDD);** Sensory discrimination disorder refers to problems with accurately perceiving and interpreting sensory information coming in or experienced from one or more of the sensory systems (Miller et al., 2007; Lane and Reynolds, 2020; Parham and Mailloux, 2020). Discrimination abilities allow for recognizing qualitative and quantitative sensory features and differences among various objects and experiences processed through the sensory systems. People with this type can register sensory stimuli. However, appreciating or detecting the qualities of a given stimulus is a challenge and can occur with one or more sensory systems.
- **Sensory-based motor disorder (SBMD),** is further divided into subtypes (Miller et al., 2007).
    - **Sensory over-responsivity (SOR):** Atypical behaviors associated with SOR are characterized by intense, exaggerated responses to sensory events that most children do not perceive as negative or obnoxious, often resulting in withdrawal and avoidance behavior.
    - **Sensory under-responsivity (SUR):** Atypical behaviors with SUR include muted or slowed responses to sensory experiences, often with an apparent lack of awareness, lethargy and/or indifference, or diminished responsivity.
    - **Sensory craving (SC);** is sometimes referred to as sensory seeking. Atypical behavior associated with SC includes a need for more intense sensory input than what one would typically want, or that would naturally occur, often manifesting as inappropriate, disruptive, disorganized and/or risky behavior (Miller et al., 2007, 2017; James et al., 2011; Schoen et al., 2014).

Prevalence estimates of iSPD range from 5 to 16% of children in the general population, while 60–90% of children with coexisting neurodevelopmental conditions such as autism spectrum disorder (ASD) have been estimated to have sensory problems (Ahn et al., 2004; Ben-Sasson et al., 2009; James et al., 2011; Galiana-Simal et al., 2020; Jussila et al., 2020). Mulligan et al. (2019) reported that 20% of the children in their sample had a co-occurring disorder while the remaining 80% had not been diagnosed with another neurodevelopmental disorder. [1]

Unfortunately, there are a limited number of diagnostic assessment tools available to evaluate the sensory processing abilities of children, and no tool is available for explicitly identifying and measuring the SPD types as described by Miller et al. (2007).[1]

Research evidence is building regarding how sensory processing deficits manifest within various populations and how iSPD may be differentiated among children with other neurodevelopmental conditions. As high as 90% of children with ASD have sensory processing difficulties, with the most common pattern of SPD being the SOR modulation subtype (Schoen et al., 2009; Tavassoli et al., 2014; Tomchek et al., 2014; Little et al., 2018). Children with ASD were more under-reactive to auditory stimuli but over-reactive to taste and smell.

Sensory under-responsivity has been associated with depressive symptoms and internalizing behaviors, while externalizing behaviors have been more related to sensory craving, and over-reactivity. Studies demonstrating how the symptoms of children with iSPD differ from those seen in children with other neurodevelopmental conditions, including ADHD and ASD are particularly relevant for supporting SPD as its own diagnostic entity. Miller et al. (2012) compared clinical assessment findings among samples of neurotypicals, children with ADHD, those with SMD, and those with dual diagnoses. All clinical groups had significantly more sensory, attention, activity, impulsivity, and emotional difficulties than typical children. [1]

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[1] Mulligan S, Douglas S and Armstrong C (2021) Characteristics of Idiopathic Sensory Processing Disorder in Young Children **CC BY**

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9.8: Conclusion

Conclusion of Sensory and Perceptual Development

Sensory and perceptual development is intriguing and something that infant/toddler caregivers need to understand and incorporate in their caregiving practices. Development of the sensory system begins in utero and doesn't end. Infant and toddler curriculum should include multiple sensory experience options throughout the day every day. The importance of sensory and perceptual development should be expounded on often to families and caregivers, as it lays a foundation for life, beginning at the very beginning.

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9.9: References

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CHAPTER OVERVIEW

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10.1: Introduction

Introduction to Cognitive Development

Imagine all of your thoughts as if they were physical entities, swirling around inside your mind. How is it possible that your brain is able to move from one thought to the next in an orderly fashion? Our brains are always active as they endlessly perceive, process, plan, organize, and remember. Upon waking each morning, you begin thinking—contemplating the tasks that you must complete that day. In what order should you run your errands? Should you go to the bank, the cleaners, or the grocery store first? Can you get these things done before you head to class or will they need to wait until school is done? These thoughts are one example of cognition at work. Simply put, cognition is thinking, and it encompasses the processes associated with perception, knowledge, problem solving, judgment, language, and memory. In this section we will learn about how cognition develops in infancy and toddlerhood. [1]



Figure **10.1.1**: Child pausing to examine a yellow block. ([2])

[1] Spielman et al., (2020). Psychology. *OpenStax*. Licensed under CC by 4.0

[2] Image from Markus Spiske on Unsplash

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10.2: Studying Cognition- Jean Piaget

Jean Piaget

The scientific study of cognitive development in young children traces its roots back to the 20th century to Jean Piaget, a pioneer in the field of child development (Piaget, 1954, 1983). Piaget described children as active learners who, through continuous interactions with their environments, construct a complex understanding of the physical world around them. From infancy to adolescence, children progress through four cognitive stages: (1) the sensorimotor stage from birth to 2 years (when cognitive functioning is based primarily on motor reflexes and perceptions); (2) the preoperational stage from 2 to 7 years (when symbolic thought and language become prevalent, but reasoning is illogical by adult standards); (3) the concrete operational stage from 7 to 12 years (when logical reasoning abilities emerge but are limited to concrete objects and events); and (4) the formal operational stage at around 12 years (when thinking about abstract, hypothetical, and contrary-to-fact ideas becomes possible). The sensorimotor stage can further be divided into six substages. The sensorimotor substages divide the first two years of life into phases. Each substage builds upon the previous stage as the child's cognition develops. During the first two years, Piaget stressed the central role sensory and motor abilities have on supporting early cognition. According to Piaget, infant and toddler cognitive development is primarily driven by motor and sensory interactions with the environment. [1]

While Piaget's theory of cognitive development continues to be foundational in understanding infant and toddler cognition, Piaget's theory has many limitations. For example, research has revealed that infants have internal mechanisms of learning, not just motor and sensory abilities, that drive cognitive development such as the automatic number system and statistical learning (Saffran & Kirkham, 2018; Wang & Feigenson, 2021). Some researchers believe infants are born with core knowledge – innate systems that help infants learn about the physical and social world around them (Spelke & Kinzler, 2007; Stahl & Feigenson, 2019). Another limitation to his theory is that Piaget underestimated the cognitive abilities of infants and toddlers. As an example, Piaget (1954) suggested that object permanence did not begin to develop until 8 to 12 months of age, as indicated by younger infants' failures to search for hidden objects, but research has since discovered object permanence develops much earlier, around three to six months of age (Baillargeon, 1987; Bremner, Slater & Johnson, 2015). [1]

[1] Houdé & Borst (2014). Measuring inhibitory control in children and adults: brain imaging and mental chronometry. *Frontiers in Psychology, 5*, 616. CC by 4.0

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10.3: How is Infant and Toddler Cognition Studied?

Studying Cognition

Infants' emerging understanding of the physical and social world is commonly investigated by using violation-of-expectation experiments. In violation-of-expectation experiments, unexpected events that violate physical or social rules lead to different responses in infants' gaze behavior (Baillargeon, 2004), pupil dilation (Jackson & Sirois, 2009), and brain responses (Köster, Langeloh, & Hoehl, 2019). For example, infants detect impossible physical events, such as a ball rolling through a wall (Spelke et al., 1992), changes in numbers, such as when the number of toys changes (Simon, Hespos, & Rochat, 1995), or irrational human actions, such as a pretzel that is put toward the ear instead of the mouth (Reid et al., 2009). Interesting research on the development of moral cognition used the violation-of-expectation paradigm and a cookie scenario, presented in Figure **10.3.1**, to study the possibility that young infants might expect resources to be divided equally between similar recipients (Dawkins, Sloane & Baillargeon, 2019). Infants as young as four months of age expected an experimenter to divide two cookies equally between two similar animated puppets, and they detected a violation (measured by longer looking time) when the researcher divided them unequally instead. [1] [2]

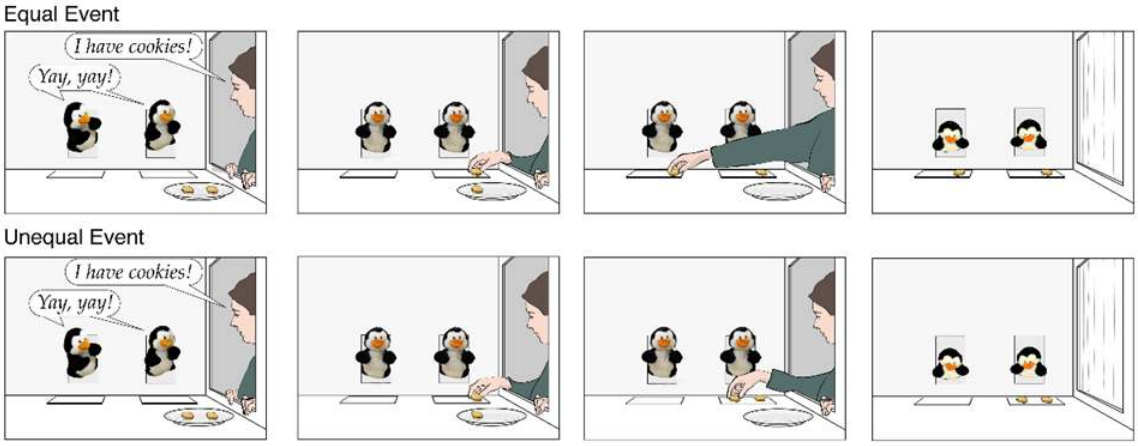


Figure **10.3.1**: Example of how an experiment on moral cognition used violation-of-expectation. ([3])

A second common method to study cognition in infants and toddlers is called habituation. Many prominent studies of infant cognition over the past two decades have relied on the fact that infants habituate to repeated stimuli – i.e. that their looking times tend to decline upon repeated stimulus presentation (Aslin, 2007; Oakes, 2010). Habituation is one of the earliest cognitive processes to emerge in development (Colombo & Mitchell, 2009) and reflects a basic form of learning: once a stimulus is fully encoded in the mind, the infant habituates to it and demonstrates decreased attention to the stimulus. Researchers have found that the duration of time to habituate in infancy accounts for up to 30 percent of the variance in cognitive ability at older ages (Bornstein & Sigman, 1986; Colombo, 1993; Miller et al., 1980). This indicates that habituation provides important insight into early cognition as it relates to the development of more complex cognitive abilities later in childhood. [4]

To illustrate how habituation is used to research cognition, one study explored the visual habituation of objects in hearing and deaf non-signing infants and toddlers (Monroy et al., 2019). The children were shown one of the objects in Figure **10.3.2** until they habituated to it (three consecutive trials in which the mean looking time to the stimulus was less than or equal to 50% of the mean looking time during the first three habituation trials). After habituation, the infant was then presented with randomized trials containing both a new object (not shown in the habituation phase) and the familiar object (shown in the habituation phase). Findings revealed that deaf infants were slower to habituate to and demonstrated a lower look-away rate than hearing infants. Evidence from prior studies suggests that the 'look-away' rate—brief eye gaze shifts away from the target stimulus during habituation—reflects processing efficiency and attentional control (Bahrick et al., 2016). One explanation for these results is that deaf infants' cognitive development may be protracted because of delayed language development (these deaf infants already had or were waiting to receive a cochlear implant and all of them had limited access to a fully-accessible language, like sign language). [4]

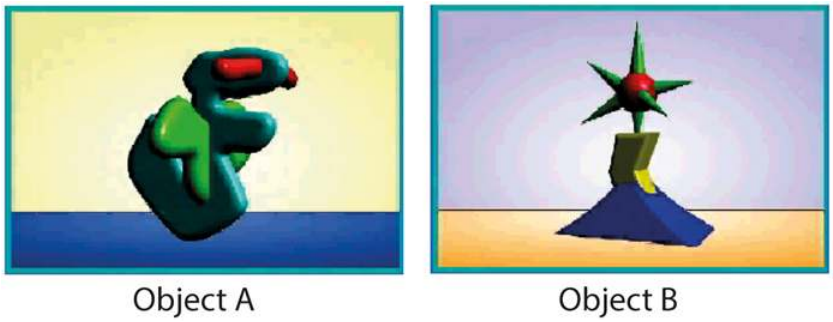


Figure **10.3.2**: Examples of objects used in an infant habituation experiment. ([5])

[1] Köster et al., (2020). Making sense of the world: infant learning from a predictive processing perspective. *Perspectives on Psychological Science, 15*(3), 562-571. CC by 4.0

[2] Buyukozer et al., (2019). Do infants in the first year of life expect equal resource allocations? *Frontiers in Psychology, 10*, 116. CC by 4.0

[3] Image from Buyukozer et al., (2019). Do infants in the first year of life expect equal resource allocations? *Frontiers in Psychology, 10*, 116. CC by 4.0

[4] Monroy et al., (2019). Visual habituation in deaf and hearing infants. *PloS One, 14*(2), e0209265. CC by 4.0

[5] Image from Monroy et al., (2019). Visual habituation in deaf and hearing infants. *PloS One, 14*(2), e0209265. CC by 4.0

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10.4: Cognitive Milestones, 2-36 months

Milestones of Cognitive Development

Infants and toddlers are constantly learning about the world as they experience it and actively engage with it during the first three years of life. Milestones represent what most children can do by specific ages; however, it is important to remember that children do not achieve these milestones at the same exact ages--milestones only represent the average age at when they are achieved. If a child has not achieved specific milestones by a specific age, it does not necessarily suggest a delay or disability; however, there are specific ages where if certain milestones are not achieved, caregivers should encourage the child's parents to communicate with their family pediatrician. Here is a table of some of the cognitive milestones infants and toddlers typically develop.

What most children can do at each age

Age	What Most Children Can Do By Each Age [1]
2 months	● Pay attention to faces ● Begin to follow things with their eyes and recognize people at a distance ● Begin to act bored (cry, act fussy) if activity doesn't change
4 months	● Let you know if they are happy or sad ● Respond to affection ● Reach for a toy with one hand ● Use their hands and eyes together, such as seeing a toy and reaching for it ● Follow moving things with their eyes from side to side ● Watch people's faces closely ● Recognize familiar people and things at a distance
6 months	● Look around at things nearby ● Bring things to their mouth ● Show curiosity about things and try to get things that are out of reach ● Begin to pass things from one hand to the other
9 months	● Watch the path of something as it falls ● Look for things they see you hide ● Play peek-a-boo ● Put things in their mouth ● Move things smoothly from one hand to the other ● Pick up things like cereal o's between thumb and index finger
12 months	● Explore things in different ways, like shaking, banging and throwing ● Find hidden things easily ● Look at the right picture or thing when it's named ● Copy gestures ● Start to use things correctly; for example, drink from a cup, brush hair with a brush ● Bang two things together ● Put things in a container and take things out of a container ● Let things go without help ● Poke with index (pointer) finger ● Follow simple directions like "pick up the toy"
18 months	● Know what ordinary things are for; for example, telephone, brush, and spoon ● Point to get the attention of others ● Show interest in a doll or stuffed animal by pretending to feed them ● Point to one body part ● Scribble on their own ● Can follow 1-step verbal commands without any gestures; for example, sits when you say "sit down"
24 months	● Find things even when hidden under two or three covers ● Begin to sort shapes and colors ● Complete sentences and rhymes in familiar books ● Play simple make-believe games ● Build towers of 4 or more blocks ● Might use one hand more than the other ● Follow two-step instructions such as "Pick up your shoes and put them in the closet." ● Name items in a picture book such as a cat, bird, or dog
36 months	● Can work toys with buttons, levers, and moving parts ● Play make-believe with dolls, animals, and people ● Do puzzles with 3 or 4 pieces ● Understand what "two" means

Age	What Most Children Can Do By Each Age [1]
	● Copy a circle with a pencil or crayon ● Turn book pages one at a time ● Build towers of more than 6 blocks ● Screw and unscrew jar lids or turn door handles

[1] CDC's Developmental Milestones by the Centers for Disease Control and Prevention is in the public domain.

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10.5: Cognitive Development Concerns

Concerns

The above chart represents averages of when infants and toddlers achieve various cognitive milestones. What about children who do not achieve these milestones by the ages listed? While children can indeed develop different abilities at different times, too great a delay in acquiring specific milestones can be a concern. The information in Figure# is from the Center for Disease Control and Prevention (CDC). The chart adopts a proactive stance--we should take action early when developmental concerns arise rather than the perspective of waiting to see if a child “catches up”. Again, while children do develop at individual paces, being proactive during these critical early years is essential. The chart below lists milestones that, if children are not achieving by specific ages, caregivers should encourage parents to communicate with their family’s pediatrician. Most caregivers are not professionally trained to officially assess the developmental abilities of children; however, caregivers have the ability to track developmental progress and are often the first to notice developmental concerns.

When to encourage parents to communicate with a pediatrician

Age	Encourage parents to communicate with their family's pediatrician if: [1]
By 4 months	● Child doesn't watch things as they move ● Child doesn't smile at people
By 6 months	● Child doesn't try to get things that are in reach ● Child shows no affection for caregivers ● Child has difficulty getting things to mouth ● Child doesn't respond to sounds around him ● Child doesn't laugh or make squealing sounds
By 9 months	● Child doesn't play any games involving back-and-forth play ● Child doesn't respond to own name ● Child doesn't seem to recognize familiar people ● Child doesn't look where you point ● Child doesn't transfer toys from one hand to the other
By 12 months	● Child doesn't search for things that she sees you hide ● Child doesn't say single words like "mama" or "dada" ● Child doesn't learn gestures like waving or shaking head ● Child doesn't point to things ● Child loses skills he once had
By 18 months	● Child doesn't point to show things to others ● Child doesn't know what familiar things are for ● Child doesn't copy others ● Child doesn't gain new words ● Child doesn't have at least 6 words ● Child doesn't notice or mind when a caregiver leaves or returns ● Child loses skills he once had
By 24 months	● Child doesn't use 2-word phrases (for example, "drink milk") ● Child doesn't know what to do with common things, like a brush, phone, fork, spoon ● Child doesn't copy actions and words ● Child doesn't follow simple instructions ● Child loses skills she once had
By 36 months	● Child drools or has very unclear speech ● Child can't work simple toys (such as peg boards, simple puzzles, turning handle) ● Child doesn't speak in sentences ● Child doesn't understand simple instructions ● Child doesn't play pretend or make-believe ● Child doesn't want to play with other children or with toys ● Child doesn't make eye contact ● Child loses skills he once had

[1] CDC's Developmental Milestones by the Centers for Disease Control and Prevention is in the public domain

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10.6: Cognitive Processes

Processes of Cognition

Imagine being an infant, what would learning about the world be like? From the sounds, sights and smells, there would be a lot of new things to try to make sense of! Indeed, the potential information available in the environment is both voluminous and complex. This led William James to coin his famous phrase about “the blooming, buzzing confusion” that confronts the newborn (James, 1890). Contrary to what James thought, infants show remarkable feats of learning as they make sense of the world, beginning in the last trimester of fetal life and accelerating through infancy and toddlerhood. But how is it that infants are able to learn in such complex environments? Let’s next discuss various cognitive processes during infancy and toddlerhood. [1]

[1] Kidd et al., (2012). The Goldilocks effect: Human infants allocate attention to visual sequences that are neither too simple nor too complex. *PloS One*, *7*(5), e36399. CC by 4.0

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10.6.1: Imitation

Infant Imitation

Imitation of others' behavior is considered a central means of learning, specifically for social cognition and the learning of cultural norms (Goertz et al., 2011; Kugiumutzakis & Trevarthen, 2015; Meltzoff & Marshall, 2018). Imitation has been defined in numerous ways, emphasizing the matching of either the form of movements, the outcomes, or the intentions of an action. The often cited findings from Meltzoff and Moore (1977; 1983), that newborns imitate adult facial expressions, has been called into question. Recent research has been unable to replicate their findings and has pointed out critical weaknesses and limitations in those early newborn imitation studies (Kennedy-Costantini et al., 2017; Oostenbroek et al., 2016; Oostenbroek et al., 2018; Slaughter, 2021).[1]



Figure **10.6.1.1**: Infant imitating an adult sticking their tongue out. ([2])

While newborn imitation continues to be debated, it is clear that imitation plays a role in learning for older infants and toddlers. It has been found that 12 to 18 month-olds learn one to two novel actions every day, merely by observing others around them (Barr & Hayne, 2003). Rather than imitating everything and everyone, however, infants tend to be selective in their imitative behavior, a tendency that is present beginning around 12 months of age (Schwier et al., 2006; Zmyj, Daum & Aschersleben, 2009). For example, in one study researchers presented a novel head action to two groups of 14-month-olds whereby the model illuminated a light-box with her forehead by sitting in a chair and leaning forward until her head pressed on the light-box (Gergely, Bekkering & Király, 2002). While one group of infants observed the unusual head action with the model freely resting her hands next to the light box (hands-free condition), the other group observed a demonstration of the identical head action, but the model had her hands occupied by holding a blanket wrapped around her torso (hands-occupied condition). Figure **10.6.1.2** illustrates the two conditions. The majority (69%) of infants in the hands-free condition imitated this novel action of using their forehead to turn on the light-box, whereas only 21% of infants did so in the hands-occupied condition. The authors argued the results suggest that infants inferred that the model must have had good reasons to freely choose to perform the unusual action in the hands-free condition, whereas the model would have used her hands in the hands-occupied condition if she was not using her hands to hold the blanket. As a result, while imitation can be a great way to learn, the imitation process for infants and toddlers is complex as they consider various factors that may influence what actions of adults are rational or logical before imitating.[3] [4]

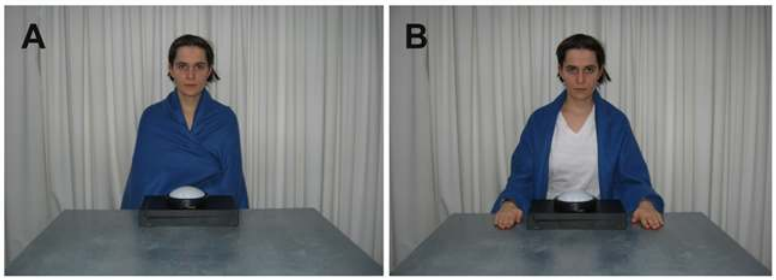


Figure **10.6.1.2**:Images of the two conditions in the light-box experiment. (C[5])

As imitation is one way infants and toddlers learn about the world, caregivers can support cognitive development through imitation by including infants and toddlers in everyday care routines and by demonstrating more complex actions during play and social interactions. Care routines (e.g., diapering, meal time, etc.,) can sometimes become more like adult-driven chores if caregivers quickly rush through with the goal of completion. However, care routines often involve complex actions that can be rich learning opportunities for young children to watch, imitate and learn from. For example, the care routine of meal time involves motor movements to support pouring, scooping, holding, passing, etc., and also involves the learning of social patterns such as waiting, turn taking, manners etc.,. These motor actions and social patterns may be challenging for young toddlers, but are important as they practice these skills and are able to participate more in the meal time routine. Instead of preparing individual plates ahead of time and out of the sight of the children, plates can be prepared and shared in their presence. A family-style meal presentation where food and drinks are served at the table with toddlers, allows for them to be able to watch, imitate and learn from the meal time routine. Additionally, during play and social interactions, caregivers who are engaged with infants and toddlers and demonstrate different ways to use and play with materials encourage infants and toddlers to imitate similar actions as they learn about how the world works.

[1] Paukner et al., (2017). Testing the arousal hypothesis of neonatal imitation in infant rhesus macaques. *PLoS One*, *12*(6), e0178864. CC by 4.0

[2] Image by HeatherDawnKemp on Pixabay.

[3] Gellén & Buttelmann (2017). Fourteen-month-olds adapt their imitative behavior in light of a model's constraints. *Child Development Research*. CC by 4.0

[4] Beisert et al., (2012). Rethinking 'rational imitation in 14-month-old infants: A perceptual distraction approach. *PloS One*, *7*(3), e32563. CC by 4.0

[5] Image from Beisert et al., (2012). Rethinking 'rational imitation in 14-month-old infants: A perceptual distraction approach. *PloS One*, *7*(3), e32563. CC by 4.0

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10.6.2: Categorization

Concept of Categorization

Infants and toddlers are constantly experiencing new and recurring objects and events. The ability to form categories is a core cognitive ability that helps organize these experiences. Without categorization, we would treat every entity we encounter (e.g., every golden retriever) as unique. Identifying a category to which an object or entity belongs (e.g., a dog, a retriever) permits us to make inferences that go beyond our immediate experience with that entity (e.g., retrievers bark, have sharp teeth, etc.). Categorization, therefore, is a fundamental cognitive process, and one that is especially important for infants and toddlers who encounter new objects, entities, and events every day. [1] [2]



Figure **10.6.2.1**: Infant with different categories of objects. ([3])

A considerable body of research reveals that in the first months of life, infants can already successfully and spontaneously form object categories of animals, vehicles, and geometric shapes (Balaban & Waxman, 1997; Novack et al., 2021; Quinn, Eimas & Tarr, 2001). For example, Figure **10.6.2.2** shows a sample of stimuli used in a categorization experiment with 3 to 4 month old infants (Ferry, Hespos & Waxman, 2010). In the familiarization phase, infants were shown various types of dinosaurs, varying in color. In the test phase, infants saw two objects in the same color, one dinosaur (familized object) and one non-dinosaur object not shown in the familiarization phase (novel object). To measure categorization, infants' looking time at the objects in the test phase was measured. The results demonstrate that already by 3 to 4 months of age, infants are cognitively forming categories of objects they encounter. [1] [2]

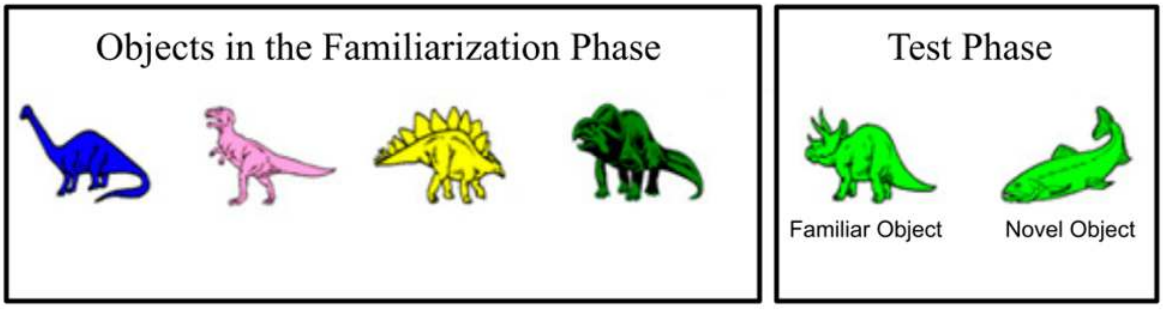


Figure **10.6.2.2**: Example stimuli from infant categorization research. ([4])

By 12 months, however, infants reach a turning point where what matters is not whether infants are listening to language in general, but more precisely, what is being said about specific objects. By 12 months, infants track not only which objects and which words are presented, but also how the words and objects are paired together (Waxman & Braun, 2005). Specifically, when infants hear the same label with each object, the labels highlight commonalities between them and thus facilitate their categorization, whereas when infants hear a distinct label for each object, the labels highlight their differences and thus facilitate their individuation (Dewar & Xu, 2007; Xu, Cote & Baker, 2005). [5]

The research on categorization suggests that young infants begin categorizing objects by 3 to 4 months of age and that language promotes categorization. Therefore caregivers can support categorization through learning experiences and language use. With

learning experiences, caregivers can provide play objects and manipulatives where similarities and differences can be easily identified through color, size, texture and shape. Objects within and across categorical boundaries are also important. For example, objects of one type of animal such as fish can be provided alongside another type of animal, such as birds. This can help children identify commonalities within the category of fish and differences across the categories of fish and birds. To promote categorization with language, caregivers can be purposeful with the language they use by labeling objects within and across categories and highlighting similarities and differences between objects. Figure **10.6.2.3** shows a toddler holding three leaves. Each leaf is a different color, size and shape. As a caregiver, what words or phrases could you use to support a toddler's categorization process when playing with these leaves?



Figure **10.6.2.3**: Categorization of Leaves. ([6])

[1] Althaus et al., (2020). Infant categorization as a dynamic process linked to memory. *Royal Society Open Science*, *7*(10), 200328. CC by 4.0

[2] Kadlaskar et al., (2020). Does human touch facilitate object categorization in 6-to-9-month-old infants? *Brain Sciences*, *10*(12), 940. CC by 4.0

[3] Image from Shirota Yuri on Unsplash

[4] Image adapted from Kadlaskar et al., (2020). Does Human Touch Facilitate Object Categorization in 6-to-9-Month-Old Infants? *Brain Sciences*, *10*(12), 940. CC by 4.0

[5] Ferguson et al., (2015). The precision of 12-month-old infants' link between language and categorization predicts vocabulary size at 12 and 18 months. *Frontiers in Psychology*, *6*, 1319. CC by 4.0

[6] Image from Markus Spiske on Unsplash

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10.6.3: Numerical Cognition

Understanding Numbers

Evidence suggests that there is an innate, non-symbolic sense of quantity that gives rise to our basic numerical intuitions. The Approximate Number System (ANS) allows humans and non-human animals to estimate quantities without explicitly counting. For example, if you look at the two images in Figure **10.6.3.1**, which image has more dots than the other? Can you figure it out by simply looking at the two images--without counting any of the dots? While this example is slightly challenging because the number of dots in the two images is similar, in experiments like this, using dots, infants have the innate ability to distinguish between various quantities. [1]

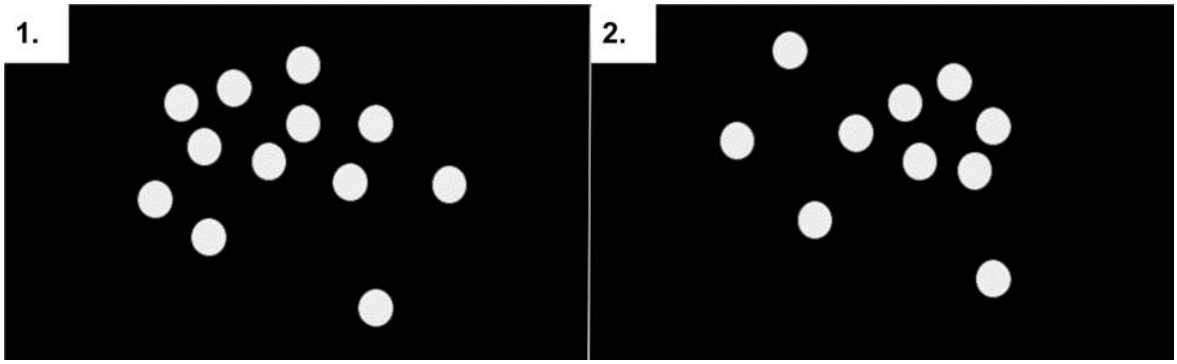


Figure **10.6.3.1**: The Approximate Number System Test. ([2])

The ANS is present at birth as newborns are able to discriminate object sets if the ratio is at least 1:3 (e.g., arrays of 4 vs.12 dots) (Izard et al., 2009). The ability to discriminate between displays of large numbers, known as number acuity (efficiency), improves throughout childhood (Halberda & Feigenson, 2008) with dramatic changes in number acuity observed within the first year of life. In a visual only comparison, four month olds can discriminate between a 1:4 ratio but not a change to a 1:3 ratio; however, if audio and visual information are both provided, four month olds can discriminate between a 1:3 ratio, but not a change to a 1:2 ratio (Wang & Feigenson, 2021). Six-month-old infants can reliably discriminate between sets with a ratio of 1:2 (e.g., arrays of 8 vs.16 dots) but cannot discriminate between sets with a 2:3 ratio (e.g., arrays of 8 vs.12 dots) (Feigenson, 2011; Xu & Spelke, 2000). By about 9 to 10 months of age, infants are able to discriminate 2:3 ratios (e.g., arrays of 8 vs. 12 dots) but fail with 4:5 ratios (e.g., arrays of 8 vs.10 dots) (Lipton & Spelke, 2003; Xu & Arriaga, 2007; Xu & Spelke, 2000). [3]

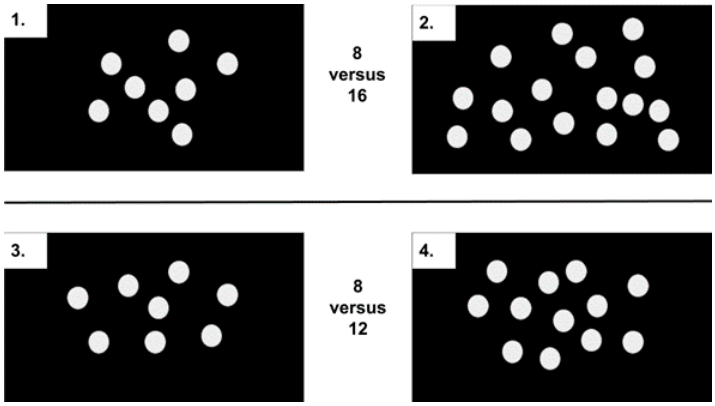


Figure **10.6.3.2**: Number acuity: 6 month olds can discriminate between sets with a ratio of 1:2 (e.g., arrays of 8 vs.16 dots) but cannot discriminate between sets with a 2:3 ratio (e.g., arrays of 8 vs.12 dots). ([4])

Number acuity in infancy is related to later mathematical performance throughout childhood, adolescence and the adult years (Halberda et al., 2008; Mazzocco, Feigenson & Halberda, 2011; Libertus, Feigenson & Halberda, 2013; Starr, Libertus & Brannon, 2013). To illustrate, one study (Starr, Libertus & Brannon, 2013) placed two monitors in front of six month olds. One monitor always displayed the same number of dots (although the dots changed, varying in placement array) and the other monitor changed between various numbers of dots and placement array. Some infants spent more time looking at the monitor that displayed the

changing numbers of dots than other infants. The researchers then followed the same children into preschool where they measured various math abilities. Results showed that the infants who spent more time looking at the monitor that displayed the changing numbers of dots had greater mathematical skills as preschoolers.

While early number acuity may be inborn, other numerical abilities are not and develop overtime. Children come to understand the meaning of exact number words very slowly (Wynn, 1990, 1992). English-speaking children first learn the meaning of the word "one" around two-and-a-half years of age but lack knowledge of numbers larger than one. About four to five months after learning the meaning of "one," children understand the word "two" but not larger numbers, such as "three" or "four." It takes several more months for children to display knowledge of the word "three." Not until children are three or four years of age do they fully grasp the cardinality principle—that each number word refers only to an exact set of that quantity with the last number in the count list referring to the total number of items in the set (Carey, 2009). [5]



Figure **10.6.3.3**: Toddler using an abacus ([6])

Before infants and toddlers may fully understand the meaning of specific number words, they show an early sensitivity to counting. Eighteen-month-old infants showed a preference for correctly ordered counting sequences; that is, although they were unable to recite the count list themselves, they recognized and preferred to listen to the correct order of the number words (Ip et al., 2018). Similarly, 14 to 18 month-old infants appear to be able to use their ability to recognize the count list to help them overcome typical memory limits (Wang & Feigenson, 2019). Infants generally display working memory capacity limits of three items and fail to remember the number of hidden items when it exceeds this limit (Feigenson & Carey, 2003). However, when objects are counted before being hidden, infants are able to overcome this memory limit (Wang & Feigenson, 2019). Thus, even though toddlers may not grasp the full meaning of number words, they may still be aware of the numerical nature of these words and may be able to use counting knowledge despite lacking precise representations of the quantities.



Figure **10.6.3.4**: CNumbered stepping stones. ([7])

Although research suggests ANS to be innate, ANS is only an early foundation to support mathematical development. As mathematical knowledge continues to develop, caregivers play a critical role in supporting it. Infants and toddlers build early foundations for math during play and daily care routines. Young children naturally explore math concepts as they play, and caregivers support their math knowledge and vocabulary with the language they use. Caregivers can use math talk during care routines by discussing spatial concepts like, "I'm going to pick you *up*" or they can compare the size of their shoes as they get

ready to go outside, “Your shoes are *smaller* than my shoes.” Caregivers can use math language during mealtimes: “How many blueberries do you have left? Do you need more?” The more math language children hear each day, the greater the growth of their math knowledge. [8]

Additionally, infants and toddlers need time and space to play in open-ended ways with varied materials to boost their emerging math skills. Caregivers can introduce math concepts like size and shape, and spatial words like in, between, and under during any type of play or routine. Create and look for patterns in the environment and point them out to children. Find patterns in your clothing or around the environment like stripes on a rug and point them out to children while using math language to describe the patterns. Indoor and outdoor environments present unlimited ways that we can discuss math. When working with infants and toddlers, purposefully look around the environment and at the materials being used for math concepts you can discuss. [8]

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[1] Ma et al., (2021). Approximate number sense in students with severe hearing loss: A modality-neutral cognitive ability. *Frontiers in Human Neuroscience*, *15*, 296. CC by 4.0

[2] Image by Todd LaMarr. CC by 4.0

[3] Zorzi & Testolin (2018). An emergentist perspective on the origin of number sense. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *373*(1740), 20170043. CC by 4.0

[4] Image by Todd LaMarr is licensed under CC by 4.0.

[5] Silver et al., (2021). Measuring Emerging Number Knowledge in Toddlers. *Frontiers in Psychology*, 3057. CC by 4.0

[6] Image from luis arias on Unsplash

[7] Image from Eric Tompkins on Unsplash

[8] “Supporting Math Skills in Infants and Toddlers” from Head Start’s Early Childhood Learning and Knowledge Center is in the public domain.

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10.6.4: Executive Functions

Purpose of Executive Functions

Executive functions are a complex set of cognitive abilities, which enable us to coordinate mental processes, manipulate information, solve new problems, sequence information, inhibit non-useful responses and generate new strategies to accomplish goals in a flexible way (Diamond, 2012; Henry, Messer, & Nash, 2012; Miyake & Friedman, 2012). Most executive function research focuses on three core areas: inhibition; working memory and cognitive flexibility, which some suggest underpin other more complex executive functions such as planning, problem solving, reasoning, etc., (Friedman & Miyake, 2017). [1]

Executive functions play an important role in the everyday life of infants and toddlers, allowing them to focus attention on specific tasks, to engage in successful problem solving, and to plan for their next action. Executive functions begin to emerge early in infancy, with basic skills needed for executive functions emerging before three years of age, and more specific skills developing in early childhood (Garon, Bryson & Smith, 2008). It has been suggested that each component of executive function develops at its own rate across childhood and adolescence, reaching maturity at different ages (Diamond, 2013). The gradual acquisition of executive functions relate to the development of the prefrontal cortex and other brain areas from infancy to adulthood (Fiske & Holmboe, 2019; Thompson, 2016; Tsujimoto, 2008). [2] [3]

Figure **10.6.4.1** depicts the growth of executive function abilities in infants and toddlers from 9 to 30 months of age (Hendry & Holmboe, 2021). This data highlights two important findings. First, executive function abilities improve with age, a consistent finding across studies (Hendry et al., 2016; Putnam et al., 2006). As Figure **10.6.4.1** shows, there is a steady increase in executive function skill across the first thirty months. Second, there are early individual differences already evident by the end of the first year. This means that at any given age, some infants and toddlers have greater executive function abilities than others. Understanding early differences could be important as preschool and kindergarten children's performance on executive function tests is correlated with academic achievement (for both mathematical and literacy assessments) in the U.S., South Korea, Taiwan, and China (McClelland et al., 2014; Ponitz et al., 2009; Wanless et al., 2011). [4]

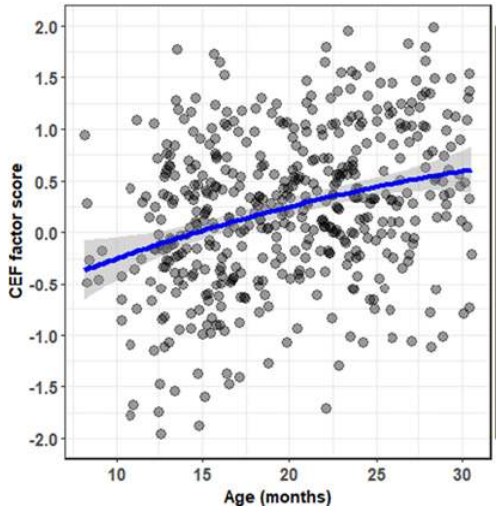


Figure **10.6.4.1**: Cognitive Executive Function (CEF) scores by age. (C[1])

Next, let's look at the three core areas of executive function, inhibition, working memory and cognitive flexibility, more in depth.

Inhibition

Inhibition, or inhibitory control, is a child's ability to stop a dominant response and demonstrate more adaptive and/or socially acceptable behavior (Diamond, Kirkham, & Amso, 2002; Rennie, Bull, & Diamond, 2004). Inhibition is important in the successful execution of tasks by providing the child with the flexibility and freedom to choose and control their actions (Dowsett & Livesey, 2000), for instance, by waiting for one's turn, sharing or cleaning up toys before playing somewhere else. [6]

The developmental trajectory of inhibition begins towards the end of the first year of life (Diamond, 2002, Diamond et al., 2007, Garon et al., 2008, Wolfe & Bell, 2007) with research suggesting that some early forms of inhibitory and attentional control emerge

already at around 6 months of age (Courage, Reynolds, & Richards, 2006; Holmboe, Bonneville-Roussy, et al., 2018). Inhibition skills develop rapidly between the ages of 22 and 33 months (Carlson, 2005; Kochanska, Murray, & Harlan, 2000), and the proportion of time children can successfully wait improves significantly between the ages of 30 and 42 months (Caughy, Mills, Owen, & Hurst, 2013). Following this, inhibition shows a rapid improvement during the toddler and preschool years (Friedman et al., 2011, Garon et al., 2008, Garon et al., 2014, Holmboe, Larkman, et al., 2018, Simpson & Riggs, 2005), increasing at a more steady pace throughout middle childhood (Best & Miller, 2010, Best et al., 2009), before eventually reaching adult levels in early adolescence (van den Wildenberg & van der Molen, 2004, Williams et al., 1999). [6] [7]

As infants and toddlers grow, caregiver–child interactions have an important impact on the development of children's inhibition skills. Well-organized infant and toddler classroom environments and caregivers' use of clear, proactive strategies in supporting behavior create predictability within the classroom that further enables the child to gain a sense of control and exhibit appropriate behavior while inhibiting more inappropriate behaviors (Salminen et al., 2021). Children's ability to show better inhibition control in classrooms also relates to the caregivers' sensitivity and responsiveness towards children's needs and developing skills. Children's feelings of frustration can be reduced by creating a safe and welcoming environment, showing interest in supporting infants' and toddlers' autonomy, understanding their way of seeing the world, and supporting their willingness to attend to learning activities in a personally meaningful way (Hamre & Pianta, 2005; Ladd, Birch, & Buhs, 1999). These caregiver practices of sensitivity and responsiveness may further indicate to children that their own actions and decisions matter, hence sending out stronger signals of how to behave in an acceptable way. [6]

The concept of caregiver mind-mindedness is related to (but distinct from) that of sensitivity, but is also related to the development of inhibition. Mind-mindedness refers to a caregiver's proclivity to treat an infant as an "individual with a mind rather than merely as a [child] with needs that must be satisfied" (Meins, Fernyhough, Fradley & Tuckey, 2001). For example, if, during a game of peek-a-boo, the infant signals that they are overstimulated (e.g., by turning away from the caregiver, tuning out, frantic movements, etc.), the caregiver's appropriate understanding of the behavioral signal in terms of the child's internal states (e.g., feeling overwhelmed) is critical in guiding the caregiver's reaction. When the caregiver accurately understands the signal, they are more likely to show an attuned response: pause the game, enabling the infant's autonomic system to recover from the heightened arousal. Conversely, when the caregiver does not have a mind-minded perspective, they may not see or may misinterpret the infant's signal and are more likely to continue the peekaboo game. The infant then does not experience recovery from heightened physiological arousal in a way that is matched to his or her current state of being. [8] [9] [10]

One way to know a caregiver's level of mind-mindedness is to measure the proportion of attuned comments in which a caregiver refers to a child's desires, cognitions and emotions (Meins, Fernyhough, Fradley & Tuckey, 2001). Despite only about 10% of caregiver verbal comments being mind-mindedness comments that accurately reflect the child's internal state (Helmerhorst, Colonnesi & Fukkink, 2019), caregiver mind-mindedness of infants at nine months of age predicts children's developing inhibitory control at 2 and 3 years of age (Cheng, Lu, Archer & Wang, 2018). There are cultural differences in the level of mind-mindedness of caregivers. Mind-mindedness was lower in Chinese and Hong Kong caregivers compared to caregivers in the U.K. and Canada (Bernier, Carlson & Whipple, 2010; Hughes, Devine & Wang, 2017). [8] [9]

Working Memory

Working memory refers to a child's ability to hold information in memory long enough to successfully complete a task, for instance, remembering simple instructions and then performing accordingly (Adams, Bourke, & Willis, 1999). For a toddler, this can be seen in completing a task with two parts (e.g., "take your paintbrush to the sink and wash your hands") or remembering simple rules in a game or in play. The basic components of working memory start to develop across the child's first year of life, while more complex working memory abilities, such as updating or manipulating representations develop during toddlerhood and throughout the preschool period (Alloway, Gathercole, Willis, & Adams, 2004; Gathercole, 1998; Pelphrey & Reznick, 2002). [6]

Cognitive Flexibility

Cognitive flexibility, the ability to shift between different tasks or goals, is considered a key aspect of executive functions, allowing individuals to regulate their thoughts and actions adaptively Jurado & Rosselli, 2007; Miyake et al., 2000). Cognitive flexibility is sometimes also referred to by shifting, attention switching, or task switching, and includes both the ability to disengage from irrelevant information in a previous task and to focus on relevant information in a forthcoming task (Monsell, 2003). Thus, cognitive flexibility enables one to think divergently, change perspective and adapt to a continuously changing environment. [11]

There is sparse research on the development of cognitive flexibility in infants and toddlers, as most research finds even 3 year olds struggle on tasks of cognitive flexibility. The Dimensional Change Card Sorting (DCCS) task is widely used to measure the cognitive flexibility of children. The DCCS task asks children to sort cards (e.g., a red rabbit and a blue boat) with one of the two target cards (e.g., a red boat and a blue rabbit) according to one rule (e.g., by color), and then after several successful trials, switch to another rule (e.g., by shape). Previous findings using the DCCS task indicated that most 3-year olds had difficulty switching between the dimensions, but by age 4, most children could successfully switch to the new rule (Perner & Lang, 2002; Zelazo, Frye & Rapus, 1996). Cognitive flexibility matures along a steep slope during early childhood (Diamond, 2006; Garon et al., 2008) and this is thought to be driven by neurodevelopmental changes in the prefrontal cortex (Diamond, 2002; Ezekiel et al., 2013). [12]

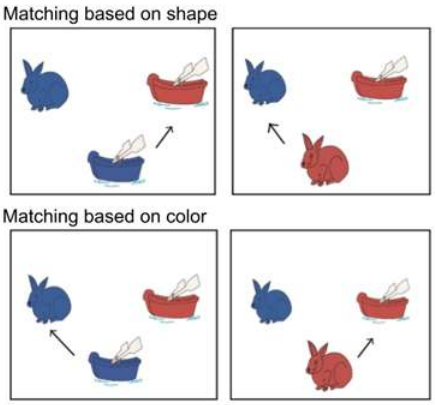


Figure **10.6.4.2**: Examples from a Dimensional Change Card Sorting (DCCS) task. ([12])

There are important cultural differences in early executive function skills. Findings from cross-cultural investigations suggest that children from Eastern cultures (e.g., Chinese) typically perform better on executive function tasks than their Western counterparts (Sabbagh et al., 2006; Oh & Lewis, 2008; Lewis et al., 2009; Lan et al., 2011; Grabell et al., 2015). Different explanations have been proposed. While children from Eastern cultures are expected to have mastery of impulse control around 2 years of age, children from Western cultures are not expected to be able to do so until the preschool years (Chen et al., 1998). This could create opportunities for Chinese children to be taught the importance of self-control (Ellefson et al., 2017) and start practicing executive function skills at an earlier age than their U.S. counterparts (Sabbagh et al., 2006). In a collectivist culture like China, children practice and learn how to behave in society through adult modeling of the “acceptable” behaviors (Jian, 2009). On the other hand, individual choices and negotiation are valued elements in caregiving practices in individualistic cultures (Greenfield et al., 2006). According to Lan and colleagues (2011), the difference of educational styles between countries (e.g., China and the U.S.) is the major reason for the variation in executive function skills. While being able to control one's behavior, attention and concentration are a central element of Chinese education, self-expression and decision-making freedom are more of the focus in U.S. education (Song & Jinyu, 2016). [13]

The overall behaviors and practices of infant and toddler caregivers have a significant role in the development of executive functions (Bernier, Carlson & Whipple, 2010; Fay-Stammbach, Hawes & Meredith, 2014). Stephanie Carlson (2003) argued that caregiving contributes to the development of executive function through three primary aspects of interaction (scaffolding behavior, stimulation, and sensitivity) and that each has different effects on executive function.

Scaffolding refers to how caregivers verbally and non-verbally guide and instruct children during challenging tasks (Lewis & Carpendale, 2009), support children’s autonomous exploration, and encourage children to make decisions autonomously to solve problems (Matte-Gagn & Bernier, 2011). For example, a caregiver might provide gentle guidance to a child frustrated by an ever-collapsing block tower by placing the larger blocks at the base. The strategies provided by caregivers tell children not only what to do, but also ways to think, guiding improvements in cognitive control, inhibition and the ability to think flexibly during problem-solving.

Sensitivity represents a caregiver’s ability to perceive and accurately interpret the signals shown explicitly or implicitly in an infant’s behavior, and to then respond appropriately (Pederson et al., 1990). Children who experience their environments as predictable and consistent are inclined to achieve higher-level self-regulation in their early lives and are more motivated to gain

cognitive control (Carlson, 2003). For example, caregiver-toddler interactions that are warm and responsive predict longitudinal effortful control performance and delay of gratification (inhibition) ability (Kochanska et al., 2000; Sethi et al., 2000).

Stimulation covers the wide range of interactions between caregivers and children, such as the creation of environments for cognitive skill development through activities like reading (Bradley et al., 2011) and playing together (Rome-Flanders, Cronk & Gourde, 1995). Caregiver language has specifically been found to play a critical role in children's later executive processing (Daneri et al., 2019; Landry et al., 2002). For example, caregiver verbal scaffolding during problem-solving tasks shows both concurrent and longitudinal associations with executive function in early childhood (Bernier et al., 2010; Hammond et al., 2012; Hughes & Ensor, 2009). This research emphasizes the importance of developmentally-appropriate activities that also challenge infants and toddlers accompanied by sensitive scaffolding by caregivers. [14] [15]

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[1] Mason et al., (2021). Executive function training for Deaf children: Impact of a music intervention. *Journal of Deaf Studies and Deaf Education, 26*(4), 490-500. CC by 4.0

[2] Ferguson et al., (2021). The developmental trajectories of executive function from adolescence to old age. *Scientific Reports*, *11*(1), 1-17. CC by 4.0

[3] Keil et al., (2021). Family environment and development in children adopted from institutionalized care. *Pediatric Research*, 1-9. CC by 4.0

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10.6.5: Self-Regulation

Development of Self-Regulation

Infants have the ability to express themselves through vocalizations, facial expressions and movements of their body. For example, upon hearing a loud unexpected sound, an infant may close their eyes, tense their body and cry to express their internal state. However, while they can express themselves, infants have limited capacity for self-regulation. Self-regulation is the ability to control behavior and responses in adaptive ways across a variety of dimensions, including attention, emotion, behavior, and cognition (Calkins, 2007; Calkins & Fox, 2002). Self-regulation is a cornerstone of healthy development (Robson, Allen & Howard, 2020; Thompson, 2016) and has been linked to the development of language, mathematics, reading, and literacy skills (von Salisch et al., 2015; Bohlman & Downer, 2016; Lin et al., 2016). Consider the strategies you personally use for self-regulation. When you feel scared, anxious, unmotivated or distracted, what strategies have you discovered that help you regulate your internal state?



Figure **10.6.5.1**: Caregiver helping a child self-regulate ([1]

During infancy, the early beginning of self-regulation can be seen in infants' responses to input from caregivers and the environment (Samdan et al., 2020). The ongoing development of motor skills, attention, and emotion subsequently influence the development of self-regulation abilities (Calkins, 2007), as infants and toddlers begin to recruit newly developed skills for self-regulating. Whereas a young infant relies upon the caregiver to distract them from an unfavorable experience, an older infant can control their eyes and/or head to purposefully look away and a toddler can use newly developed motor abilities to independently crawl or walk away. [2]

It is important to recognize that processes of self-regulation might differ across cultures (Jaramillo et al., 2017). The strategies an individual uses to modify their internal states and behaviors are immersed in a cultural context that gives priority to prevailing values and outcomes in the socialization process. In this way, caregivers shape an infant's developing self-regulation skills and at the same time communicate culturally-appropriate socioemotional norms and expectations. As an example, two studies (Harwood et al., 1999; Carlson and Harwood, 2003) compared socialization goals and practices of European American and Puerto Rican toddler caregivers. In line with their socialization goals, European American caregivers preferred educational practices that gave children learning opportunities. They structured learning situations indirectly, as they used suggestions and verbal approvals to guide children to act in a certain way, while giving them much room to choose for themselves what to exactly do. Puerto Rican caregivers, instead, tended to use more authority to teach children the ways of acting, according to what they expected. They intervened physically more often (e.g., by physically moving children to do something), used more explicit signals to obtain children's attention, and gave more direct orders than European American caregivers. [3]

Caregivers are instrumental in the development and maintenance of self-regulatory abilities among infants and toddlers. As they develop, infants transition from dependence on caregivers for help in self-regulating to more autonomous self-regulation. Let's return to and provide more information about the scenario of the infant who hears a loud unexpected sound presented at the beginning of this topic. Eli, 3 months old, is a new child in the infant room at a child care center. Ms. Williams, his primary caregiver, learned from his family what techniques work best to calm Eli when he is upset. One day, a loud noise from the street suddenly wakes Eli and he starts to cry. Ms. Williams lifts him from his crib and holds him close, swaying from side to side until he relaxes and returns to sleep. [4] [5]

As infants have limited self-regulation abilities, the role of caregivers is essential. By responding to the infant in a way that meets their needs, the caregiver supports the infant's emerging regulatory abilities. As the example from the scenario highlights, Eli was

able to express his internal state, but he depended on his caregiver to help him regulate his internal state. Soothing by holding and rocking or by reorienting a child's attention is a common practice for regulating distress. The caregiver's regulating actions not only soothe the infant, but also demonstrate to the infant, culturally-appropriate strategies for self-regulation.

[1] Photo from Paul Hanaoka on Unsplash

[2] Schworer et al., (2021). Early regulatory skills and social communication development in infants with Down Syndrome. *Brain Sciences*, *11*(2), 208. CC by 4.0

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[5] Finlay-Jones et al., (2021). Caregiver-mediated interventions to support self-regulation among infants and young children (0–5 years): A protocol for a realist review. *BMJ Open*, *11*(6), e046078. CC by 4.0 NC

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10.6.6: Persistence

Development of Persistence

As toddlers continue to grow, their developing abilities will lead them to taking on more challenging tasks such as climbing new obstacles and playing with toys in more complex ways, such as stacking blocks to create tall towers. But when these tasks become challenging, what determines when a toddler will give up or demonstrate persistence? Persistence in childhood has repeatedly been associated with positive outcomes. Persistence at 6 months predicts cognitive development at 14 months (Banerjee & TamisLeMonda, 2007), persistence at 3 years predicts language and math skills in kindergarten (Mokrova et al., 2013), and persistence in childhood predicts later academic achievement (Meier & Albrecht, 2003), success at career work, and healthy relationships, well into adulthood (Duckworth, Peterson, Matthews, & Kelly, 2007; EskreisWinkler, Duckworth, Shulman, & Beal, 2014). [1]



Figure **10.6.6.1**: Persisting in a difficult task. ([2])

During challenging tasks, we consider the costs and rewards for continued persistence. Recent work has provided evidence that young children also consider costs and rewards when making decisions. For example, 18-month-olds weigh the expected costs and benefits of their actions when deciding whether to help an adult construct a tower composed of blocks of different weights (Sommerville et al., 2018). When toddlers were presented with a task researchers purposefully created to be impossible to do, increased failure led to decreased effort by toddlers (Radovanovic et al., 2021). Interestingly, toddlers who attempted various strategies during the impossible task persisted for longer in trying to do it. This research emphasizes the importance of developmentally-appropriate activities for infants and toddlers as well as the importance for caregivers to demonstrate different approaches to solve challenges. [1]

One factor that influences even very young children's decisions about when to persist and when to give up is the behavior of the adults in their environment (Kamins & Dweck, 1999; Lucca, Horton & Sommerville, 2019). For example, toddlers tend to make generalizations about when to persist based on adult behavior. When 15-month-olds observed an adult work hard to achieve a particular goal (e.g. trying different strategies, repeating actions), they themselves attempted to activate a novel toy more times than toddlers who observed an adult succeed after little to no effort (Leonard, Lee & Schulz, 2017). Thus, our persistence with challenging tasks as caregivers, are demonstrations for infants and toddlers to learn about persistence themselves. [1]

[1] Rett & Walker (2020). Knowing when to quit: Children consider access to solutions when deciding whether to persist. *Cognitive Science*. CC by 4.0

[1] Photo by Alexander Dummer on Unsplash

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10.6.7: Spatial Skills

Development of Spatial Skills

Spatial skills refer to the cognitive processing of spatial information, which “involves shapes, locations, paths, relations among entities and relations between entities and frames of reference” (Newcombe & Shipley, 2015). Spatial abilities are an important part of cognitive development because early spatial skills are associated with map use (Liben et al., 2013), numerical skills (Zhang, 2016; Cornu et al., 2018; Fanari et al., 2019), math reasoning and knowledge (Casey et al., 2015; Rittle-Johnson et al., 2019), early writing skills (Bourke et al., 2014), motor skills (Jansen & Heil, 2010), and executive functions (Lehmann et al., 2014; Frick and Baumeler, 2017). [1]



Figure **10.6.7.1**: Toddler stacking blocks ([2])

Spatial thinking often involves mental rotation. Mental rotation refers to the ability to imagine how an object that has been seen from one perspective would look if it were rotated in space into a new orientation and viewed from the new perspective. This ability is crucial even for infants because from soon after birth they are confronted with and must cognitively represent moving and rotating objects in their natural environment. Whether a caregiver or a favorite toy, infants must learn how to recognize people and objects when viewed from different orientations. Figure **10.6.7.2** provides an example of a test item frequently used to measure mental rotation. At the top is an image of a “same” stimulus in which the object on the right is the same as the object on the left, just rotated. At the bottom is an image of a “different” stimulus, no matter how the image on the left is rotated, it cannot be represented by the image on the right. [3] [4] [5]

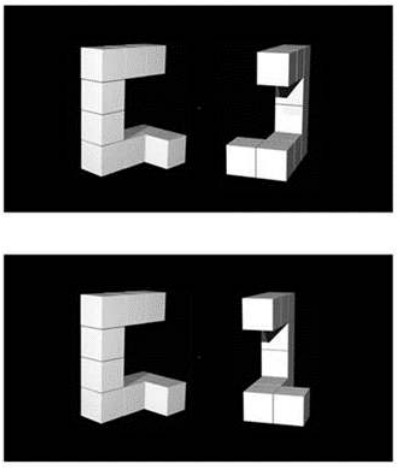


Figure **10.6.7.2**: Example of a mental rotation test item. ([6])

Several studies have reported mental rotation abilities in infants as young as 3 to 5 months of age with greater abilities in boys than in girls in early infancy (Constantinescu et al., 2018; Johnson & Moore, 2020; Lauer et al., 2015; Quinn & Liben, 2014). As an example, Moore and Johnson (2008) habituated three month old infants to a video of an object, like in Figure **10.6.7.3**, as it rotated

around its vertical axis. Then, in test trials, infants saw the same object (just rotated) or a different object (its mirror image). In Figure **10.6.7.4** image A represents the "back side" of the habituation object seen in Figure **10.6.7.4** (thus it is the same image, just rotated). In Figure **10.6.7.4** image B represents the mirror-image of the object seen in image A. The results of the study revealed that only the boys, not the girls, differentiated between the same and the mirror object. Thus, mental rotation is developed already by three months of age, with a gender difference favoring males in the ability to mentally rotate an object in three-dimensional space. [7]

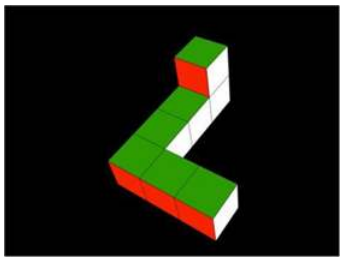


Figure **10.6.7.3**: 3 dimensional geometric object. (Copyright; author via source)

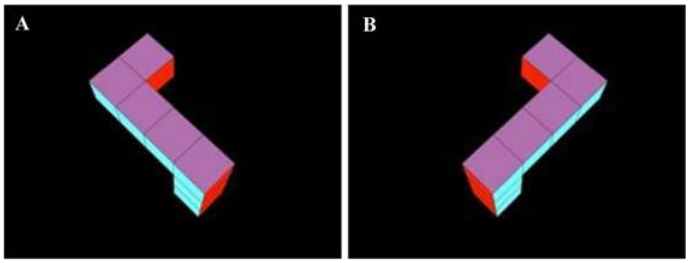


Figure **10.6.7.4**: 3 dimensional geometric objects. (Copyright; author via source)

Studies suggest there are various factors that might be important for supporting the early development of mental rotation abilities. Campos et al. (2000) provided evidence that self-produced locomotion, such as crawling, is relevant for infant visual-cognitive ability in general, while other studies have demonstrated a specific association between infant crawling and mental rotation ability (Gerhard-Samunda, Jovanovic & Schwarzer, 2021; Schwarzer et al., 2012). In addition, manual object exploration, such as when infants and toddlers use their hands to manipulate, rotate and transfer objects, might be associated with infant mental rotation ability (Möhring & Frick, 2013; (Soska et al., 2010). These findings demonstrate a relation between mental rotation abilities in infants and toddlers and object and environment exploration. Caregivers can support the development of mental rotation abilities by encouraging infants and toddlers to directly explore objects of various sizes, shapes, colors, etc, with their hands and by supporting the exploration of mobile children. [7]



Figure **10.6.7.5**: Toddler exploring objects with her hands. ([8])

[1] Yang et al., (2020). Is early spatial skills training effective? A meta-analysis. *Frontiers in Psychology, 11*, 1938. CC by 4.0

[2] Image from Ryan Fields on Unsplash

[3] Johnson & Moore (2020). Spatial thinking in infancy: Origins and development of mental rotation between 3 and 10 months of age. *Cognitive Research: Principles and Implications*, *5*(1), 1-14. CC by 4.0

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[6] Image from Ganis & Kievit (2015). A new set of three-dimensional shapes for investigating mental rotation processes: Validation data and stimulus set. *Journal of Open Psychology Data*, *3*(1), e3. CC by 3.0

[7] Schwarzer et al., (2013). How crawling and manual object exploration are related to the mental rotation abilities of 9-month-old infants. *Frontiers in Psychology*, *4*, 97. CC by 4.0

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10.6.8: Mindset and Praise

Effect of Praise on Mindset

As a student, what were your favorite and least favorite classes in school? For many people, their least favorite class was math and they might say statements like “I’m just not a math person”. This statement suggests that people are born with specific abilities (like being skilled at math or art, or sports, etc.,). The problem with this statement is that we are not born to be or to not be “math people”. While indeed genetics and environment play a role in developing abilities, so too does the mindset we have.

Mindsets are defined as implicit beliefs individuals hold about basic human abilities and attributes, such as intelligence (Dweck, 2006). They exist on a spectrum from fixed mindsets, which refer to believing that specific human attributes are static and unchangeable, to growth mindsets, which refer to believing that these attributes are malleable and can be shaped and developed with effort. So if we return back to math, someone who says “I’m just not a math person” probably has a fixed mindset because they are suggesting human abilities are unchangeable—you are either born a math person or not. In contrast, someone with a growth mindset can still struggle with math, but believes that their ability in math can be changed—practicing more and finding new strategies can help them improve. [1]

The role of mindsets has been widely investigated in the educational field, especially with older children, as mindsets are related to motivation and behavior, including the way students handle academic setbacks and challenges (Blackwell, Trzesniewski & Dweck, 2007; Aditomo, 2015). People with a fixed mindset are more prone to interpret their setbacks to a lack of inborn ability when compared to people with a growth mindset, who instead attribute setbacks to a lack of effort (Dweck, Chiu & Hong, 1995; Dweck, 2006). Growth mindset has been linked to students’ higher resilience, psychological well being, and school engagement (Yeager et al., 2019; Zeng, Hou & Peng, 2016). [1]

Why do some people have a growth mindset while others have a fixed mindset? What factors contribute to someone developing a specific mindset? As infants and toddlers develop, they frequently reveal new abilities that are exciting for caregivers to witness. Praise is a common response to these new abilities. While praise may seem like a positive response, research has revealed that the effect of praise depends on the type of praise, and that, surprisingly, some types of praise negatively affect the motivation of the person receiving praise. Many studies have found that receiving effort-focused praise positively affected motivation, while receiving ability-focused praise negatively affected motivation (e.g., Brummelman et al., 2014; Mueller & Dweck, 1998). In a landmark study by Mueller and Dweck (1998), fifth-grade children were asked to work on a set of tasks; then, they were praised for their ability (e.g., “You must be smart”), were praised for their effort (e.g., “You must have worked hard”), or received no additional feedback (i.e., the control group). Subsequently, children were given a more difficult set of problems and failed. Compared to children in the control group, children in the effort praise group reported more task enjoyment and performed higher on the subsequent task, while children in the ability praise group reported less task enjoyment and performed lower on the task. [2]

> These effects of ability-focused and effort-focused praise are related to one’s mindset about one’s ability and attributes (e.g., Gunderson et al., 2013; Pomerantz & Kempner, 2013). Children who receive effort-focused praise tend to endorse a growth mindset, and their enjoyment and subsequent task performance are high following failure; in contrast, those who receive ability-focused praise tend to endorse a fixed mindset, and their enjoyment and subsequent task performance are low following failure (Dweck, 2008; Mueller and Dweck, 1998). Effort-focused praise emphasizes the fundamental role of effort for growth/improvement, whereas ability-focused praise implies that individuals’ intelligence is an internal and perhaps fixed/stable trait. [2]

Research with infants and toddlers demonstrates that mindsets about one’s abilities are already forming during the first three years of life and the type of praise received from caregivers is important in shaping a child’s mindset. Eighteen month old toddlers who have caregivers who use more effort-focused praise are more persistent in challenging tasks (Lucca, Horton & Sommerville, 2019). Toddlers who receive more ability-focused praise from their caregivers are more likely to have a growth mindset later in childhood as 7 to 8 year olds (Gunderson et al., 2013) and higher academic achievement in the fourth grade (Gunderson et al., 2018).

As caregivers of infants and toddlers, we not only need to be cognizant of how our praise affects childrens’ developing mindsets, but also the impact our personal mindsets can have. Recent research has focused on caregivers’ mindsets as a key factor that may shape caregiving behaviors and perspectives toward children (Justice et al., 2020). Caregivers’ mindsets refers to the beliefs that

caregivers hold regarding whether children's development is fixed or malleable as well as their belief of the importance of effort for learning (Sisk et al., 2018). [3]

Recently, Rowe and Leech (2018) implemented a random-assignment experiment to examine use of a caregiver mindset intervention to improve caregivers' non-verbal interactions with 10-month-old infants. Caregivers assigned to a training condition participated in training emphasizing the malleability of early language skills and that caregivers can play a key role in facilitating these skills through non-verbal interactions. Compared to caregivers in a control group, the trained caregivers interacted more frequently with their children at 12 months of age, and this effect was particularly strong for caregivers who originally had a fixed mindset. Such research suggests that caregiver mindset may be a key factor for improving children's early experiences and development. To discover what your mindset is, (\PageIndex{1}\) presents a short Mindset assessment. [3]

Example 10.6.8.1 Mindset activity

Directions: Select an answer for each of the eight questions.

1. "No matter how much intelligence you have, you can always change it a good deal"
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
2. "You can learn new things, but you cannot really change your basic level of intelligence"
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
3. "I like my work best when it makes me think hard"
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
4. "I like my work best when I can do it really well without too much trouble"
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
5. "I like work that I'll learn from even if I make a lot of mistakes"
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot

6. “I like my work best when I can do it perfectly without any mistakes”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
7. “When something is hard, it just makes me want to work more on it, not less”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
8. “To tell the truth, when I work hard, it makes me feel as though I’m not very smart”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot

Directions: Select an answer for each of the eight questions.

1. “No matter how much intelligence you have, you can always change it a good deal”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
2. “You can learn new things, but you cannot really change your basic level of intelligence”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
3. “I like my work best when it makes me think hard”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
4. “I like my work best when I can do it really well without too much trouble”
    1. Disagree a lot
    2. Disagree

3. Disagree a little
4. Agree a little
5. Agree
6. Agree a lot

5. “I like work that I’ll learn from even if I make a lot of mistakes”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
6. “I like my work best when I can do it perfectly without any mistakes”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
7. “When something is hard, it just makes me want to work more on it, not less”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot
8. “To tell the truth, when I work hard, it makes me feel as though I’m not very smart”
    1. Disagree a lot
    2. Disagree
    3. Disagree a little
    4. Agree a little
    5. Agree
    6. Agree a lot

Research suggests that mindsets begin developing during infancy and toddlerhood and that caregivers play a pivotal role in which mindset children develop. The type of praise we use is important. Caregivers should be aware of their praise and attempt to use more effort-focused praise in an attempt to help children develop a growth mindset. Using effort-focused praise with infants and toddlers is important as their mindsets are beginning to develop and effort-focused praise during the first three years is related to the development of a growth mindset and educational achievement later in childhood.

[1] Puusepp et al., (2021). Mindsets and neural mechanisms of automatic reactions to negative feedback in mathematics in elementary school students. *Frontiers in Psychology*, 3297. CC by 4.0

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10.7: Conclusion

Conclusion of Overview of Cognitive Development

While it was once thought that the experience a young infant likely has when engaging with the world is one of “blooming, buzzing confusion” (James, 1890), research has since revealed that infants are cognitively making sense of the world around them in complex ways. While some cognitive processes seem to be inborn, other cognitive processes unfold throughout the first three years of life. What is clear is that through everyday experiences with supportive caregivers, infants and toddlers are making sense of their world and developing important cognitive skills that they will continue to build on later in childhood.

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CHAPTER OVERVIEW

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11.1: Introduction

Introduction to Theories of Cognitive Development

The first three years of a child's life are full of many first-time experiences, from the sensory experiences in early infancy to the various new experiences motor and language abilities afford. Just think about the difference in experience of an infant not yet mobile and an infant who is able to walk around independently! Every experience, whether novel or repeated, supports their emerging cognition. Cognition refers to thinking and memory processes, and cognitive development refers to changes in these processes over time. This section will introduce you to the major theories of cognitive development, with special attention to the theories of Jean Piaget and Lev Vyotsky. [1]

[1] Kelvin Seifert & Rosemary Sutton (2009). "Educational Psychology." CC by 4.0

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11.2: Jean Piaget

Overview of Jean Piaget



Figure **11.2.1**: Jean Piaget. ([1])

Jean Piaget (1896-1980) was a renowned psychologist of the 20th century and a pioneer in developmental psychology. Piaget did not accept the prevailing theory that knowledge was innate. Instead, he believed a child's knowledge and understanding of the world developed over time, through the child's interactions with the world. By observing that interaction, Piaget was able to perceive how children created schemas (mental ways to organize information) that shaped their perceptions, cognitions, and judgment of the world. Just as almost all babies learn to roll over before they learn to sit up by themselves, Piaget believed that children gain their cognitive ability in a developmental order. These insights—that children at different ages think in fundamentally different ways—led to Piaget's stage theory of cognitive development. As a stage theorist, Piaget believed cognitive change occurred in distinct stages with a fixed-order, rather than continuous development that argued for a more gradual continuous process (see Figure **11.2.2** for an analogy). Despite various limitations, Piaget's theory of cognitive development is one of the most enduring theories in psychology. [2]

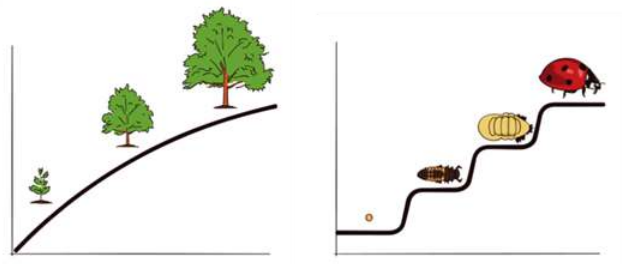


Figure **11.2.2**: Continuous and discontinuous development depicted by the analogies of a tree growing versus a ladybug life cycle. ([3])

Piaget believed that children do not just passively learn but actively try to make sense of their worlds. He argued that, as they learn and mature, children develop schemas that help them remember, organize, and respond to information. Furthermore, Piaget thought that when children experience new things, they attempt to reconcile the new knowledge with existing schemas through methods that he called assimilation and accommodation. [4]

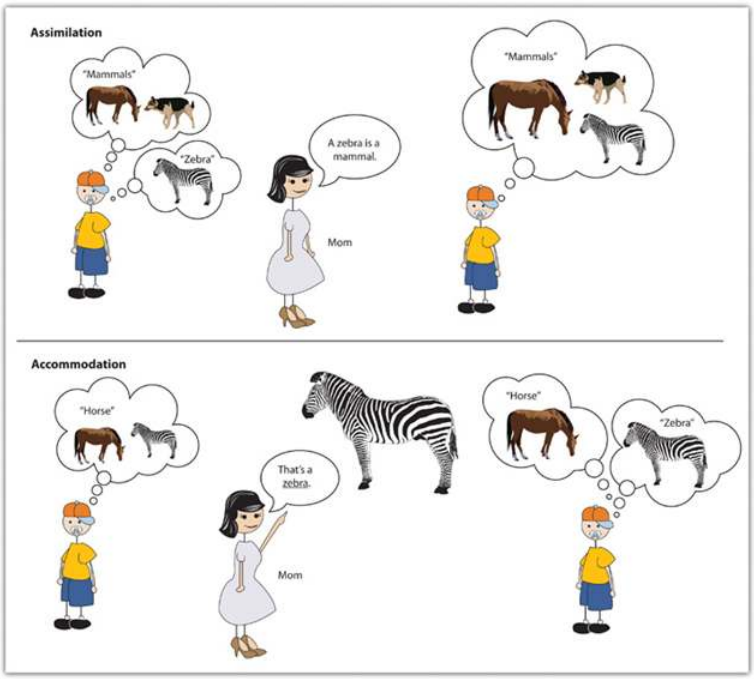


Figure **11.2.3**: Assimilation and Accommodation. ([5])

When children apply assimilation, they use already developed schemas to understand new information. If children have learned a schema for horses, then they might call the striped animal they see at the zoo a horse rather than a zebra. In this case, children fit the existing schema (knowledge that defines a horse separate from other animals) to the new experience (a zebra) because zebras fit the basic schema of a horse. Accommodation, on the other hand, involves learning new information, and thus changing/updating the schema. When a mother says, "No, honey, that's a zebra, not a horse," the child may adapt the schema to fit the new experience, learning that there are different types of four-legged animals, only one of which is a horse and that zebras are unique because of their black and white stripes.

Piaget's Stages of Cognitive Development

Over his lifetime, Piaget contributed significantly to the study of cognitive development in children. Piaget's most important contribution to understanding cognitive development, and the fundamental aspect of his theory, was the idea that development occurs in unique and distinct stages, with each stage occurring at a specific time, in a sequential manner, and in a way that allows the child to think about the world using new capacities. Piaget classified children's cognitive development into four sequential stages: (1) The sensorimotor period from birth to 24 months, (2) the pre-operations period between the approximate ages of two and seven years old, (3) the concrete operational period that begins around age seven and continues through about 11 years old, and (4) the formal operations period that begins around age 11 and continues through adolescence.[2]

Piaget's Stages of Cognitive Development

Stage	Approximate age range	Characteristics	Stage attainments
Sensorimotor	Birth to about 2 years	The child experiences the world through the fundamental senses of seeing, hearing, touching, and tasting.	Object permanence
Preoperational	2 to 7 years	Children acquire the ability to internally represent the world through language and mental imagery. They also start to see the world from other people's perspectives.	Theory of mind; rapid increase in language ability
Concrete operational	7 to 11 years	Children become able to think logically. They can perform operations on objects, but only those which are real ("concrete"), not those which are abstract.	Conservation
Formal operational	11 years to adulthood	Adolescents can think systematically, can reason about abstract concepts, and can understand ethics and scientific reasoning.	Abstract logic

Figure **11.2.4**: Piaget's Stages of Cognitive Development. ([6])

As this text is about infants and toddlers, we will primarily focus on the first stage, the sensorimotor stage, which includes children between the ages of 0 to 2 years. During the sensorimotor stage, children use their senses and motor capabilities to understand the world. In fact, infants' use of their senses to perceive the world is so central to their understanding that whenever infants do not directly perceive objects, as far as they are concerned, the objects do not exist. Piaget found, for instance, that if he first interested infants in a toy and then covered the toy with a blanket, infants who were younger than 6 months of age would act as if the toy had disappeared completely—they never tried to find it under the blanket but would nevertheless smile and reach for it when the blanket was removed. Piaget found that it was not until about 8 months that the infants realized that the object was merely covered and not gone. Piaget used the term **object permanence** to refer to the child's ability to know that an object exists even when the object cannot be perceived. [4]



Figure 11.2.5: 1. Mother engages infant's attention with the toy. [7]



Figure 11.2.6: 2. Mother hides the toy in one of the bowls, ensuring that infant is watching figure



Figure 11.2.7: 3.Mother covers the bowls and asks, "Where's the toy?" then pushes bowls towards the infant.



Figure 11.2.8: 4. Infant reaches for one of the cloths to uncover the toy

Sensorimotor Substages

The sensorimotor period begins at birth and continues through the child's first two years. It focuses on the development of schemes as infants' sensory and motor systems interact with the world. There are six substages within the sensorimotor period.

Sensorimotor Substages

Sensorimotor Substage	Age
Substage 1: Simple Reflexes	Birth to 1 month
Substage 2: Primary Circular Reactions	1 to 4 months
Substage 3: Secondary Circular Reactions	4 to 8 months
Substage 4: Coordination of Circular Reactions	8 to 12 months
Substage 5: Tertiary Circular Reactions	12 to 18 months
Substage 6: Internalization of Schemes and Early Representational Thought	18 months to 2 years

Stage 1 lasts from birth until around 1 month of age. At this first stage, learning by experiencing the world is largely driven by inborn motor and sensory reflexes, like the sucking and palmar reflexes. With the palmar reflex, when something is placed in the palm of an infant, their involuntary reflex is to close their fingers around it and cling on to it. By doing so, the infant is able to experience shape, texture, temperature, weight, etc.,. The palmar reflex typically disappears by six months of age (Anekar & Bordoni, 2020). At this stage, Piaget proposed that learning about the world is not primarily voluntary, instead, infants begin to encounter the world as a result of their inborn reflexes. [2] [8]



Figure **11.2.9**:Infant grasping onto an adult's finger. ([1])

Stage 2, which occurs approximately between 1 and 4 months, includes the primary circular reaction in which an infant happens to experience an event and then attempts to repeat the action. The infant begins to discriminate between objects and adjust responses accordingly as reflexes are replaced with voluntary movements. An infant may accidentally engage in a behavior and find it interesting, such as making a vocalization. This interest motivates them to try to do it again and helps the infant learn a new behavior that originally occurred by chance. At first, most actions have to do with the body, but in the months to come, will be directed more toward objects. [2] [8]



Figure **11.2.10**: Infant vocalizing. ([10])

Stage 3, which takes place between 4-8 months, involves secondary circular reactions when an infant repeats an action with a specific, desired consequence or to achieve an unrelated consequence. The infant becomes more and more actively engaged in the outside world and takes delight in being able to make things purposely happen on their own. Repeated motion brings particular interest, for example, as the infant is able to bang two things together or when sticking out their tongue leads to their parents laughing. [2] [8]



Figure **11.2.11**: Infant sticking out her tongue. ([11])

Stage 4, which occurs approximately between 8 and 12 months, comprises the use of familiar means to obtain ends. It entails deliberate planning of steps to meet a goal or objective. The infant can engage in behaviors that others perform and anticipate upcoming events. Perhaps because of continued maturation of the prefrontal cortex, the infant becomes capable of having a thought and carrying out a planned, goal-directed activity such as seeking a toy that has rolled under the couch. The object continues to exist in the infant's mind even when out of sight and the infant now is capable of making attempts to retrieve it. [2] [8]



Figure **11.2.12**: Infant uses a stick to play with a xylophone. ([12])

Stage 5, which takes place between 12 to 18 months of age, is a tertiary circular reaction in which an infant experiments with their environment using the properties of one object to manipulate another object, in other words, using an experimental object, like a stick, to push a ball that then makes a noise. The infant actively engages in more experimentation to learn about the physical world. Gravity is learned by pouring water from a cup or pushing bowls off of table tops. The caregiver tries to help the child by picking it up again and placing it back on the table. And what happens? Another experiment! The child pushes it off the table again causing it to fall and the caregiver to pick it up again! [2]



Figure **11.2.13**: Infant playing in a pool of water. ([1])

Stage 6, which occurs approximately between 18 and 24 months, is characterized by insight, wherein the child observes how other people manipulate the environment to reach the desired goal, then the child applies that knowledge to obtain the desired goal. The child is now able to solve problems using mental strategies, to remember something heard days before and repeat it, to engage in pretend play, and to find objects that have been moved even when out of sight. Take for instance, a toddler who is upstairs in a room with the door closed, supposedly taking a nap. The doorknob has a safety device on it that makes it impossible for the child to turn the knob. After trying several times to push the door or turn the doorknob, the child carries out a mental strategy learned from prior experience to get the door opened-knocking on the door! The child is now better equipped with mental strategies for problem-solving.[2]



Figure **11.2.14**: Toddler using an abacus. . ([1])

The culmination of stage 6 and the sensorimotor period is the child's understanding of object permanence, that objects have an existence independent of the child's interaction with them. Classic examples of understanding object permanence include a child's realization that when a caregiver leaves a room, the parent continues to exist, or the child's attempt to recover a hidden toy, indicating the child's understanding that the toy still exists outside of view (Beilin & Fireman,1999). [2]

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[2] Scott & Cogburn (2021). Piaget. *StatPearls*. Treasure Island (FL): StatPearls Publishing. CC by 4.0

[3] Image from Siegler (2021). Cognitive development in childhood. In R. Biswas-Diener & E. Diener (Eds), Noba textbook series: Psychology. Champaign, IL: DEF publishers. CC by SA NC 4.0

[4] "Introduction to Psychology" by Walinga & Stangor. CC by NC SA 4.0

[5] Assimiliation and Accomodation in "Introduction to Psychology" by Walinga & Stangor. CC by NC SA 4.0

[6] Piaget's Stages of Cognitive Development. in "Introduction to Psychology" by Walinga & Stangor. CC by NC SA 4.0

[7] Image adapted from Clackson et al., (2019). Do helpful mothers help? Effects of maternal scaffolding and infant engagement on cognitive performance. *Frontiers in Psychology*, *10*, 2661. CC by 4.0

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11.3: Applying Piaget's Sensorimotor Stage

Sensorimotor Stages

While learning about the sensorimotor stage, did you notice how Piaget used observable behaviors from children to understand and categorize cognitive progression? Children reveal their thinking through their observable behaviors. The key then to understanding a child's cognitive development is that we, as caregivers, need to take the time to carefully observe and document children's behavior. The sensorimotor substages can act like a map to help us understand a child's current cognitive stage and also the next stage(s) they will progress into. Knowing which substage children are in can inform us about the function of their behaviors and provide us insight into possible activities to support their cognitive progression.

For example, in stage 3, infants take delight in being able to make things purposefully happen on their own; therefore, caregivers can consider including play objects that infants can easily manipulate and that have a 'consequence'--an outcome that can be experienced by the child. In comparison, during stage 5, an infant directly experiments with their environment; therefore, caregivers can include various play objects that can be used to engage with the immediate contextual environment. Children in stage 5 love pouring water back and forth between containers of different sizes and shapes. As contexts change (e.g., inside/outside, water play, table activities, etc.,), so too should the experimental play objects to best encourage experimental curiosity. Remember, the first and most important thing we can do as caregivers is purposefully observe children. Observe the children and how they use objects and then reflect on their behaviors to consider additional or alternative objects to support their experimentation.

Preoperational Stage

Although Piaget suggested that only one year of toddlerhood is spent in the preoperational stage, learning about this stage is important because it sheds light on the future trajectory of cognitive growth in toddlers. Furthermore, the fact that Piaget includes the second year of a child's life in the next stage of cognitive development, highlights the important cognitive growth that occurs from 24 to 36 months of age.

At about 2 years of age, and until about 7 years of age, children move into the preoperational stage. During this stage, children begin to use more language and to think more abstractly about objects. The term 'operational' refers to logical manipulation of information, so children at this stage are considered pre-operational because children's logic is based on their own personal knowledge of the world so far, rather than on conventional knowledge. Children also begin to use more conversational language in the preoperational stage, but they cannot understand adult logic or mentally manipulate information. [1] [2]

The preoperational period is defined by semiotic function, or representational thought through signs and symbols. This stage exhibits five characteristic behaviors: imitation, symbolic play, drawing, mental image, and verbal recalling of events. The first behavior, imitation, is when the child models observed behavior even after the disappearance of the thing the child is imitating. For example, the child may mimic a person's dance or how they play with an object, even after the person is no longer present. The next behavior, symbolic play, is a step beyond imitation. This "make-believe" or "play pretend" behavior is characterized by the child's ability to project an idea onto an object, symbolically. "Let's pretend that I am the mama and this is my baby," and the child points to a stuffed animal. In this example, both the child and the stuffed animals are symbols in the game of make-believe. The third identified behavior, drawing, begins early in the preoperational period, and incorporates both play and imitation. Drawing often begins with scribbles and proceeds to graphic imagery with the representation of objects that are present in the child's world. Through drawing, the child may represent family members with stick figures, with the key characteristic being that the child understands that the stick figures are only representations of the family, not the actual family members. Finally, the verbal recalling of events, which is the culmination of semiotic function, is the child's use of language to imitate and reflect upon events that occurred in the child's past. Mastery of semiotic function is important because it indicates that a child can think and assimilate knowledge rather than merely act on objects that are physically present (Marwaha, Goswami & Vashist, 2017). [3]

Limitations of Piaget's Theory

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[2] Lally & Valentine-French (2019). Lifespan Development: A Psychological Perspective. CC by NC SA 4.0

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11.4: Vygotsky's Sociocultural Theory of Cognitive Development

Sociocultural Theory



Figure 11.4.1: Lev Vygotsky. ([2])

Zone of Proximal Development:

Vygotsky's best known concept is the Zone of Proximal Development (ZPD). Vygotsky stated that children should be taught in the ZPD, which occurs when they can almost perform a task, but not quite on their own without assistance. With the right kind of teaching, however, they can accomplish it successfully. A good teacher identifies a child's ZPD and helps the child stretch beyond it. Then the teacher gradually withdraws support until the child can then perform the task unaided. This highlights the importance of instructional decisions related to types and quality of interactions in designing effective learning experiences for infants and toddlers. [1] [3]

Researchers have applied the metaphor of scaffolds (the temporary platforms on which construction workers stand) to this way of teaching. Scaffolding is the temporary support that caregivers give a child to do a task. Scaffolding represents the way in which a caregiver guides a child's learning during a goal-oriented task by offering or withdrawing support at different levels depending on the child's individual developmental level and learning needs. Scaffoldings typically include a mutual and dynamic nature of interaction where both the learner and the one providing the scaffold influence each other and adjust their behavior as they collaborate. In an interactive game of peek-a-book, a caregiver can scaffold an infant's attention and understanding of object permanence by changing the length of time they stay hidden and by changing how they reveal themselves (e.g., using their hands or another object to hide behind). Research suggests that even in infancy scaffolding plays an important role in the development of cognitive abilities (Cuevas et al. 2014; Matte-Gagné & Bernier 2011; Neale & Whitebread, 2019). Ideas such as the ZPD and scaffolding bring to light a fundamentally different view of a caregiver who serves more as a facilitator of learning rather than someone providing general knowledge. Likewise, the learner takes on more responsibilities such as determining their learning goals, becoming a resource of knowledge for peers, and actively collaborating in the learning process (Grabinger, Aplin, & Ponnappa-Brenner, 2007). This often contrasts with how many people perceive education--as the teacher being the source of knowledge and the teacher directly giving their knowledge to the children. [1] [4] [3]



Figure **11.4.2**: Caregiver assisting a toddler in the garden. ([5])

For infant and toddler caregivers, every interaction, whether during play or a care routine, is an opportunity to engage with a child inside their ZPD. To begin to engage with an infant or toddler inside their ZPD, we must first purposefully observe them. Beginning with observation is critical because it allows us to first understand what the child is interested in and hypothesize about what their goals may be. Furthermore, observation reveals their current ability or understanding about the activity and objects they are engaged in. Next, we should then reflect upon our observations and consider our role within the child's ZPD. What type and level of assistance can we offer to the child? What is the least amount of assistance we can provide as guidance? While implementing assistance to the child, we should constantly be reflecting upon how our assistance changes their activity and reflect upon our potential new role as their behaviors change.



Figure **11.4.3**: Infant and caregiver exploring flowers. ([6])

Contingency is one strategy to use while engaging with a child in their ZPD. Contingency describes the extent to which a caregiver's interaction is dependent upon attributes of the child (for example their age, ability, attention, interest, and whether or not they are struggling with the task at hand). A contingent caregiver response is one which occurs when a child requires help of some kind, as opposed to assistance which appears unnecessary because it occurs when a child is coping adequately. A contingent response will also provide the appropriate level of support to assist the child – not taking over the task completely, and not giving too little assistance to not have any effect. As a result, to respond contingently, a caregiver must be present in the unfolding of an activity and observe the child carefully. [4]

Development and learning originate in social, historical, and cultural interactions.

Vygotsky contended that thinking has social origins. Social interactions play a critical role especially in the development of higher order thinking skills, and cognitive development cannot be fully understood without considering the social and historical context within which it is embedded. He explained, "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first between people (interpsychological) and then inside the child (intrapsychological)"

(Vygotsky, 1978). It is only through working with others on a variety of tasks that a child adopts socially-shared experiences and acquires useful strategies and knowledge (Scott & Palincsar, 2013). [3]

Barbara Rogoff (1990) refers to this process as guided participation, where a learner actively acquires new culturally valuable skills and capabilities through a meaningful, collaborative activity with an assisting, more experienced other, such as a caregiver. It is critical to notice that these culturally-mediated functions are viewed as being embedded in sociocultural activities rather than being self-contained. Development is a "transformation of participation in a sociocultural activity" not a transmission of discrete cultural knowledge or skills (Matusov, 2015). The processes of guided participation reveal the Vygotskian view of cognitive development "as the transformation of socially-shared activities into internalized processes," or an act of enculturation (John-Steiner & Mahn, 1996). In this way, children cognitively learn about the world by participating in it with others. [3]

Examples of guided participation can be seen when caregivers involve infants and toddlers in everyday routines. In her research with Mayan families in Guatemala, Rogoff et al., (1993) reported mothers guiding their toddlers through the process of making tortillas. Mothers would give the toddlers small balls of dough to practice rolling and flattening. This cultural practice both contributed to the child's cognitive development and their learning of practices important for their culture. As another example, consider a group care setting during meal time where toddlers are seated with a caregiver and the meal is separated into larger bowls on the table where the toddlers are seated. The toddlers are able to participate in the routine by serving themselves using the serving spoons and then feed themselves using the utensils. The first few times this routine is started, the caregiver may do more serving and guiding, but eventually, through practiced participation, toddlers are able to participate more deeply, all the while learning culturally-valuable skills such as turn-taking, conversation around a meal, vocabulary and the motor skills needed to serve and eat.

This Vygotskian notion of social learning stands in contrast to some of Piaget's more popular ideas of cognitive development, which assume that development through certain stages is biologically determined, originates in the individual, and precedes cognitive complexity. This difference in assumptions has significant implications to the design and implementation of learning experiences. If we believe, as Piaget did, that development precedes learning, then we will make sure that new concepts and problems are not introduced until learners have first developed the capabilities to understand them. On the other hand, if we believe as Vygotsky did that learning drives development and that development occurs as we learn a variety of challenging concepts and principles with others, then we will ensure that activities are structured in ways that promote interaction. We will know that it is the process of learning that enables achievement of higher levels of development, which in turn affects a child's "readiness to learn a new concept" (Miller, 2011). [3]

Private Speech

Do you ever talk to yourself? Why? Chances are, this occurs when you are struggling with a problem, trying to remember something, or feel very emotional about a situation. Children talk to themselves too. Piaget interpreted this as Egocentric Speech or a practice engaged in because of a child's inability to see things from another's point of view. Vygotsky, however, believed that children talk to themselves in order to solve problems or clarify thoughts. As children learn to think in words, they do so aloud before eventually closing their lips and engaging in private speech or inner speech. Thinking out loud eventually becomes thought accompanied by internal speech, and talking to oneself becomes a practice only engaged in when we are trying to learn something or remember something. This inner speech is not as elaborate as the speech we use when communicating with others (Vygotsky, 1962). Despite the fact that toddlers are still progressing through the early stages of language acquisition, they nevertheless use private speech. For example, young toddlers, between 14 to 18 months of age, independently use gestures to help think through the use of complex toys and for self-regulation (Basilio & Rodríguez, 2017) and when left alone in their bed at night, toddlers sing to themselves as a way to "practice musical skills, reflect, experiment, self-soothe, and understand their own worlds" (Sole, 2017). [1]



Figure **11.4.4**: Toddler constructing block tower. ([7])

Although Piaget's theory of cognitive development receives more attention, sociocultural theory has several widely recognized strengths. First, it emphasizes the broader social, cultural, and historical context of all human activity. It does not view individuals as isolated entities; rather, it provides a richer perspective, focusing on the fluid boundary between self and others. It portrays the dynamics of a child acquiring knowledge and skills from the society and then in turn shaping their own personal environment (Miller, 2011). Second, sociocultural theory is sensitive to individual and cross-cultural diversity. In contrast to the universal aspects of Piaget's theory, sociocultural theory acknowledges both differences in individuals within a culture and differences in individuals across cultures. It recognizes that "different historical and cultural circumstances may encourage different developmental routes to any given developmental endpoint" depending on particular social or physical circumstances and cultural tools available (Miller, 2011). Finally, sociocultural theory greatly contributes to our understanding of cognitive development by integrating the notion of learning and development. The idea of learning driving development rather than being determined by a developmental level or age of the child fundamentally changes our understanding of the learning process and has significant instructional and educational implications for the care and education of infants and toddlers. [3]

Limitations of Vygotsky's Theory

There are critical limitations to the sociocultural perspective. The first limitation is related to Vygotsky's premature death, as many of his ideas remained incomplete. Furthermore, his work was largely unknown until fairly recently due to political reasons and issues with translation. The second major limitation is associated with the vagueness of the ZPD. Individuals may have wide or narrow zones, which may be both desirable and undesirable, depending on the circumstances. Knowing only the width of the zone "does not provide an accurate picture of a child's learning, ability, style of learning, and current level of development compared to other children of the same age and degree of motivation" (Miller, 2011). Additionally, there is little known about whether a child's zone is comparable across different learning domains, with different individuals, and whether the size of the zone changes over time. And importantly, there is not a common metric scale to measure ZPD. [3]

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[1] Lally & Valentine-French (2019). Lifespan Development: A Psychological Perspective. CC by NC SA 4.0

[2] Image by josemota is licensed under CC by 2.0. CC BY-NC-SA 2.0

[3] "Sociocultural Perspectives of Learning" by Polly et al., is licensed under CC by 4.0

[4] Neale & Whitebread (2019). Maternal scaffolding during play with 12-to 24-month-old infants: stability over time and relations with emerging effortful control. *Metacognition and Learning*, *14*(3), 265-289. CC by 4.0

[5] Image by Anna Earl is licensed under CC by 4.0

[6] Image by Liana Mikah is licensed under CC by 4.0

[7] Image by Markus Spiske is licensed under CC by 4.0

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11.5: Theory of Core Knowledge

Understanding the Theory of Core Knowledge

The theory of core knowledge proposes that infants are born with 'core knowledge systems' that support basic intuitions about the world (Spelke & Kinzler, 2007). Whereas Piaget claimed that children construct knowledge by engaging with the world and Vygotsky claimed children develop cognitively by participating with others in culturally-relevant activities, the theory of core knowledge claims that children are born with basic knowledge. Supporters of this theory suggest that the many studies documenting cognitive abilities in just the first few months of infancy, provide evidence for this theory. For example, Renée Baillargeon's early work discovered that object permanence is developed in infants at a much younger age than Piaget proposed--already by 3 to 4 months of age (Baillargeon, 1987)! The fact that infants have an understanding of object permanence already, in only the first few months of life, suggests that this knowledge might be inborn. [1]

In one experiment on object permanence, young infants were familiarized with a display in which a screen lying flat and facing the infant rotated up and away from the infant 180° in the manner of a drawbridge (Baillargeon, 1987). During the test phase, a new object was then placed at the far edge of the screen, which either did or did not impede the rotating screen (see Figure **11.5.1** for a depiction of the experimental scenarios). In the "impossible" scenario, the screen moved exactly as during familiarization, appearing to rotate right through the object. In the "possible" scenario, the screen rotated only to the point where it would be expected to make contact with the object and then stopped moving. Infants looked longer at the "impossible" scenario than the 'possible' scenario – which was interpreted in terms of a violation of infants' expectations regarding object permanence. In another experiment on object permanence (see Figure **11.5.1** for a visual depiction of the scenarios), 3 to 4 month old infants looked longer at an impossible event (tall carrot moving behind a box with a section cut out near the top of the box that should have shown the green top of the carrot as it moved behind the box) than the possible event (short carrot moving behind a box with a section cut out near the top of the box that should not have shown the green top of the carrot as it moved behind the box) (Baillargeon & DeVos, 1991).

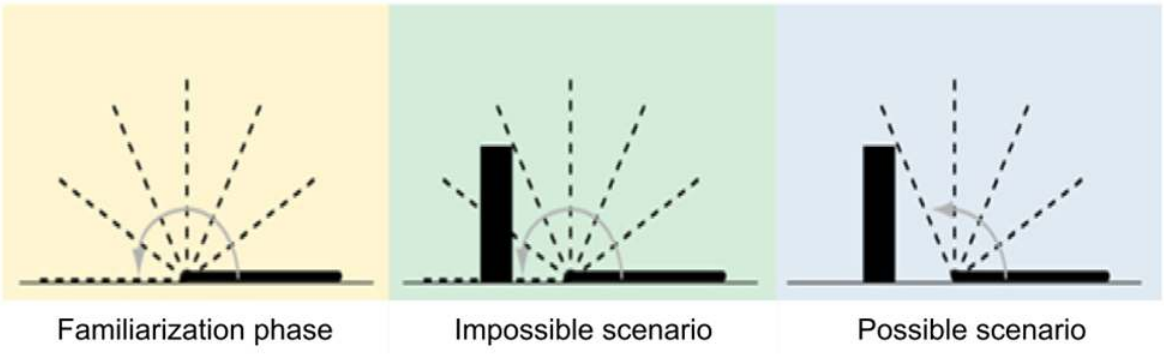


Figure **11.5.1**: Depiction of the object permanence stimuli from Baillargeon (1987). Side view of habituation and test displays. In both conditions, infants were habituated to a 180° drawbridge-like motion. The decline and plateau of looking times during habituation are depicted. In the Experimental Condition, infants completed two types of test trials, both of which contained a new object on the far side of the display. The *Impossible Test* involved the same full 180° rotation from habituation, but now the screen surprisingly passed through the box as it completed its rotation (with the box disappearing as it became obscured). The *Possible Test* involved a novel shorter rotation of screen up to the point where it would contact the box, where it stopped; this motion was "possible" in terms of solidity and object permanence, but was more *perceptually novel* than the Impossible Test. infants dishabituated to the Impossible Test but not the Possible Test. However, in the Control Condition no preference was observed. These results were interpreted as reflecting the violation of infants' expectations regarding solidity and/or object permanence.. ([2])

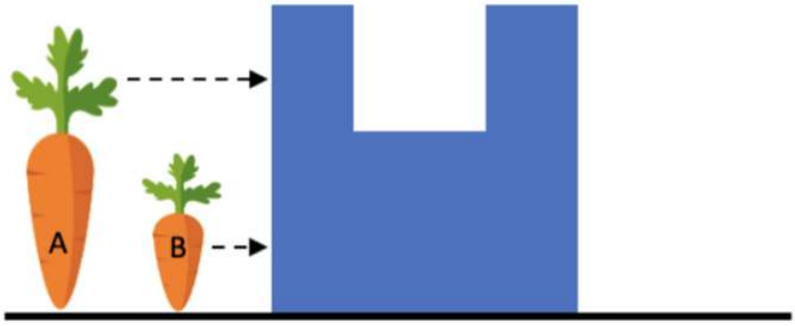


Figure **11.5.1**: Depiction of the object permanence stimuli ([3])

Building on Baillargeon's early research, many studies have since continued to document a range of abilities that are collectively described as 'core systems of knowledge' and suggest basic inborn knowledge about the physical world (Hamlin, Wynn & Bloom, 2010; Spelke, 1998; Spelke et al., 1992; Spelke & Kinzler, 2007; Wang & Feigenson, 2021). Unlike Piaget's and Vygotsky's theories, the theory of core knowledge suggests that some aspects of early knowledge do not need to be learned with experience or from more knowledgeable others because children are instead born with this knowledge. [1]

[1] Grace et al., (2021). Implicit Computation and the Origins of Knowledge. Preprint. CC by 4.0

[2] Image adapted from Turk-Browne et al., (2008). Babies and brains: Habituation in infant cognition and functional neuroimaging. *Frontiers in Human Neuroscience*, *2*, 16. CC by 4.0

[3] Image from Grace et al., (2021). Implicit Computation and the Origins of Knowledge. Preprint. CC by 4.0

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11.6: Information Processing

Theory of Information Processing

Information processing theory uses the analogy of a computer to consider how the mind works.

It is theorized that cognitive processes work in specific sequences, as does a computer, by receiving input, processing the information, and delivering an output. In this way, the mind functions like a biological computer responsible for processing information from the environment. As children grow, their brains also grow, leading to advances in their ability to cognitively process the information they receive. In contrast with Piaget's theory of cognitive development that proposed development occurs in stages, information processing theory instead emphasizes a continuous pattern of development. [1]

Memory is one cognitive process that is commonly used to explain information processing theory. The idea is that there are specific steps in the memory process, similar to how information storage on a computer can involve multiple distinct steps. Using the Atkinson and Shiffrin Model shown in Figure **11.6.1**, memory has three main components in which information can flow in and out of the memory system. The process begins when information from our senses flows into sensory memory. If we pay attention to this information, it then enters short-term memory where, if attention is further maintained toward it, it can continue on to long-term memory. [1]

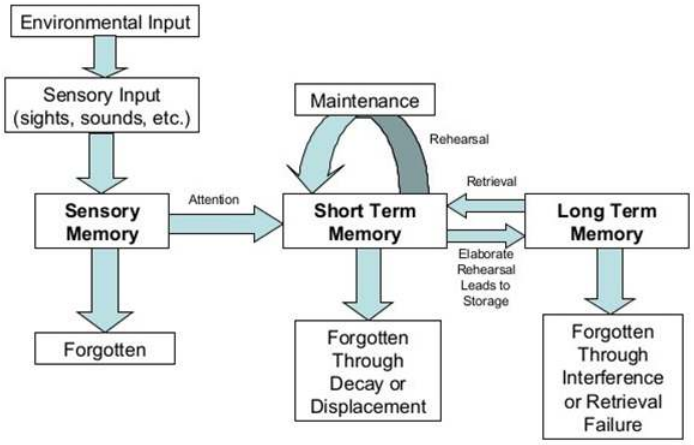


Figure **11.6.1**: Environmental input to Sensory input (sights, sounds, etc.) both feeding into Sensory memory, from where it can either be forgotten or into short-term memory. In short-term memory it's either forgotten through decay or displacement of maintenance occurs through rehearsal. A two-way exchange between short-term memory and long term memory occurs. During this exchange elaborate rehearsal leads to storage (short term to long term) or items are retrieved from short term into long term. Once in long term it can be forgotten through interference or retrieval failure. ([2])

Along with suggesting specific steps in cognitive processes, following the analogy of a computer, information processing theory explains growth in cognitive abilities through continuous maturational growth in cognitive systems and the brain. Whereas Piaget proposed stages based on ages to represent important periods of change in cognitive growth, information processing theory instead examines the continuous growth in cognitive processes. Consider the cognitive process of visual working memory, which is a cognitive system that actively holds visual information, such as the color or shape of something, in the mind temporarily for use in ongoing tasks. Research reveals a continuous increase in visual working memory capacity over the first year (Rose et al., 2001; Kaldy and Leslie, 2003, 2005; Oakes et al., 2006, 2017; Kibbe and Leslie, 2011; Kwon et al., 2014; Kaldy et al., 2016) that continues to develop into childhood (Simmering, 2012; Guillory et al., 2018). For example, ten and twelve month-old infants are successful in remembering three objects but are unable to remember more than three objects (Feigenson and Carey, 2003, 2005). Similarly, brain research has found visual working memory activation evident by 4 months of age with continuous developmental change between 4 months and one year of age (Reyes et al., 2020). As an example of how growth in some cognitive systems influence the abilities in other cognitive systems, fourteen month-old infants can use high-level strategies such as chunking to remember more items (Feigenson and Halberda, 2004; Kibbe and Feigenson, 2016). Information processing research continues to document the continuous growth in cognitive processes of infants and toddlers. [3] [4]

[1] Information processing theory from Wikipedia is licensed under CC by SA 4.0

[2] Image from Dkahng is licensed under CC by SA 4.0

[3] Isbell et al., (2015). Visual working memory continues to develop through adolescence. *Frontiers in Psychology, 6*, 696. CC by 4.0

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11.7: Conclusion

Conclusion to Theories Cognitive Development

This section presented four theories of cognitive development. The two main cognitive theories of Piaget and Vygotsky were explained, compared and applied to the care and education of infants and toddlers. Both of these theories continue to be highly influential in leading discussions of cognitive development in young children. The theories of core knowledge and information processing were also discussed and related to the theories of Piaget and Vygotsky. Despite the strengths and limitations of each theory, what is clear is that recent research has revealed that infants and toddlers know more about the world than was once thought, and it is through their active engagement with the world and quality interactions with others that is most important for ongoing cognitive development.

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11.8: References

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CHAPTER OVERVIEW

12: Cognitive Development- Strategies in Group Care

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12.2: Observing Cognition
12.3: The COVID-19 Pandemic- Proof of the Importance of Quality Learning Experiences
12.4: Environments that Support Cognitive Development
12.5: Materials that Support Cognitive Development
12.6: Interactions that Support Cognitive Development
12.7: Experiences that support Cognitive Development
12.8: Conclusion
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12.1: Introduction

Introduction to Strategies to Support Cognitive Development in Group Care

Cognitive development refers to the increasing efficiency and ability of the mental processes associated with perception, knowledge, problem solving, judgment, language, and memory. When infants and toddlers are actively engaged with the physical and social world, they reveal their developing cognitive abilities. To support their developing cognition, caregivers can create safe and stimulating environments with age appropriate materials that invite engagement and exploration while interacting with them in language-rich ways. This section will present various strategies to create environments and interactions that optimally support the cognitive development of infants and toddlers. [1]

[1] Spielman et al., (2020). Psychology (2nd ed.). OpenStax. Licensed under CC by 4.

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12.2: Observing Cognition

Importance of Observation

The best way for caregivers to start to learn about the cognitive abilities of infants and toddlers is simply to observe them because they reveal their ever-evolving understanding of the world through their interactions with objects and people. To illustrate, look at the sequence of photos displayed in Figure **12.2.1** of Nora, a fifteen-month-old toddler from Nigeria. There are a few different objects Nora is playing with. There are rectangle stacking blocks of various colors and sizes and a recycled food container that has a circle cut into the lid. This sequence of six photos represents only a few seconds of her play, but in just these few seconds, we can learn a lot about her cognition. When you look at the photos, what insight do they provide about Nora's developing understanding of how the world works?



Figure 12.2.1: Nora has a yellow block in her left hand and a blue block in her right hand, but is primarily focused on the blue block. In front of her is the cylinder container with a hole in its lid. and various other blocks scattered around the base of the cylinder. With the blue block in her right hand, Nora moves it toward the hole in the cylinder container and drops it onto the container lid. When laid horizontally on top of the container, the blue block is too long to fit through the round hole.



Figure 12.2.2: Nora lifts the blue block up again, angles one end toward the hole, guides the block part way into the hole and releases it as it falls into the container.



Figure **12.2.3**:Nora swings her left hand, with the yellow block, toward the hole. In the same continuous movement, as her hand nears the hole entry point, she angles the end of the yellow block toward the hole and guides it directly through the hole.



Figure **12.2.4**: Nora picks up another yellow block (from off camera) and focuses her eyes on the hole as she again angles the end of the block toward the hole and drops it into the container.



Figure 12.2.5: she selects an orange block but as she moves it toward the hole, she moves her eye gaze away from the hole and toward the remaining blocks on the floor. As she looks toward the blocks on the floor, her hand guiding the orange block gets stuck on the lid as the angle of the block does not fit into the hole. She then looks toward the container, adjusts the angle of the block and drops it into the hole.



Figure 12.2.6:Nora grabs a large toy object (from off camera) and guides it toward the hole. In the first attempt to fit it into the container, it does not fit. Nora twists her wrist to change the angle and tries again, but it does not fit. [1]

In Figure 12.2.1, Nora has a yellow block in her left hand and a blue block in her right hand, but is primarily focused on the blue block. In front of her is the cylinder container with a hole in its lid. and various other blocks scattered around the base of the cylinder. With the blue block in her right hand, Nora moves it toward the hole in the cylinder container and drops it onto the container lid. When laid horizontally on top of the container, the blue block is too long to fit through the round hole. In Figure 12.2.2, Nora lifts the blue block up again, angles one end toward the hole, guides the block part way into the hole and releases it as it falls into the container. In Figure 12.2.3, Nora swings her left hand, with the yellow block, toward the hole. In the same continuous movement, as her hand nears the hole entry point, she angles the end of the yellow block toward the hole and guides it

directly through the hole. In Figure **12.2.4**, Nora picks up another yellow block (from off camera) and focuses her eyes on the hole as she again angles the end of the block toward the hole and drops it into the container. In Figure **12.2.5**, she selects an orange block but as she moves it toward the hole, she moves her eye gaze away from the hole and toward the remaining blocks on the floor. As she looks toward the blocks on the floor, her hand guiding the orange block gets stuck on the lid as the angle of the block does not fit into the hole. She then looks toward the container, adjusts the angle of the block and drops it into the hole. In Figure **12.2.6**, Nora grabs a large toy object (from off camera) and guides it toward the hole. In the first attempt to fit it into the container, it does not fit. Nora twists her wrist to change the angle and tries again, but it does not fit.

These six photos of Nora represent only a few seconds of play, but nevertheless demonstrate important information about infant and toddler cognitive development. First, children are actively making sense of the world around them through interactions with the physical and the social world. Like young scientists, they use their knowledge to make hypotheses, then act upon them, constantly updating their knowledge based on the results. In this way, it is through the interactions with the physical and social worlds that cognition primarily grows; therefore, the quality of the physical and social environments and overall learning experiences of infants and toddlers is of utmost importance for supporting optimal cognitive development. As evidence, let's next consider how the COVID-19 pandemic has demonstrated the significance of early learning experiences for supporting cognitive development in infants and toddlers.

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12.3: The COVID-19 Pandemic- Proof of the Importance of Quality Learning Experiences

COVID-19 and Quality Care

COVID-19 (coronavirus disease 2019) is a disease caused by a virus named SARS-CoV-2 and was first discovered in December 2019 in Wuhan, China. The virus spread throughout the world and in the spring of 2020, many schools and childcare centers in the U.S. closed in an effort to reduce its spread and impact.

The COVID-19 pandemic presented a unique opportunity to explore the importance of learning experiences on the cognitive development of infants and toddlers as the childcare arrangements of children changed. Compared to toddlers born before the pandemic, children born during the pandemic showed lower scores in cognition, language and motor abilities as toddlers (Deoni, Beauchemin, Volpe & D'Sa, 2021; Huang et al.m 2021; Shuffrey et al., 2021). The negative cognitive impact was greatest for boys and for children from lower socioeconomic backgrounds. These results suggest the pandemic somehow changed learning experiences enough to make a significant impact on the experiences that support optimal cognitive development. Although there are various potential contributing factors that could be argued to explain these results (e.g., reduced social interaction, increased screen time, increased parental stress, etc.,), one significant contributing factor was the care and educational experiences infants and toddlers received during the pandemic. [1]



Figure **12.3.1**: Toddler wearing a mask during the COVID-19 pandemic. ([2])

During the early months of the pandemic childcare arrangements shifted. Some childcare providers closed temporarily and later opened with strict protocols. Many children, instead of attending a group care program, stayed home under the care of parents and extended family. The various experiences infants and toddlers received during the pandemic had an impact on their cognitive development.

One study examined how childcare arrangements during the pandemic impacted cognitive growth in infants and toddlers (Davies et al., 2021). Their data revealed that children who attended infant and toddler group care programs during the pandemic showed greater cognitive growth, regardless of their socioeconomic background. The benefits of attending infant and toddler group care programs for cognitive development, compared to other childcare arrangements such as care from a family member, may be due to group care programs being more likely to implement developmentally appropriate learning materials and adult-child interactions which scaffold learning, and have been shown to promote early cognitive development (Clark et al., 2013; DeJoseph, Sifre, Raver, Blair, & Berry, 2021; Rosen et al., 2020). [3]

Interestingly, compared to children who attended infant and toddler group care programs, informal childcare by family members did not show the same benefits for cognitive growth (Davies et al., 2021). Although the overall evidence is mixed regarding the cognitive benefits of informal childcare (Green, Pearce, Parkes, Robertson, & Katikireddi, 2020; Hansen & Hawkes, 2009; Laing & Bergelson, 2019; Melhuish et al., 2015), the strengths of infant and toddler group care programs, such as caregiver-child interactions, predictable schedules, lower screen use, and caregiver education is likely to be important for supporting cognitive growth (Dowsett, Huston, Imes, & Gennetian, 2008). [3]



Figure **12.3.2**: Caregiver wearing a mask while holding an infant. ([4])

The handful of studies that have examined the impact of the COVID-19 pandemic on the cognitive development of infants and toddlers have highlighted the role learning experiences have in supporting cognitive development. In particular, the quality of the care and educational experiences infants and toddlers receive are related to their cognitive growth. These findings further document the significant role infant and toddler caregivers have in creating safe and high quality contexts that contribute to the trajectory of cognitive development in children.

In the next section we will discuss four factors of infant and toddler quality group care that support cognitive development: environments, materials, experiences and interactions.

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[1] "Basics of COVID-19" from the CDC is in the public domain.

[2] Image from Leo_Fontes on Pixabay.

[3] Davies et al., (2021). Early childhood education and care (ECEC) during COVID-19 boosts growth in language and executive function. *Infant and Child Development*, e2241. CC by 4.0

[4] Image from marcinjozwiak on Pixabay

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12.4: Environments that Support Cognitive Development

Cognitive Development and the Environment

Environments are significant in supporting cognitive development because they are both the stimulating backdrop and the active contributor of learning. Therefore, we should change the way we think of environments—we should think of them as learning environments instead of simply physical environments. Learning environments are nurturing spaces that support the development of all young children. They include classrooms, play spaces, areas for caregiving routines, and outdoor areas. Learning environments are well-organized and managed settings. They offer developmentally-appropriate schedules, indoor and outdoor opportunities for choice, play, exploration, and experimentation. Learning environments include age-appropriate equipment and materials They integrate home cultures and are flexible to support the changing ages, interests, and characteristics of a group of children over time.[1]



Figure **12.4.1**: Which includes a bench with two storage baskets within. A small size armchair with a pillow and two child size cubbies in the corner. Children's artwork and pictures adorn the wall. ([2])

The educational framework of Reggio Emilia holds the classroom environment to a special status and therefore provides a great perspective to learn about how the environment can support cognitive development. Reggio Emilia was founded by Loris Malaguzzi (1920–1994) to provide provisions for children of the city of Reggio Emilia, Italy, after World War II (Wien, 2008). The Reggio Emilia philosophy perceives physical space as a primary aspect of cognitive development, envisioned as a third teacher (Wien, 2008). What do you think it means to consider the environment as a third teacher? The importance of the environment lies in the belief that children can best create meaning and make sense of their world through environments that support "complex, varied, sustained, and changing relationships between people, the world of experience, ideas and the many ways of expressing ideas." (Cadwell, 1997). While infants and toddlers are active meaning makers, the quality of materials and interactions in their environments influence the quality of meaning that they can make.[3] [4]

Physically, Reggio Emilia classrooms generally incorporate natural light and indoor plants. Classrooms capture the attention of children through the use of mirrors, photographs, and children's work accompanied by transcriptions. Other supportive elements of the environment include ample space for supplies, frequently rearranged to draw attention to their aesthetic features. The Reggio Emilia environment informs and engages the viewer while always making an effort to create opportunities for children to interact.[4]



Figure 12.4.2: A childsize table with a low profile woven basket and small wooden objects within. Two life plans and a large window letting in natural light sit behind the table. ([5])

With this basic understanding of some of the ideas related to how Reggio Emilia regards learning environments, we can now start to consider important factors for creating learning environments in infant and toddler classrooms. Here are some factors, inspired by Reggio Emilia, to consider for the environments of infants and toddlers:[3]

- Create environments that have an open concept, allowing flow between rooms and amongst areas within a classroom. Windows, indoor plants and materials from nature create a feeling of flow between indoor and outdoor spaces.
- Photographs hung on walls should represent the children, their families and individuals of various cultures who are enrolled in the program and that make up the local community.
- Hang child-created artwork around the classroom ensuring they are placed on walls that are located at heights the children can easily visually engage with.
- Label shelves and containers to support early literacy and help make the process of finding and cleaning easier.
- Consider how the type of storage impacts invitation and ease of access. Storing and displaying materials in clear containers and open baskets visually invites children to play with them and provides easy access without challenging lids to open.



Figure 12.4.3: Play materials stored in open baskets on a low shelf. The bottom shelf contains various size wooden rings in a wooden basket. The upper woven basket contains clean wine corks. ([6]

In addition to the overall physical setting of the environment, it is important to consider how materials in the environment are arranged. Reggio Emilia philosophy suggests that children should be allowed to touch, move, listen, see, taste, discover, and explore the world around them in an enriching and supportive environment. Therefore, materials should be developmentally-appropriate, intriguing and easily accessible. Figure 12.4.3shows two collections of materials stored in baskets on a shelf. How does

the storage and arrangement of the materials both invite engagement and allow for ease of access? The materials are stored in open baskets so their contents are visible and easy to access. The baskets are open, without lids, inviting participation. Additionally, the baskets are placed on a low shelf at the height of children.[3]

[1] "Learning Environments" from Head Start ECLK is in the public domain.

[2] Image by Todd LaMarr is licensed under CC by 4.0

[3] Aljabreen (2020). Montessori, Waldorf, and Reggio Emilia: A comparative analysis of alternative models of early childhood education. *International Journal of Early Childhood*, *52*(3), 337-353.

[4] Reggio Emilia approach from Wikipedia is licensed under CC by SA 3.0

[5] Reggio Inspired toddler classroom by Todd LaMarr is licensed under CC by 4.0

[6] Play Materials by Todd LaMarr is licensed under CC by 4.0

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12.5: Materials that Support Cognitive Development

Materials and Cognitive Development

Jean Piaget's theory of cognitive development proposed a pivotal connection between experiences and cognitive development during the sensorimotor stage of infancy and toddlerhood. The sensorimotor period begins at birth and continues through the child's first two years. During this stage, infants and toddlers experience the world through sensation (sensory) and movement (motor). Materials can stimulate both sensory and motor experiences and therefore are an important way to support the cognitive development of infants and toddlers. [1]

To encourage exploration, the selection of materials provided to infants and toddlers should be age-appropriate and based on what caregivers observe them to be interested in. As infants age, their strategies for exploring materials changes. For example, mouthing is a predominant form of exploration at 6 months of age but is exchanged for more refined forms of manual exploration later in infancy (Kaur, Srinivasan & Bhat, 2015). Another example can be seen in the developmental changes in grasping ability. Infants improve their grasping abilities between 6 and 15 months of age (Butterworth, Verweij & Hopkins, 1997). Similarly, 12 to 14 month old infants show appropriate, anticipatory changes in grasp formation based on object shape and size compared to 5 to 6 month old infants (Barrett et al., 2008; Fagard, 2000). Infants with more advanced motor abilities (i.e., those who could crawl, stand, or walk) are more interested in objects with handles (Nelson & Oakes, 2021). Based on this research, caregivers should observe the developmental changes of infants and toddlers, such as exploration and grasping strategies, and provide materials that continue to challenge, intrigue and support their age-appropriate developing abilities. For example, consider the collection of play materials in Figure **12.5.1**. How might the different developing grasping abilities of infants and toddlers influence how they are able to hold, manipulate and explore the various materials? [1]



Figure **12.5.1**: Various play materials including Various play materials which include wooden cars, small rings and balls, plastic people and golf ball size wiffle balls. ([3]

Along with age-appropriateness, exploratory behaviors are also influenced by material properties including size, shape, texture, and weight of objects (Barrett et al., 2008; Bourgeois et al., 2005; Corbetta & Snapp-Childs, 2009; Libertus et al., 2013; Newell et al., 1989, 1993; van Hof et al., 2002). For example, infants showed greater grasping of smaller objects whereas they looked more at larger objects (Rochat, 1989). In addition, 9 to 12 month old infants explored object properties such as shape, size, and texture by rotating, fingering, and transferring objects, whereas they explored properties such as weight, sound, and rigidity by banging and shaking objects (Ruff, 1984). Infants' grasping patterns depended on object size and structure as smaller objects were grasped with one hand and larger objects were grasped with two hands (Kaur, Srinivasan & Bhat, 2015). Similarly, infants squeezed non-rigid objects more compared to rigid objects (Barrett et al., 2008; Newell et al., 1989, 1993). This research suggests that caregivers should constantly be observing the developing abilities of infants and toddlers and providing age-appropriate materials based on these close observations. [2]

Loose Parts

Loose parts refers to materials that are open-ended and manipulable (Nicholson, 1971). Loose parts are moveable, non-dictated materials that children can use in a variety of ways (Daly & Beloglovsky, 2015; Maxwell, Mitchell, & Evans, 2008). Loose parts

are often considered in contrast to pre-designed toys, like most toys sold at stores. For example, a toy airplane, if provided to a child, will probably be used in a limited number of ways, limited to what the toy is, an airplane. In contrast, materials such as leaves and popsicle sticks affords creative engagement with unlimited ways to interact with the materials. Figure **12.5.2** is a picture of a loose parts table with various objects from nature: small pumpkins, leaves, slices of trunk from a small tree, sticks, etc., and tools like tweezers and magnifying glasses, to support further exploration. Take a moment to look over the objects and tools in Figure **12.5.2**, then consider these questions:[4]

- What do you imagine toddlers doing while at the table?
- How many different ways of using the materials can you imagine for toddlers?
- How do the carefully selected tools (twissors, magnify glasses) further support exploration than would probably happen if the tools were not present?
- What other tools could be added?
- What cognitive concepts are toddlers experiencing as they engage with the materials?



Figure **12.5.2**: Materials from nature. ([5])

When children have exposure to intriguing loose parts, they become curious. Children's curiosity is triggered when they see and experience new things and have unique experiences that may not be otherwise possible in the indoor environment. This sense of curiosity is how children become inspired to engage in new explorations and discoveries (Perry, 2004). Loose parts give children the freedom to develop their play experiences based on their personal ideas and goals, rather than the play being predetermined by the materials or surroundings (Änggård, 2011). This means that the materials do not dictate the type of play children engage in. Children create play episodes based on their past experiences, curiosity, creativity, and new ideas.[4]



Figure **12.5.3**: Collections of loose parts. Baskets each full of small wooden objects, old fashion hair rollers, toilet paper rolls, small wooden disks, popsicle sticks, canning jar lids, green bottle caps. ([6])

[1] Scott & Cogburn (2021). Piaget. *StatPearls Publishing*. CC by 4.0

[2] Kaur et al., (2015). Atypical object exploration in infants at-risk for autism during the first year of life. *Frontiers in Psychology, 6*, 798. CC by 4.0

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[4] Flannigan & Dietze (2017). Children, outdoor play, and loose parts. *Journal of Childhood Studies*, 53-60. CC by NC 4.0

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12.6: Interactions that Support Cognitive Development

Cognitive Development and Interactions

While materials are indeed important for supporting cognitive development, the interactions we, as caregivers, have with infants and toddlers may be even more important. Toddlers who experience more language from caregivers have greater cognitive abilities later in childhood (Brown, Wang & McLeod, 2022; Marchman & Fernald, 2008). One study examined features of childcare quality for two year olds and their potential association to later cognitive abilities when the same children were four years of age (Côté et al., 2013). Childcare quality was measured using two dimensions. The 'Provision for Learning' dimension measured the availability, accessibility, and diversity of activities available for children. The 'Teaching and Interactions' dimension measured the quality of the interaction and engagement between caregivers and children. Overall, higher levels of quality childcare at age two was associated with stronger cognitive abilities at age four. Of the two dimensions, it was the dimension of 'Teaching and Interactions' that was associated with longitudinal cognitive performance, supporting the role of quality interactions for cognitive growth. Interestingly, the 'Provision of Learning' dimension did not significantly contribute to later cognitive development.



Figure **12.6.1**: Infants interacting with a caregiver. ([1])

These results are supported by numerous studies that also have found it is the quality of relationships and the interactions within these relationships during infancy and toddlerhood that are most significant for supporting cognitive development and long-term cognitive growth (Forget-Dubois et al., 2009; Fraley, Roisman, & Haltigan, 2013; Marchman & Fernarld, 2008; McCormick et al., 2020; Rodriguez & Tamis-LeMonda, 2011). In a longitudinal study, Tamis-LeMonda and colleagues (2019) found that the early learning environments of infants and toddlers predicted their later academic skills all the way out into fifth grade. Using the phrase "learning environment" can be slightly misleading as it may lead one to think only about the physical environment and objects/materials. While one dimension of it did focus on stimulating objects/materials, the other two dimensions focused on stimulating engagement and interactions (frequency of engaging children in literacy activities and sensitive and stimulating interactions). The research is clear: access to quality learning materials is important, but it is the quality of the interactions while using these materials that may be the most important.

What is the take away message for infant and toddler caregivers?

- Consider communication to be an integral part of the curriculum.
- If you plan an activity, do not just consider what the child will be doing, but also consider the critical role of the adult and their interactions during the activity.
- Enroll in or provide staff training that demonstrates how to improve interactions with infants and toddlers.
- Implement caregiving policies that support and encourage quality interactions, such as primary care, small groups, continuity of care, individualized care, culturally responsive care, and inclusive care.

[1] Image by ParentiPacek on Pixabay.

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12.7: Experiences that support Cognitive Development

Cognitive Development and Experiences

The overall value of high quality experiences infants and toddlers receive during childcare supports their cognitive development. High-quality, center-based childcare during the first three years of life shows benefits for children's cognitive, language, and social development at school entry and beyond, across a range of national contexts (Albers, Riksen-Walraven & de Weerth, 2010; Barnes & Melhuish, 2017; Burchinal et al., 2000; Camilli, Vargas, Ryan, & Barnett, 2010; Drange & Havnes, 2019; Eryigit-Madzwamuse & Barnes, 2014; Hansen & Hawkes, 2009; Melhuish et al., 2015; Melhuish & Gardiner, 2017; National Institute of Child Health and Human Development Early Child Care Research Network, 2000; Ruzek et al., 2014). These effects are particularly pronounced in children from disadvantaged backgrounds (Connell & Prinz, 2002; Felfe, Nollenberger, & Rodríguez-Planas, 2015; Geoffroy et al., 2007, 2010; Larose, Côté, Ouellet-Morin, Maughan, & Barker, 2020; Melhuish, 2004; Melhuish et al., 2015), meaning that investment in early childhood education and care is a powerful way of reducing socioeconomic inequalities (Bustamante et al., 2021; Center on the Developing Child, 2010; Heckman, 2006; Reynolds, 2021). [1]



Figure **12.7.1**: Toddler experimenting with water and buckets outside. ([2])

While the benefits of center-based childcare is well documented, the quality of care and education for infants and toddlers is not created equal as numerous studies have documented dramatically different differences in childcare quality (Kuchirko & Nayfeld, 2020; Kuchirko & Tamis-LeMonda, 2019). In a national study of Early Head Start center-based programs for infants and toddlers in the U.S., most classrooms were of midrange quality with higher scores in the area of emotional and behavioral support and lower scores in the area of engaged support for learning (Vogel et al., 2015). The National Institute of Child Health and Human Development (NICHD) Study of Early Child Care is one of the largest research projects on early childcare in the U.S. and has followed over 1,000 children longitudinally to measure the long term impact of experiencing high quality infant and toddler childcare. Children who received higher quality care as infants and toddlers scored higher on cognitive tests across the first three years and all the way through adolescence (Belsky, 2006; NICHD Early Child Care Research Network, 2001; Vandell et al., 2010). Importantly, caregiver language (asking questions, responding to child vocalizations, etc.,) was the strongest predictor of cognitive development. [3]

The research is clear: high quality infant and toddler care is important for supporting cognition, but what does high quality care look like? The overall quality of care and education for infants and toddlers is commonly separated into two components—structural quality and process quality (Beller et al. 1996; Howes & Rubenstein, 1983; Penn, 2011; Phillipsen et al., 1997). Structural quality refers to components such as the physical environment (buildings, space and materials), child–staff ratios, staff education and training, and curriculum (Barros et al., 2016; Slot et al., 2015; OECD, 2006). On the other hand, process quality focuses on the nature of interactions between the children and caregivers, among children, and among adults—teachers, parents, staff, and on the nature of leadership and pedagogy (Barros et al., 2016; Cryer 1999; Goelman et al. 2006; Slot, 2017; Thomason & La Paro, 2009; Vandell and Wolfe 2000). Structural quality is easier to measure although process quality may be more strongly related to greater developmental outcomes. [4]



Figure **12.7.2**: Caregiver with older infant sitting in lap. ([5])

There are various tools that can be used to measure structural and process qualities. One commonly used tool is the Infant-Toddler Environmental Rating Scale Revised Edition (ITERS-R; Harms et al. 2006), used to measure the overall quality of classrooms serving children from birth through 30 months of age. The ITERS-R includes 39 items, organized under 7 subscales: Space and Furnishings (5 items); Personal Care Routines for infants and toddlers (6 items); Listening and Talking (3 items); Age Appropriate Activities (10 items); Adult–Child Interaction (4 items); Program Structure (4 items); and Parent and Staff Communication (7 items). [4]

ITERS-R Items and Subscales. [4]

Space and Furnishings

- Indoor space
- Furniture for routine care and play
- Provision for relaxation and comfort
- Room arrangement
- Display for children

Personal Care Routines

- Greeting/departing
- Meals/snacks
- Nap
- Diapering/toileting
- Health practices
- Safety practices

Listening and Talking

- Helping children understand language
- Helping children use language
- Using books

Age Appropriate Activities

- Fine motor
- Active physical play
- Art
- Music and movement

- Blocks
- Dramatic play
- Nature/science
- Promoting acceptance of diversity

Adult–Child Interaction

- Supervision of play and learning
- Peer interaction
- Staff–child interaction
- Discipline

Program Structure

- Schedule
- Free play
- Group play activities

Parent and Staff Communication

- Provisions for parents
- Provisions for personal needs of staff
- Provisions for professional needs of staff
- Staff interaction and cooperation
- Staff continuity
- Supervision and evaluation of staff
- Opportunities for professional growth

Using the ITERS, scores of overall quality range from ‘inadequate’ (score of 1) to ‘excellent’ (score of 7), with a ‘minimum’ (score of 3) and ‘good’ (score of 5) in between. Studies that have used the ITERS to assess quality have found low scores in general. Research in the U.S. has found quality scores of infant and toddler programs to be in the low to medium range (La Paro, Williamson & Hatfield, 2014; Tietze & Cryer, 2004). For example, one study examined the quality of 93 toddler programs across the state of North Carolina and found that 83% of the programs were in the mid-range, with scores between 3 to 5 (La Paro, Williamson & Hatfield, 2014). While childcare centers in the U.S. score higher in overall average quality compared to most other countries, there is more variance in the quality of U.S. programs compared to other countries (Vermeer et al., 2016). Higher than average quality scores have also been found in Australia (Fenech, Sweller & Harrison, 2010).

ITERS scores from around the world are low. Results from studies in the Netherlands found an overall quality score on the ITERS to be at the minimal level, with an average score of 3, and showing a downward trend in quality over time (Helmerhorst et al., 2015; Vermeer et al., 2008). Seventy-five childcare centers in Eastern and Western Germany had an average ITERS score of 3.2 (Tietze & Cryer, 2004). Three studies in Portugal reported poor-quality care and education with scores all under 3 (Barros & Aguiar, 2010; Pessanha et al., 2007; Pinto et al., 2013). Results from a study of 93 centers in Norway found a minimal average quality of 3.9 (Bjørnestad & Os, 2018). In Greece, infant and toddler programs ranged between 2.60 to 5.40 using ITERS (Megalonidou, 2020). In England, 75 childcare centers were assessed and found to have a mean score of 4.2 (Smith et al. 2009). Chile reported an ITERS score between 3 to 4, with public childcare centers (3.08) scoring lower than private centers (3.57) (Cárcamo et al., 2014). Across seventy-nine infant and toddler classrooms from Jinan, in the Shandong province in eastern China, the overall mean score was 3.50 (Hu et al., 2019). Overall quality was low in Ecuador with an average score of 2.08 (Lopez Boo, Dormal & Weber, 2019). [4]



Figure **12.7.3**: Toddler experimenting with bubbles. ([6])

What is the take away message for infant and toddler caregivers?

- Quality of learning experiences during the first three years is related to later cognitive abilities.
- Infants and toddlers who attend center-based programs of higher quality have higher cognitive scores later in childhood and adolescence.
- The overall quality of care and education infants and toddlers experience can vary widely.
- While programs in the U.S. tend to receive average quality scores in the midrange and above, U.S. programs have been found to vary greatly in quality.
- While a handful of countries receive quality scores in the midrange and above, many more countries consistently receive scores of low quality, emphasizing the importance of education and training for infant and toddler caregivers and staff.
- Caregivers can use measures of program quality, such as the ITERS-R, to assess the quality of their programs, identify areas of lower performance and strive to improve.
- As process quality may be more strongly related to cognitive development than structural quality, caregivers can seek to actively improve their abilities and strategies for engaging with infants and toddlers, especially in terms of language exposure.

Another tool that can be used to measure the quality of interactions between caregivers and children is the The Classroom Assessment Scoring System (CLASS). The CLASS defines teaching quality through the lens of interactions. It provides the ability to measure and improve the interactions that matter most for student outcomes. Implementing a tool like the CLASS can provide data which can be used to provide professional development and improve overall quality.

[1] Davies et al., (2021). Early childhood education and care (ECEC) during COVID-19 boosts growth in language and executive function. *Infant and Child Development, e2241*. CC by 4.0

[2] Image from igrow on Pixabay.

[3] Vogel et al., (2015). Toddlers in Early Head Start: A portrait of 2-year-lds, their families, and the programs serving them. Vol 1: Age 2 report. OPRE report 2015-10. *Administration for Children & Families*. In the public domain.

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12.8: Conclusion

Conclusion of Supporting Cognitive Development in Group Care

Infants and toddlers are active meaning makers, eager to engage with the physical and social world around them. Experiences that are age appropriate and stimulating optimally support their developing cognitive abilities. Caregivers can play a pivotal role in supporting cognitive development by creating quality experiences with materials and through their interactions. This chapter discussed how caregivers can create environments and interactions and use learning materials to create overall high quality experiences for infants and toddlers.

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CHAPTER OVERVIEW

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13.1: Introduction

Introduction to Language Development

There is something truly special about language development. Beyond the amazing feat that infants and toddlers acquire complex language systems rapidly and with relative ease, language changes a child's interactions with the people around them and how they think about their physical surroundings. Language affords the ability for adults and children to share inner thoughts and feelings and discuss past, present, and future events. With language, children transform their thinking about the world around them with new ways to label, organize, categorize and memorize. Furthermore, early language ability in toddlerhood is important not only for later language ability but also for cognitive development in later childhood. This section will provide an overview of communication and language development during the first three years, considering acquisition patterns and the importance of individual differences.

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13.2: Communication and Language Milestones in Infancy and Toddlerhood

Milestones

Milestones represent what most children can do by specific ages; however, it is important to remember that children do not achieve these milestones at the same exact ages—milestones only represent the average age at which they are achieved. If a child has not achieved specific milestones by a specific age, it does not necessarily suggest a delay or disability; however, there are specific ages where if certain milestones are not achieved, caregivers should encourage the child's parents to communicate with their family pediatrician. Here is a table of common communication and language milestones for infants and toddlers.

What most children can do by age[1]

Age	What Most Children Can Do By Each Age
2 months	• Coo and make gurgling sounds • Turn their head toward sounds
4 months	• Begin to babble • Babble with expression and copy sounds they hear • Cry in different ways to show hunger, pain, or being tired
6 months	• Respond to sounds by making sounds • String vowels together when babbling ("ah," "eh," "oh") and like taking turns with a caregiver while making sounds • Respond to their own name • Make sounds to show joy and displeasure • Begin to say consonant sounds (jabbering with "m," "b")
9 months	• Understand the meaning of "no" • Make a lot of different sounds like "mamamama" and "bababababa" • Copy the sounds and gestures of others • Use their fingers to point at things
12 months	• Respond to simple spoken requests • Use simple gestures, like shaking their head "no" or waving "bye-bye" • Make sounds with changes in tone (sounds more like speech) • Say "mama" and "dada" and exclamations like "uh-oh!" • Try to say words caregivers say
18 months	• Say several single words • Say "no" and shake their head "no" • Point to show someone what they want
24 months	• Point to things or pictures when they are named • Know names of familiar people and body parts • Say sentences with 2 to 4 words • Follow simple instructions • Repeat words overheard in conversation • Point to things in a book
36 months	• Follow instructions with 2 or 3 steps • Can name most familiar things • Understand words like "in," "on," and "under" • Say their first name, age, and sex • Name a friend • Say words like "I," "me," "we," and "you" and some plurals (cars, dogs, cats) • Talk well enough for strangers to understand them most of the time • Carry on a conversation using 2 to 3 sentences

Communication & Language Concerns

The above chart represents averages of when infants and toddlers achieve various communication and language milestones. What about children who do not achieve these milestones by the ages listed? While children can indeed develop different abilities at different times, too great a delay in acquiring specific milestones can be a concern. The chart below is from the Center for Disease Control and Prevention (CDC). The chart adopts a proactive stance—we should take action early when developmental concerns arise rather than the perspective of waiting to see if a child "catches up". Again, while children do develop at their own pace, being proactive during these critical early years is essential as early recognition of delays and disabilities can lead to early intervention with the potential for greater positive outcomes (Caselli, Pyers & Lieberman, 2021; Fuller et al., 2020; Roberts & Kaiser, 2015). Caregivers should encourage parents to communicate with their family's pediatrician if children are not achieving milestones by the ages listed below. Most caregivers are not professionally trained to officially assess the developmental abilities of children; however, caregivers have the ability to track developmental progress and are often the first to notice developmental concerns.

Language Development Concerns[1]

Age	Encourage parents to communicate with their family's pediatrician if:
By 4 months	• Child doesn't coo or make sounds • Child doesn't smile at people
By 6 months	• Child doesn't make vowel sounds ("ah", "eh", "oh") • Child doesn't respond to sounds around him • Child doesn't laugh or make squealing sounds
By 9 months	• Child doesn't babble ("mama", "baba", "dada") • Child doesn't play any games involving back-and-forth play • Child doesn't respond to their own name • Child doesn't seem to recognize familiar people • Child doesn't look where you point
By 12 months	• Child doesn't say single words like "mama" or "dada" • Child doesn't learn gestures like waving or shaking head • Child doesn't point to things
By 18 months	• Child doesn't copy others • Child doesn't gain new words • Child doesn't have at least 6 words
By 24 months	• Child doesn't use 2-word phrases (for example, "drink milk") • Child doesn't copy actions and words • Child doesn't follow simple instructions
By 36 months	• Child drools or has very unclear speech • Child can't work simple toys (such as peg boards, simple puzzles, turning handle) • Child doesn't speak in sentences • Child doesn't understand simple instructions • Child doesn't play pretend or make-believe • Child doesn't want to play with other children or with toys • Child doesn't make eye contact

[1] CDC's Developmental Milestones by the Centers for Disease Control and Prevention is in the public domain.

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13.3: Early Communication with Eye Gaze

The Importance of Eye Gaze

Infants and toddlers learn language best through face-to-face interactions with their caregivers in social contexts, and face-to-face communication is inherently multimodal as it uses more than just speech to communicate (e.g., gestures, facial expressions, eye gaze, etc.,). Eye gaze is, in fact, a central element in human communication. Not only do adults often use social eye gaze when communicating with infants, but infants also show a sensitivity to, and preference for, eye gaze signals early on (Simpson et al., 2020). Newborns look longer at faces with open eyes than faces with closed eyes (Batki et al., 2000). They also prefer faces with direct gaze with which they can engage in mutual eye contact (Farroni, Johnson & Csibra, 2004). Infants begin developing gaze-following abilities between 2 to 4 months, which become fairly stable by 6 to 8 months (D'Entremont et al., 1997; Gredeback et al., 2010). Following gaze cues becomes almost automatic, with adult's gaze direction causing fast visual attention shifts even in infants as young as 3 months of age (Hood et al., 1998).



Figure **13.3.1**: Demonstration of Eye Gaze. ([1])

There is a strong association between infants' ability to follow an adult's gaze direction, and their later receptive and expressive vocabulary (Çetinçelik, Rowland & Snijders, 2020). Eye gaze, both in the form of eye contact and gaze following, may direct and help infants in sustaining their attention and thus learn about relevant information in the environment. For example, when an infant follows an adult's gaze to the sky toward an airplane overhead, the sounds produced by the airplane and the language the adult uses while communicating in the moment about the airplane can be more easily linked to the airplane itself. The use of eye gaze cues support infants' learning by highlighting the important information in the environment and channeling their attention to it. [1]

[1] Image by Zach Vessels on Unsplash

[2] Çetinçelik et al., (2020). Do the eyes have it? A systematic review on the role of eye gaze in infant language development. *Frontiers in Psychology, 11*. CC by 4.0

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13.4: Stages of Language Acquisition

Language Acquisition

Children will typically go through the four stages of language acquisition.

1. Pre-language stage (3 to 10 months) where a child makes a lot of ‘cooing’ and ‘babbling’;
2. The holophrastic stage (12 to 18 months) where a child starts to comprehend a single unit of utterance like ‘milk’, ‘eat’, ‘dad’, ‘brother’;
3. Two-word stage (18 to 20 months) where a child, through a process of acquiring two nouns or a noun and a verb (noun + verb), begins pairing two words together such as ‘baby chair’, ‘mommy eat’, ‘cat bad’;
4. Telegraphic speech-stage (before 3 years old) defines a stage where a child puts some words together, even if the words are in the incorrect order. It has a similar meaning as a sentence, such as ‘cookie I want’, ‘toy me fall’, but is not a complete sentence. [1]

[1] Fitria & Musthafa (2019). Conversational Interaction to Develop the Two-Word Stage of A Child’s Second Language Acquisition. In *Eleventh Conference on Applied Linguistics*. Atlantis Press. CC by NC 4.0 https://www.atlantis-press.com/proceedings/conaplin-18/125911514

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13.5: Infant Vocal Development

Vocal Development

The quality of infants' vocalizations progresses markedly during the first year of life. From birth, infants produce reflexive vocalizations, such as cries, fusses, and vegetative noises (e.g., coughs, burps, sneezes), as well as prespeech (a.k.a. "protophone") vocalizations (Buder, Warlaumont & Oller, 2013; Oller et al., 2009). Protophones are speech-like sounds including both canonical babbling (consisting of canonical syllables such as 'ba' or 'da' and sequences, 'baba' or 'dada' and so on) and non-canonical babbling (e.g. squeals, growls and vowel-like sounds). Infants produce approximately 3,500 protophone vocalizations every day (Oller et al., 2019). Infants begin cooing around two months of age. By three months of age, infants typically demonstrate an expanded range of vocal types, such as raspberries, squeals, growls, full vowels, yells, and whispers (Buder, Warlaumont & Oller, 2013; Oller, 2000). Between four to six months of age, infants begin to produce single syllable babbling sounds (e.g., da, ba) and then combine these syllable sounds (e.g., dadada, bababa) between six-eight months of age.[1] [2]



Figure **13.5.1**: Example of vocalization. ([3])

Babbling represents the specific sounds used in the language a child is exposed to. At around 7 months infants typically begin to demonstrate canonical babbling, which contains both consonants and vowels with swift transitions between them. Canonical babbling is considered speech-like and is a foundation for the first words that infants begin producing around the first birthday (Oller, 2000; Stoel-Gammon & Cooper, 1984). Cross-linguistic research shows that monolingual infants between 8 to 12 months of age begin to produce the characteristic intonation (Whalen, Levitt & Wang, 1991), syllable, and word-forms (Levitt & Utman, 1992; Levitt & Wang, 1991; Lleó, Prinz, El Mogharbel & Maldonado, 1996) of the specific language to which they are exposed, whether that be Spanish, Russian, Tagalog, a signed language or Arabic (Petitto & Marentette, 1991; Sundara, Ward, Conboy & Kuhl, 2020). Interestingly, frequency of early infant vocalizations is related to expressive language at twelve months of age (Lyakso, Frolova & Grigorev, 2014; Werwach, Mürbe, Schaadt & Männel, 2021).[1] [4]

While infants' early vocalizations are important, it is the specific combination of infant vocalizations followed up by a caregiver response that is the strongest predictor of language growth (Donnellan et al., 2020). When caregivers respond to infants' vocalization it creates a meaningful dyadic interaction that extends language learning. When caregivers do respond to the speech-like vocalizations from infants, infants are more likely to produce another speech-like vocalization, creating a language-rich interactional loop (Warlaumont, Richards, Gilkerson & Oller, 2014) that is positively related to later vocabulary development (Lopez, Walle, Pretzer & Warlaumont, 2020).

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[1] Lopez et al., (2020). Adult responses to infant prelinguistic vocalizations are associated with infant vocabulary: A home observation study. *PloS One, 15*(11), e0242232.

[2] Oller, et al., (2021). Protophones, the precursors to speech, dominate the human infant vocal landscape. *Philosophical Transactions of the Royal Society B, 376*(1836), 20200255. CC by 4.0

[3] Image by Jonathan Borba on Unsplash.

[4] Sundara et al., (2020). Exposure to a second language in infancy alters speech production. *Bilingualism: Language and Cognition*, *23*(5), 978-991. CC by 4.0

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13.6: Gesture Development

Gesturing

Infants and toddlers use a variety of gestures to communicate. Gestures involve movements of the body, particularly the fingers, hands, and head, that are interpreted as a form of intentional communication (Iverson & Thal, 1998). Children most commonly produce two main types of gestures—deictic and representational (Iverson & Thal, 1998). Deictic gestures, such as pointing, establish reference to indicate or call attention to something and can be used to indicate a wide range of meanings in the immediate environment (Bates, Camaioni, & Volterra, 1975). Infants start to use pointing gestures within the second half of their first year of life and usually before they begin talking. Infants may first use so called whole-hand points, in which the arm and the hand are extended toward a referent, followed by index-finger points, in which the arm and the index finger are clearly extended toward a referent (Lock et al., 1990; Liszkowski & Tomasello, 2011; Lüke et al., 2017). [1] [2]

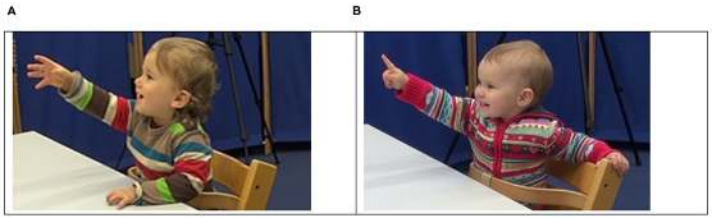


Figure **13.6.1**: examples of whole hand pointing and index-finger pointing ([3])

The second main type of gestures, representational gestures, identify a referent and carry fixed semantic meaning. Representational gestures may include (a) culturally defined conventional gestures (e.g., shaking head for ‘‘no,’’ waving for ‘‘bye’’), (b) iconic gestures (e.g., moving arms in the air to represent an airplane flying), or (c) baby signs, which involve hand movements deliberately taught by an adult (e.g., bringing the hands together and tapping the fingertips to indicate ‘‘more’’). Gestures provide infants and toddlers a way to refer to objects and events as they are developing spoken language, and provide caregivers an opportunity to contingently respond to and translate the child’s gesture into words (Dimitrova et al., 2016). These bidirectional influences between caregivers and children help scaffold the development of communication and language (LeBarton & Iverson, 2017). [1]

Although gestures can be a form of preverbal communication, the use of gestures continues to grow throughout toddlerhood, even with the onset and development of children’s expressive language. Figure **13.6.2**shows the number of gestures produced by a large group of Hebrew-speaking toddlers. At each month during the second year of life, some toddlers produce very few gestures, while others produce a lot. For example, at nineteen months of age, the median is around forty gestures produced. The median is a midpoint, separating the top higher scores from the bottom lower scores. Therefore, this graph shows the large differences in the number of gestures toddlers produce, as some produced only around 30 gestures at nineteen months while others produced nearly twice as many.[4]

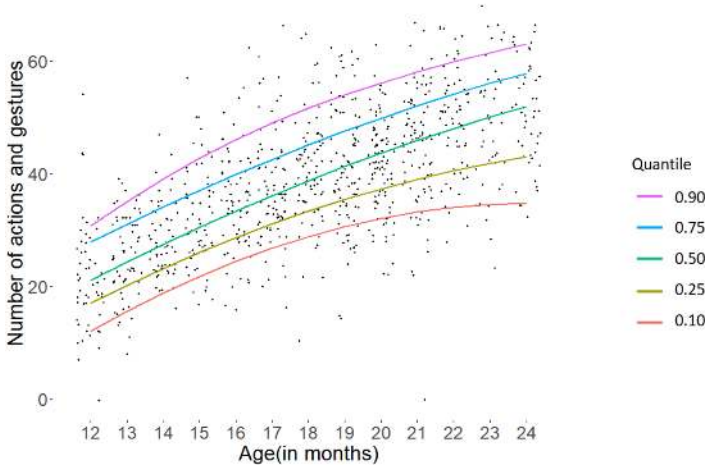


Figure **13.6.2**: Number of gestures produced from a sample of 881 native Hebrew-speaking children in the second year of life. The results show that as age increased, the gap grew between toddlers ranked at the lowest and highest quantiles in terms of the number of words produced by each group. The gap between the number of words produced by toddlers in the 0.10 and the 0.90 quantiles at 12 months was 24 words, while the gap between the number of words produced by toddlers in the same quantiles at 24 months was 279 words ([4])

Gesture and Its Relation to Language Acquisition.

Early infant gestures are more than simple motor accomplishments—rather gestures are indicative of a dynamic, social process involving gradual transitions in the way in which infants engage with their physical environment and the people within it. Decades of research have revealed a robust correlation between gesture use and the later development of receptive language (Rowe & Goldin-Meadow, 2009; Rowe, Ozcaliskan, & Goldin-Meadow, 2008; Watt, Wetherby, & Shumway, 2006) and expressive language (Iverson & GoldinMeadow, 2005; Rowe & Goldin-Meadow, 2009). Brooks and Meltzoff (2008) offer a potential explanation for the predictive power of early gestures for later language outcomes. They argue that pointing has a bidirectional function; it aids infants by providing them with a communicative tool, and it makes caregivers more likely to produce the labels that the toddler is pointing at, therefore fostering the infant's linguistic abilities. Furthermore, by gesturing, children can obtain and maintain attention of the adult, thereby establishing new language learning opportunities (Bates et al., 1979;Capone & McGregor, 2004). Pointing at the beginning of the second year is related to the beginning of word comprehension and production, and it plays a key role in coordinating attention to persons, objects, and events with other people and to labels associated with them (Sansavini et al., 2010; Tomasello et al., 2007). Thus, infants who point less frequently may have fewer opportunities to initiate and maintain joint attention with their caregivers and to associate labels with their referents in daily interactions. [5] [1] [6] [7]

Gesture and its Relation to Language Delay.

In addition to gesture being positively correlated with later language abilities, gesture is also indicative of children with developmental delays and disabilities. Reduced gesture use has been reported in toddlers with language delays early in development (Hsu & Iyer, 2016; Iverson et al., 2018; Lüke et al., 2017; Manwaring et al., 2019). Language delay can be identified between 18 and 36 months in young children with limited expressive vocabularies, equivalent to the 10th percentile or below compared to normative values, and who are free from cognitive, neurological, socio-emotional, or sensory disabilities (Rescorla, 2011). Research suggests a lower rate of pointing in toddlerhood may be an early marker of language delay (Lüke et al., 2017; Sansavini et al., 2019). Lower production of communicative gestures between 18 and 28 months of age also distinguishes truly delayed late talkers from "late bloomers" (their language development is initially delayed, but they eventually catch up), highlighting the predictive value of measures of gesture use for later expressive language skills (Thal & Tobias, 1992). Taken together, these findings underscore the relevance of gestures in the second year as a potential index of later language acquisition and delay. [1] [7]



Figure **13.6.3**: Toddler producing a gesture. ([8])

Gesture and its Relation to Autism Spectrum Disorder.

Autism spectrum disorder (ASD) is a developmental disability that can cause significant social, communication and behavioral challenges. Gesture deficits have been identified as one of the earliest social communication indicators of ASD (Iverson et al., 2018; Mitchell et al., 2006; Yirmiya & Charman, 2010). Young children with ASD may demonstrate particular difficulty with deictic gestures compared to typically developing toddlers (LeBarton & Iverson, 2016; Manwaring et al., 2018; Özçalişkan, Adamson, & Dimitrova, 2016). Studies of infants at increased genetic risk for ASD (due to having an older sibling diagnosed with ASD) indicate that reduced gesture use is present in infancy (Mitchell et al., 2006) and persists over time (Iverson et al., 2018) in infants later diagnosed with ASD. There is emerging evidence showing that social-communication skills in ASD do not differ significantly from typical development during the first year of life, with identical outcomes for typically-developing and high-risk infants who go on to receive an autism diagnosis (Rogers, 2009; Elsabbagh and Johnson, 2016). This trajectory, nevertheless, begins to diverge soon after, with a steady decline in the growth rates of both gesture and language production (Iverson et al., 2017) and a decline in social engagement in toddlers later diagnosed with ASD. [9] [1] [6]

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[1] Manwaring et al., (2019). The gesture–language association over time in toddlers with and without language delays. *Autism & Developmental Language Impairments, 4*, 2396941519845545. CC by 4.0

[2] Lüke et al., (2020). Integrated communication system: Gesture and language acquisition in typically developing children and children with LD and DLD. *Frontiers in Psychology, 11*, 118. CC by 4.0

[3] Image by Rohlfing et al., (2017). An interactive view on the development of deictic pointing in infancy. *Frontiers in Psychology, 8*, 1319. CC by 4.0

[4] Gendler-Shalev & Dromi (2021). The Hebrew Web Communicative Development Inventory (MB-CDI): Lexical Development Growth Curves. *Journal of Child Language*, 1-17. CC by 4.0

[5] Cameron-Faulkner et al., (2021). A cross-cultural analysis of early prelinguistic gesture development and Its relationship to language development. *Child Development, 92*(1), 273-290. CC by 4.0

[6] Ramos-Cabo et al., (2019). Gesture and language trajectories in early development: An overview from the autism spectrum disorder perspective. *Frontiers in Psychology, 10*, 1211. CC by 4.0

[7] Sansavini et al., (2019). Low rates of pointing in 18-month-olds at risk for autism spectrum disorder and extremely preterm infants: a common index of language delay? *Frontiers in Psychology, 10*, 2131. CC by 4.0

[8] Image by Humphrey Muleba on Unsplash

[9] "What is Autism Spectrum Disorder?" by the CDC is in the public domain.

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13.7: Statistical Learning

What is Statistical Learning?

Before infants can successfully link appropriate sound sequences to their referents, they must determine the set of sounds within a speech stream that correspond to potential words. For example, infants must segment the auditory statement “that is such a cute doggie” into meaningful chunks to accurately link it to its referent (e.g., “doggie”). This ability to segment speech sounds into word-level units, termed “word segmentation,” is a critical part of the word learning process (Saffran & Kirkham, 2018). Successful word segmentation requires exposure to the patterns and probabilities of sound sequences, maintaining phonological working memory and the order of the sequence of phonemes within the stream of speech to track the transitional probability so that one can increasingly identify potential word boundaries. Infants, children, and adults are all skilled at statistical word segmentation, often referred to as “statistical learning skills” (Aslin & Newport, 2012; Aslin, 2014; Saffran & Kirkham, 2018). [1]

Statistical learning is the implicit ability to track regularities in linguistic or other input (e.g., visual or motor) and learn from the distributional information (Saffran, 2001; Lany & Saffran, 2013). The foundational statistical learning experiments in 8-month-old infants demonstrated that young infants could segment speech into potential word units using transitional probabilities or co-occurring probability information between syllables (Saffran, Aslin & Newport, 1996; Aslin, Saffran & Newport, 1998). Researchers have argued that the ability to learn from the patterns of language a child is exposed to plays an important role in language learning (Saffran, 2001, 2003). These studies suggest that during their first year, before children begin to produce words, they start learning the patterns of the language they hear, tracking the sound combinations that correspond to potential words. Furthermore, statistical word segmentation is one of the important aspects of word learning and vocabulary acquisition in toddlers. Eighteen-month-olds’ ability to use statistical information derived from fluent speech to identify words within the stream of speech and then to map the words to meaning predicts vocabulary size at 24-months and vocabulary growth from 18 to 24 months (Ellis, Borovsky, Elman & Evans, 2021). [1]

[1] Ellis et al., (2021). Toddlers’ ability to leverage statistical iInformation to support word learning. *Frontiers in Psychology, 12*, 641. CC by 4.0

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13.8: First Words

Word Development

Most infants produce their first word sometime around their first birthday, with over 75% doing so before twelve months of age (Schneider, Yurovsky & Frank, 2015). Despite tremendous individual variation in children's rate of development (Fenson et al., 2007), the first words that they utter are strikingly consistent (Schneider, Yurovsky, & Frank, 2015; Tardif et al., 2008): they tend to talk about important people in their life ("mom," "dad"), social routines ("hi," "uh-oh"), animals ("dog," "duck"), and foods ("milk," "banana"). Even as children learn from their own experiences and according to their own interests (Mayor & Plunkett, 2014; Nelson, 1973), their vocabulary grows rapidly, typically adding more nouns, but also verbs ("go") and other predicates ("hot") to their repertoires. Figure **13.8.1** shows when the proportion of children between 10 to 30 months of age, across various languages, begin producing the word "dog" and "jump" in their native language. The higher the dots on the chart, the higher the proportion of children, at that specific age, are producing the word. What similarities and differences across languages do you notice? Over just their first 3 years, children learn hundreds, even thousands of words (Fenson et al., 1994; Mayor & Plunkett, 2011). [1]

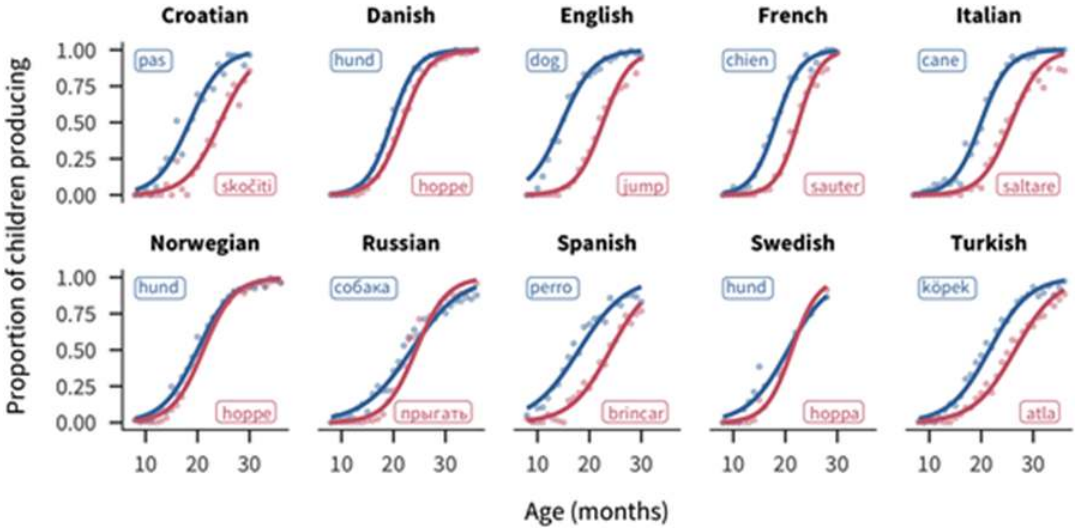


Figure **13.8.1**: Production trajectories for the words. (Copyright; author via source)

[1] Braginsky et al., (2019). Consistency and variability in children's word learning across languages. *Open Mind*, *3*, 52-67. CC by 4.0

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13.9: Charting language growth in infants and toddlers

Language Growth

Many times the growth of infant and toddler language development is only discussed with isolated stages and distinct milestones. The reality is that in between isolated stages and milestones, language is growing month by month (and even really day by day). In addition to presenting language milestones, it is important to acknowledge the month by month growth in comprehension and production in early language development. To illustrate what language growth looks like month by month over the first three years years, let's examine some data.

When we talk with infants and toddlers, they can understand a lot, despite not yet being able to say much in return. Figure **13.9.1** illustrates the month by month development of language comprehension in children from eight months to eighteen months of age. The 50th percentile lines indicate the median growth over time. The data shows a steep upward trajectory of growth. At 8 months of age, half of the infants did not understand more than 7 words. By twelve months of age the median number of words an infant understood was around 20; however, just a few months later (fifteen months) the number of comprehensible words doubled and by eighteen months of age was around 80 comprehensible words.

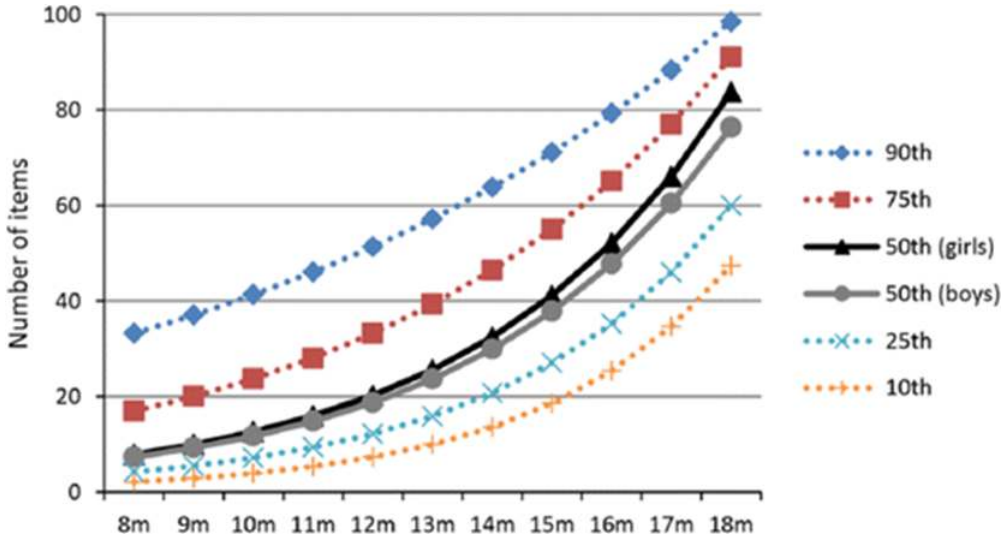


Figure **13.9.1**: Words understood as a function of age (months), gender and percentile level. All lines have a steep upward trajectory from 8m to 18m. 10th: 0 to 42, 25th: 8-60, 50th (girls) 9-81, 50th (boys) 9-79, 75th: 18-90, 90th 35-100 ([1]

Figure **13.9.2** illustrates the growth curves for the same children, but this time looking at language production rather than comprehension. Comparing Figure# and Figure# allows us to notice the growth differences between language comprehension and production. The data support the well-established pattern in language acquisition literature that children's receptive vocabulary far exceeds their expressive ability during infancy and toddlerhood.

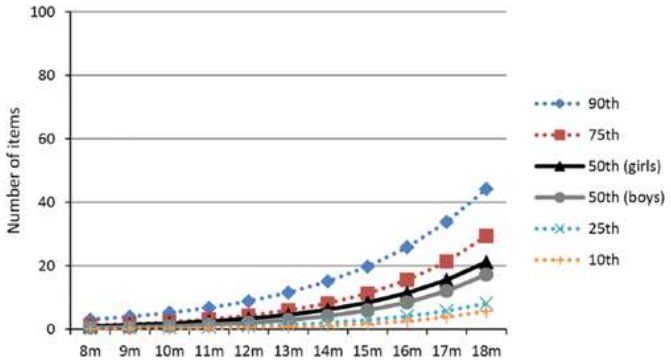


Figure **13.9.2**: Words produced as a function of age (months), gender, and percentile level. All lines start at 8m and end at 18m. 10th: remains close to 0 until around 15m ends at 8. 25th remains close to zero until 15m ends at 9. 50th (boys) begins climbing from zero at 14m ends at 20. 50th (girls) begins climbing at 14m, ends at 20. 75th: begins climbing at 14m ends at 14. 90th: begins climbing at 10m ends at 42. ([1]

Figure 13.9.2 shows the language production abilities of children through eighteen months of age, with expressive ability improving from 14 to 18 months. What does language production growth look like in toddlers after 18 months of age? Figure 13.9.3 presents the median growth trend for the language production of 4,867 native English-speaking toddlers between 16-30 months of age in the U.S. Each grey dot represents the expressive vocabulary level of one individual child. The height of a dot represents how many words a child produces at a given age—the higher the dot is on the chart, the more words a child produces. The blue line represents the median growth curve. Notice how steep the blue line is—this illustrates how quickly expressive language abilities grow in toddlers!

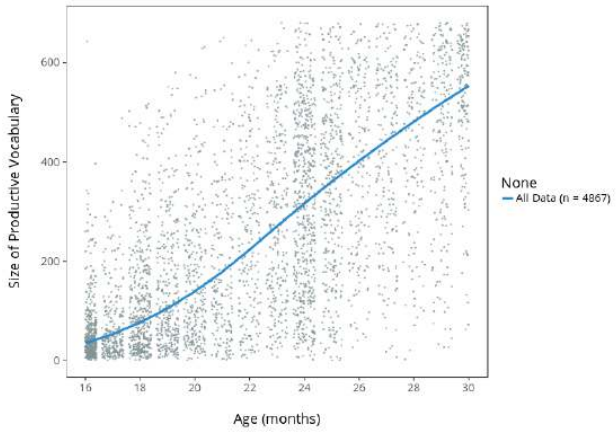


Figure 13.9.3: Productive vocabulary size by child's age. ([2])

Take a moment to analyze the data in Figure 13.9.3. What else do you notice about the data? Did you notice that the data for many children is far above the blue median line and the data for many others is located far beneath it? If so, you noticed the fact that there are early individual differences in language development. Figure 13.9.4 is the same data from Figure 13.9.3, but now five lines are present. These five lines divide the data into five different language growth trajectory curves. Notice how the top red line captures children who, at 16 months, have the highest vocabulary, the steepest growth curve in the chart and continue to have the highest vocabulary through 30 months of age. The opposite is true for the bottom purple line—these children have the lowest vocabulary at 16 months, the least steep growth curve and at 30 months, they continue to have the lowest vocabulary levels. From this chart we can see that early individual differences in language ability emerge in toddlerhood and the children with stronger language skills continue to have stronger language abilities later on. Although this chart only extends until 30 months of age, studies that have followed children longitudinally show that stronger language skills in toddlerhood is related to stronger language and cognitive abilities later in childhood (Gilkerson et al., 2018; Marchman & Fernald, 2008).

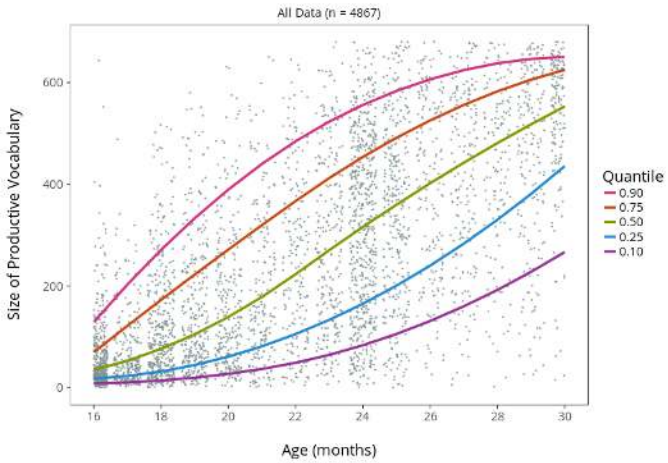


Figure 13.9.4: Growth curves for the number of words children produce. Table of scores found Wordbank | Analyses (stanford.edu) ([3])

[1] Image by Frota et al., (2016). Infant communicative development assessed with the European Portuguese MacArthur–Bates Communicative Development Inventories short forms. *First Language*, *36*(5), 525-545. CC by 3.0.

[2] Image by Wordbank is licensed under CC by 4.0

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13.10: Native Language Development in Non-English Languages

Development for Non-English Languages

If you work with infants and toddlers, you may have children who are learning more than one language. Infants may be exposed to one language, such as English, in a group care setting while also learning a different language natively with their family at home. You may wonder: do the comprehension and productive language growth patterns look similar or different across languages? In Figure **13.10.1**, the language growth patterns for American English (Fenson et al., 2000), Spanish (Jackson-Maldonado et al., 2013), Galician (Pérez-Pereira & Resches, 2007) and European Portuguese (Frota et al., 2016) are compared. The top graph shows language comprehension growth in children between the ages of 8 to 18 months and the bottom graph shows language production growth in children between the ages of 8 to 18 months. These findings indicate that overall early language development trends are similar across languages.

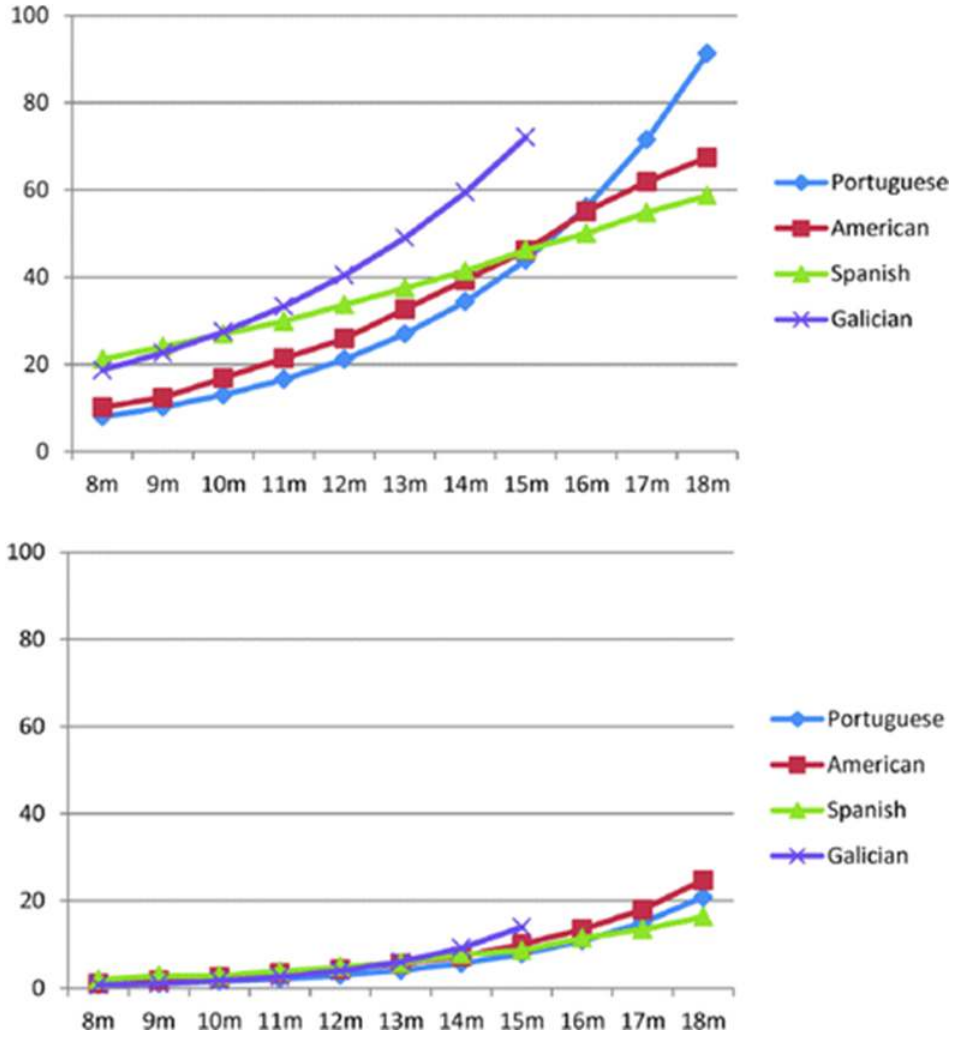


Figure **13.10.1**: Fitted vocabulary comprehension (top panel) and vocabulary production (bottom panel) scores by language (50th percentile).. ([1])

As language production is limited during the first year of life, examining production from 16 to 30 months reveals much more growth. Figure **13.10.2** presents the month-by-month vocabulary production scores for toddlers between the ages of 16 to 30 months across the same four languages.

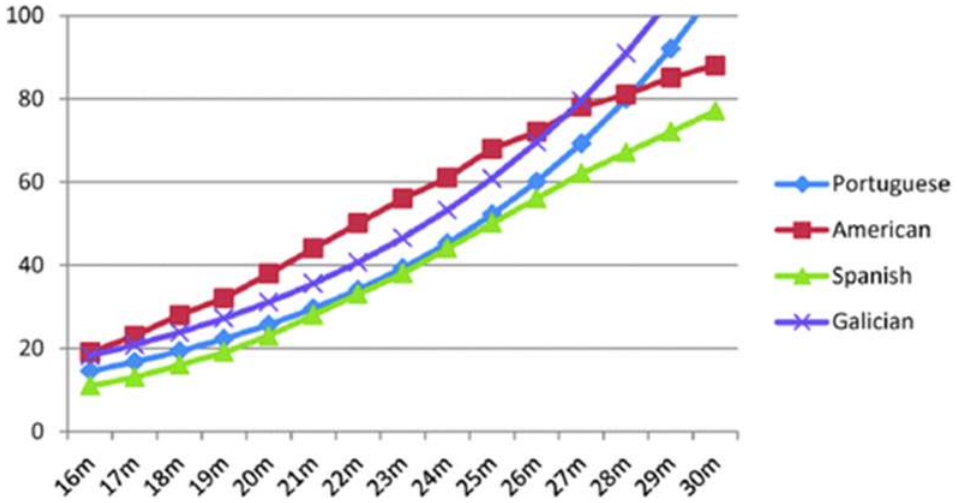


Figure **13.10.2**: Toddler form: Fitted vocabulary production scores by language (50th percentile). ([1])

A common finding in language development research is that a sex effect emerges—female and male infants and toddlers have different rates of growth (Bornstein et al., 2004; Eriksson et al., 2012; Simonsen et al., 2014). Figure **13.10.3** presents vocabulary production growth for fourteen different languages from children between the ages of 16 to 36 months of age. Across many languages there are early language differences by sex, often to the advantage of girls in the early months.

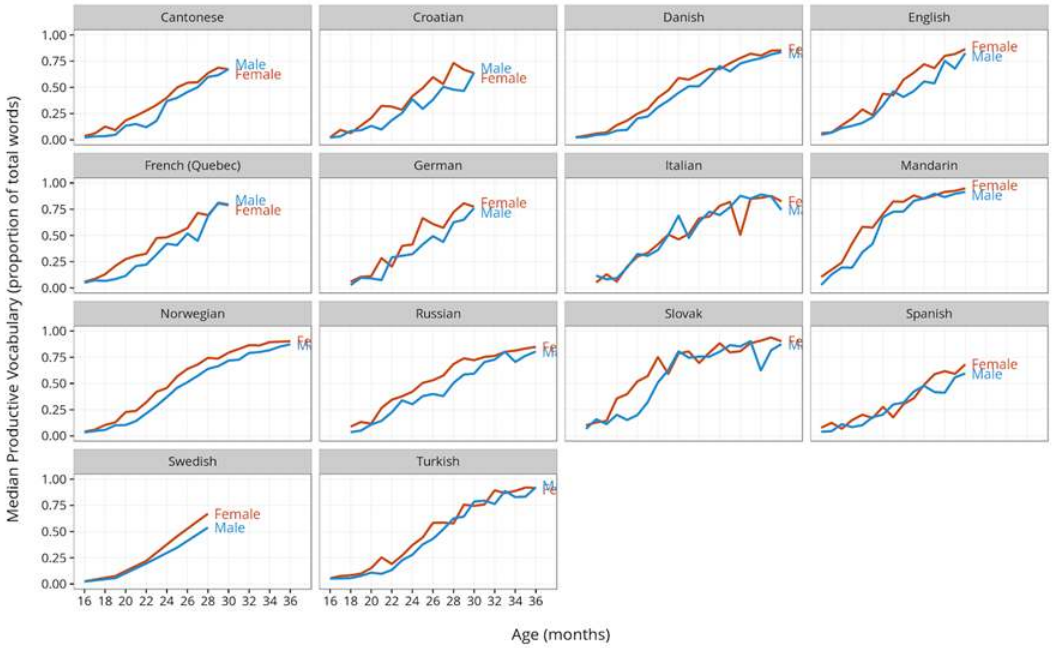


Figure **13.10.3**: Sex Differences in Vocabulary Development. Table of scores can be found Wordbank | Analyses (stanford.edu) ([2])

[1] Image by Frota et al., (2016). Infant communicative development assessed with the European Portuguese MacArthur–Bates Communicative Development Inventories short forms. *First Language*, *36*(5), 525-545. CC by 3.0.

[2] Image by Wordbank is licensed under CC by 4.0

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13.11: Development in Language Processing Efficiency

Language Processing

Throughout the second year of life, toddlers are rapidly developing in their ability to understand and produce language. The speed at which children are able to process language while comprehending it, is a critical aspect of language growth during toddlerhood. An experiment called the looking-while-listening (LWL) task has been used to measure language processing efficiency in children. Typically, in LWL tasks, children see a pair of images on a screen (e.g., a ball on the left side of the screen and a shoe on the right) while simultaneously listening to speech that refers to one of these images (e.g., "Where's the ball?"). Children look towards the objects being named as their eye movements are monitored and are then coded offline to measure the speed with which children move their gaze to the correctly named pictures.[1]

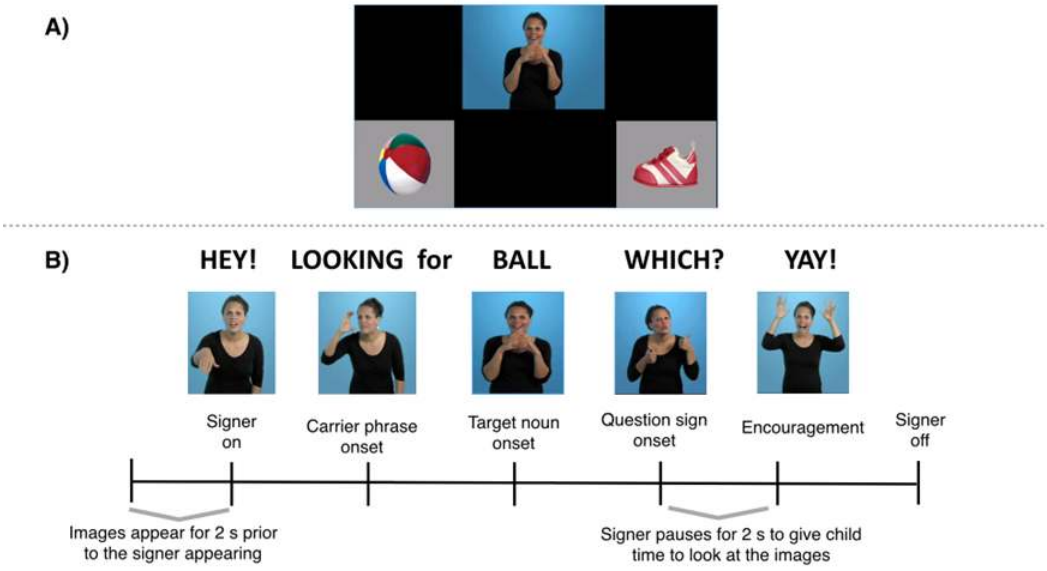


Figure **13.11.1**: Configuration of a version of the looking-while-listening task adapted for children learning American Sign Language (ASL): A) shows the stimuli presented to the children and B) shows the configuration of the sentences. ([2])

The large body of research using this task has revealed important discoveries:

1. **Maturational improvement**. Language development involves more than the ability to understand or express single words—children need to be able to efficiently process streams of language in real-time. Over toddlerhood, children are consistently improving in their ability to rapidly and efficiently process language in real-time (Fernald, Perfors & Marchman, 2006; Fernald et al., 1998; MacDonald et al., 2018).
2. **Individual differences**. While all children improve in their language processing efficiency over time, there are important individual differences early on. Children who have larger expressive vocabularies and who are exposed to more child-directed language are more efficient at processing language in real-time (Hurtado, Marchman & Fernald, 2008; MacDonald et al., 2018; Marchman et al., 2017; Weisleder & Fernald, 2013). Already by eighteen months of age, children from higher SES backgrounds had larger vocabularies and faster response times in the LWL task and by twenty four months of age, there was a six month gap in language processing efficiency ability between children from low and high SES backgrounds (Fernald, Marchman & Weisleder, 2013). Late talking toddlers with more efficient language processing skills at eighteen months of age were more likely to "bloom", showing greater increases in language ability at thirty months of age (Fernald & Marchman, 2012).
3. **Links to later abilities**. Early language processing abilities are associated not just with language outcomes later in childhood, but also cognitive outcomes as well. Amongst preterm toddlers, those who were more efficient at processing language at eighteen months scored higher on language and IQ tests at fifty-four months of age (Marchman et al., 2018). In a group of children followed longitudinally, language processing at twenty-five months was associated with language and cognitive outcomes at eight years of age (Marchman & Fernald, 2008). One hypothesis for why more efficient language processing leads

to these outcomes is that faster processing of familiar words frees up cognitive resources that can then be dedicated to the learning of new words (Fernald & Marchman 2012). [3]

4. **Caregiver language input increases child language ability**. The quantity and quality of language exposure from caregivers is positively associated with toddlers' language growth. Toddlers who heard more child-directed language from caregivers at 18 to 19 months of age, had larger vocabularies and were more efficient at processing language when they were two years of age (Hurtado, Marchman & Fernald, 2008; Weisleder & Fernald, 2013). It is important to emphasize that it was child-directed language that was most significant, not language that was simply overheard. This research suggests that caregivers should engage in meaningful back-and-forth conversations with infants and toddlers as they increase the quantity and quality of language children are exposed to, especially child-directed language.

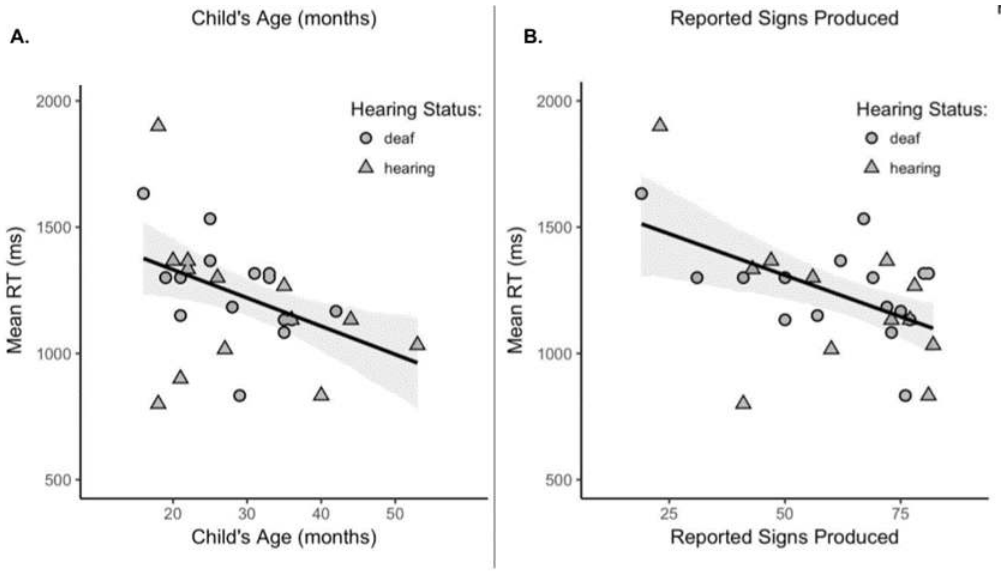


Figure **13.11.2**: Scatterplots showing relations between children's age (A.) and vocabulary production (B.) and measures of their mean response time on a LWL task adapted for children learning (ASL). Shapes represent children's hearing status (circle for Deaf native signers; triangles for hearing native signers). ([2])

[1] Peter, et al., (2019). Does speed of processing or vocabulary size predict later language growth in toddlers? *Cognitive Psychology, 115*, 101238. CC by 4.0

[2] Image by MacDonald et al., (2017). Real-time lexical comprehension in young children learning American Sign Language. *PsyArXiv*. CC by 4.0

[3] Peter, et al., (2019). Does speed of processing or vocabulary size predict later language growth in toddlers? *Cognitive Psychology, 115*, 101238. CC by 4.0

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13.12: Conclusion

Conclusion of Overview of Language Development

Before children can produce their first word, the process of acquiring a language is already well underway as infants use eye gaze, gestures and vocalizations to communicate. Research has identified acquisition patterns, which has helped in the creation of milestone charts. Milestones reveal the patterns of language development and help caregivers notice if a child's delay should lead to a conversation with a specialist. While there are general language patterns, there are also important individual differences throughout the acquisition process. Despite all we now know, observing children acquiring language is still an amazing experience to behold. Learning how to best support and encourage language development is critical as language experience during the first three years is a foundation for language and cognitive abilities later in childhood (Gilkerson et al., 2018).

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13.13: References

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CHAPTER OVERVIEW

14: Theories of Language Acquisition

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14.5: Interactionist/Social Theory
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14.1: Introduction

Introduction to Theories of Language Acquisition

If you have ever tried to learn a language as an adult, you know just how great of a challenge it is. Despite years of practice, enrollment in language classes, books, videos, and countless resources, etc., learning a language as an adult is difficult! Now imagine what learning a language must be like for an infant. Infants do not enroll in language classes, do not have access to various help resources, and do not have the wealth of previous knowledge you do as an adult. So how do infants acquire language? Language theories attempt to explain the 'how' behind language acquisition. This section presents some of the main theories that have been proposed to explain how infants and toddlers acquire language.

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14.2: Behaviorism

Behaviorism and Language Acquisition

You might recall the theory of behaviorism from an introductory child development or psychology course you have taken. Behaviorism is a perspective on learning that focuses on changes in individuals' observable behaviors— changes in what people say or do. In terms of language acquisition, behaviorism might make note of the developmental changes in early non-language communication (i.e., eye gaze, gesture, and vocalization) or the changes in language development as children accumulate increasing vocabularies and then begin combining words. These are all aspects of language development that can be observed.

To explain how these developments in language acquisition actually take place, behaviorists applied many of the same ideas that they used to understand how children learn in general. For example, behaviorists proposed that one way children learn is through operant conditioning. B.F. Skinner believed that behavior is motivated by the consequences we receive for the behavior: the reinforcements and punishments. Operant conditioning focuses on how the consequences of a behavior affect the behavior over time. It begins with the idea that certain consequences tend to make certain behaviors happen more frequently. For example, when an infant vocalizes through cooing or babbling, the result will likely be an adult who turns toward the infant with attention, makes eye contact and responds with engaged infant-directed language. Thus, as a reward for vocalizing, the infant receives adult attention and infant-directed language--a highly desired type of communication for infants! With a great gift like this, the infant is very likely to vocalize again in the hope to receive the same gift next time. Indeed, research has found that the more responsive caregivers are when interacting with infants and toddlers, the earlier they will achieve language milestones (Masek et al., 2021; Tamis-LeMonda, Bornstein & Baumwell, 2001). Through operant conditioning children also receive rewards for using language in a functional manner. For example, a behaviorist might suggest that children learn to say the word "drink" when they are thirsty because after doing so they receive something to drink, which reinforces their use of the word for getting a drink. [1] [2]



Figure **14.2.1**: Caregiver and infant engaged in an interaction. ([3])

[1] https://courses.lumenlearning.com/atd-hostos-childdevelopment/chapter/human-language-development/

[2] Behaviorism. Authored by: Nicole Arduini-Van Hoose. CC by NC SA courses.lumenlearning.com/edpsy/chapter/behaviorism/

[3] Image by Larry Crayton on Unsplash.

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14.3: Nativism

Nativism and Language Acquisition

Nativism suggests that infants are born with an innate ability to acquire language that is hardwired in human brains. The linguist Noam Chomsky, the most well-known nativist, argued that human brains contain a language acquisition device (LAD) that includes a universal grammar that underlies all human language (Chomsky, 1965, 1972). Chomsky proposed that children are born with knowledge of general grammatical rules so that with exposure, children are able to acquire language rapidly and with relative ease. The idea is that each of the many languages used around the world has the same underlying set of grammatical rules that are hardwired into human brains--a "universal grammar". Chomsky (1959) rebutted behaviorism's argument on several grounds. Chomsky argued that it was unlikely that parents were doing the slow and careful shaping of children's vocalizations that behaviorism proposed. According to Chomsky, language develops as long as the infant is exposed to it. No additional teaching, training, or reinforcement is required for language to develop. [1] [2]



Figure **14.3.1**: Noam Chomsky. ([3])

1. All human languages share certain properties.
2. Children are exposed to different inputs yet still converge on the same grammar.
3. Children know things about language which they could not have learned from the input available to them. This is the most famous, and most powerful, argument for universal grammar.
4. Humans are the only species that has language.
5. Children learn language quickly and effortlessly, on minimal exposure.
6. All children acquiring language go through the same stages in the same order.
7. Different brain circuits are responsible for representing/processing linguistic and non-linguistic information.

There is general agreement among experts that babies are genetically programmed to learn language. In fact, fetuses have already begun their language acquisition journey while they are still in the womb (DeCasper & Spence, 1986; Ghio, Cara & Tettamanti, 2021; Moon, Lagercrantz & Kuhl, 2013)! Additionally, children are born ready to acquire any language they are exposed to, even languages of an entirely different modality (spoken modality versus a signed modality), such as a American Sign Language (Krentz & Corina, 2008; Stone, Petitto & Bosworth, 2018). Neuroscience continues to document the innate brain mechanisms that support language acquisition in infants (Friederici, 2017; Friederici & Wartenburger, 2010; Kuhl, 2010; Perani, et al., 2011). Nevertheless, there is still debate about Chomsky's idea that there is a universal grammar that can account for all language learning. Evans and Levinson (2009) surveyed the world's languages and found that none of the presumed underlying features of the language acquisition device were entirely universal. In their search they found languages that did not have noun or verb phrases, that did not have tenses (e.g., past, present, future), and even some that did not have nouns or verbs at all, even though a basic assumption of a universal grammar is that all languages should share these features. Another limitation to the nativist theory is their lack of acknowledgement of the role of social interactions and cultural contexts in language acquisition. In summary, most experts agree that children are born primed to acquire language; however, the role of social interactions and the effect various contexts can have on the acquisition process is undeniable. [1] [4]

[1] Martha Lally and Suzanne Valentine-French (2019). Lifespan Development: A Psychological Perspective, Second Edition. CC by 4.0 http://dept.clcillinois.edu/psy/LifespanDevelopment.pdf

[2] Sturdy, C. B., & Nicoladis, E. (2017). How much of language acquisition does operant conditioning explain?. *Frontiers in Psychology*, *8*, 1918. CC by 4.0 https://www.frontiersin.org/articles/10.3389/fpsyg.2017.01918/full

[3] Image from Wikimedia CC by 4.0

[4] Dąbrowska, E. (2015). What exactly is Universal Grammar, and has anyone seen it?. *Frontiers in Psychology*, *6*, 852. CC by 4.0 https://www.frontiersin.org/articles/10.3389/fpsyg.2015.00852/full

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14.4: Cognitive Theory

Cognitive Theory and Language Acquisition

Cognitivists believe that language emerges within the context of other general cognitive abilities like memory, attention and problem solving. Once language does emerge it is usually within a specific sequence of stages that is universal in most children (Goodluck, 1991). The common progression through these language stages suggests that language is developing alongside other cognitive abilities. For example, infants and toddlers typically go through four stages of language acquisition:

1. Pre-language stage (3 to 10 months) where a child makes a lot of ‘cooing’ and ‘babbling’;
2. The holophrastic stage (12 to 18 months) where a child starts to comprehend a single unit of utterance like ‘milk’, ‘eat’, ‘dad’, ‘brother’;
3. Two-word stage (18 to 20 months) where a child, through a process of acquiring two nouns or a noun and a verb (noun + verb), begins pairing two words together such as ‘baby chair’, ‘mommy eat’, ‘cat bad’;
4. Telegraphic speech-stage (before 3 years old) defines a stage where a child puts some words together, even if the words are in the incorrect order. It has a similar meaning as a sentence, such as ‘cookie I want’, ‘toy me fall’, but is not a complete sentence. [1]

Jean Piaget is famous for his four stages of cognitive development. He believed that children do not think like adults and so before they can begin to develop language they must first actively construct their own understanding of the world through their interactions with the environment. A child has to understand a concept before they can acquire the particular language which expresses that concept. For example, a child first becomes aware of a concept such as a ‘cat’ and only afterward do they acquire the words to convey that concept. Essentially it is impossible for a young child to voice concepts that are cognitively unknown to them; therefore, a child must first learn about their environment, then they can connect language to their prior experiences. [1]

Piaget's cognitive theory states that children's language reflects the development of their logical thinking and reasoning skills in stages. In this way, Piaget’s stages reflect the primary role cognitive development has over language development and also reflects how language develops overtime as a child’s cognitive development progresses through each stage. Infants and toddlers are included in the first two stages of Piaget’s theory. These stages are most often discussed in reference to cognitive development. Their connection with language development will be explained below. [1]

Sensory-Motor Stage (birth to 2 years).

Infants and toddlers are learning about the world through motor and sensory experiences. Initially, language is limited to infants because they must first experience the world and develop mental schemas as a way to represent these experiences. The first words that infants produce are strikingly consistent as they tend to talk about important people in their life (“mom,” “dad”), social routines (“hi,” “uh-oh”), animals (“dog,” “duck”), and foods (“milk,” “banana”) (Schneider, Yurovsky, & Frank, 2015; Tardif et al., 2008). From a cognitive theorist perspective, this makes sense because these first words represent schemas that infants have been able to consistently develop and reinforce, due to high frequency exposure. In other words, infants’ first words are for concepts they have strong cognitive representations for. [2]

Pre-Operational Stage (2 years to 7).

From 2 to 3 years of age, children's cognitive development makes rapid progress. The increase in quantity and complexity of mental schemas to represent and organize the world, allows toddlers to be able to quickly accommodate new words into their vocabulary. As Figure **14.4.1** exemplifies, just within the third year of life (the first year under the preoperational stage) the vocabulary production abilities of toddlers rapidly increases. Children's language becomes "symbolic" allowing them to talk beyond the "here and now" and to talk about things such as the past, future, and feelings. Cognitivists would emphasize that the increase in vocabulary is driven first by an increase in cognitive development.

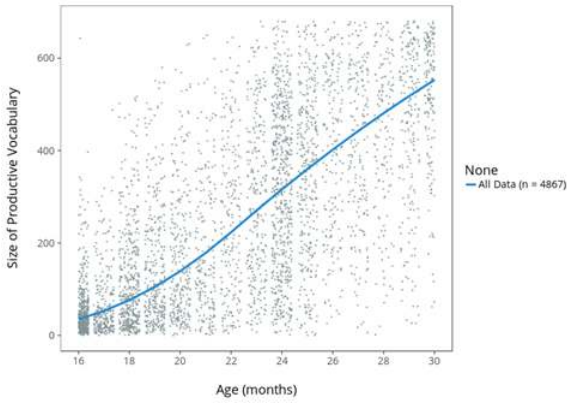


Figure **14.4.1**: Productive vocabulary size by child's age. ([3])

[1] Psycholinguistics/Theories and Models of Language Acquisition. CC BY-SA 3.0 https://en.wikiversity.org/wiki/Psycholinguistics/Theories_and_Models_of_Language_Acquisition#cite_note-A_Linguistic_Introduction-8

[2] Braginsky, M., Yurovsky, D., Marchman, V. A., & Frank, M. C. (2019). Consistency and variability in children's word learning across languages. *Open Mind*, *3*, 52-67. CC by 4.0 direct.mit.edu/opmi/article/doi/10.1162/opmi_a_00026/5378/Consistency-and-Variability-in-Children-s-Word

[3] Image by Wordbank is licensed under CC by 4.0 wordbank.stanford.edu/analyses?name=vocab_norms

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14.5: Interactionist/Social Theory

Interactionist/Social Theory of Language Acquisition

The interactionist/social theory proposes that language exists for the purpose of communication and can only be learned in the context of interaction with adults and other children. It stresses the importance of the environment and culture in which the language is being learned. Interactionists acknowledge the presence of innate biological mechanisms, but emphasize the critical role of social interactions (Jensen & Arnett, 2017; Levine & Munsch, 2018). Lev Vygotsky is the most well-known interactionist theorist and provided a theoretical framework for other interactionists to further develop theories of language acquisition. [1]

Influenced by the work of Vygotsky, Jerome Bruner believed that social interaction plays a fundamental role in the development of cognition in general and language in particular. Whereas Chomsky focused on innate mechanisms of language acquisition such as the idea of a language acquisition device (LAD), Bruner proposed the language acquisition support system (LASS) in opposition to Chomsky (Bakhurst & Shanker, 2001). The LASS refers to the social and cultural experiences that support and encourage language acquisition. This includes child-directed language exposure (e.g., parentese, dialogic reading, etc.,) as well as the various activities children engage in while also receiving exposure to language. Whereas the LAD emphasizes that children come into the world programmed ready to learn language, the LASS emphasizes that it is the world that is ready to expose and support children in learning language. [2]



Figure **14.5.1**: Caregiver interacting with an infant. . ([3])

A powerful argument for the critical role of social interaction and not just language exposure in general, comes from the body of research comparing language learning from live interactions versus pre-recorded exposure played from a screened device. Toddlers who hear a new word uttered by a speaker on a recorded video are less likely to learn that word than those who hear the same word from an in-person speaker (Krcmar et al., 2007; Krcmar, 2010; Kuhl, Tsao & Liu, 2003; Roseberry et al., 2014; Troseth et al., 2018). Although language learning from video occurs in some situations (e.g., Scofield et al., 2007; Linebarger and Vaala, 2010; Vandewater, 2011), when learning from video is directly compared to learning from face-to-face interactions, toddlers usually learn better from an actual event or person who is present. Even when language is presented through a screen, infants demonstrate greater language learning when two or more infants are present together (Lytle, Garcia-Sierra & Kuhl, 2018). To explain what is missing from video, Patricia Kuhl and her colleagues (2003) proposed that interpersonal social cues offered in a face-to-face setting “attract infants’ attention and motivate learning” and that the presence of a person allows the sharing of “information that is referential in nature” (Kuhl, 2007). A speaker’s communicative intentions may be less clear when offered on video, and the parts of language may be more challenging to extract. [4]



Figure **14.5.1**: Caregiver holding an infant. ([5])

The interactionist approach can also help explain how differences in the quantity and quality of language exposure affect a child's language development. The contexts that children are raised in can be very different and the differences in language exposure

across various contexts should be emphasized when considering how children acquire language (Rowe & Weisleder, 2020). Differences in language exposure, even exposure very early in life, such as exposure at a neonatal intensive care unit (NICU) for children born premature, can have long lasting effects. Variations in the amount of adult language a newborn heard on a single day in the NICU were positively associated with language skills at 7 and 18 months of age (Caskey et al, 2014) and the more language premature children heard at 16 months, the faster their language processing abilities were at 18 months of age (Adams et al., 2018). Furthermore, the higher the quality (responsive, verbally elaborative, and non-intrusive) of caregiver interactions with 22 month old children born prematurely, the larger their vocabulary comprehension was at three years of age (Loi et al., 2017). This research, along with so much more, demonstrates the critical importance of social interaction and exposure in the process of language acquisition. [6]

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[1] Psycholinguistics/Theories and Models of Language Acquisition from Wiki University is licensed under CC BY-SA 3.0

https://en.wikiversity.org/wiki/Psycholinguistics/Theories_and_Models_of_Language_Acquisition#cite_note-A_Linguistic_Introduction-8

[2] "Jerome S. Bruner" Psychology Wiki. CC-BY-SA https://psychology.wikia.org/wiki/Jerome_S._Bruner

[3] Image by Jonathan Borba on Unsplash.

[4] Troseth, G. L., Strouse, G. A., Verdine, B. N., & Saylor, M. M. (2018). Let's chat: On-screen social responsiveness is not sufficient to support toddlers' word learning from video. Frontiers in psychology, 9, 2195. CC by 4.0 https://www.frontiersin.org/articles/10.3389/fpsyg.2018.02195/full

[5] Image by Bethany Beck on Unsplash.

[6] Brignoni-Pérez, E., Morales, M. C., Marchman, V. A., Scala, M., Feldman, H. M., Yeom, K., & Travis, K. E. (2021). Listening to Mom in the NICU: effects of increased maternal speech exposure on language outcomes and white matter development in infants born very preterm. Trials, 22(1), 1-9. CC by 4.0

https://trialsjournal.biomedcentral.com/track/pdf/10.1186/s13063-021-05385-4.pdf

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14.6: Statistical Learning

Statistical Learning Theory of Language Acquisition

The natural environment presents infants with multiple streams of information occurring simultaneously. They encounter many objects, some moving, some stationary; they hear sounds, some language-related, others from animals and objects; they see people, some interacting with them, others in the background. Despite all of this information, these experiences are not completely random, there are predictable patterns that occur together. An infant's surroundings contain statistical regularities that they can use to detect structure in a busy environment. Infants are able to detect regularities and co-occurrences in visual shape sequences and visual scenes (Fiser & Aslin, 2002; Kirkham et al., 2002, 2007). For example, take a look at Figure **14.6.1**, which shows three object clusters, each cluster is composed of three colored shapes. Can you spot the regularity that co-occurs across the three object clusters? Although the three object clusters are not exactly the same, the regularity that occurs across all three are the yellow and pink connected shapes. In one study (Wu et al., 2011), 9-month-old infants were shown sequences involving these same three-shape object clusters in which two pieces always co-occurred and one piece constantly changed. They found that infants could keep track of which pieces co-occurred, suggesting that infants were able to track the statistical regularities they experience. [1]

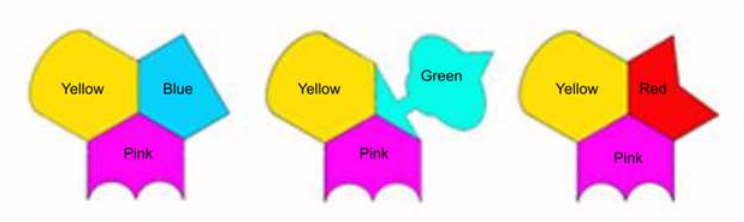


Figure **14.6.1**: Sample of stimuli from an infant statistical learning task. ([2])

Just as infants are able to track regularities in the visual environment, they are also able to track the regularities that naturally occur in language. When we talk, we produce a consistent stream of speech sounds. An important task for an infant is to figure out which specific set of sounds within a speech stream go together to create words. One way infants do this is by tracking the statistical regularities of speech sounds that co-occur together. To demonstrate this, a research study (Antovich & Graf Estes, 2018) had 14 month olds listen to a speech stream consisting of four made up words: timay, dobu, kuga, pimo. While listening, the children heard each of the four words repeated 120 times, but the order of the words was mixed up. Despite the random presentation of words in a consistent speech stream, there were regularities of sounds that always co-occurred. For example, 'ti' was always followed by 'may' (the two syllables in the word 'timay'), and 'pi' always co-occurred with 'mo' (the two syllables in the word 'pimo'). However, as the order of the words was mixed up, the last syllable of a word and the first syllable of the next consecutive word occurred much less frequently as 'may' (the last syllable in the word 'timay') could be followed up by either of the other three words at any time. The results revealed that even though the words used were made up, the infants were able to track the statistical regularities and segment the words from the continuous speech stream. This research study, along with many others (for a review, see Romberg & Saffran, 2010), demonstrates that infants are able to track the statistical regularities of the language they are exposed to and this helps them in the initial stages of acquiring their native language(s).

There is now a wealth of data documenting the statistical learning abilities of infants and toddlers (Saffran, 2020; Saffran & Kirkham, 2018). Detecting visual statistical regularities has even been documented in newborns (Bulf et al., 2011). Researchers have argued that statistical learning plays an important role in language learning (Saffran, 2001, 2003). These studies suggest that during their first year of language acquisition, before children begin to produce words, they start learning the patterns of the language they hear, tracking the sound combinations that correspond to potential words. Newman et al. (2006) discovered a relationship between infants' ability to segment the speech stream into words and language proficiency at 24 months and, even later in childhood, between 4 and 6 years of age. Additionally, there is a growing body of evidence showing that statistical learning recruits the same brain areas as those used in language processing (de Vries et al., 2011; Folia et al., 2011; Petersson et al., 2012). [3] [4]

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[1] Barry, R. A., Graf Estes, K., & Rivera, S. M. (2015). Domain general learning: Infants use social and non-social cues when learning object statistics. *Frontiers in Psychology*, *6*, 551. CC by 4.0

[2] Image adapted from Barry, R. A., Graf Estes, K., & Rivera, S. M. (2015). Domain general learning: Infants use social and non-social cues when learning object statistics. *Frontiers in Psychology*, *6*, 551. CC by 4.0

[3] Ellis, E. M., Borovsky, A., Elman, J. L., & Evans, J. L. (2021). Toddlers' Ability to Leverage Statistical Information to Support Word Learning. *Frontiers in Psychology*, *12*, 641. CC by 4.0 https://www.frontiersin.org/articles/10.3389/fpsyg.2021.600694/full

[4] Arciuli, J., & Torkildsen, J. V. K. (2012). Advancing our understanding of the link between statistical learning and language acquisition: The need for longitudinal data. Frontiers in psychology, 3, 324. https://www.frontiersin.org/articles/10.3389/fpsyg.2012.00324/full#h9

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14.7: Native Language Magnet Theory Expanded (NLM-e)

Native Language Magnet Theory of Language Acquisition

Young children are born ready to learn their native language or languages rapidly and with relative ease, following similar developmental paths regardless of culture or language. In this way, young infants are “citizens of the world” (Kuhl, 2004) because they are able to phonetically distinguish between the sounds of all the world’s languages and acquire any language they are exposed to. Phonetics refers to how the sounds in a language are made and what they actually sound like. Infants are very good at noticing phonetic differences, and they can tell the difference between all kinds of different sounds from many different languages. But this ability changes within the first year of life. To acquire a language, infants must be able to discover which specific phonetic distinctions will be utilized in their native language. The early ability of young infants to phonetically distinguish between the sounds of different languages begins to diminish as repeated exposure to one’s native language leads to infants becoming “culture-bound listeners”, now only able to distinguish the sounds in their native language (Kuhl, 2004). For example, at six months of age, English-learning babies are about 80-90% successful at noticing phonetic differences in English, in Hindi, and in Salish (Werker & Tees, 1984). But by ten months of age, their success rate drops to about 50-60%, and by the time they are one year old, they are only about 10-20% successful at hearing the phonetic differences in Hindi and Salish. The theory of NLM-e explains the narrowing of infant speech perception and the subsequent growth of native language abilities. [1] [2]

NLM-e proposes that young infants’ universal early speech perception ability narrows with language experience as the brain neurally commits to the child’s native language, thereby fostering the language acquisition process. There are five basic principles of NLM-e (Kuhl et al., 2008):

Distributional patterns and infant-directed language are agents of change.

In order to comprehend language infants first have to acquire the sound inventory of a given language, that is, learn how many and which speech sounds are functionally distinct units. When a caregiver talks with an infant, what the infant hears is a long strand of continuous language sounds. How does an infant learn the individual words within a speech stream? One of the mechanisms they use is distributional learning, which refers to learning by simply listening to the frequency distributions of the speech sounds in language. Different languages have different distributional sound patterns, as some sounds are more likely to frequently be heard together than others. Infants as young as 2 months of age are sensitive to the distributional sound patterns in language (Maye, Werker, & Gerken, 2002; Wanrooij, Boersma, & van Zuijen, 2014). As research suggests distributional learning is one of the mechanisms by which infants start to acquire the phonemes of their native language, NLM-e includes it as an important agent of change. [3] When adult caregivers talk with infants and toddlers, they tend to use a different speech style, often referred to as infant-directed speech, that includes higher pitch, greater pitch range, and longer pauses between words, (Fernald et al.,1989; Outters et al., 2020). Infants prefer to listen to infant-directed speech over adult-directed speech at birth (Cooper & Aslin, 1990), as well as later in infancy (Fernald, 1985; Werker & McLeod, 1989). When listening to infant-directed speech, compared to adult-directed speech, infants are better able to discriminate speech sounds (Karzon, 1985; Trainor & Desjardins, 2002), more efficiently segment words from continuous speech (Thiessen, Hill & Saffran, 2005), demonstrate better long-term memory for words (Singh et al., 2009), and learn new words more effectively (Graf Estes & Hurley, 2013; Ma et al., 2011). As a result, NLM-e proposes that infant-directed speech is an agent of change because it helps infants phonetically discriminate language sounds as well as helps them acquire their native language. [4] [5]

Language exposure produces neural commitment that affects future learning.

Adults who either heard or spoke an additional language as a child have better perception and production abilities when relearning that childhood language later in life. Thus, exposure to a language within the first year of life provides sustained benefit to learners as language exposure in infancy leads to neural commitment. Furthermore, the benefits of early non-native language exposure begins to be observed almost immediately. For example, infants’ speech perception abilities change with as little as 5 hours of exposure to a second language (Kuhl et al., 2003; Conboy & Kuhl, 2011) and remain changed even a month after exposure has been discontinued (Sundara et al., 2020). [6]

Social interaction influences early language learning at the phonetic level.

In a series of studies Kuhl and colleagues have shown the significance of social interaction on phonetic learning. When English-monolingual infants were exposed to Mandarin Chinese through a “live condition” (experimenter directly interacting with the infant during learning) the infants demonstrated phonetic learning of the foreign language; however, exposure to Mandarin Chinese from a video did need lead to phonetic learning (Kuhl, Tsao & Liu, 2003). When these same Mandarin Chinese videos were presented to infants over an interactive touchscreen device, greater phonetic learning occurred for infants paired together, compared to infants without a social partner (Lytle, Garcia-Sierra & Kuhl, 2018). This line of research highlights the importance social interactions have on language learning at the phonetic level. [7]

Early speech perception predicts language growth.

NLM-e proposes that early language perception abilities (such as phonetic perception) is related to later language abilities. Indeed research has shown this association. Six month old infants’ speech perception ability is related, longitudinally, to language development at 13 months, 16 months and 24 months of age (Tsao, Liu & Kuhl, 2004). More recent research is finding this association lasts throughout early childhood as infants with greater speech perception abilities at 11 months of age demonstrated greater grammatical abilities as six year olds (Zhao et al., 2021).

The perception-production link is forged developmentally.

Early phonetic perception abilities are related to later language production abilities (Zhao et al., 2021). The connection between language perception and language production is built through the experiences of language exposure and infant vocalizations. Through language exposure, infants establish mental maps to represent the specific sounds of their native language. Through vocalization, infants relate the articulatory properties they use to create various sounds, to the sounds they hear themselves produce and then relate that to the language sounds they have mapped out from adult language exposure. This developmental perspective on language acquisition suggests that early language perception is critical and that language production relies upon perceptual abilities

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https://en.wikiversity.org/wiki/Psycholinguistics/Theories_and_Models_of_Language_Acquisition#cite_note-A_Linguistic_Introduction-8

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[3] Chládková, K., & Šimáčková, Š. (2021). Distributional learning of speech sounds: An exploratory study into the effects of prior language experience. Language Learning, 71(1), 131-161. CC by 4.0

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14.8: Conclusion

Conclusion for Theories of Language Acquisition

The process of language acquisition for infants and toddlers is truly a remarkable phenomenon. This section presented a few of the prominent theories of language acquisition. As research progresses and techniques are developed, we continue to gain new insights into the language acquisition process. While children may be born with mechanisms that aid in the early phases of language acquisition, such as statistical learning, the critical importance of the quantity and quality of interactions infants and toddlers have with caregivers and other people is of pivotal significance

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14.9: References

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CHAPTER OVERVIEW

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15.1: Introduction

Introduction to Supporting Language in Group Care

While children are born ready to acquire language, the quantity and quality of exposure they receive is critical for the trajectory of their language development. For children who attend group care, the language caregivers share with infants and toddlers is essential. This section will emphasize the importance of the quantity and quality of language exposure during the first three years and explain various practices caregivers can implement to increase both the quantity and quality of the language they use with infants and toddlers

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15.2: Language Growth and Individual Differences

Individuality of Language Growth

Language develops rapidly during the first three years of life. Figure **15.2.1** shows growth curves for the development of toddlers' productive vocabulary between 16 to 30 months of age. On the x-axis is the age of children and the y-axis represents how many words children produce. Each gray dot is a child's data. When you look at this chart closely, what do you notice? Did you notice the individual differences within each age? For example, look at the spread of dots at 24 months. Even within the same age, 24 months, there is a large variability in productive vocabulary between children. At 24 months, some children have been heard to speak more than 500 or even 600 words, while many others spoke less than 200 words. Also, notice that the growth curves suggest that these individual differences start early, before 16 months and continue throughout the second year of life. Where do these individual differences in language ability come from and do they have any long term significance?

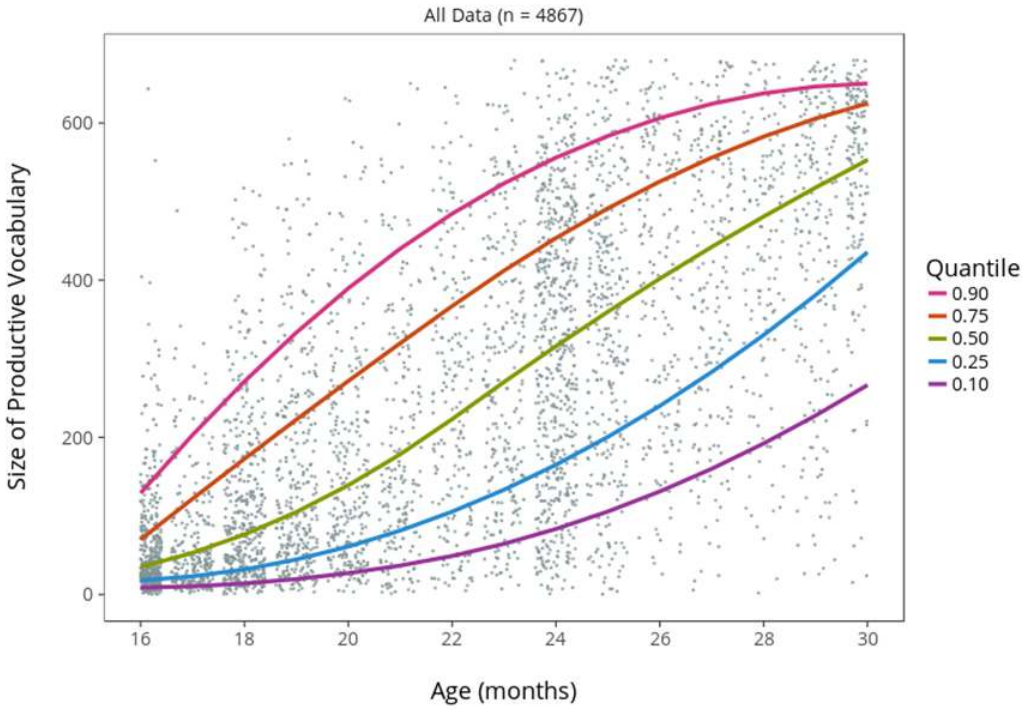


Figure **15.2.1**: Growth curves for the number of words children produce. Table with all data points can be found Wordbank | Analyses (stanford.edu) ([1])

Early individual differences in language ability does have long term significance. For example, individual differences in language processing abilities remain stable across development — those children who were faster at processing language at 19 months continued to be faster at processing language 12 months later (Peter et al., 2019). For children born prematurely, children who were faster at processing language at 18 months, had larger vocabulary comprehension abilities at 30 months (Marchman et al., 2016) and had higher scores on language and IQ at 54 months (Marchman et al., 2018). By 18 months, children from higher SES backgrounds already have larger productive vocabularies and are more efficient at processing language (Fernald, Marchman & Weisleder, 2013). When these same children were followed up six months later, those with larger vocabularies and more efficient language processing skills at 18 months continued to perform at a higher level: at two years of age, children from lower SES backgrounds performed at the level children from higher SES backgrounds did when they were 18 months old—representing a six month performance gap by age two. [2]

In summary, individual differences in language ability begin to form early in life and have the potential to lead to very different developmental outcomes later in childhood. Specifically, larger vocabularies and more efficient language processing skills in toddlerhood is related to higher performance on language, cognitive and academic assessments in later childhood. Clearly early individual differences in language ability are important, but where do they come from?

The Word Gap

The individual differences in language abilities that appear early in the first three years can be partly explained by the various levels of language exposure children recieve. For example, early language processing abilities are associated with the amount of language children hear as research has found that children who are exposed to less language tend to have lower language abilities (Fernald & Weisleder, 2010; Hurtado, Marchman & Fernald, 2008). [3]



Figure **15.2.2**: Caregiver interacting with a toddler. ([4])

In one important study on individual differences, researchers went into families' homes once per month and recorded what children heard and said for one hour (Hart & Risley, 1995). They started doing this when the infants were nine months old, and they kept going to their homes every month until the children were three years old. During this time, the toddlers began to talk, and the scientists tracked every new word that they produced. They also wrote down all the words and sentences that parents said to their children. After analyzing these recordings, they found that most children started speaking around their first birthday, but some learned new words much more quickly than others did. They also found that children were better at learning new words if their parents talked to them a lot at home. Children who heard lots of language—more words, more different words, more questions, more encouraging words, and more words that described things—had bigger vocabularies than children who did not hear as much language. [5]

One important finding from this study was that children heard more language if they were from families with a higher socioeconomic status (SES). This relationship between family (SES) and the amount of words spoken to the child has become known as the word gap. Hart and Risley (2003) estimated that there is a 30 million word gap—children from higher SES families are exposed to 30 million more words by age three than children from families with a lower SES. While some researchers argue that the actual word gap may be less than the 30 million words originally proposed, the word gap is nonetheless present and impactful, as numerous studies have documented a difference in language exposure based on family SES (Ellwood-Lowe, Foushee & Srinivasan, 2022; Hoff, 2003; Huttenlocher et al., 2010; Golinkoff et al., 2019; Rowe, Leech & Cabrera, 2017). For example, the language of parents with a lower SES often use a lower diversity of words in comparison to the language of parents with a higher SES (Burchinal et al., 2008; Huttenlocher et al., 2010). As a consequence of these input differences, children with a higher SES background often have a larger vocabulary (Gilkerson et al., 2017; Hoff, 2006) and more often use diverse and advanced grammatical constructions than children from lower SES families (Huttenlocher, Vasilyeva, Cymerman & Levine, 2002). [6]

The idea of a word gap highlights the importance of early language exposure for positive long term developmental trajectories. Early language experiences and abilities lead to stronger later language performance and are even related to later cognitive and

academic abilities (Bornstein, Hahn, Putnick & Pearson, 2018; Lehrl et al., 2020; Rodriguez & Tamis-LeMonda, 2011; Rose, Lehrl, Ebert & Weinert, 2018; Tamis-LeMonda et al., 2019). For example toddlers with larger vocabularies and more efficient language processing demonstrated stronger language and cognitive skills at 8 years of age (Marchman & Fernald, 2008).

Quantity of Language Exposure

While indeed family SES is related to early language differences in children, family SES alone does not reveal the full story. In one study, researchers looked at the potential factors in language growth across a group of toddlers, all from families with a low SES (Weisleder & Fernald, 2013). Children wore a special recorder that captured the language they were exposed to throughout the day, over multiple days. Results revealed great variability in language exposure, even though the children were all from families with lower SES. Figure **15.2.3** charts the varied language exposure of the children. Each colored column represents one child and the height of the column represents the number of words a child heard in a 10 hour day—the taller the bar, the more words heard by a child. Some children heard over 25,000 words in one day, while others heard under 2,500 words in one day. This is data from just one day, but imagine the compounding effect this has over the first three years of a child's life if these daily patterns are repeated! [5]

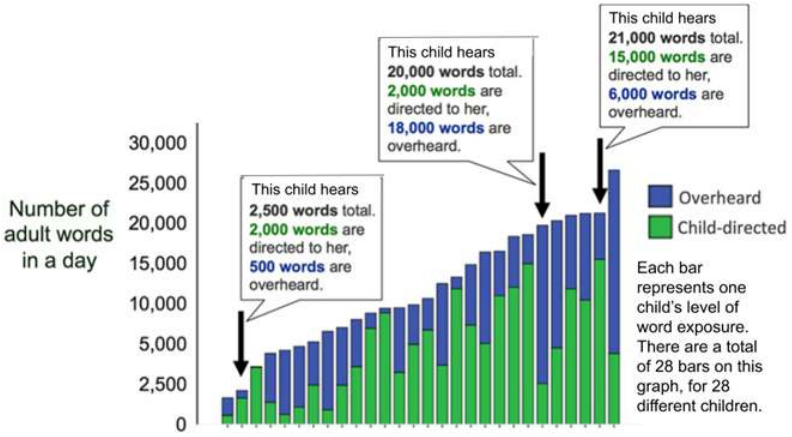


Figure **15.2.3**: Number of words toddlers, from low SES families, heard in one day. Each bar represents one child's level of word exposure. There are total of 28 bars on this graph, for 28 different children. This graph shows the number of words that different kids heard from grownups in 1 day. The bottom section/green part of each bar shows the number of words that grownups said to that kid in 1 day. The top/blue part of each bar shows the number of words that kids overheard when grownups were talking to other people. For example, kid 2 heard 2,500 words total. 2,000 words are directed to her, and 500 words are overheard. Child 23 hears 20,000 words total. 2,000 words are directed to her, 18,000 words are overheard. Child 27 hears 21,000 words total. 15,000 words are directed to her, 6,000 words are overheard. ([7]

These results move the spotlight away from SES per se and instead shine it more specifically on the variable language experiences of children, one of which can include SES. In general, children from families with high SES hear more language than children from families with low SES, but even within the same SES level there are significant differences in language experience. There are also other reasons besides SES for wide-ranging levels of language exposure. For example, in Senegal, cultural traditions and beliefs discourage caregivers from talking with infants and toddlers, therefore greatly restricting their language exposure (Weber, Fernald & Diop, 2017). Other research shows that the quantity of words infants experience varies greatly based on how infants are placed during activities and the type of activity. Infants placed in sitting devices (e.g., bouncy seats, highchairs) experience fewer adult words and less consistent language exposure throughout the day (Malachowski, Salo, Needham & Humphreys, 2021). Considering various daily activities, infants were exposed to the most words during book sharing (mean of 55.91 words per minute) and grooming (mean of 56.60 words per minute) and the least amount of words during object play (mean of 34.10 words per minute) and feeding (mean of 32.44 words per minute) (Tamis-LeMonda et al., 2019).

Until now we have learned that the number of words children are exposed to can vary greatly depending on factors such as SES and culture, but what does the "typical" amount of language exposure look like? To estimate how many words infants and toddlers hear across different ages, another team of researchers also used small language recorders worn by children to count the number of words infants and toddlers heard throughout the day (Gilkerson et al., 2017). Figure **15.2.4** summarizes some of their data. Take a moment to look carefully at the data in Figure **15.2.4**. What did you notice? Consider how developmental growth in other domains, such as motor abilities, might influence the amount of words children hear.

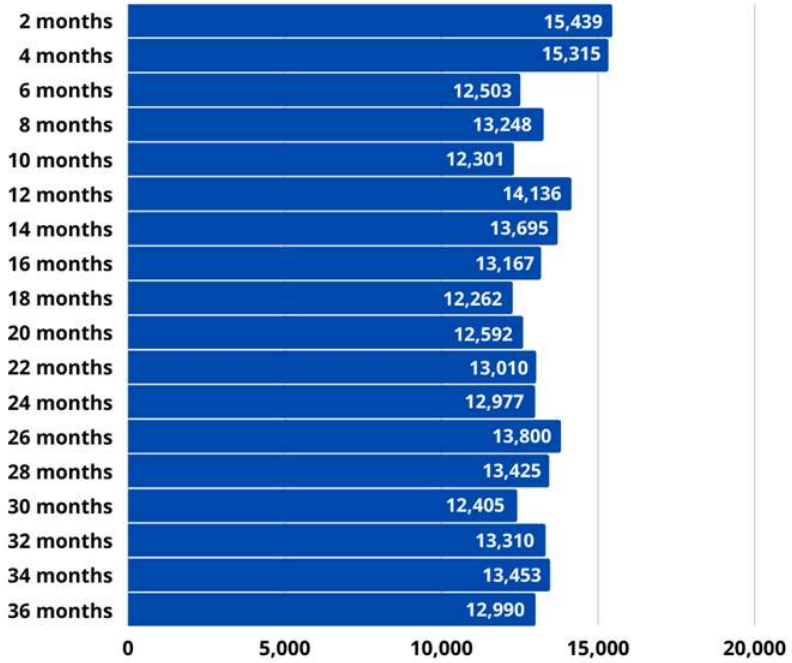


Figure **15.2.4**:Average number of words children are exposed to daily at different ages. 2 months = 15,439, 4 months=15,315, 6 months=12,503, 8 months-13,248, 10 months=12,301, 12 months=14,136, 14 months=13,695, 16 months=13,167, 18 months = 12,262, 20 months = 12,592, 22 months=13,010, 24 months=12,977, 26 months=13,800, 28 months=13,425, 30 months-12,405, 32 months =13,310, 34 months=13,456, 36 months=12,990 [8])

Did you notice that infants typically heard more words than toddlers, with the youngest infants, 2 to 4 months of age, hearing the most words? Why do you think infants and younger toddlers are exposed to more words than older toddlers? Across 2 to 36 months of age, children are approximately exposed to an average amount of words between the range of 12,000 to just over 15,000. Although the difference between 12,000 and 15,000 may not seem very significant, consider how these numbers could play out over just one year. A child who is exposed to 12,000 words everyday for one year would hear 4,380,000 words, but a child exposed to 15,000 words daily would hear 5,475,000 words in one year. This represents a difference of over one million words!

It is critical to stress that while this data was recorded in the child's home environment as families moved throughout their daily routines in an attempt to capture "natural" language exposure, the data in no way should be interpreted as representing what may be "typical" language exposure for all children. The participants in the study were all monolingual English speaking children, mostly (66%) white, all from the Denver, Colorado area and educated with a high school GED (26%), some college experience (29%) and a college degree (23%). Irrespective of these limitations, the data does provide intriguing insight into daily natural language exposure for infants and toddlers.

Quality of Language Exposure

While quantity, the sheer amount of language children are exposed to, is clearly important, research suggests the quality of the exposure is even more important (Hirsh-Pasek et al., 2015; Romeo et al., 2018). Let's revisit the chart that showed the number of words toddlers, from low SES families, heard in one day (see Figure **15.2.5**). While the height of the columns represents the quantity of language exposure, the colored sections of the columns represent the quality of exposure. Some children heard lots of language spoken directly to them, like when they were talking and playing with their caregivers, this is referred to as child-directed speech. The bottom color of each column is green, representing the amount of words heard that were child-directed. Other children heard lots of language that was not directed to them, like when their caregivers were talking to each other or to other children nearby, this is referred to as overheard speech. The top color of each column is blue, representing the amount of overheard words. [8]

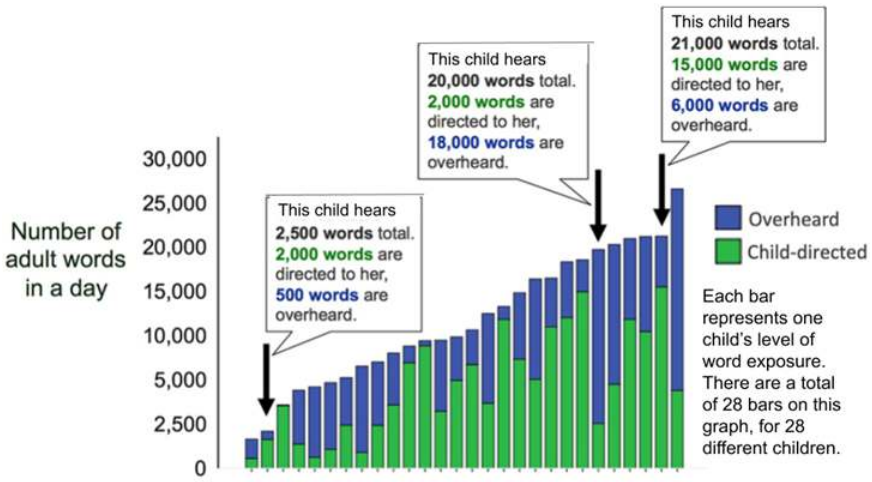


Figure **15.2.5**: Number of words toddlers, from low SES families, heard in one day. Each bar represents one child's level of word exposure. There are total of 28 bars on this graph, for 28 different children. This graph shows the number of words that different kids heard from grownups in 1 day. The bottom section/green part of each bar shows the number of words that grownups said to that kid in 1 day. The top/blue part of each bar shows the number of words that kids overheard when grownups were talking to other people. For example, kid 2 heard 2,500 words total. 2,000 words are directed to her, and 500 words are overheard. Child 23 hears 20,000 words total. 2,000 words are directed to her, 18,000 words are overheard. Child 27 hears 21,000 words total. 15,000 words are directed to her, 6,000 words are overheard. ([5])

Distinguishing between the quantity of language children are exposed to is critical. The research revealed that the toddlers who heard more child-directed language had bigger vocabularies and had more efficient language processing abilities than the children who did not hear as much child-directed speech. This shows that the quality of the words caregivers use with infants and toddlers, such as child-directed speech, may be even more important than the overall quantity of language exposure.

Child-directed language is just one way to think about the quality of language infants and toddlers experience. Another way to perceive language quality is through the conversational turn counts between children and adults. Turn counts are an important quality measure because they capture the critical interactive and responsive aspect of a back-and-forth conversation. After controlling for SES, toddlers who experienced more conversational turn counts with caregivers had higher IQ scores and language abilities later in childhood at ages 9 and 13 (Gilkerson et al., 2018).



Figure **15.2.6**: Caregiver holding a toddler. ([9])

There are important early differences in the quantity and quality of language that infants and toddlers experience above and beyond SES. Research has found that both quantity and quality of language exposure during the first three years of life is related to language and cognitive abilities in later childhood. While caregivers should consider increasing the quantity of language their infants and toddlers experience, focusing on various quality aspects of their language interactions is the most important. The next session will introduce various strategies that caregivers can use to improve the quantity and quality of the language they share with infants and toddlers.

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[1] Image by Wordbank is licensed under CC by 4.0

[2] Peter et al., (2019). Does speed of processing or vocabulary size predict later language growth in toddlers? Cognitive Psychology, 115, 101238. CC by 4.0

[3] Dickinson et al., (2012). How reading books fosters language development around the world. *Child Development Research*. CC by 3.0

[4] Image by Luiza Braun on Unsplash.

[5] Lew-Williams & Weisleder (2017). How do little kids learn language? *Frontiers in Young Minds*, 5(45). CC by 4.0

[6] Grolig (2020). Shared storybook reading and oral language development: A bioecological perspective. *Frontiers in Psychology, 11*, 1818. CC by 4.0

[7] Image adapted from Lew-Williams & Weisleder (2017). How do little kids learn language? *Frontiers for Young Minds*, *5*, 45. CC by 4.0

[8] Image by Todd LaMarr is licensed under CC by 4.0.

[9] Image by Luiza Braun on Unsplash.

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15.3: Strategies that Support Language Development

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15.3.1: Strategies that Support Language Development-Responsiveness and Sensitivity

Responsiveness and Sensitivity

Responsiveness refers to a caregiver's ability to detect and respond to a child's behavioral signals during shared interactions (Landry et al., 2001). Sensitivity refers to caregivers who are aware and capable of understanding a child's behaviors and that respond to the child's needs in a timely and appropriate manner (Grossmann, Bretherton, Waters & Grossmann, 2013). Thus responsiveness and sensitivity are related constructs that when implemented, support the language development of infants and toddlers (Alvarenga et al., 2021; Madigan et al., 2019). [1]



Figure **15.3.1.1**: Caregiver responding to an infant's interest. ([2])

Infants and toddlers benefit from interacting with responsive and sensitive caregivers. For example, removing social feedback from interactions between caregivers and infants leads to fewer vocalizations from 5-month-old infants (Goldstein, Schwade & Bornstein, 2009), while providing social feedback in response to 8 month olds' vocalizations results in a higher number of vocalizations (Goldstein, King & West, 2003). One study found that when children were 9 and 13 months old caregivers' responsiveness predicted when children reached various language milestones, such as when children produced their first words and first fifty words (Tamis-LeMonda, Bornstein & Baumwell, 2001). Both caregiver responsiveness and sensitivity are related to the development of expressive language abilities in toddlers (Bruce, Panneton & Taylor, 2022; Prime, Wade & Gonzalez, 2020) and higher levels of caregiver sensitivity during infancy are related to greater abilities in language comprehension in toddlerhood (Baumwell, Tamis-LeMonda & Bornstein, 1997). [3] [4]

To support language development, caregivers should participate in training sessions that practice and improve their ability to provide responsive and sensitive care and interactions with infants and toddlers. When caregivers do receive such training, their responsiveness improves and is linked to an improvement in communication abilities of infants (Alvarenga et al., 2021). Engaging in responsive and sensitive interactions not only takes practice, but also uninterrupted focused time with children. To be responsive, a caregiver must pay close attention to a child's signals and to be sensitive, a caregiver must respond to their signals in a timely and appropriate way.

---

[1] Caldas et al., (2018). The socio-communicative development of preterm infants is resistant to the negative effects of parity on maternal responsiveness. *Frontiers in Psychology, 9*, 43. CC by 4.0

[2] Image by Alina Ryabchenko on Unsplash.

[1] Marklund et al., (2021). An association between phonetic complexity of infant vocalizations and parent vowel hyperarticulation. *Frontiers in Psychology*, 2873. CC by 4.0

[2] Dickinson et al., (2012). How reading books fosters language development around the world. *Child Development Research*. CC by 3.0

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15.3.2: Strategies that Support Language Development-Turn-taking

Turn-taking

Infants spend much of their awake time in face-to-face interactions with their caregivers and it is this face-to-face conversational setting that provides an important context for infants to start acquiring language. Additionally, before infants acquire language they start to interact in social exchanges with caregivers characterized by turn-taking patterns, such as peek-a-boo games and give and take interactional sequences (Bates, Camaioni & Volterra, 1975; Ratner & Bruner, 1978; Rochat, Querido & Striano, 1999). These mutually engaged interactions can consist of behaviors in multiple modalities such as vocalizations, gazes and smiles. Conversational turn-taking is important during infancy as it lays the foundation for the flow and pattern of interactions, but continues to be important throughout toddlerhood and the preschool years as the amount of turn-taking children and caregivers engage in is related to language development and brain function (Donnelly & Kidd, 2021; Romeo et al., 2018, 2021). [1]



Figure **15.3.2.1**: Caregiver and an infant engaged in a face-to-face turn-taking interaction ([2]

There are many ways caregivers can engage in turn-taking with children. Questions are a common way to start back-and-forth conversations (Gilkerson et al., 2018; Rowe, Leech & Cabrera, 2017). Questions can have many formats (Wasik & Hindman, 2013), including open (involving no single correct answer and likely requiring multiple word response) or closed (single correct answer), with the latter including label questions (What's this called?) or yes/no questions (Is this a dog?). There is extensive evidence that questions in the classroom are a powerful tool for eliciting child language and fostering conversation. Open-ended questions may be relatively rare, representing approximately only 5% of caregivers' prompts (Davis, Torr & Degotardi, 2015; Siraj-Blatchford & Manni, 2008). Interestingly, Kidd and Rowland (2021) found that, with two and three year olds, when presented with conversational opportunities, children contributed just about one-third (37%) of the turns. Caregivers can try to increase the number of turn-taking exchanges during interactions by talking about abstract, non-present concepts (Leech & Rowe, 2021). [3]

[1] Hilbrink et al., (2015). Early developmental changes in the timing of turn-taking: a longitudinal study of mother–infant interaction. *Frontiers in Psychology, 6*, 1492. CC by 4.0

[2] Image by Marcin Jozwiak on Unsplash.

[3] Hindman et al., (2021). Understanding child-directed speech around book reading in toddler classrooms: Evidence from early Head Start programs. *Frontiers in Psychology, 12*, 719783-719783. CC by 4.0

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15.3.3: Strategies that Support Language Development- Protoconversations

Protoconversations

Infants produce both speech-like vocalizations (i.e., protophones) and cries from birth (Nathani, Ertmer & Stark, 2006). Even before infants produce their first words, caregivers and infants show turn-taking communication patterns referred to as “protoconversation” (Bateson, 1975; Trevarthen & Aitken, 2001). Protoconversations involve communicative turn-taking between caregivers and infants using a variety of communication such as vocalizations, gestures, facial expressions and language. Infants between 3 and 5 months produce more than 40% of their turns in overlap with caregivers, while this proportion of overlap decreases after 5 months and drops to around 20% at 18 months (Hilbrink, Gattis & Levinson, 2015). Caregiver responses (verbal or non-verbal) to infant protophones most often occur within one second after infant protophones (Keller et al., 1999; Yoo, Bowman & Oller, 2018). Caregiver responses to protophones thus appear to provide a rich learning opportunity. Through protoconversation, caregivers play a key role for infants in helping them learn the turn-taking system necessary for communication (Hilbrink, Gattis & Levinson, 2015). Furthermore, many longitudinal studies have shown that protophones are foundations for language development (Koopmans-van Beinum & van der Stelt, 1986; Oller, 1980; Roug et al., 1989; Stark, 1980). In summary, early turn-taking and protoconversations support language development by laying the foundation of back-and-forth communication and highlight the role of social interactions for supporting language development (Donnelly & Kidd, 2021). [1]



Figure **15.3.3.1**: Caregiver and an infant engaged in a protoconversation. ([2])

Caregivers can use protoconversations to support language development in the following ways:

- Recognize that protophones offer a special opportunity to bond with an infant and are important for the beginning development of speech.
- Even before an infant’s vocalizations begin to sound like speech, engage with the infant in protoconversations.
- A protoconversation involves contingent, bidirectional turn taking, so make sure you allow for time devoted to an infant where you can respond to their communication promptly and continue the turn taking conversation.
- Being an engaging caregiver in the communicative partnership positively affects the quantity and quality of infant vocalizations (Goldstein & Schwade, 2008).

- There are various ways to respond to infant vocalizations including physical touch, vocalizations, speech and facial expressions. In terms of vocal and speech responses, caregivers have been found to primarily use affirmations and imitations with young infants, and then expand their responses to include expansions, descriptions, and questions as children's abilities increase (Tamis-LeMonda, Bornstein & Baumwell, 2001). This shows that caregivers are sensitive to infant vocal capacities and respond accordingly, thereby fostering infant vocal development.

[1] Yoo et al., (2018). The origin of protoconversation: An examination of caregiver responses to cry and speech-like vocalizations. *Frontiers in Psychology, 9*, 1510. CC by 4.0

[2] Image by Raul Angel on Unsplash.

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15.3.4: Strategies that Support Language Development-Infant-Directed Speech

Infant-Directed Speech

When caregivers interact with infants, their speech often takes on specific, distinguishing features in a speech register known as infant-directed speech (Ferjan Ramírez, 2022; Fernald et al., 1989). Infant-directed speech is produced by caregivers of most (although not all) linguistic and cultural backgrounds and is typically characterized by a slow, melodic, high-pitched, and exaggerated cadence (Farran, Lee, Yoo & Oller, 2016; Fernald et al., 1989; Kitamura, Thanavishuth, Burnham & Luksaneeyanawin, 2001; Pye, 1986; Shute & Wheldall, 1999). From early in life, infants tune their attention to infant-directed speech, preferring to listen to infant-directed speech over adult-directed speech at birth (Cooper & Aslin, 1990), as well as later in infancy (Cooper & Aslin, 1994; Cooper, Abraham, Berman & Staska, 1997; Fernald, 1985; Hayashi, Tamekawa & Kiritani, 2001; Kitamura & Lam, 2009; ManyBabies Consortium, 2020; Newman & Hussain, 2006; Pegg, Werker & McLeod, 1992; Santesso, Schmidt & Trainor, 2007; Singh, Morgan & Best, 2002). [1]

Infants' preference for infant-directed speech may play a useful role in early language learning. For example, infants are better able to discriminate speech sounds in infant-directed speech than in adult-directed speech (Karzon, 1985; Trainor & Desjardins, 2002), more efficiently segment words from continuous speech in an infant-directed speech register (Thiessen, Hill & Saffran, 2005), demonstrate better long-term memory for words spoken in infant-directed speech (Singh, Nestor, Parikh & Yull, 2009), and learn new words more effectively from infant-directed speech (Graf Estes & Hurley, 2013; Ma, Golinkoff, Houston & Hirsh-Pasek, 2011). Overall amount of infant-directed speech in everyday speech input between 7 to 11 months is positively correlated with language outcomes at five years of age (Weisleder & Fernald, 2013), and amount of infant-directed speech in a one-on-one setting between 11 and 14 months of age is correlated with productive vocabulary at 24 months (Ramírez-Esparza, García-Sierra & Kuhl, 2014; 2017a) as well as word production at 33 months (Ramírez-Esparza et al., 2017b). [2] [3]

[1] Byers-Heinlein et al., (2021). A multilab study of bilingual infants: Exploring the preference for infant-directed speech. *Advances in Methods and Practices in Psychological Science, 4*(1), 2515245920974622. CC by 4.0

[2] Byers-Heinlein et al., (2021). A multilab study of bilingual infants: Exploring the preference for infant-directed speech. *Advances in Methods and Practices in Psychological Science, 4*(1), 2515245920974622. CC by 4.0

[3] Marklund et al., (2021). Relationship between parents' vowel hyperarticulation in infant-directed speech and infants' phonetic complexity on the level of conversational turns. *Frontiers in Psychology, 12*, 2712. CC by 4.0

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15.3.5: Strategies that Support Language Development-Singing

Singing

While infant-directed speech has been extensively investigated, research on infant-directed singing and its relationship with language development is gaining more attention (Falk & Tsang, 2020; Papadimitriou et al., 2021). Across most cultures, caregivers naturally sing to infants throughout the day (Fernald, 1992; Hilton et al., 2022; Trehub & Trainor, 1998; Yan et al., 2021). In fact, one study captured daylong audio recordings from thirty-five 6 to 12 month old infants and found that 100% of the infants heard both live and recorded music (Mendoza & Fausey 2021). However, not all children are exposed to singing daily. Nationally in the U.S., only 57.4% of infants and toddlers are sung to everyday (Keating, 2021). Comparing the prevalence of daily singing with infants and toddlers across the U.S., Texas had the lowest prevalence (47.6%), Alaska had the highest (72.3%) and California was just under the national average (56.4%) (Keating, 2021). Similar to infant-directed speech, infant-directed singing is characterized by higher pitch and slower tempo than non-infant-directed versions of the same songs by the same singers (Trainor, Clark, Huntley & Adams, 1997; Trehub, Hill & Kamenetsky, 1997; Trehub et al., 1998). [1] [2] [3]

Two common types of songs for infants and toddlers include lullabies and play songs. In line with their soothing function, lullabies feature very slow tempo, low pitch, falling pitch contours, limited amplitude variation, and soothing tone of voice (Trehub, Trainor & Unyk, 1993; Trehub & Trainor, 1998; Unyk, Trehub, Trainor & Schellenberg, 1992), properties that are shared with soothing infant-directed speech. Although play songs are commonly sung to Western infants, unlike lullabies, they are not universal (Trehub & Trainor, 1998). Examples of play songs are “Old MacDonald had a farm”, “Five little monkeys jumping on the bed” and “The wheels on the bus”. [4]



Figure **15.3.5.1**: Caregiver singing with an infant. (Copyright; author via source)

Research indicates that infants find infant-directed singing more engaging and prefer to listen to it compared to non-infant-directed singing (Masataka, 1999; Nakata & Trehub, 2004; Trainor, 1996; Tsang, Falk & Hessel, 2017). Singing lullabies to infants, even unfamiliar lullabies in an unfamiliar language, helps infants relax and enter a calmer state (Bainbridge et al., 2021). Songs allow infants to capitalize on the acoustic boundary cues within song melodies to organize a continuous song into structurally relevant parts and recognize different phrases while the song unfolds. For example, six month old infants are able to segment children’s songs into phrases (Hahn, Benders, Snijders & Fikkert, 2020). Already before their first birthday infants are able to recognize changes in the syllable order in songs (François et al., 2017; Lebedeva & Kuhl, 2010; Suppanen, Huotilainen, & Ylinen, 2019; Thiessen & Saffran, 2009), differentiate between rhyming and non-rhyming songs (Hahn, Benders, Snijders, & Fikkert, 2018), and learn novel words recurring in the song lyrics (Snijders, Benders, & Fikkert, 2020). Furthermore, infant-directed singing is related

to later language development. Specifically, higher levels of infant-directed singing is related to greater language comprehension abilities in infants and later language skills in toddlerhood (Franco et al., 2020; Papadimitriou et al., 2021; Schaal et al., 2020). [5] [6]

Early newborn neural responses to singing predicts later language development at 18 months (François et al., 2017). Even a short, one-month intervention at nine months of age was found to be associated with enhanced neural responses for temporal structure processing in both music and speech contexts, compared to a control group (Zhao & Kuhl, 2016). This research suggests that detection and prediction of auditory patterns, crucial skills for both music and speech, were positively affected by early musical activities. [7]

Similar to infant-directed speech, infant-directed singing is more engaging and has the potential to positively influence children's language development. Caregivers can take advantage of the power of singing by including singing across a range of activities. While singing to calm a child or while putting them to sleep is common, caregivers can include singing through daily routines and activities and create short songs in the moment.

---

[1] Franco et al., (2020). Singing to infants matters: Early singing interactions affect musical preferences and facilitate vocabulary building. *Journal of Child Language*, 1-26. CC by 4.0

[2] Yan et al., (2021, preprint). Across demographics and recent history, most parents sing to their infants and toddlers daily. CC by 4.0

[3] Corbeil et al., (2013). Speech vs. singing: Infants choose happier sounds. *Frontiers in Psychology, 4*, 372. CC by 3.0

[4] Corbeil et al., (2013). Speech vs. singing: Infants choose happier sounds. *Frontiers in Psychology, 4*, 372. CC by 3.0

[5] Corbeil et al., (2013). Speech vs. singing: Infants choose happier sounds. *Frontiers in Psychology, 4*, 372. CC by 3.0

[6] Hahn et al., (2020). Six-month-old infants recognize phrases in song and speech. *Infancy, 25*(5), 699-718. CC by 4.0

[7] Franco et al., (2020). Singing to infants matters: Early singing interactions affect musical preferences and facilitate vocabulary building. *Journal of Child Language*, 1-26. CC by 4.0

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15.3.6: Strategies that Support Language Development-Joint Attention

Joint Attention

Joint attention refers to a shared focus between a caregiver and a child (including gaze, pointing, and visual attention). Joint attention is an important feature of language development because once joint attention is shared, the caregiver and child have a communicative context in which information about objects or events in the environment can effectively be communicated. [1]



Figure **15.3.6.1**: Caregiver and toddler engaged in joint attention ([2])

During the child's first two years of life, joint attention is thought to emerge gradually in interaction with the child's emotional and social development, as well as resulting from cognitive development involving skills like processing, attention and self-regulation (Morales et al., 2000). Already in the first four months of life, infants start to engage with their caregivers in sustained periods of face-to-face or mutual eye gaze (Johnson & de Haan, 2011). Between the ages of 9 to 12 months, children start to explore their environment more. At this point, dyadic attention shifts to triadic attention in which caregiver and child start to coordinate and systematically divide their attention between objects or events in the environment and with each other (Carpenter et al., 1998; Wille, Van Lierde & Van Herreweghe, 2019). It should be noted, however, that these episodes of triadic joint attention do not occur frequently until children are about 15 to 18 months old (Carpenter et al., 1998). [1]

Joint attention is related to language development. Children's ability to respond to bids of joint attention by their caregiver at 6, 8, 10, and 18 months of age has been reported to predict vocabulary size at 30 months of age (Morales et al., 2000). Interestingly, there is also some evidence suggesting that responding to joint attention may be predictive of receptive vocabulary size and that initiating joint attention may be predictive of expressive vocabulary size (Markus et al., 2001; Mundy, Fox & Card, 2003; Mundy & Gomes, 1998). Gaze-following behavior at 10 to 11 months predicted receptive vocabulary at both 14 and 18 months (Brooks & Meltzoff, 2005). Further, full-term infants' responsiveness to gaze alternations in triadic interactions at 9 months and initiating triadic interactions at 14 months were positively correlated with later language, such that infants with more responsivity to gaze shifts had better receptive and expressive language scores at 30 months (De Schuymer et al., 2011). Individual differences in responding to joint attention at 9 and 12 months and initiating joint attention at 18 months predicted 24-months expressive language (Mundy et al., 2007). [4] [3]



Figure 15.3.6.1: Caregiver and toddler engaged in joint attention. ([4])

One reason joint attention is related to language development is because shared attention toward an object allows for language to be more easily mapped to objects. For example if a caregiver and an infant are jointly attending to the same object, such as a dinosaur, when the caregiver uses the word “dinosaur” it creates a clear link between the object (dinosaur) and its linguistic label.

Although engaging in joint attention is a natural activity for caregivers, it does require an investment of uninterrupted time to truly engage with infants and toddlers. So much of a caregivers’ time can be devoted to care routines, preparation and cleaning, it can be a challenge to set aside time for joint attention to take place. For joint attention to occur, caregivers must be fully present in their interactions with children as they share joint attention through eye gaze, visual attention and pointing, oftentimes accompanied with physical touch and language. One study found that across 200 toddlers recorded for twenty minutes while attending group care programs, one third of the children did not engage in any joint attention with caregivers (Smith, 1999). When caregivers practice reading the communicative cues and practice engaging in joint attention with infants and toddlers, they improve in their ability to share in joint attention with children (Cain, Rudd & Saxon, 2007; Gouri-Guberman, 2015; Rudd, Cain & Saxon, 2008). One reason joint attention may be beneficial is that it increases the amount of time infants pay attention to something, such as an object. During moments of joint attention, caregivers can increase an infant’s attention by talking about and manually manipulating the object an infant is interested in (Suarez-Rivera, Smith & Yu, 2019).

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[1] Lammertink et al., (2022). Joint attention in the context of hearing loss: A meta-analysis and narrative synthesis. *Journal of Deaf Studies and Deaf Education*, *27*(1), 1-15. CC by 4.0

[2] Image by Kenny Krosky on Unsplash.

[3] Çetinçelik et al., (2021). Do the eyes have it? A systematic review on the role of eye gaze in infant language development. *Frontiers in Psychology*, *11*, 3627. CC by 4.0

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15.3.7: Strategies that Support Language Development-Baby Signs and Sign Language

Baby Signs and Sign Language

Baby signs are gestures created to provide an early way for caregivers to communicate with infants and toddlers and acquire insight and respect for underestimated communicative abilities of children before they can talk (Vallotton, 2008; 2011). The baby signs system is not a full system and is not the same as sign language. Baby signs were created as a means to ease communication as manual communication often precedes spoken language production (Goldin-Meadow, Goodrich, Sauer & Iverson, 2007). Baby signs are usually used while simultaneously using a spoken language and do not mark each word spoken in a sentence. For example, if a caregiver asks an infant, “Do you want more?”, the baby sign for ‘more’ will be used when the spoken word ‘more’ is pronounced.

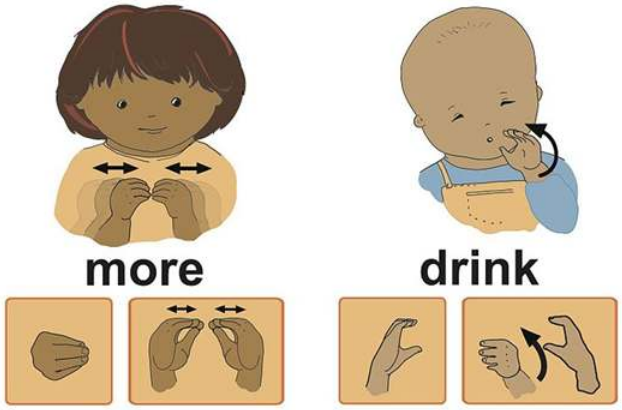


Figure **15.3.7.1**: Signs for ‘more’ and ‘drink’. Signs for more: fingers of both hands together and bring them together and apart repeatedly. Sign for drink, hold hand as if holding a cup and bring to mouth to mimic drinking. ([1])

In comparison to baby signs, sign languages are fully-fledged language systems naturally created by Deaf individuals. As misconceptions about sign languages continue to persist, there are a few facts to know: [2]

- Sign languages are complex language systems with similar linguistic properties as spoken languages (Sandler, 2017; Woll, 2013).
- Most countries have their own sign language (Jepsen, De Clerck, Lutalo-Kiingi & McGregor, 2015), such American Sign Language in the U.S., Lengua de Señas Mexicana in Mexico and Nederlandse Gebarentaal, the primary sign language used in the Netherlands.
- Infants and toddlers learning a signed language as a native language show acquisition patterns and reach milestones similar to children learning a spoken language (Caselli, Lieberman & Pyers, 2020; Lillo-Martin & Henner, 2021; MacDonald et al., 2018).
- Similar neural systems support the processing of both signed and spoken languages (Corina & McBurney, 2001; MacSweeney, Capek, Campbell & Woll, 2008).

After early investigations reported that very young children of Deaf parents often attained early language milestones in sign language at younger ages than children learning a spoken language (Bellugi, & Klima, 1982; Bonvillian, Orlansky & Novack, 1983; McIntire, 1977), other investigators began to study the learning of signs or symbolic gestures by the young hearing children of hearing parents (Acredolo & Goodwyn, 1996; Goodwyn & Acredolo, 1993, 1998). In this research, those infants who were taught a collection of “baby signs” typically acquired the signs faster than speech-trained infants acquired a collection of spoken target words. The investigators attributed the children’s slower acquisition of spoken words to the difficulties and complexities involved in spoken language production early in a child’s development. In other words, a child’s physical ability to produce speech or control the muscles needed for recognizable speech seems to lag behind the child’s physical ability to control the arm and hand movements needed to produce recognizable signs. The children in the sign-trained group showed a long-term advantage on a number of language development measures throughout early childhood, as well as higher school-age IQ scores (Acredolo,

Goodwyn, & Abrams, 2002; Goodwyn, Acredolo, & Brown, 2000). These findings indicate that early signing or symbolic gesturing does not hamper verbal development and may, in fact, enhance it. [3]

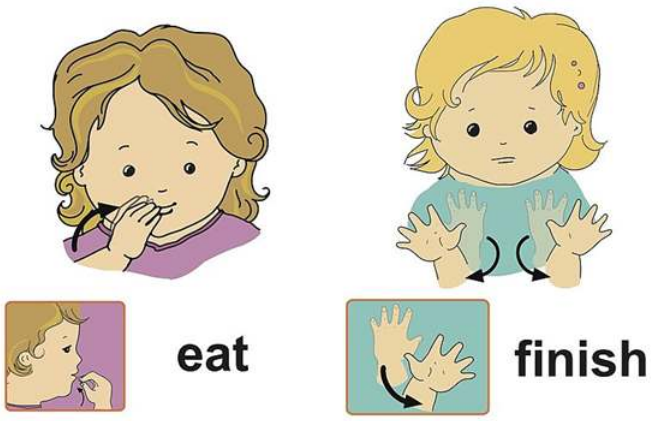


Figure **15.3.7.2**: Signs for 'eat' and 'finish'. Sign for eat bring fingers of one hand to mouth repeatedly. Sign for finish spread fingers apart and with palms facing out shake hands back and forth. ([4])

In another investigation, forty infants were followed from the age of eight months to twenty months where half of the mothers modeled signs or gestures for a limited number of target set signs, whereas the remaining half of the mothers focused on spoken language input (Kirk, Howlett, Pine & Fletcher, 2013). The mothers in the sign/gesture-input conditions became more sensitive to their infants' nonverbal cues than the mothers in the speech-only condition. Numerous studies have shown that use of baby signs is related to more responsiveness from caregivers and helps infants and caregivers to be more insync with each other when interacting (Góngora & Farkas, 2009; Norman & Byrne, 2021; Olson & Masur, 2013; Paul et al., 2019; Vallotton, 2009; 2012; Zammit & Atkinson, 2017). This increased sensitivity to infants' nonverbal cues may be an important benefit of sign input as such sensitivity may contribute to closer caregiver-infant bonding. [3]

In an attempt to explain the positive outcomes associated with baby-signing in their research, Goodwyn and Acredolo suggested that the children's symbolic gestures or signs may have elicited more spoken language input from the children's parents as well as indicated to the parents the specific topics in which the children were interested in. There are, however, other possible interpretations. One is that combining sign and spoken language input may facilitate the vocal production of typically developing babies as it does for many children with Down syndrome (Özçalişkan et al., 2016) or autism (Özçalişkan et al., 2017). A second possibility is that because "baby-signing" typically involves caregivers producing signs for only the key words in their utterances, this combining of signs and spoken language may help infants segment the speech stream by making the signed words more prominent, thus facilitating their acquisition (Mueller & Acosta, 2015). [3]



Figure **15.3.7.3**: Signs for ‘tired’ and ‘hurt’ . Sign for tired, cup hands and drag down chest. Sign for hurt, extend pointer finger, curl other fingers in and move hands together and apart. ([5])

Along with the claim of potentially fostering more rapid spoken language development, the early use of signs also has been associated with fewer and less severe temper tantrums in infancy and early childhood (Acredolo et al., 2002). Additional support for this claim of improved social behavior is seen in a study of hearing infants who were taught manual signs early in their lives. Once these infants acquired minimal functional sign skills, their incidence of crying and whining decreased substantially (Thompson et al., 2007). [3]

Caregivers can easily learn basic signs and use them with infants and toddlers. Using baby signs per se is not necessary. Baby signs are based on signed languages and often require unnecessary financial purchases. Baby signs are sometimes modified to be easier to manually produce for young children, but young children natively acquire sign languages and naturally produce signs that caregivers can understand even if they are not exact replicates of the adults’. Two free resources to learn signs are Lifeprint created by Dr. Bill Vicar and the ASL Sign Bank.

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[2] Corina et al., (2013). Cross-linguistic differences in the neural representation of human language: Evidence from users of signed languages. *Frontiers in Psychology, 3*, 587. CC by 3.0

[3] Bonvillian et al., (2020). *Simplified signs: A manual sign-communication system for special populations*. Cambridge, UK: Open Book Publishers. CC by 4.0

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15.3.8: Strategies that Support Language Development-Shared Reading

Shared Reading

Is reading books with infants and toddlers important? Most likely, you quickly answered this question with a resounding “yes!”. While most people might strongly agree that reading with young children is an important activity, only 37.2% of infants and toddlers nationally are read to everyday (Keating et al., 2021). Reading is so important because it maximizes the kinds of experiences that optimally predict language learning. A study of 3,547 children between 1 to 2 years of age, found that children who were read to for at least eleven minutes everyday had stronger reading, spelling, and grammatical skills in both third grade and fifth grade (Brown, Wang & McLeod, 2022). There are at least three ways in which book reading influences language learning: [1]

- First, it offers children the opportunity to hear new vocabulary items embedded in varied grammatical sentences. Books written for children use well-formed, relatively short sentences that are rich in varied vocabulary. Furthermore, books often use the same words in diverse grammatical constructions, offering implicit lessons in how words are used. The texts of books tend to have more words that are less commonly used than does spoken language (Dickinson & Tabors, 2001) and books encourage use of a wider range of words than would occur in everyday conversations. Indeed, shared reading is a robust predictor of children’s vocabulary and reading comprehension abilities (Demir-Lira, Applebaum, Goldin-Meadow & Levine, 2019; Sénéchal, 2011). [1]
- The second way in which book reading enriches children’s language development is that it promotes joint attention and interest. Consider all the ways in which books help children maintain their attention. Children’s books often use bold colors and strong contrasts and typically depict illustrated objects and animals that appeal to young children. The page of the book provides a clear focus for attention, and, unlike movable toys such as balls and trucks, books are held and remain relatively stationary. An attentive adult can easily notice what a child is attending to and build on it with commentary. In turn, children are able to draw an adult’s attention to interesting areas of the pictures using a broad range of cues including gestures, sounds, and words. Thus, attention can be managed by the child as well as the adult. [1]
- Finally, book reading helps children learn language because it requires the participants, both caregiver and child, to be active and engage in responsive interactions about word meanings. It is an opportunity for a caregiver to focus on the child and make efforts to be responsive to their interests. When caregivers and young children communicate during book reading and move away from the text, they are engaging in a language-rich activity that yields even more varied vocabulary and diverse sentence structures (Arnold, D. H., Lonigan, Whitehurst & Epstein, 1994; Whitehurst et al., 1988). Dialogic reading occurs when adults follow the child’s interest and engage in conversation about material on the printed page or about experiences the child has had that relate to the story. Book reading becomes an “up close and personal” experience when done in this way and yields the most in the way of language learning (Valdez-Menchaca & Whitehurst, 1992). [1]

Additionally, the frequency of shared reading, the age at which caregivers begin to read to children and repeated reading of books are important factors that further the benefits of shared reading for language development.

The importance of reading frequency for children from birth to age three is clearly revealed by numerous studies (Rodriguez & Tamis-LeMonda, 2011). Just reading one picture book every day can lead to an increase of approximately 78,000 words each year (Logan, Justice, Yumus & Chaparro-Moreno, 2019). Findings of a large study finding caregivers’ reports of daily book reading at age 14 months related to vocabulary and language comprehension at 14 and 24 months (Raikes et al., 2006). A longitudinal study focused on 1,046 children examined language and cognitive abilities at 14, 24, and 36 months of age (Rodriguez et al., 2009). Literacy experiences at each of the three ages was related to language and cognitive skills at three years of age. [1]



Figure **15.3.8.1**: Infant looking through a collection of books. ([2])

There is also evidence that the age at which parents begin to read to children is important. One observational study found that children in households where reading was reported with children as young as eight months had stronger early language growth (Debaryshe, 1993). An intervention study compared the effects of interactive reading when their babies were 4 months old and when babies were 8 months old. Only the condition with older babies was effective, with improved language abilities being found when the babies were 12 and 16 months old (Karrass & Braungart-Rieker, 2005). [1]

Repeated readings of the same books can also increase children's engagement (Fletcher & Jean-Francois, 1998; Morrow, 1988) and enhance their language learning through shared reading (Snow & Goldfield, 1983). Children who read a familiar book talk more than when reading a novel book (Fletcher & Reese, 2005). Moreover, parents and children talk more about related content or their own experiences when re-reading the same book, which also increases children's world knowledge (Haden et al., 1996; Hayden & Fagan, 1987). For children with lower language abilities, repeated readings of the same book increase engagement in comparison to readings of different books (Morrow, 1988). Repeated readings provide multiple opportunities for repeated imitation (Ninio, 1983) and processing of novel words in a meaningful context (Sénéchal, 1997) as books contain more unique words compared to child-directed speech (Montag, Jones & Smith, 2015). Experimental studies have found that children's expressive vocabulary is enhanced after two or more readings of the same book, whereas one reading often does not result in significant vocabulary gains (Horst, Parsons & Bryan, 2011; McLeod & McDade, 2011; Sénéchal & Cornell, 1993; Sénéchal, 1997;). [3]

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[1] Dickinson et al., (2012). How reading books fosters language development around the world. *Child Development Research*. CC by 3.0

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[3] Grolig (2020). Shared storybook reading and oral language development: A bioecological perspective. *Frontiers in Psychology, 11*, 1818. CC by 4.0

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15.3.9: Strategies that Support Language Development-Dialogic Reading

Dialogic Reading

Imagine you are sitting down to read a book with a toddler. You open the book and Figure **15.3.9.1** shows what is on the first page. Take a moment to look at the page in Figure **15.3.9.1** and consider how you would read this page with a toddler.

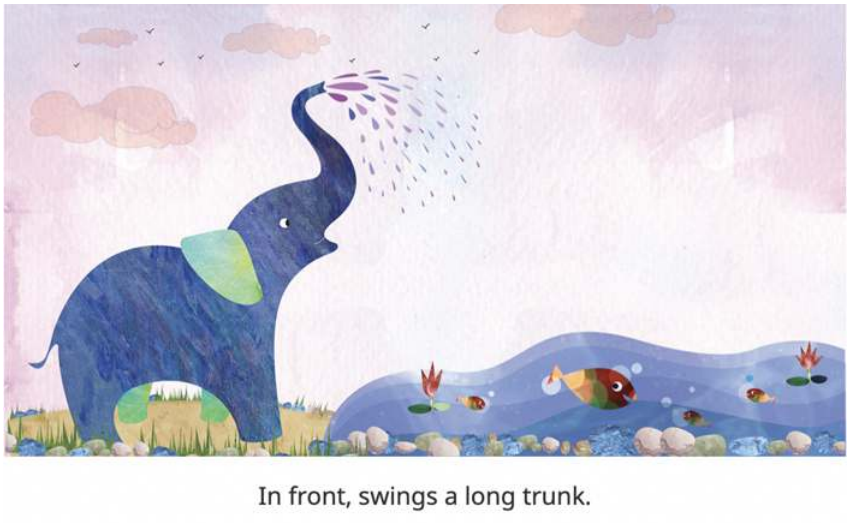


Figure **15.3.9.1**: A page from a children's book. [1]

For many of us, we read books with children by focusing on the text. Reading the words on the pages is a great start, but there can be so much more to discuss! Variation in how books are read and discussed has been found to be important. Ninio (1980) examined interactions between Israeli caregivers and infants between 17 and 22 months of age. Caregivers tended to use one of three interactional routines, asking one of two types of questions "What's that?," "Where's that?," or simply naming objects. A large study of the reading approaches of 126 caregivers found variability in how they read to children at age 7 and 24 months (Britto, Brooks-Gunn & Griffin, 2006). Caregiver reading style was related to language growth, with children showing greater language growth when they were encouraged to participate in the reading and supported in their understanding; however, this reading style was found in only 30 of the 126 caregivers. [2]

One of the most common methods to improve caregivers' reading with young children is dialogic reading as it is not commonly implemented when caregivers read with infants and toddlers (Huebner & Meltzoff, 2005). To encourage caregivers to see that reading should be about more than just the words on pages, reading with infants and toddlers is best perceived as an interaction between the caregiver, the child and the book. Perceiving book reading as more of an interaction is oftentimes referred to as dialogic reading. Dialogic reading uses techniques that encourage the caregiver to be responsive to the child with conversations that follow the child's interest and lead. Dialogic reading typically involves recasts, expansions, and open-ended questions, all of which have been shown to have a positive impact on a child's language development (Baker & Nelson, 1984; Cleave et al., 2015; Farrar, 1990; Girolametto & Weitzman, 2002; Huttenlocher et al., 2010; Nelson, 1977). A meta-analysis of dialogic reading found that it loses its value with the older children (Mol, Bus, De Jong & Smeets, 2008). It may be that the method is best suited to book reading with infants, toddlers, and younger preschool children. [2] [3]



Figure **15.3.9.2**: Caregiver reading with two toddlers. ([1])

One reason dialogic reading is so beneficial for children's language development is because it involves quality language-boosting practices. For example, the child-directed speech delivered during interactive shared book reading contains higher levels of syntactic and lexical diversity than the speech children are exposed to during play-based activities (Cameron-Faulkner & Noble, 2013; Demir-Lira, Applebaum, Goldin-Meadow & Levine, 2019; Noble et al., 2018; Salo, Rowe, Leech & Cabrera, 2016), and high levels of syntactic and lexical diversity in speech directed to children are linked to higher levels of syntactic and lexical diversity in children's speech (Huttenlocher et al., 2002). Interactive shared book reading has also been shown to foster higher levels of joint attention, responsiveness, and contingent talk, all of which have been shown to support language development (Carpenter et al., 1998; Farrant & Zubrick, 2013; McGillion, Pine, Herbert & Matthews, 2017; Tomasello & Farrar, 1986). It also encourages the caregiver to use additional language-boosting practices, which have all been shown to support children's language development, including expanding, recasting, and asking open-ended questions (Baker & Nelson, 1984; Cleave et al., 2015; Girolametto & Weitzman, 2002; Huttenlocher et al., 2010). []



Figure **15.3.9.3**:Caregiver reading with an infant. ([4])

Many studies that have trained caregivers in dialogic reading strategies report positive gains in young children's language outcomes (Chacko, Fabiano, Doctoroff & Fortson, 2018; Grolig, Cohrdes, Tiffin-Richards & Schroeder, 2020; Kim & Riley, 2021; Lonigan et al., 1999; Opel, Ameer & Aboud, 2009; Purpura, Napoli, Wehrspann & Gold, 2017; Simsek & Erdogan, 2015; Towson, Gallagher, & Bingham, 2016; Valdez-Menchaca & Whitehurst, 1992). For example, Valdez-Menchaca and Whitehurst (1992) trained teachers to read using a dialogic reading style that involved asking more open-ended questions and responding to children's attempts to answer these questions with low-income Mexican toddlers. Children who received the dialogic reading intervention scored significantly higher on measures of both expressive and receptive language than children in the control group. [3]

Many studies have found that asking basic comprehension questions during shared reading increases the effects on oral language skills in comparison to reading story books aloud without asking questions (Flack, Field & Horst, 2018; Wasik, Hindman & Snell,

2016). Asking such literal comprehension questions both serves to attain joint attention and to establish a fundamental understanding of concepts and events. Discussing the meanings of new words in the context of the story and in other contexts facilitates a deeper word understanding (Coyne et al., 2009).[5]

By implementing the PEER sequence, the caregiver:[3]

- prompts the child to say something about the book,
- evaluates the child's response,
- expands the child's response, and
- repeats the prompt to help the child learn from the expansion.

A fundamental element of dialogic reading is the use of prompts to begin the PEER sequence while reading with a child. The acronym CROWD stands for five recommended prompts:[3] [6]

- Completions
  - Example: “Five little monkeys jumping on the _____”. The child fills in “bed” to participate in completing the thought.
- Recalls
  - Example: What happens after the wolf huffs and puffs? The child recalls the story and puts that into their own words.
- Open questions
  - Example: “Tell me what is happening in this picture.” The child practices putting their own thoughts into words.
- Wh-questions
  - Example: What is that? Why is that happening? At many different levels children can put their thoughts into words.
- Distancing questions
  - Example: What happened when we made your birthday cake? Children remember past events and relate them to the present and future.

Let’s take another look at the page from a children’s book presented earlier. Imagine creating an interaction with the child about this page using the PEER and/or CROWD dialogic reading strategies. After imagining what you might say using the dialogic reading strategies, reflect on how the quantity and quality of your language was impacted.



Figure **15.3.9.1**: A page from a children’s book. ([1])

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[2] Dickinson et al., (2012). How reading books fosters language development around the world. *Child Development Research*. CC by 3.0

[3] Noble et al., (2020). The impact of interactive shared book reading on children's language skills: A randomized controlled trial. *Journal of Speech, Language, and Hearing Research*, *63*(6), 1878-1897. CC by 4.0

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[5] Grolig (2020). Shared storybook reading and oral language development: A bioecological perspective. *Frontiers in Psychology, 11*, 1818. CC by 4.0

[6] "Using Mariposa, Mariposa (Butterfly, Butterfly) to promote dialogic reading: A powerful way to encourage language development in one or more languages" from Head Start ECLKC is in the public domain.

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15.4: Conclusion

Conclusion to Supporting Language Development in Group Care

Language develops rapidly during the first three years of life and the quantity and quality of language exposure is important not only for later language development, but also for later cognitive and academic abilities. Caregivers play an essential role in exposing children to a high quantity and high quality of language and can use many strategies to improve their ability to do so.

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15.5: References

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CHAPTER OVERVIEW

16: Multilingualism

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16.1: Introduction

Introduction to Multilingualism

Many infants and toddlers around the world, and a growing number in the U.S. are learning more than one language. In order to design the most responsive and linguistically enriching care and educational experiences for multilingual infants and toddlers, it is important for caregivers to have a good understanding of the unique contexts that shape the development of children learning multiple languages, in which ways they differ from those of monolingual children and practices to best support their multilingual development. This section will explain what multilingualism means, address common misconceptions, describe how infants and toddlers develop multiple languages and provide strategies for caregivers to best support multilingual children.

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16.2: Defining Multilingualism

What is Multilingualism?

What does it mean to be multilingual? Across educational and research fields, a number of different terms and definitions have been used to describe children who are multilingual. The term multilingual may encompass or overlap substantially with other terms frequently used, such as ‘bilingual’, ‘dual language learner’, ‘English language learner’ and ‘children who speak a language other than English’. For the purpose of this section, the term multilingual refers to children who are learning two (or more) languages at the same time, or learning an additional language while continuing to develop their native language(s). [1]



Figure **16.2.1**: Toddler and caregiver from India. ([2])

Multilingualism is a complex construct that has been redefined over the past several decades. Scholars once defined multilinguals exclusively as a small group of speakers who were perfectly “balanced” in their languages (Lambert, Havelka, Gardner, 1959). The definition of multilingualism has since expanded to include individuals with varying degrees of proficiency and different language experiences. An individual’s multilingual status is not a trait that can be directly measured—multilingualism cannot be determined in the same way as someone’s height, for example. When measuring multilingualism, researchers often rely on a combination of factors, such as language proficiency and amount of exposure, to determine an individual’s multilingual status (Anderson, Mak, Keyvani Chahi & Bialystok, 2018; Li, Sepanski & Zhao, 2006, 2014; Marian, Blumenfeld & Kaushanskaya, 2007; Marian & Hayakawa, 2020). [1]

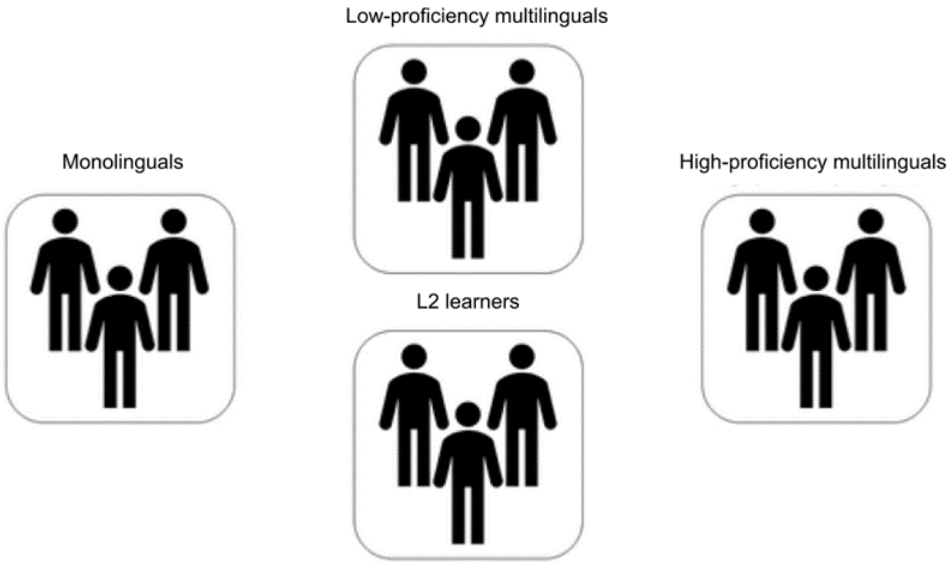


Figure **16.2.2**: Representation of a categorical model of multilingualism with different possible groups of multilinguals. ([4])

In order to account for the full spectrum of multilinguals' experiences and language abilities, some scholars have proposed that multilingualism should be viewed as a continuous variable (Baum & Titone, 2014; de Bruin, 2019; Kaushanskaya & Prior, 2015; Marian & Hayakawa, 2020; Takahesu Tabori, Mech & Atagi, 2018). Under such an approach, the continuum of being multilingual would span the range from completely monolingual (i.e., never having any exposure to a second language) to fully proficient multilingual (i.e., "balanced" across languages).Figure **16.2.3** shows a visual representation of a continuous model of multilingualism. Other models of multilingualism may even combine both categorical and continuous models (Kremin & Byers-Heinlein, 2021). Clearly, being multilingual is much more complex than simply learning or knowing two or more languages. [3]



Figure **16.2.3**: Representation of a continuous model of multilingualism. ([5])

Each multilingual child's language learning experience is unique: children differ in terms of the specific languages they are learning, when they start learning each, and how they experience them. Contexts for multilingualism may be very different across families, child care programs, communities, and cultures (Rowe & Weisleder, 2020). Taking this diversity into account is key to understanding early multilingual development. As a result, each multilingual child will have their own developmental path (de Bruin, 2019)—there are nearly as many ways to grow up multilingual as there are multilingual children! [6]

Despite the diversity, a common factor across multilingual development is the crucial role of the quantity and quality of exposure infants and toddlers receive in their different languages (Marchman, Fernald & Hurtado, 2010; Ramírez-Esparza, García-Sierra & Kuhl, 2017). For example, we would not expect a child to learn a language they only hear for 5 minutes per day (low quantity) or to learn a language from 5 hours a day of isolated vocabulary words recited from an audiotape (low quality). It is difficult to know exactly what combination of quantity and quality is required, but some studies estimate that children need a minimum of 10% to 25% of overall exposure in a language to achieve fluency in it, which will only occur if their language experience is rich and varied (Place & Hoff, 2011). If children do not receive sufficient high-quality multilingual exposure, they are unlikely to become proficient in all of their languages. [7]

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[1] US Department of Health and Human Services. (2017). Policy statement on supporting the development of children who are dual language learners in early childhood programs is in the public domain.

[2] Image from Saradhi Photography on Unsplash.

[3] Kremin & Byers-Heinlein (2021). Why not both? Rethinking categorical and continuous approaches to bilingualism. *International Journal of Bilingualism*, *25*(6), 1560-1575. CC by 4.0

[4] Image adapted from Kremin & Byers-Heinlein (2021). Why not both? Rethinking categorical and continuous approaches to bilingualism. *International Journal of Bilingualism*, *25*(6), 1560-1575. CC by 4.0

[5] Image from Kremin & Byers-Heinlein (2021). Why not both? Rethinking categorical and continuous approaches to bilingualism. *International Journal of Bilingualism*, *25*(6), 1560-1575. CC by 4.0

[6] Fibla et al., (2021 preprint). Bilingual language development in infancy: What can we do to support bilingual families? CC by 4.0

[7] Fibla et al., (2021 preprint). Bilingual language development in infancy: What can we do to support bilingual families? CC by 4.0

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16.3: Demographics of Multilingual Children

Multilingual Children

Many children around the world are multilingual. Recent estimates suggest that approximately 7,000 languages are currently spoken worldwide in only 196 Countries (Simons & Fennig, 2018). This suggests that the vast majority of the world's population is consistently exposed to two or more languages and can be considered multilingual (Baker, 2006; Jonak, 2015; Marian & Shook, 2012). Reported rates of multilingualism in places such as Europe (67%), Canada (55%), India (25%), and the United States (20%) indicate that multilingualism is both common and increasing (Luk, 2017; Office of the Registrar General & Census Commissioner, India, 2001). The current rates for the number of multilingual children are often even higher than that for adults. For example, in the U.S. 26% of 5 to 17 year children nationwide are multilingual, although rates differ by state. In the U.S. the state of California has the highest percentage of multilingual children at 43%, while only 2% of children in West Virginia are multilingual (Kids Count Data Center, 2019). An estimated 15% of children in Australia (Australian Bureau of Statistics, 2006), 18% to 25% of children in Canada (Schott et al., 2021), 29% of children in parts of Spain (Statistical Institute of Catalonia, 2007) and 90% of children in Singapore (Wu et al., 2020) grow up multilingual. [1] [2] [3]

It is much more challenging to find estimates of the number of children under age three that are multilingual. Data from Canada provides unique insight into estimates of infant and toddler multilingualism and how rates differ geographically even within the same country. Across Canada, 15.6% of children aged 0 to 4 and 20.4% of children aged 5 to 9 years of age are multilingual. Broken down by province/region, the rate of child multilingualism was highest in Northern Canada (Yukon, Northwest Territories, and Nunavut), with nearly one in three children speaking two languages at home, in most cases an Indigenous language and English. Nearly one in four children aged 0 to 4 in Toronto, Vancouver, Ottawa, and Montréal, spoke at least two languages at home. In Calgary and Edmonton, rates were one in six for children aged 0 to 4. Provinces with larger cities had higher overall rates of multilingualism (i.e., British Columbia, Alberta, Ontario, and Quebec). Across all provinces, the rate of multilingualism among 5 to 9 year olds was higher than 0 to 4 year olds, which could be due to some children acquiring a community language at school and then starting to use that language at home. This pattern has been documented in the United States for native Spanish-speaking children learning English (Hammer, Lawrence & Miccio 2008). [4]



Figure **16.3.1**: Map of Canada. ([5])

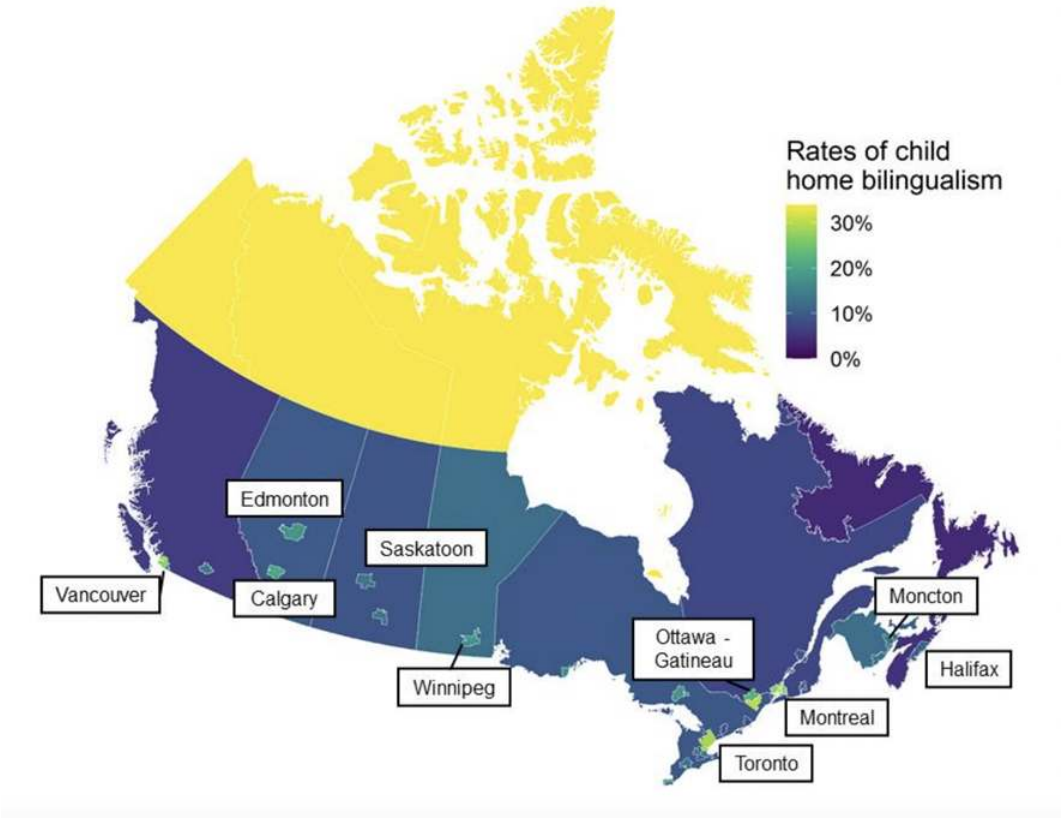


Figure **16.3.2**: Rates of multilingualism amongst children between 0 to 9 years of age across Canada. ([6])

Rates of multilingualism amongst children between 0 to 9 years of age across Canada

Children who are multilingual are a highly diverse group from varied family backgrounds with a wide variety of life and language experiences. In the U.S., children in a multilingual home, are likely to have parents without a high school education, are likely to be growing up under economic challenges, and are likely to be raised in specific cultural contexts that may differ from mainstream U.S. norms. (Winsler et al., 2014). In addition, it has been found that children with immigrant parents (who are likely to be multilingual) are more likely than those with parents born in the U.S. to live in two-parent families (Hernandez & Napierala, 2012); immigrant mothers are more likely to be married, less likely to be depressed, and more likely to have larger families than nonimmigrant mothers (Mistry, Biesanz, Chien, Howes, & Benner, 2008). These sociocultural factors represent a constellation of strengths and potential challenges for multilingual children growing up in the U.S. [7]



Figure **16.3.3**: Infant with his Indonesian grandmother ([1])

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16.4: Multilingualism- Beliefs and Misconceptions

Beliefs and Misconceptions

Caregiver beliefs and knowledge about multilingualism affect their caregiving practices, which in turn can impact children's developmental outcomes. As infant and toddler multilingualism becomes a prominent phenomenon across the U.S. it is critical to examine how caregivers' beliefs and knowledge regarding multilingualism relates to childrens' language experiences in group care and childrens' developmental outcomes over time. [7]

One common concern about multilingualism is that early exposure to multiple languages is confusing for children. Research does not support this concern. Young infants can perceive the difference between different languages within the first few days or months of life (Bosch & Sebastián-Gallés, 2001; Byers-Heinlein, Burns & Werker, 2010). Infancy and toddlerhood represent a sensitive period for language acquisition, when the brain is particularly receptive to the properties of language (Kuhl et al., 2005; Werker & Tees, 2005). For this reason, multilingual children exposed to their languages earlier in development become better at them, and will speak and process them in a more native-like manner (Bialystok, 2001; Zhao, Boorom, Kuhl & Gordon, 2021). [3]

Another common concern is that childhood multilingualism can cause language disorders and delays. Research does not support this concern. Language disorders and delays occur in multilingual children at the same rates as in monolingual children (Kohnert, Ebert & Pham, 2020; Peña et al., 2011). In fact, many children with various developmental disabilities also grow up multilingual, including children with specific language impairments (Paradis et al., 2011), children with Down Syndrome (Kay-Raining Bird et al., 2005), and children with autism spectrum disorder (Gonzalez-Barrero & Nadig, 2019). Importantly multilingual children with developmental disabilities should have difficulties across their languages, not just with one language (Kohnert, 2010; Peña, Iglesias & Lidz, 2001; Restrepo & Kruth, 2000). Multilingualism neither causes nor facilitates/aggravates a possible condition of dyslexia or any specific language disorders in general (Crescentini, Marini & Fabbro, 2012). To ensure accurate assessment of the language development of multilingual infants and toddlers, caregivers must assess all of the child's languages (Nayeb et al., 2021) [1] [3] [8]

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16.5: How Multilingualism is Different

Uniqueness of Multilingualism

As the population of young multilingual children continues to increase across the U.S., there has been a corresponding explosion of research about their development. These research findings provide a scientific basis for designing child care program approaches, and assessment procedures. [7]

Some features of multilinguals' language development may look like speech or language delays (Sandhofer & Uchikoshi, 2013). The ongoing challenges of processing more than one language and frequently switching between languages results in a different set of language and cognitive strengths and needs for multilingual children than those of monolingual children (Francis, 2021). Young children who are learning through two languages initially make slower progress in each of their languages than monolingual children (Sandhofer & Uchikoshi, 2013). In addition, they typically have smaller vocabularies in each of their languages than monolingual children, but their total vocabulary size (the sum of what children know in all of their languages) is similar to monolingual children (Core, Hoff, Rumiche & Señor, 2013). Young multilinguals also take longer to recall words from memory and have lower scores on verbal fluency tasks, as their language processing is more complex than that of monolingual children (Petitto et al., 2011). Most often these differences are temporary and disappear as young multilinguals become more proficient in both of their languages (Conboy, 2013). It is important to remember that these early differences in the language development of young multilinguals are just that—differences and not delays! They are a byproduct of the challenges of hearing, processing, and making meaning from multiple language systems during the early childhood years. [1]

[1] Luo et al., (2021). Parental beliefs and knowledge, children's home language experiences, and school readiness: The dual language perspective. *Frontiers in Psychology*, *12*. CC by 4.0

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16.6: The Science of Multilingualism Development

Language Discrimination

One potential challenge for infants growing up with regular exposure to multiple languages is in discriminating between languages. Being able to separate the languages from very early on seems crucial given that the child has to establish different linguistic systems for the languages. [1]

Early research on monolingual infants has demonstrated that newborns are able to discriminate between different languages but only if the languages belong to different rhythmic classes. For example, French newborns could discriminate English from Japanese, Spanish and Italian but not from Dutch (Nazzi, Bertoncini & Mehler, 1998; Ramus et al., 2000). The only study on multilingual exposure effects with newborns tested infants from multilingual English–Tagalog mothers who regularly used both languages during pregnancy (Byers-Heinlein, Burns & Werker, 2010). The experiment tested discrimination using a habituation paradigm in which infants were first exposed to either English or Tagalog sentences until their sucking rates to a special pacifier decreased below a predefined criterion (habituation) and then were presented with sentences from the other language. Results revealed that both monolingual and multilingual infants showed an increase in their sucking after the language change, demonstrating that multilingual newborns were able to discriminate between both languages, just like monolinguals. [1]

At the age of 4 months, monolingual infants begin to discriminate languages of the same rhythmical class from their native language (Bosch & Sebastián-Gallés, 2001; Chong, Vicenik & Sundara, 2018; Molnar, Gervain & Carreiras, 2014; Nazzi, Jusczyk & Johnson, 2000) suggesting that they have acquired some inventory of cues that help them separate their native language from other languages. Similar to monolinguals, multilinguals are able to discriminate between languages at the same age as monolinguals (Bosch & Sebastián-Gallés, 2001; Garcia, Guerrero-Mosquera, Colomer & Sebastian-Galles, 2018). For example, monolingual Basque and multilingual Spanish/Basque infants were first habituated with stimuli from one language, and then tested with stimuli from both languages. Results showed that both groups were able to discriminate between the two languages (Molnar, Gervain & Carreiras, 2014). This suggests that by the age of 4 months multilingual infants have detected some properties that separate their two languages and that they can assign these properties specifically to one of their languages. [1]



Figure **16.6.1**: Caregiver holding infant in arms. ([2])

Growth of Word Learning

Word learning starts in the second half of the first year of life, with some evidence for knowledge of a limited number of words as early as 6 months (Bergelson & Swingley, 2012; Tincoff & Jusczyk, 1999, 2012). Word learning then increases, often with a sharp acceleration, in the second year of life (Fenson, Dale, Reznick, Bates, Thal & Pethick, 1994). This early development is characterized by extensive individual variability in the sizes of both receptive and productive vocabularies. [1]

Since multilingual infants' input is distributed over more than one language, they are likely to receive less input in each of their languages than monolinguals, which can have an impact on early lexical development. Moreover, since multilingual infants will vary in terms of the relative amount of input they receive in their languages, the languages might not develop at the same speed. Recent studies support these points. When multilinguals are evaluated on each of their languages separately, studies report that they

lag behind monolinguals starting in the second year of life (Core, Hoff, Rumiche & Señor, 2013) and the relative amount of exposure for each language is related to the growth of that specific language (Grüter, Hurtado, Marchman & Fernald, 2014). [1]

One crucial aspect when comparing monolingual and multilingual infants' trajectories of word learning is in how vocabulary is counted. One is conceptual vocabulary: counting every referent for which a child has a word for in either language (a French–German child would get a 1 for knowing either chien, hund, or both); another approach is total vocabulary, counting every word known across both languages (the same child would get a 2 for knowing both chien and hund). Considering how to measure multilingual vocabulary growth, especially when comparing to monolinguals, is critical as the results can vary greatly (Hoff et al., 2012). For example, a study comparing English–German and English monolingual 24 to 27 month old toddlers found that the multilinguals' total vocabularies were significantly larger than both their conceptual vocabularies and the English vocabularies of English-learning children (Junker & Stockman, 2002). Evidence also suggests that vocabulary growth is influenced by language dominance, with higher vocabulary scores in the dominant as compared to the non-dominant language (Hoff et al., 2012). What is clear is that when multilinguals' vocabulary levels are evaluated using measures that take into account both of their languages, they fall within a similar range as monolingual infants. When assessing the language development of multilinguals, the development of all of their languages should always be considered (Nayeb et al., 2021). [1]



Figure **16.6.2**: Toddler (1.5 years old) growing up in China. ([3])

Besides charting the growth trajectory of word learning through vocabulary knowledge, some studies have explored word learning by investigating the speed at which multilingual infants recognize words in each of their languages. Previous research with monolinguals has revealed that speed of language processing is related to later cognitive and language outcomes (Fernald, Perfors & Marchman, 2006; Hurtado, Marchman & Fernald, 2007; Marchman & Fernald, 2008). In a study with Spanish/English 30 month old multilinguals, results revealed that processing speed in each of the children's languages was related to their vocabulary in that specific language (Marchman, Fernald & Hurtado, 2010). Similar findings were also shown in another study with 16 to 22 month old Spanish/English multilinguals (DeAnda, Hendrickson, Zesiger, Poulin-Dubois & Friend, 2018). This research suggests that language processing speed and vocabulary acquisition are linked in multilinguals, as had been found in monolinguals, but that this link is language specific. [1]

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[1] Höhle et al., (2020). Variability and stability in early language acquisition: Comparing monolingual and bilingual infants' speech perception and word recognition. Bilingualism: *Language and Cognition*, *23*(1), 56-71. CC by 4.0

[2] Image by Jonathan Borba on Unsplash

[3] Image by chen lei on Unsplash

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16.7: Effects of Multilingualism on Development

Multilingual children grow to know and use multiple languages, and their development is not akin to "two monolinguals in one person" (Grosjean, 1989). One reason is that children's experience is divided between their different languages. Moreover, multilingual children must engage in a constant "mental juggling" of their two languages (Kroll et al., 2011; Kroll & Bialystok, 2013; Bosworth, Binder, Tyler & Morford, 2021), which can present challenges and opportunities for cognition, language representation, and processing (Marian & Shook, 2012). The experience of being multilingual can have an impact on both brain and cognitive development. [1]

Brain Development

Research with multilingual infants indicates that the human brain is adept at acquiring multiple languages simultaneously (Ferjan Ramírez et al., 2016; Garcia-Sierra, Ramírez-Esparza, & Kuhl, 2016), and that infants who grow up multilingual, efficiently monitor and control their languages (Byers-Heinlein, Morin-Lessard, & Lew-Williams, 2017). Studies also show that acquiring multiple languages in infancy, compared to acquiring an additional language in later childhood or adolescence, results in more efficient neural language processing (Berken, Gracco & Klein, 2017; Klein, Mok, Chen & Watkins, 2014) and higher brain tissue density in regions supporting language, memory, and attention (Mechelli et al., 2004). [2]

Multilingualism sculpts the brain's functional and structural organization (Arredondo, Aslin & Werker, 2021; Hayakawa & Marian, 2019; Pliatsikas, 2020). For example, multilingual infants show different brain responses to native and non-native speech sounds compared to monolingual infants (Conboy & Kuhl, 2011; Garcia-Sierra et al., 2011), and multilingual children recruit different brain areas during sentence processing (Jasinska & Petitto, 2013). Adult research shows that the age of acquisition of a second language affects the brain's language networks (Berken, Gracco, & Klein, 2017), and functional connectivity (Kousaie, Chai, Sander, & Klein, 2017). Moreover, multilingualism also affects the structure of both gray (Andrea et al., 2004; Ressel et al., 2012) and white matter (Kuhl et al., 2016) in adults. Looking at the tissue in the brain, there are regions that predominantly contain neuron cell bodies and dendrites and regions that are largely composed of just axons. These two regions are often referred to as gray matter (the regions with many cell bodies and dendrites) or white matter (the regions with many myelinated axons). Patterns of structural differences appear to depend on whether the languages were acquired simultaneously from birth, or sequentially before age five (Berken, Gracco, Chen & Klein, 2015), suggesting that timing of multilingualism interacts with brain development. [1] [3]

Garcia et al., (2018) analyzed the brain activity of 4.5 month old monolingual and multilingual infants in their native language and two foreign languages. Figure **16.7.1** shows the event related potential (ERP) waveforms of monolingual (left side) and multilingual (right side) infants to native (blue), Italian (green) and German (red) languages. The ERP component they looked at was the P200. Most ERP components are referred to by a letter (usually N or P) indicating polarity (negative/positive), followed by a number indicating the latency or timing delay between the presentation of a stimulus and the specific brain response in milliseconds. So the P200 component refers to a positive spike around 200 milliseconds after the stimulus. [4]

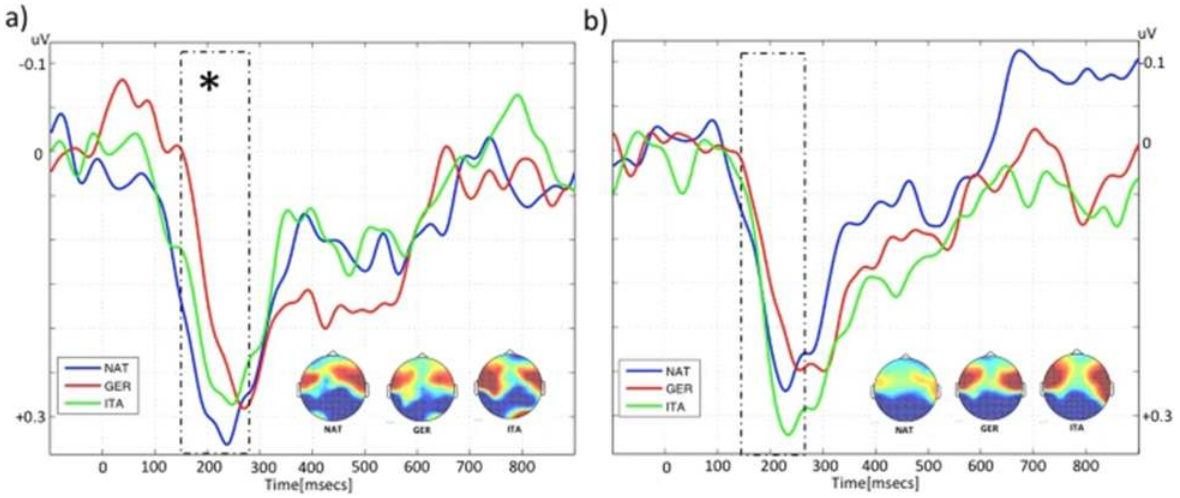


Figure 16.7.1: ERP waveforms to native and non-native languages in monolingual (a) and multilingual (b) four-month-old infants. ([5])

Although both groups of infants showed a P200 response to all languages, monolinguals showed shorter latencies (less processing time) of the P200 component for their native language compared to the language of the different rhythmic class (German). In other words, the P200 waveform for monolinguals listening to their native language occurred earlier than their responses for the non-native languages, especially German. This can be seen in Figure 16.7.1 by the early peaking of the waveform for their native language. In contrast, multilinguals did not show a statistically significant difference in the latency of the P200 component for any of the languages. This lack of differences may reflect multilinguals' reduced familiarity with each of their languages since multilinguals' speech input is split across multiple languages. Therefore, multilinguals' P200 response to their native language would be more similar to the one elicited by the unfamiliar languages for monolinguals. The results point in the direction of different language discrimination strategies for multilingual and monolingual infants. While only monolingual infants show early discrimination of their native language based on familiarity, multilinguals perform a later processing pattern which is compatible with an increase in attention to the speech signal. This is the earliest evidence found for unique brain specialization induced by multilingualism. [6]

Neuroimaging studies suggest that monolingual infants activate a left-lateralized brain network in response to spoken language, which is similar to the network involved in processing spoken and signed language in adulthood. Left-lateralization to language refers to the brain processing language primarily on the left side. How does language experience, like being multilingual, impact this left-lateralization process? To answer this question, researchers conducted a functional near-infrared spectroscopy (fNIRS) experiment with sixty infants between the ages of 4 to 8 months (Mercure et al., 2020), some infants were spoken language monolinguals and some were spoken language multilinguals, but neither of these two groups had ever been exposed to sign language. [7]



Figure 16.7.2: Infants participating in an fNIRS experiment. [8]

Functional near-infrared spectroscopy (fNIRS) measures hemodynamic (blood flow) responses elicited from neuronal activation by shining near-infrared light into the brain. Figure 16.7.2 shows an infant and a toddler wearing the fNIRS cap during an experiment. As this light passes through the head, some of it is absorbed by the blood flowing through the brain. When brains are active, they

require oxygen from the bloodstream—the harder a particular area of the brain is working, the more oxygenated blood will be sent to that area and the more light will be absorbed there. Because the fNIRS cap measures how much light comes back out of the brain, the areas with less light shining through them are the most active.[7] [9]

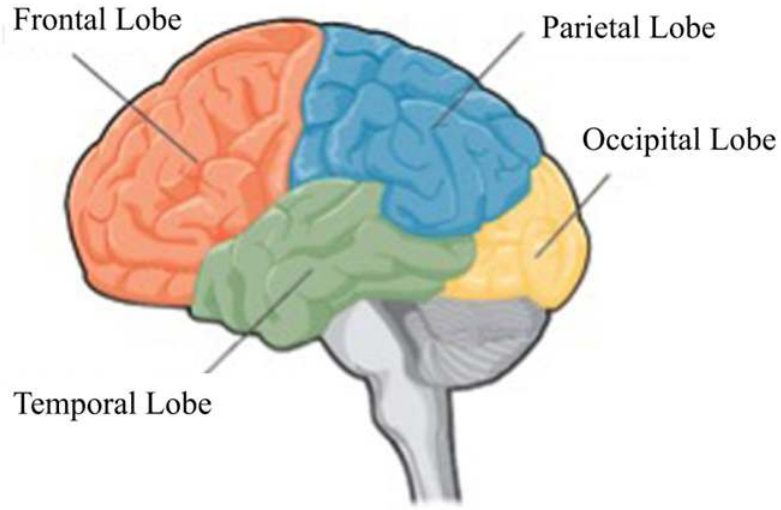


Figure 16.7.3: Lobes of the brain. ([10])

As shown in Figure 16.7.4, across all infants, viewing sign language elicited a significant increase in oxygenated blood mainly in the right temporoparietal area when all infants were considered together as a single group. In monolinguals, sign language elicited an increase in oxygenated blood in the temporoparietal area of both hemispheres. In multilinguals, a significant increase of oxygenated blood was observed in the right temporoparietal area. Results indicate that the neural tissue supporting language is plastic in infancy and influenced by language input and language modality (spoken modality versus signed modality), suggesting that there may be different neural paths to language development based on different language experiences.[17]

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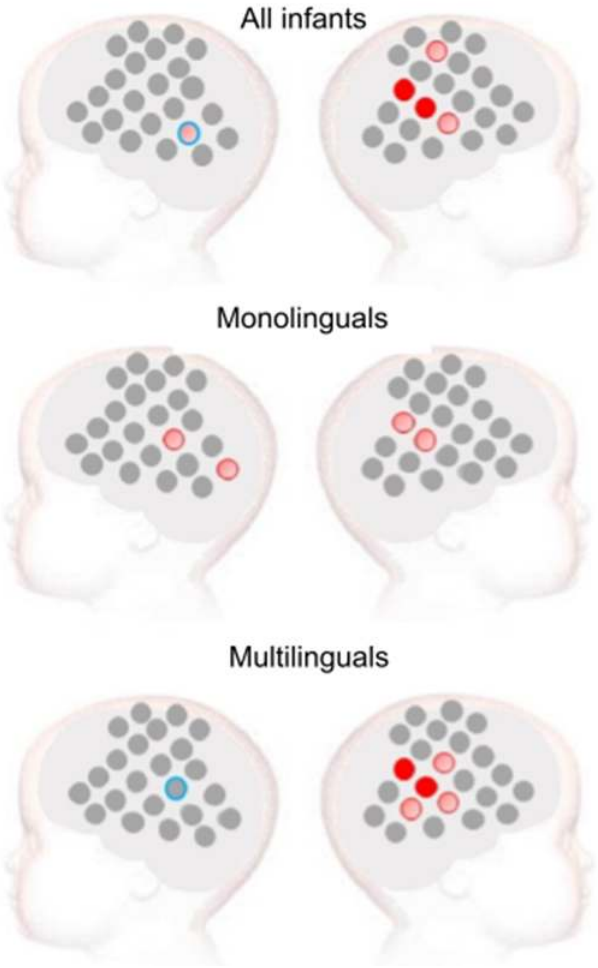


Figure 16.7.4: Activation for sign language in (A) all infants, (B) monolinguals and (C) spoken language multilinguals. ([8])

Although research on the brain development of infant and toddler multilingualism is a growing area with more questions than answers, the research so far seems to suggest that, like what behavior research has discovered, the development of multilinguals is somewhat unique and different from that of monolinguals.

Cognitive Development

Does being multilingual lead to enhanced cognitive abilities? Many claim that the experience of multilingualism leads to a cognitive advantage in executive functioning, a view that has gained substantial traction within the popular media. According to the prevailing multilingual advantage hypothesis, because the mental representations for each language are always "turned on", multilinguals become highly practiced at selecting and controlling attention after years of experience managing conflicts between competing phonological and lexical mental representations. Over the course of time, these practice effects generalize to problems outside the domain of language and contribute to a bilingual advantage in executive functioning (Bialystok, 2011, 2017; Bialystok, Craik & Luk, 2012; Kroll & Bialystok, 2013). Research suggests that potential cognitive advantages to being multilingual appear early, even within the first three years of life. [11]

The idea that each language known by a multiglinal is always "turned on" suggests that even when they are speaking, writing, listening or thinking in one language, mental representations for the other language(s) are simultaneously activated (Kroll, Bobb & Hoshino, 2014). For example, Figure 16.7.5 has three pictures in it: a piece of paper, cheese (wedges and slices) and a wrist watch. In an eye-tracking experiment, researchers showed participants arrays of stimuli containing multiple pictures (Shook & Marian, 2012), similar to this. As participants looked at the pictures, they heard a statement that named one specific picture in the array and all the participants needed to do was look at the picture named. So if a participant was looking at the array of pictures in Figure

16.7.5 and heard “cheese”, all they would need to do was look at the picture of cheese. Quite simple, huh? The results however revealed something interesting.



Figure 16.7.5: Stimuli used to simultaneously activate multilinguals’ mental language representations. ([12])

Some of the participants looked at another picture before looking at the named picture in every trail. To find out why, we need to look closer to the backgrounds of the participants. In this study, participants included hearing English monolinguals and hearing American Sign Language(ASL)/English multilinguals. The pictures were carefully selected to contain pictures with ASL translations that shared phonological features. The ASL signs for cheese and paper are phonologically similar. To illustrate, Figure 16.7.6 shows the ASL signs for ‘cheese’ and ‘paper’. These two signs share the phonological feature of handshape. The findings from the study revealed that the ASL/English multilinguals spent more time looking at signs that were phonologically similar to the named picture (Shook & Marian, 2012). The results suggest that even though the study was conducted in English and did not involve ASL at all, ASL was simultaneously activated when English was activated. This study supports numerous others in finding that the mental representations of each language are always active in multilinguals (Kroll & Bialystok, 2013; Villwock, Wilkinson, Piñar & Morford, 2021).



Figure 16.7.6: ASL signs for cheese and paper. ([13])

Enhanced cognitive abilities, mainly related to executive function, appear early, even in infancy and toddlerhood (Barac, Bialystok, Castro & Sanchez, 2014). Bilingual toddlers between 24 and 31 months of age show enhanced inhibitory control, another executive function, compared to monolingual toddlers (Crivello et al., 2016). A study even found evidence of enhanced cognitive abilities in infancy! Seven month old infants have greater cognitive control, another executive function, compared to monolingual infants (Kovács & Mehler, 2009). [14]

It is important to note that not all studies have found cognitive advantages related to multilingualism (Giguere, Dickson, Tulloch & Hoff, 2022). A mounting number of large-scale comparisons of multilingual and monolingual adults (Lehtonen et al., 2018; Nichols et al., 2020; Paap et al., 2013, 2015), however, have cast doubt on the multilingual advantage account. Despite many studies claiming to show supportive evidence from sets of multilinguals tested across the lifespan, these multilingual effects are currently the subject of intense research debate. For example, in a study of over 11,000 people, when confounding variables were controlled for, multilinguals did not show any advantage in executive function (Nichols et al., 2020). As with adult studies, large meta-analyses on the overall research with multilingual children have found little support for a cognitive advantage (Gunnerud et al., 2020; Lowe, Cho, Goldsmith & Morton, 2021). [15]

[1] Byers-Heinlein et al., (2019). The case for measuring and reporting bilingualism in developmental research. *Collabra: Psychology*, *5*(1). CC by 4.0

[2] Ramírez & Kuhl (2020). Early second language learning through SparkLing™: Scaling up a language intervention in infant education centers. *Mind, Brain, and Education*, *14*(2), 94-103. CC by 4.0

[3] "Anatomy and Physiology" on OpenStax is licensed under CC by 4.0.

[4] "Event-related potential" from Wikipedia is licensed under CC by SA 3.0

[5] Image from Garcia et al., (2018). Evoked and oscillatory EEG activity differentiates language discrimination in young monolingual and bilingual infants. *Scientific Reports*, *8*(1), 1-9. CC by 4.0

[6] Garcia et al., (2018). Evoked and oscillatory EEG activity differentiates language discrimination in young monolingual and bilingual infants. *Scientific Reports*, *8*(1), 1-9. CC by 4.0

[7] Mercure et al., (2020). Language experience impacts brain activation for spoken and signed language in infancy: Insights from unimodal and bimodal bilinguals. *Neurobiology of Language*, *1*(1), 9-32 CC by 4.0

[8] Images adapted from Mercure et al., (2020). Language experience impacts brain activation for spoken and signed language in infancy: Insights from unimodal and bimodal bilinguals. *Neurobiology of Language*, *1*(1), 9-32 CC by 4.0 and Soltanlou & Artemenko (2020). Using light to understand how the brain works in the classroom. *Frontiers in Young Minds*, *8*, 88. CC by 4.0

[9] Aanestad et al., (2021) What is happening in children's brains when they are playing pretend? *Frontiers in Young Minds*, *9*, 644083.

[10] Image adapted from "The brain and spinal cord" on OpenStax is licensed under CC by 4.0

[11] Lowe et al., (2021). The bilingual advantage in children's executive functioning is not related to language status: A meta-analytic review. *Psychological Science*, *32*(7), 1115-1146.

[12] Images adapted from Unsplash.

[13] Images adapted from Hochgesang, Crasborn, & Lillo-Martin (2022). ASL Signbank. New Haven, CT: Haskins Lab, Yale University. CC by NC SA 4.0

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[15] Leivada et al., (2021). On the phantom-like appearance of bilingualism effects on neurocognition: (How) should we proceed? *Bilingualism: Language and Cognition*, *24*(1), 197-210. CC by 4.0

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16.8: Strategies for Caregivers Working with Multilingual Infants and Toddlers

Caregivers play a key role in supporting the language development of multilingual infants and toddlers (Adamson et al., 2021; Grüter, Hurtado, Marchman & Fernald, 2014). Let's now take a look at various language strategies caregivers can implement with young multilinguals.

Supporting Heritage Languages

All young children in multilingual environments have the potential to learn multiple languages at the same time and develop a similar level of proficiency in each language (Albareda-Castellot, Pons, & Sebastián-Gallés, 2011; Pearson, Fernandez, Lewedeg, & Oller, 1997). Proficiency requires sufficient exposure and high quality learning opportunities in each language, however, in the U.S. this is rarely the case (Hoff et al., 2012), despite many parents expressing a preference for child care providers who speak the child's heritage language (Ward, Oldham LaChance, & Atkins, 2011). The term heritage language refers to a language that is spoken at home, but not by the majority of society which uses the societal language. In the U.S. multilingual infants and toddlers are more likely to be in multilingual care when they are 9 months old, less likely at 24 months and very unlikely to receive multilingual childcare services once they are 52 months of age and attending center-based childcare (Espinosa et al., 2017). Multilingual children are exposed to their heritage language in child care less and less as they get older, reflecting the change from care primarily provided by relatives during infancy and early toddlerhood to more center-based care during later toddlerhood and during the preschool years. Relatives were most likely, and caregivers in centers least likely, to use the family's heritage language. This research suggests that in the U.S. multilingual infants and toddlers who attend childcare programs have fewer opportunities to develop proficiency in both of their languages as English-only learning is most commonly offered in center-based programs.[1] [2] [3]



Figure **16.8.1**: A caregiver interacting with infants. ([4])

Center-based caregivers can do a lot to support the multilingual development of infants and toddlers. Caregivers can adapt pedagogical practices to include use of children's heritage languages in simple ways, such as with posters hung on the wall, books and songs—all including heritage languages. Encourage active engagement with family and community members, who share the same heritage languages as children, as an integral part of the classroom. If possible, hiring staff that use the same languages with enrolled children can be emphasized in job searches. Caregivers can also take the time to learn common words and basic phrases in a child's heritage language.[1]

Language Quantity and Quality

Just like with monolingual children, the quantity and quality of language multilingual children are exposed to is important (Adamson et al., 2021; Grüter, Hurtado, Marchman & Fernald, 2014). Quantity refers to the amount of language and quality refers to how language is shared with children. Critically, the quantity and quality of the language environment provided by caregivers matters more than the language caregivers use (Song, Luo & Liang, 2021; Unsworth, 2016). Thus, caregivers should primarily communicate with infants and toddlers in the language(s) they are most proficient in so as to maximize the quality of their language input.[5]

Caregivers who expose children to more language, have children with greater language abilities (Hoff, 2006; Weisleder & Fernald, 2013). In one longitudinal study, Spanish/English multilingual toddlers were assessed at 30 months and then again at 36 months of age (Hurtado, Grüter, Marchman & Fernald, 2014). The results revealed that toddlers who were exposed to more language showed greater language abilities. Importantly, the amount of exposure in a particular language was related to the level of growth in that language. So for Spanish/English multilingual toddlers, children who received a higher level of Spanish exposure relative to English, showed greater development in Spanish compared to English. Some research has also found a cross-language relationship with multilingual children, showing that a strong foundation of a heritage language can support the acquisition of an additional language, like English (Cha & Goldenberg, 2015; Kim, Curby & Winsler, 2014; Willard et al., 2021). Spanish/English multilingual toddlers who had stronger Spanish language processing skills at two years of age had stronger English language skills at 4 ½ years of age (Marchman, Bermúdez, Bang & Fernald, 2020). This research is especially important as it provides scientific validation for supporting heritage languages in English-based childcare programs.

Quality of language exposure can include various ways of sharing language with infants and toddlers. When children engage in more frequent and higher-quality language interactions with caregivers they demonstrate better long-term language and academic outcomes (Adamson et al., 2021; Hirsh-Pasek et al., 2015; Huttenlocher et al., 2010; Pace et al., 2019; Storch & Whitehurst, 2002). Although many studies focus on English-speaking families (Hirsh-Pasek et al., 2015; Masek et al., 2021), high-quality, early language interactions also support the communication skills of children from other cultural and linguistic backgrounds. For example, studies investigating Spanish-speaking caregivers' use of more complex, elaborative language, found that it promoted children's narrative skills (Escobar, Melzi & Tamis-LeMonda, 2017; Hammer & Sawyer, 2016; Luo et al., 2014; Tamis-LeMonda et al., 2014). Additionally, more frequent back-and-forth conversations in caregiver–child interactions when the children were 2.5 years of age predicted later language and literacy development in Spanish/English multilingual children (Adamson et al., 2021). [6]

Quality language exposure can occur during any and every interaction caregivers have with infants and toddlers. Let's now discuss several strategies caregivers can use to improve the quality of language they share with children.

Infant-directed Language

When caregivers interact with infants, their speech often takes on specific, distinguishing features known as infant-directed speech (Fernald et al., 1989). Infant-directed speech (IDS) is produced by caregivers of most (although not all) linguistic and cultural backgrounds and is typically characterized by a slow, melodic, high-pitched, and exaggerated cadence (Broesch & Bryant, 2015; Farran, Lee, Yoo & Oller, 2016; Fernald et al., 1989). From early in life, infants tune their attention to IDS, preferring to listen to IDS over adult-directed speech at birth (Cooper & Aslin, 1990), as well as later in infancy (Cooper & Aslin, 1994; Cooper et al., 1997; Fernald, 1985; Hayashi, Tamekawa & Kiritani, 2001; Kitamura & Lam, 2009; Newman & Hussain, 2006; Santesso et al., 2007; Werker & McLeod, 1989). [7]



Figure **16.8.2**: Caregiver holding smiling infant up in arms. ([8])

Just like monolingual infants, multilingual infants prefer to listen to IDS compared to adult-directed speech (Byers-Heinlein et al., 2021). IDS is an important aspect of quality language exposure to infants not only because they prefer to listen to it, but also

because it is related to greater language growth (García-Sierra, Ramírez-Esparza, Wig & Robertson, 2021). Caregivers who use more IDS have infants and toddlers with greater language abilities (Kalashnikova & Carreiras, 2021; Weisleder & Fernald, 2013). Multiple studies have found that greater exposure to IDS is related to a larger vocabulary size in multilingual infants (Ramírez-Esparza et al., 2017; Rosslund, Mayor, Óturai & Kartushina, 2021;).[7]

Reading

Reading with infants and toddlers is a powerful way to increase both the quantity and quality of language they are exposed to. Just reading one picture book every day can lead to an increase of approximately 78,000 words each year (Logan, Justice, Yumus & Chaparro-Moreno, 2019). Practices such as shared book reading, where a caregiver reads to a child, can support language acquisition (Dolean, 2021; Escobar, Melzi & Tamis-LeMonda, 2017; Tsybina & Eriks-Brophy, 2010) and literacy abilities (Rodriguez & Tamis-LeMonda, 2011; Sénéchal & LeFevre, 2002). However, some research suggests that caregivers may tend to emphasize one language over the other in their literacy practices, leading to unbalanced exposure to children's languages (Gonzalez-Barrero et al., 2021). Furthermore, caregivers often lack access to literacy materials in heritage languages and multilingual formats (Ahooja et al, 2021; Mosty, Lefever & Ragnarsdóttir, 2013; Zhang & Slaughter-Defoe, 2009). For example, Vietnamese families in Taiwan have very few children's books in Vietnamese at home (Yeh et al., 2015) and Chinese families living in San Francisco have very few resources in Chinese for young children at home (Lao, 2004).[9] [10]



Figure **16.8.3**: Infant reading a book in Dutch. ([11])

To support the multilingual language development of infants and toddlers through reading, child care programs should have various age-appropriate multilingual books that represent the languages of the children enrolled. Multilingual caregivers who share a heritage language with children, should read in their shared language. Child care programs can invite multilingual family members and community members to come into the program to read with children in their heritage languages. To improve access to age-appropriate books, child care programs can consult enrolled families for quality books and even create multilingual books themselves!

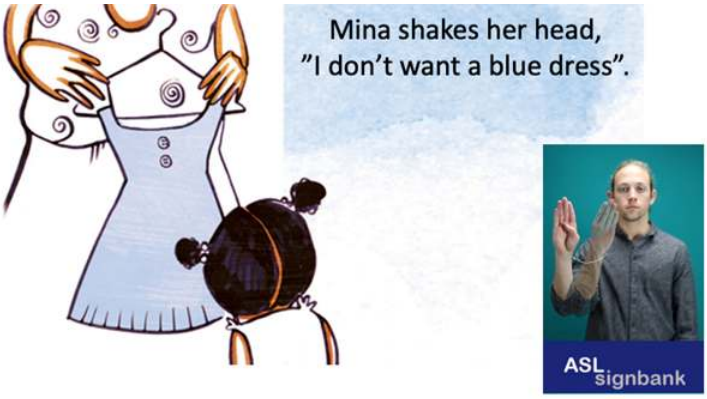


Figure **16.8.4**: Page from a multilingual book in English and American Sign Language (Copyright; author via source)

Reading with all children, but especially with infants and toddlers, should be about more than just simply reading the words on the pages. To improve the quality of shared reading, caregivers can implement dialogic reading strategies. Dialogic reading strategies help caregivers create an interaction with a child during shared reading. Dialogic reading typically involves recasts, expansions,

and open-ended questions in an attempt to scaffold the interactive reading experience, all of which have been shown to have a positive impact on a child's language development (Baker & Nelson, 1984; Cleave et al., 2015; Girolametto & Weitzman, 2002; Huttenlocher et al., 2010; Opel, Ameer & Aboud, 2009). These strategies are known as the PEER sequence. By implementing the PEER sequence, the caregiver: [12]

- prompts the child to say something about the book,
- evaluates the child's response,
- expands the child's response, and
- repeats the prompt to help the child learn from the expansion.

A fundamental element of dialogic reading is the use of prompts to begin the PEER sequence while reading with a child. The acronym CROWD stands for five recommended prompts: [12]

- Completions
- Recalls
- Open questions
- Wh-questions
- Distancing questions

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[1] Espinosa (2015). Challenges and benefits of early bilingualism in the US context. *Global Education Review*, *2*(1). CC by 3.0 NC

[2] Espinosa et al., (2017). Child care experiences among dual language learners in the United States: Analyses of the Early Childhood Longitudinal Study–Birth Cohort. *AERA Open*, *3*(2), 2332858417699380. CC by 4.0

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[4] Image from Ramírez & Kuhl (2020). Early second language learning through SparkLing™: Scaling up a language intervention in infant education centers. *Mind, Brain, and Education*, *14*(2), 94-103. CC by 4.0

[5] Luo et al., (2021). Parental beliefs and knowledge, Children's home language experiences, and school readiness: The dual language perspective. *Frontiers in Psychology*, *12*. CC by 4.0

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[8] Image by M.T ElGassier on Unsplash

[9] Fibla et al., (2021 preprint). Bilingual language development in infancy: What can we do to support bilingual families? CC by 4.0

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16.9: Conclusion

Conclusion for Multilingualism

Recognition of the value and benefits of raising multilingual children is growing here in the U.S. Unfortunately, many misconceptions about multilingualism continue to persist and most center-based child care programs are predominantly English-based. Nevertheless, there are many strategies caregivers can use to support the development of heritage languages and English that help establish a strong foundation for later language, literacy, cognitive and academic outcomes.

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CHAPTER OVERVIEW

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17.1: Introduction

Introduction to Emotional Development

It is impossible to imagine life without emotion. We treasure our feelings: the joy at a ball game, the pleasure of a loved one's touch, or the fun with friends on a night out. Even negative emotions are essential, such as the sadness when a loved one dies, anger when treated unfairly, fear that overcomes us in a scary or unknown situation, or guilt and shame when our wrongs are made public. Emotions invigorate life experiences and give those experiences meaning and flavor.[1]

Research and theory often divide emotions into 2 general categories: basic emotions (primary emotions) and self-conscious emotions (secondary emotions). Basic emotions appear first and include interest, happiness, anger, fear, surprise, sadness, and disgust. Self-conscious emotions include envy, pride, shame, guilt, doubt, and embarrassment. Unlike primary emotions, secondary emotions appear as children develop a self-concept and require social interactions to know when to feel such emotions (Akimoto & Sanbinmatsu, 1999) [1].

The core features of emotional development include the ability to identify and understand one's feelings, accurately read and comprehend emotional states in others, manage and express strong emotions constructively, regulate one's behavior, develop empathy for others, and establish and maintain relationships (National Scientific Council on the Developing Child, 2004). Infants experience, express, and perceive emotions before they fully understand them. In learning to recognize, label, manage, and communicate their emotions, and to perceive and attempt to understand the emotions of others, children build skills that connect them with family, peers, teachers, and the community[2] .



Figure 17.1.1: Displaying Emotions. ([3])

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17.2: Theories of Emotion

Exploring the Theories of Emotion

Our experiences, backgrounds, and cultures inform our emotions. Therefore, people may have different emotional experiences when confronting similar circumstances. Several theories of emotion try to explain how the various components of emotion interact with one another[1].

Below is a table of several theories surrounding emotional development. As an infant and toddler caregiver, it may not be necessary to understand each theory's details, but knowing multiple theories exist that explain the process of emotional development is important.

The theories outlined in the table come from[1]

Theories of Emotion

Theory	Major Components
James-Lange Theory	• Emotions arise from physiological arousal • You only experience a feeling of fear after physiological arousal takes place • Different arousal patterns are associated with different feelings
Cannon-Bard Theory	• Physiological arousal and emotional experience occur simultaneously yet independently (Lang, 1994) • Emotional reactions are separate and independent of the physiological arousal, even though they co-occur
Facial Feedback Hypothesis	• A person's facial expression affects emotional experience (Adelman & Zajonc, 1989; Boiger & Mesquita, 2012; Buck, 1980; Capella, 1993; Soussignan, 2002) • Suppression of facial expression lowers the intensity of some emotions experienced by participants (Davis, Senghas & Ochsner, 2009). • Intensities of facial expressions affect emotional reactions (Soussignan, 2002). • If something insignificant occurs and you smile as if you just won the lottery, you will be happier about the little things than you would be if you only had a tiny smile • If you walk around frowning all the time, it might cause you to have fewer positive emotions than you would if you had smiled
Schachter-Singer Two-Factor Theory	• Considers both physiological arousal and emotional experience • Physiological arousal is interpreted in context to produce the emotional experience • Depends on labeling the physiological experience, which is a type of cognitive appraisal
Cognitive-Mediational Theory	• Our appraisal of the stimulus determines our emotions • This appraisal mediates between the stimulus • and the emotional response, and it is immediate and often unconscious • The assessment precedes a cognitive label
Automatic Emotional Regulation (AER)	• Non-deliberate control of emotions influences the things you attend to, your appraisal, your choice to engage in an emotional experience, and your behaviors after the emotion is experienced (Mauss, Bunge & Gross, 2007; Mauss, Levenson, McCarter, Wilhelm & Gross, 2005) • People develop an automatic process that works like a script or schema, and the process does not require deliberate thought to regulate emotions • AER works like riding a bicycle. Once you develop the process, you just do it without thinking about it
Constructivist Theory of Emotional Development	• Emotions are not built into the brain at birth, but instead, they are constructed based on your experiences • Emotions are predictions that create an understanding of the world • 2 identical physiological states can result in different emotional states depending on your predictions • Example: A brain predicting a churning stomach in a bakery could lead to a brain constructing hunger. However, a brain experiencing a churning stomach while waiting for medical test results could lead a

Theory	Major Components
	brain to construct worry. Thus, a brain can construct 2 different emotions from the same physiological sensations
Appraisal Theory	• You have thoughts (a cognitive appraisal) before you experience an emotion • The emotion you experience depends on your thoughts (Frijda, 1988; Lazarus, 1991) • Appraisal theory explains the way 2 people can have 2 completely different emotions regarding the same event

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17.3: The Biology of Emotions

Diving into the Underlying Biology of Emotional Development

The limbic system, which is the area of the brain involved in emotion and memory Figure **17.3.1**), includes the hypothalamus, thalamus, amygdala, and hippocampus. The hypothalamus activates the sympathetic nervous system of any emotional reaction. The thalamus serves as a sensory relay center whose neurons project to the amygdala and the higher cortical regions for further processing. The amygdala plays a role in processing emotional information (Fossati, 2012). The hippocampus is the area that integrates emotional experience with cognition (Femenía, Gómez-Galán, Lindskog, & Magara, 2012)[1].

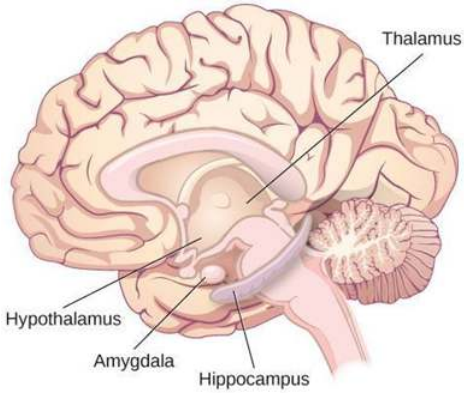


Figure **17.3.1**: The limbic system, which includes the hypothalamus, thalamus, amygdala, and hippocampus, mediates emotional response and memory ([1]

Amygdala

The amygdala has received a great deal of attention from researchers in understanding the biological basis for emotions, especially fear and anxiety (Blackford & Pine, 2012; Goosens & Maren, 2002; Maren, Phan, & Liberzon, 2013).

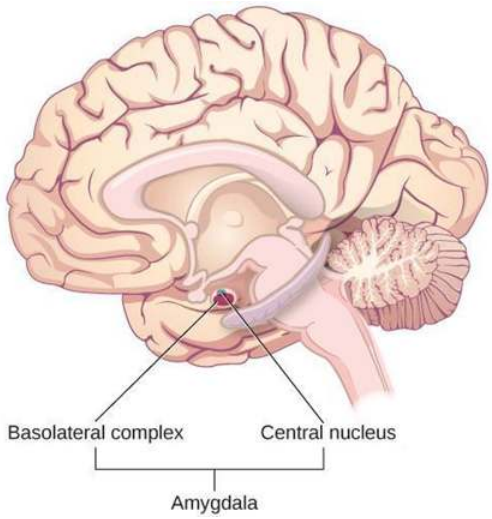


Figure **17.3.2**: The diagram above illustrates the anatomy of the basolateral complex and central nucleus of the amygdala. Raineki, Cortés, Belnoue, and Sullivan (2012) demonstrated that, in rats, negative early life experiences could alter the function of the amygdala and result in adolescent patterns of behavior that mimic human mood disorders[1].

Hippocampus

The hippocampus is also involved in emotional processing. Like the amygdala, research demonstrates that hippocampal structure and function are linked to a variety of mood and anxiety disorders.[1]

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17.4: Emotional Beginnings

Origins of Emotions

At birth, infants exhibit 2 emotional responses: attraction and withdrawal. They show interest in pleasant situations that bring comfort, stimulation, and pleasure, and they withdraw from unpleasant stimulation such as bitter flavors or physical discomfort. At around 2 months, infants exhibit social engagement in the form of social smiling as they respond with smiles to those who engage their positive attention (Lavelli & Fogel, 2005).

Social smiling becomes more stable and organized as infants learn to use their smiles to engage their parents and caregivers in interactions.



Figure **17.4.1**: Infant smiling at grandparents [1]



Figure **17.4.1**: Infant Smiling[2]



Figure **17.4.1**: infant smiling [1]

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17.5: Emotion and Self- Regulation

Self-Regulation

Emotional self-regulation refers to strategies we use to control our emotional states to attain goals (Thompson & Goodvin, 2007). As a construct, emotional regulation reflects the interrelationship of emotions, cognitions, and behaviors (Bell & Wolfe, 2004). This regulation requires effortful control of emotions and initially requires assistance from caregivers (Rothbart, Posner & Kieras, 2006).

The developing ability to regulate emotions has received increasing attention in research literature (Eisenberg, Champion & Ma, 2004). Researchers have generated various definitions of emotional regulation, and debate continues over the most valuable and appropriate way to define this concept (Eisenberg & Spinrad, 2004). Children's ability to regulate their emotions appropriately can contribute to perceptions of their overall social skills and the extent to which peers like them (Eisenberg et al., 1993). Poor emotional regulation can impair children's thinking, compromising their judgment and decision-making[1].



Figure **17.5.1**: Working on Self-Regulation. Photo by George Pak)

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17.6: Caregiver Role in Emotional Regulation

Caregivers and Regulating Emotions

Responsiveness to infants' signals contributes to their development of emotional regulation (Zaar, n.d). Young infants have minimal capacity to adjust their emotional states and depend on their caregivers to help soothe themselves. By 4 to 6 months, babies can begin to shift their attention away from upsetting stimuli (Rothbart et al., 2006). Older infants and toddlers can more effectively communicate their need for help and crawl or walk towards or away from various situations (Cole, Armstrong & Pemberton, 2010). This aids in their ability to self-regulate. Temperament also plays a role in children's ability to control their emotional states, and individual differences are noted in the emotional self-regulation of infants and toddlers (Rothbart & Bates, 2006)[1].



Figure **17.6.1**: Standing toddler covering eyes. ([2])

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17.7: Emotional Competencies

Emotionally Compentent

Emotional competence refers to the emotion-related abilities an individual needs to deal with a changing environment (Saarni, 1999). Saarni (1999) specified 8 skills of emotional competence: (1) awareness of one's emotional state, (2) ability to discern others' emotions, (3) ability to use the express terms of emotion, (4) capacity for empathic and sympathetic involvement, (5) ability to discriminate inner and outer emotional states, (6) capacity for adaptive coping with emotions, (7) emotional communication within relationships, and (8) capacity for emotional self-efficacy.



Figure **17.7.1**: All Smiles([2])

One critical outcome of developing emotional competence contributes to readiness for learning. Emotional competence also contributes to the development of social relationships, both with single individuals (friendships) and groups (peer-group entry).[1]

Theories of sociocultural development such as Vygotsky's (1986) argue that higher order psychological functions have social origins. Children's cognitive, communication, and language development are all influenced by skills acquired during joint activities (Vygotsky, 1986; Winsler, Carlton, & Barry, 2000). This framework values communication and language as socioculturals tool for thought, self-regulation, and development of competencies, including emotional competencies. Vygotsky's theory of private speech may be critical for supporting the development of Saarni's (1999) proposed skills. Private speech can help children identify and label emotions (Skills 1–5) and may function as a tool for planning, guiding, and monitoring problem-solving activity (Skills 6–8).

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17.8: Development of Sense of Self

Recognizing Self

Children begin to recognize themselves during the second year of life as they gain a sense of self separate from their primary caregiver. In a classic experiment by Lewis and Brooks (1978), children 9 to 24 months were placed in front of a mirror after a spot of rouge was placed on their nose and their mothers pretended to wipe something off the child's face. If the child reacted by touching their nose rather than the "baby" in the mirror, it suggested that the child recognized the reflection as him or herself. Lewis and Brooks found that somewhere between 15 and 24 months, most infants developed a sense of self-awareness.[1]

In 2003, after extensive analysis of existing research, Phillippe Rochat established a theory around The 5 Stages of Self-Awareness. These stages outline how children learn to identify themselves and the caregivers in their lives as separate, distinct entities. The 5 stages span from birth until age 5 (Rocat, 2003).



Figure **17.8.1**: A young infant does not yet possess self-awareness. ([1])

Stages of acquiring self-awareness

Stage 1 – Differentiation (from birth)

Immediately after birth, infants demonstrate a sense of their own body as a differentiated entity: an entity among other entities in the environment (Rochan, 2003). They can differentiate the self from the non-self. A newborn knows there is a difference between his image and the background images in a mirror and between his or her environment. Another sign of differentiation occurs when infants contact objects by reaching for them. The infant recognizes the difference between himself and the environment and also gains a sense of how his body is situated relative to that environment (Krisch, 2021).

Stage 2 – Situation (by 2 months)

In addition to differentiation, infants at this stage can also situate themselves in relation to a person. In one experiment, infants imitated tongue orientation from an adult model.

Stage 3 – Identification (by 2 years)

At this stage, the more common definition of self-awareness comes into play, where infants can identify themselves in a mirror through the "rouge test" and begin to use language to refer to themselves. Between the ages of 18 months and 2 years, children learn that the image in the mirror is not only distinct from the rest of the environment (Level 1) and not only distinct from the in-mirror environment (Level 2), but a representation of themselves (Level 3, “identification”). At 18 months, an infant will reach for a mark painted on her body, using only the image in the mirror as an indication that something on herself is amiss (Kirsch, 2021).

Stage 4 – Permanence (2 - 3 years)

This stage occurs after infancy when children know that their sense of self exists across time and space. Rochan describes the permanence state as the “Me-But-Not-Me” dilemma. As toddlers journey towards full self-awareness, they identify the image in the mirror as “self” but still frequently revert to seeing the image as an odd third-person version of self. That can be hard to grasp (and a bit terrifying to imagine) (Kirsch, 2021). It is important to note that Stage 4 permanence develops slowly. Infants still oscillate between an awareness of the self and an awareness of seeing someone else facing them (Rochat 2003).

Stage 5 – (4 to 5 years) Self-consciousness or meta-self-awareness

In stage 5, the young child first realizes that the image in the mirror is not just “me” (Level 3) and not just “me” permanently (Level 4) but the “me” that everyone else sees. 4-year-olds often respond to this realization by becoming mirror-shy, hiding their faces whenever they see their reflections. Now that they know what everyone else sees, they are unsettled (Kirsch, 2021).

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17.9: Empathy

Developing Empathy

During the first 3 years of life, children begin to develop the capacity to experience another person's emotional or psychological state (ZahnWaxler & Radke-Yarrow, 1990). The following definitions of empathy are found in research literature: "knowing what another person is feeling," "feeling what another person is feeling," and "responding compassionately to another's distress" (Levenson & Ruef 1992, p. 234). The concept of empathy reflects the social nature of emotion, as it links the feelings of 2 or more people (Levenson & Ruef, 1992). Since human life is relationship-based, one vitally important function of empathy over the life span is to strengthen social bonds (Anderson & Keltner, 2002). Research has shown a correlation between empathy and prosocial behavior (Eisenberg, 2000). Prosocial behaviors such as helping, sharing, comforting, and showing concern for others illustrate the development of empathy (Zahn, Waxler, et al., 1992). The experience of empathy is thought to be related to the development of moral behavior (Eisenberg, 2000). Adults model prosocial/empathic behaviors for infants in various ways. The behaviors are modeled through caring interactions with others and by nurturing the infant. Quann and Wien (2006) suggest that one way to support the development of empathy in young children is to create a culture of caring in the early childhood environment. "Helping children understand the feelings of others is an integral aspect of the curriculum of living together. The relationships among teachers, between children and teachers, and among children are fostered with warm and caring interactions" (p.28).[1]

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17.10: Emotions and Cognition

Relationship Between Emotions and Cognition

Brain research indicates that emotion and cognition are profoundly interrelated processes. Specifically, "recent cognitive neuroscience findings suggest that the neural mechanisms underlying emotion regulation may be the same as those underlying cognitive processes" (Bell & Wolfe, 2004, p. 366). Emotion and cognition work together, jointly informing the child's impressions of situations and influencing behavior. Most learning in the early years occurs in the context of emotional support (National Research Council and Institute of Medicine, 2000). "The rich interpenetrations of emotions and cognitions establish the major psychic scripts for each child's life" (Panksepp, 2001). Together, emotion and cognition contribute to attentional processes, decision making, and learning (Cacioppo & Berntson, 1999).

Cognitive processes like decision making are also affected by emotion (Barrett et al., 2007). The brain structures involved in the neural circuitry of cognition influence emotion and vice versa (Barrett et al., 2007). Emotions and social behaviors affect the young child's ability to persist in goal-oriented activity, seek help when needed, and participate in and benefit from relationships. Young children who exhibit healthy social, emotional, and behavioral adjustment are more likely to have good academic performance in elementary school (Cohen et al., 2005; Zero to Three, 2004). Historically, the sharp distinction between cognition and emotion may be more of an artifact of scholarship than a representation of how these processes occur in the brain (Barrett et al., 2007). Recent research strengthens the view that early childhood programs support later positive learning outcomes in all domains by promoting healthy social-emotional development (National Scientific Council on the Developing Child, 2004; Raver, 2002; Shonkoff, 2004;) [1] .



Figure **17.10.1**: Toddler working to concentrate despite the presence of strong emotions. ([2])

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17.11: The Role of Language in Emotion

Exploring the Connection Between Language and Emotion

Young children's growing language skills are vital to their emotional development. Language opens new avenues for communicating and regulating emotions (Campos, Frankel, & Camras, 2004). It helps children more effectively negotiate acceptable outcomes in emotionally charged situations.[1]

Growing evidence from developmental and cognitive science demonstrates that knowing words helps infants and adults acquire and use language concepts throughout their lifespan; this evidence suggests that language is key to developing emotional structures. [2]

Practitioners have theorized that infants use the phonological sound as a cue for differentiating between environmental sensations. This is particularly relevant for emotion categories, where the word anger, for example, can tie together multiple modalities of sensorimotor experience (such as bodily sensations, situations, or behaviors). These emotion categories also serve as "glue" for different instances of anger that are not perceptually regular or consistent with one another. For example, being angry at one's computer may not look or feel the same as being angry about an insult. Emotion labels may be an important cue for helping infants and young children understand emotion categories and apply them to their own experiences and observations. No research has directly examined this hypothesis.[2]

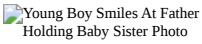


Figure **17.11.1**: Reading with Infants is an important part of Language and Emotional Development (Image at Piqsels)

2-year-olds use the straightforward emotion labels "angry" and "happy" in daily interactions, yet 2-year-olds cannot distinguish between more specific unpleasant emotion categories until they start reliably using additional negative emotion terms in daily interactions (Widen & Russell, 2008). As children acquire emotional words and start using them in everyday life with caregivers, they become increasingly competent at perceiving and labeling facial expressions in their culture's emotion categories. Just as words help infants generalize between otherwise perceptually distinct objects during learning, toddlers show a "language superiority effect" when categorizing facial expressions. Language superiority effect means 2- and 3-year-olds are better able to accurately place pictures of facial expressions in a box labeled with a word (e.g., anger) as compared to a box labeled with a face (e.g., an angry face), an effect that increases over early childhood (Russell & Widen, 2002). Studies also demonstrate a link between children's emotional understanding and linguistic development, which suggest that children's advances in emotional understanding develop at the same rate as their advances in language comprehension (Harris et al., 2005).[2]

Caregivers' conceptual knowledge about emotions and communication skills can transfer to their children. For instance, 2– to 4-year-old children’s emotional utterances correlate with the emotion labels that their mothers know and use (Cervantes & Callanan, 1998). Children whose mothers used more emotion terms when they were 18 months old were able to produce more emotion words at 24 months (Dunn et al., 1987). Children whose caregivers discussed emotions more when children were 36 months old also had better emotional understanding at 6 years of age (Dunn et al., 1991). An adult’s explanation of internal states and attributes (such as hungry, sad, or nice) scaffold children's abilities to identify and describe the same experiences in themselves and others (Saarni, 1999; Yehuda, 2005). Use of words helps children acquire complex information about an emotion category (Lindquist, 2015) By contrast, caregivers who lack conceptual knowledge about emotion or struggle to communicate this knowledge with words decrease the child's opportunities to develop a conceptual understanding of emotion.

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17.12: Knowing What They Can Do

Self-Efficacy

An infant's developing sense of self-efficacy includes an emerging understanding that he has abilities and can make things happen. Self-efficacy is related to a sense of competency and identified as a basic human need (Connell, 1990). The development of a child's sense of self-efficacy may be seen in play or exploratory behaviors when they act on an object to produce a result. For example, a child pats a musical toy to make a sound come out. Older infants may demonstrate recognition of ability through "I" statements, such as "I did it" or "I'm good at drawing."[1]

Young children have little understanding of what they can and cannot do, so the development of realistic self-efficacy is a fundamental process:

…Very young children lack knowledge of their own capabilities and the demands and potential hazards of different courses of action. They would repeatedly get themselves into dangerous predicaments were it not for the guidance of others. They can climb to high places, wander into rivers or deep pools, and wield sharp knives before they develop the necessary skills for managing such situations safely…Adult watchfulness and guidance see young children through this early formative period until they gain sufficient knowledge of what they can do and what different situations require in the way of skills (Bandura, 1986, p. 414).

During infancy, the development of perceived causal efficacy (the perception that one affects the world by one's actions) appears to be an essential aspect of developing a sense of self. As the infant interacts with her environment, she can cause predictable events, such as the sound that accompanies shaking a rattle. The understanding that one's actions can influence the environment is something Alfred Bandura referred to as personal agency: the ability to act as an agent of change in one's world. The infant also begins to understand that certain events affect people differently than they affect the child. For example, if a model touches a hot stove, it does not hurt the infant, so the infant begins to recognize their uniqueness and actual existence as an individual. During this period, interactions with the physical environment may be more important than social interactions since the physical environment is more predictable and easier to learn about (Bandura, 1986, 1997). However, social interaction quickly becomes highly influential (Kelland, 2020).



Figure **17.12.1**: Young infants learn they can make things happen by interacting with their environment ([2])

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17.13: Impulse Control

Controlling Emotions and Impulses

Children's developing capacity to control impulses helps them adapt to social situations and follow rules. As infants grow, they become increasingly able to exercise voluntary control over behavior such as waiting for needs to be met, inhibiting potentially hurtful behavior, and acting according to social expectations, including safety rules. Group care settings provide many opportunities for children to practice their impulse control skills. Peer interactions often offer natural opportunities for young children to practice impulse control as they learn about cooperative play and sharing. Young children's understanding or ignorance of requests made of them contributes to their responses (Kaler & Kopp, 1990). [1]



Figure **17.13.1**: Playing with peers allows opportunities to work on impulse control. (C[2])

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17.14: Expression of Emotion

The Importance of Emotional Expressions

Children express their emotions early in infancy through facial expressions, vocalizations, and body language.



Figure **17.14.1**: Infant crying. ([1])

Infants respond more positively to adult vocalizations containing a positive affective tone (Fernald, 1993). Tronick (1989) describes how the expression of emotion is related to emotional regulation and communication between mother and infant: “the emotional expressions of the infant and the caretaker function to allow them to mutually regulate their interactions . . . the infant and the adult are participants in an affective communication system.” (p.112). It appears the experience of positive emotions contributes significantly to emotional well-being and psychological health (Fredrickson, 2000, 2003; Panksepp, 2001). Neurophysiology and cognitive, social, and emotional factors play a part in the developmental process of social smiling (Messinger & Fogel, 2007). The ability to use words to express emotions gives young children a valuable tool in gaining assistance or social support (Saarni et al., 2006). Temperament may also play a role in children's expression of emotion. Young children's expressions of positive and negative emotions impact developing social relationships. Positive emotions appeal to social partners and enable relationships to form, while problematic management or expression of negative emotions leads to difficulty in social relationships (Denham & Weissberg, 2004). The use of emotion-related words appears to be associated with how likable preschoolers are to their peers: children who use emotion-related words are typically better liked by their classmates (Fabes at al., 2001).[2]

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17.15: Social Understanding and Self-Awareness

Understanding and Awareness

Emotions are expressed both verbally through words and nonverbally through facial expressions, voices, gestures, body postures, and movements. People constantly express emotions when interacting with others, and others can reliably judge those emotional expressions (Elfenbein & Ambady, 2002; Matsumoto, 2001). Emotions have signal value to others and influence those around us and our social interactions. Emotions and their expressions communicate information to others about our feelings, intentions, relationship with the target of the emotions, and the environment. Because emotions have this communicative signal value, they help solve social problems by evoking responses from others, signaling the nature of interpersonal relationships, and providing incentives for desired social behavior (Keltner, 2003). [1]



Figure **17.15.1**: Infant signals their needs through crying. ([5])

A parent's belief that emotions are valuable rather than dangerous correlates to their child's ability to recognize their parents' emotional facial expressions (Castro et al., 2014). Avoiding emotional expression may create a more impoverished environment for the child to practice their developing emotion-relevant skills (Dunsmore et al., 2009). Additionally, families who avoid talking about emotions with their child (due to a belief that emotions are dangerous) do not help the child acquire the conceptual knowledge necessary for learning how to differentiate between different emotional facial expressions.[2]



Figure **17.15.1**: As infants develop language they begin to express their emotions in different ways. ([6])

Remarkably, young children begin developing social understanding very early in life. Before the end of the first year, infants are aware that other people have perceptions, feelings, and other mental states that affect their behavior and are different from the infant's mental states.[3]

Emotion is displayed through a variety of mechanisms. In addition to facial expressions, tone of voice, behavior, and body language all communicate information about emotional states. Body language is the expression of emotion through body position or movement. Research suggests that we are sensitive to the emotional information communicated through body language, even when we're not consciously aware of it (de Gelder, 2006; Spielman, 2020; Tamietto et al., 2009).

Although developmental scientists once strongly believed infants are egocentric—focused on their own perceptions and experience—they now realize the opposite is true. Infants at an early stage are aware that people have different mental states (Wellman, 2011). This motivates them to figure out what others are feeling, intending, wanting, and thinking, as well as how these mental states affect others' behavior. Infants are beginning to develop a theory of mind, and although their understanding of mental states begins simply, it expands rapidly (Wellman, 2011). For example, suppose an 18-month-old watches an adult repeatedly try to drop a

necklace into a cup but fail each time. In this case, the child will immediately put the necklace into the cup himself, completing what the adult intended to do but failed to accomplish. In doing so, the child reveals his awareness of the intentions behind the adult's behavior (Meltzoff, 1995). Carefully designed experimental studies have shown that, by late preschool years, young children can understand that another's beliefs can be incorrect, memories can affect how you feel, and emotions can be hidden from others (Wellman, 2011). Social understanding grows significantly as children's theory of mind develops.4]

How do these achievements in social understanding occur? One answer is that young children are compassionate observers of other people. They make connections between their emotional expressions, words, and behavior to derive simple inferences about mental states (Gopnik, Meltzoff, & Kuhl, 2001). Some scientists believe that infants are biologically prepared to perceive people uniquely, as organisms with an inner mental life, which facilitates their interpretation of people's behavior regarding those mental states (Leslie, 1994; Thompson, 2021) This is especially likely to occur in relationships with people the child knows well, which supports the ideas of attachment theory. Growing language skills give young children words with which to represent these mental states, such as “mad” or “wants”, and talk about them with others. Thus, in conversation with their parents about everyday experiences, children learn much about people's mental states from how adults talk about them ("Your sister was sad because she thought Daddy was coming home.”) (Thompson, 2006b). Developing social understanding is based on children's everyday interactions with others and their careful interpretations of what they see and hear.[4]



Figure **17.15.1**: Relationships are an important part of emotional development (Image 329 on NappyStock)

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17.16: Facial Expression and Recognition of Emotions

Recognizing Emotions

Despite different cultural emotional display rules, our ability to recognize and produce facial expressions of emotion appears to be universal. Even congenitally blind individuals make the same facial expressions of emotions, despite never having had the opportunity to observe these facial displays of emotion in other people. Research findings suggest patterns of activity in the facial muscles involved in generating emotional expressions: this was indicted in the late 19th century in Charles Darwin's (1872) book The Expression of Emotions in Man and Animals. Substantial evidence exists for 7 universal emotions associated with distinct facial expressions. These include happiness, surprise, sadness, fright, disgust, contempt, and anger (Figure **17.16.1** (Ekman & Keltner, 1997, Elkman et al., 1969, Ekman and Friesen, 1971). [1]

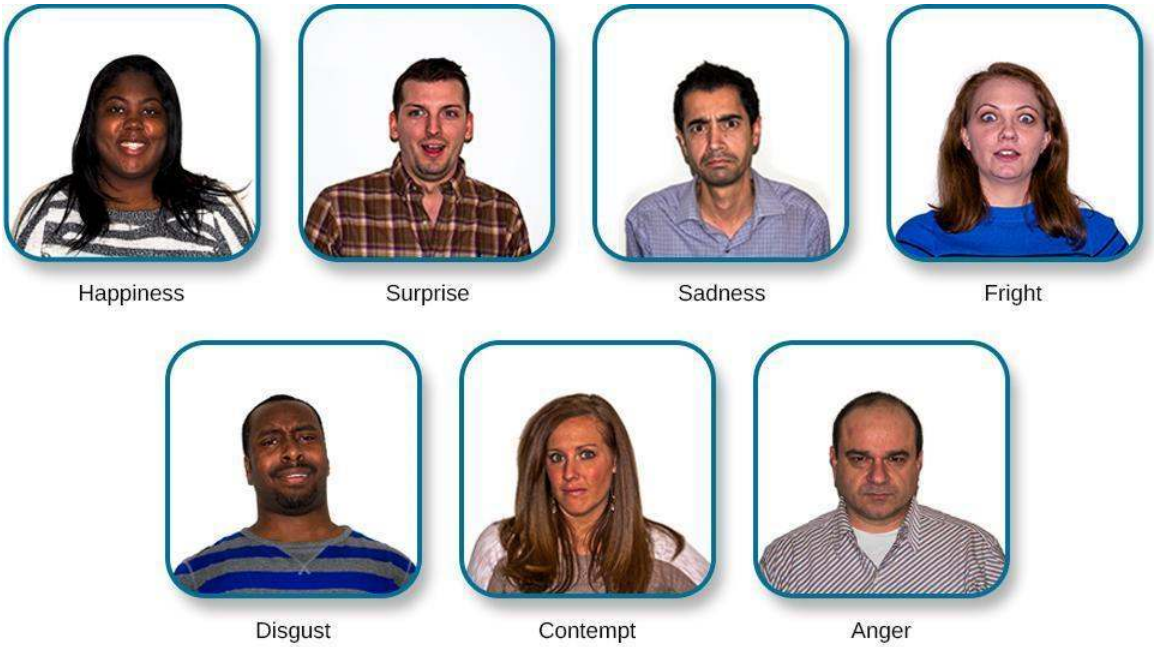


Figure **17.16.1**: The 7 universal facial expressions of emotion
(modification of work by Cory Zanker)

In terms of development, it appears that most of the facial components of human expression can be observed shortly after birth. Expressions like enjoyment and interest are present from the first days of life (Sullivan & Lewis, 2003). Researchers initially thought that infants' facial expressions corresponded to adults' facial expressions (see Differential emotion theory in Izard & Malatesta, 1987), but it's now known that facial expressions in infancy are not present like their adult-counterparts (Oster, 2005). Emotion in infancy cannot be compared to emotion in adulthood. Sroufe (1996) described precursor emotions in infancy. Precursor emotions do not have the same degree of cognitive evaluation as emotions of adults. Sroufe described how wariness and frustration can manifest as crying and distress. This observation agrees with the study of Camras et al. (2007) that does not find different facial expressions for fear and anger at 11 months.

Differences between adult and infant facial expressions can also be linked to the motor structure of infant faces. Camras et al. (1996) noted that infants may produce facial expressions in an unrelated situation because of an enlarged recruitment among facial muscles during movement. For example, infants 5 to 7 months raise their brows as they open their mouth, producing an expression of surprise.

Holodynski and Friedlmeier (2006) proposed that infants learned adult-like expressions from a sociocultural based internalization model: caregivers reproduced infant expressions in a selective and exaggerated form, allowing children to learn the connection between their emotion and a given facial expression.[1]

The appearance of adult-like expressions is not well understood (Oster, 2005). Bennett et al. (2005) showed that the organization of facial expressivity increases during infancy. 12-month-old infants showed more specific expression to a situation than 4-month-old

infants. It seems that children keep learning how to produce facial expressions through late childhood. Ekman et al. (1980) demonstrated that the ability to produce facial expression improves between 5 and 13 years. However, young children do not perfectly produce all facial expressions. The production of facial expression depends on age and the targeted emotion. Joy is well-produced at 3 years old while anger, sadness, and surprise are still not mastered at 6 years old. Field and Walden (1982) also found that positive emotions are easier to produce than negative emotions. However, Lobue and Thrasher (2014) asked children to imitate facial expressions of an adult and found no effects of age or emotion subtype on the production of facial expression for children between 2 and 8 years old.[2]



Figure **17.16.2**: Imitation of Emotion has varied and mixed research results ([4])

Facial expressions of emotion are important regulators of social interaction. This concept has been investigated through social referencing (Klinnert, Campos & Sorce, 1983), the process whereby infants seek out information from others to clarify a situation and then use that information to act. The strongest demonstration of social referencing to date comes from work on the “visual cliff”. In the first study to investigate this concept, Campos and colleagues (Sorce, Emde, Campos, & Klinnert, 1985) placed mothers on the far end of a "cliff" from the infant. First, mothers smiled at their infants and placed a toy on top of the safety glass to attract them: infants invariably began crawling to their mothers. When the infants were in the center of the table, however, the mother then posed an expression of fear, sadness, anger, interest, or joy. The results varied according to the emotion expressed: no infant crossed the table when the mother showed fear, 6% crossed when the mother showed anger, 33% crossed when the mother showed sadness, and approximately 75% of the infants crossed when the mother showed joy or interest.

Other studies provide similar support for facial expressions as regulators of social interaction. In one study (Bradshaw, 1986), experimenters posed facial expressions of neutrality, anger, or disgust toward babies as they moved toward an object and measured the amount of inhibition the babies showed in touching the object. The results for 10- and 15-month-olds were the same: anger produced the greatest inhibition, followed by disgust, then neutrality. This study was later replicated (Hertenstein & Campos, 2004) using joy and disgust expressions, altering the method so that the infants were not allowed to touch the toy (compared with a distractor object) until 1 hour after exposure to the expression. At 14 months of age, significantly more infants touched the toy when they saw joyful expressions, but fewer touched the toy when the infants saw disgust.[3]



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17.17: Pulling the Pieces Together

Emotional Intelligence

Emotional intelligence, as defined by Salovey and Mayer in Emotional Intelligence (2020), is a "subset of social intelligence that involves the ability to monitor one's own emotions and others' emotions, to discriminate among them, and to use this information to guide one's own thinking and actions" (Bechtoldt, 2008). Emotional intelligence is the capacity to acknowledge emotions in self and others, then leverage emotional information to adapt thinking and behavior to the environment and achieve one's goal.[1]



Figure **17.17.1**: Infant and Caregiver both displaying emotions. ([1])

Emotional Intelligence: The Goleman Theory

While Salovey and Mayer were the first to publish an article on emotional intelligence, true popularity of the term and concept of EI didn't occur until Dan Goleman published "Emotional Intelligence: Why It Can Matter More than IQ" (Bechtoldt, 2008). Goleman claims that EI is more critical than Intelligence Quotient (IQ) for enjoyment of a successful life and maintaining fruitful, secure relationships with others (Karafyllis & Ulshofer, 2008). Goleman proposed a new definition of intelligence which includes qualities such as optimism, self-control, and moral character. He suggests that, unlike general intelligence, which is viewed as stable over time, EI can be learned and increased at any time during one's life (Karafyllis & Ulshofer, 2008). Goleman also proposed that EI has a moral dimension, stating that "emotional literacy goes hand in hand with education for character and moral development and citizenship" (Karafyllis & Ulshofer, 2008, p.135).[2]

The image below illustrates the key competencies of emotional intelligence and demonstrates the connection between elements of emotional development in infants and toddlers and emotional intelligence.

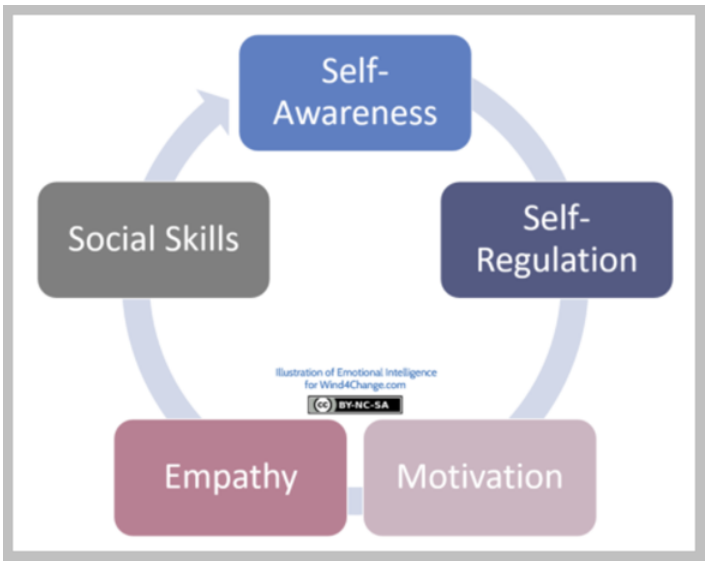


Figure **17.17.2**: Emotional Intelligence, as described by Daniel Goleman, ([2])

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17.18: Cultural Elements of Emotional Development

Culture and Emotions

Because culture impacts how people display emotion, people from varying cultural backgrounds can have very different cultural display rules of emotion. A cultural display rule is one of a collection of culturally specific standards that governs the types and frequencies of acceptable emotional displays (Malatesta & Haviland, 1982). Some cultural groups appear to express certain emotions more often than other cultural groups (Tsai, Levenson, & McCoy, 2006). Cultural groups also vary by the emotions and emotional states they value (Tsai, Knutson, & Fung, 2006). For example, research has shown that individuals from the United States express negative emotions like fear, anger, and disgust both alone and in the presence of others. In contrast, individuals from Japan only do so while alone (Matsumoto, 1990). Furthermore, individuals from cultures that tend to emphasize social cohesion are more likely to suppress emotional reactions so they can evaluate which response is most appropriate in each context (Matsumoto, Yoo, & Nakagawa, 2008). One study suggests that cultural differences in exposure to specific emotions through storybooks may contribute to young children's preferences for particular emotional states (such as excited or calm) (Tsai et al., 2007).[1]



Figure **17.18.1**: Expression of sadness can be culturally based. ([2])

Cultures also inform us about what to do with our emotions—how to manage or modify them—when we experience them. This often occurs by managing our emotional expressions through cultural display rules (Friesen, 1972). These cultural rules are learned early in life and specify the management and modification of our emotional expressions according to social circumstances. Some are taught to laugh at their boss's jokes even when they are not funny; others learn that "big boys don't cry". Culture affects how individuals express their emotions and how people experience them. Emotional regulation is also influenced by culture and the historical era in which a person lives. This cultural variability in regulation processes is significant (Mesquita & Frijda, 1992). "Cultures vary in terms of what one is expected to feel, and when, where, and with whom one may express different feelings" (Cheah & Rubin 2003, p. 3).[3]



Figure **17.18.2**: Expressing happiness together. ([3])

A crucial aspect of culture comes from the transmission of emotional meaning to its members: one way this occurs is through the development of worldviews (including attitudes, values, beliefs, and norms) related to emotions (Matsumoto & Hwang, 2013; Matsumoto et al., 2008). Emotion-related worldviews provide guidelines for desirable emotions, which facilitate norms for regulating individual behaviors and interpersonal relationships. Cultural backgrounds tell us which emotions are ideal and which are not (Tsai, Knutson, & Fung, 2006). The cultural transmission of information related to emotions occurs in many ways, not the least of which is from caregivers to children (Schönpflug, 2009; Tsai, Louie, Chen, & Uchida, 2007). As a caregiver for infants and toddlers, how might your culture's emotional norms conflict at times with the emotional/cultural norms of the children in your care?[4]

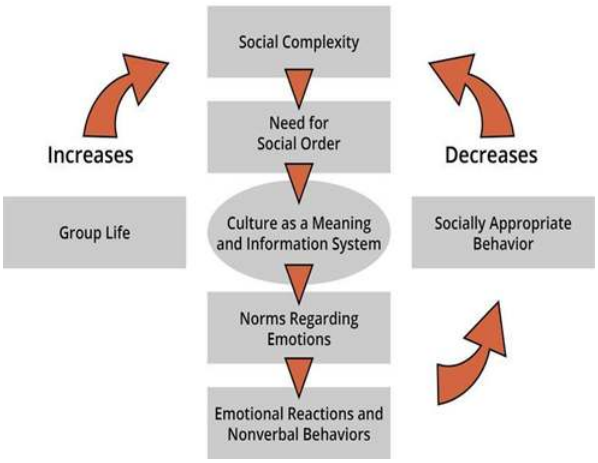


Figure 17.18.1: The role of emotions in the function of culture. Social complexity to Need for social order to culture as a meaning and information system to norms regarding emotions to emotional reactions and nonverbal behaviors which contributes to socially appropriate behavior which then decreases social complexity. . (5])

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17.19: Emotional Competence and Self-Regulation- A Strategy to Support Emotional Development

A Strategy to Support Emotional Development

Emotional Competence and Self-Regulation, ECSEL, is based on the emotional foundations of learning and cognition. ECSEL aims to help young children develop emotional competence on their path toward effective self-regulation. It teaches emotional competence to children as young as infants, helping enhance emotion regulation, self-regulation, and promote a positive sense of self, mental health, and well-being .[1]

Promoting the growth of self-regulation development and co-regulation from birth through age 2[1]

Developmental Stage	Characteristics of Self-Regulation in Infants	How Caregivers Can Provide Co-Regulation
Infancy (birth to age 1)	• Orient attention away from stressors • Engage caregivers as resources for comfort • Begin to self-soothe	• Interact in warm, responsive ways • Anticipate and respond quickly to child's needs • Provide physical and emotional comfort when a child is stressed • Modify environment to decrease demands/stress
Toddlerhood (ages 1–2, approximately)	• Begin to select and shift attention (attentional control) • Adjust behavior to achieve simple goals • Delay gratification and inhibit responses for short periods when there is structure and support • Emotions are stronger than cognitive regulation • Feelings of attachment support prosocial goals	• Reassure/calm the child when upset by removing the child from situations or speaking calmly and giving affection • Model self-calming strategies • Teach rules and redirecting to regulate behavior

Caregivers of infants and toddlers must pay attention to and document children’s feelings and emotional responses: suggest words for and help children name their feelings rather than telling children what they feel. This strategy gives children a vocabulary for feelings and communicates that they are the ones who know their feelings best. Emotional language support helps children understand what causes their feelings. Offer children, rather than tell them, possible explanations to help determine the cause of their emotion. Pay attention to your own emotional responses as young children are keenly sensitive to tone of voice and facial expressions. Model respectful, appropriate expressions of emotion, facial expressions, and tone of voice that matches feelings. Loud or intensely angry tones can be overwhelming and frightening for children.[2]

Caregivers support regulation of emotions by learning each child's preferred way of being comforted. Identify or name for children what helps them feel comforted. Acknowledge when children seek comfort or comfort themselves. Collaborate with children in providing comfort for them. Keep in mind children are able to comfort themselves. Demonstrate acceptance for all of the feelings children express. Young children use social referencing, meaning they look to adults to "read" how things are going throughout the day. When someone is crying, a teacher can provide a calm, accepting, and empathic tone to help children learn that crying is natural and related to feelings of sadness, frustration, fear, and anger. Likewise, a teacher who responds calmly when angry or afraid helps children learn that such feelings are valid and appropriate.[2]

Definition: Social Referencing

The process by which one individual consults another’s emotional expressions to determine how to evaluate and respond to circumstances that are ambiguous or uncertain.

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17.20: Conclusion

Conclusion to Emotional Development

Understanding the function and origin of emotional development provides a caregiver with foundational knowledge to support development in holistic ways. A caregiver's focus often falls to physical development, neglecting the critical support of healthy emotional development. However, evidence demonstrates that communication with family members and caregivers about emotions during early childhood is essential for children to develop healthy emotions.

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CHAPTER OVERVIEW

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18.1: Introduction

Introduction to Social Development

"How have I become the kind of person I am today?" Every adult ponders this question from time to time. Answers may include the influences of parents, peers, temperament, a moral compass, a strong sense of self, and critical life experiences such as parental divorce. Social development encompasses many influences and addresses questions about how people uniquely develop. Are humans a product of nature or nurture? How enduring are the influences of early experiences? Social development refers to the long-term changes in relationships and interactions involving self, peers, and family. It includes positive changes, such as how friendships develop, and negative changes, such as aggression or bullying. The study of social development offers perspective on these and other issues, demonstrating the complexity of external impacts on developing infants and toddlers. [1]

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18.2: What is Social Development?

Defining Social Development

In childhood, social development emerges through social influences, biological maturation, and the child's representations of the social world and the self. Understanding social development requires looking at children from 3 perspectives that interact to shape development. The first is the social context where each child lives, especially the relationships that provide security, guidance, and knowledge. The second is biological maturation which includes developing social and emotional competencies and underlying differences of individual temperament. The third is a child's growing representations of who they are and the social world around them. Social development is best understood as the continuous interaction between these social, biological, and representational aspects of psychological development.[1]



Figure **18.2.1**: Social Development is an important part of forming peer relationships. ([2])

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18.3: Theories of Social Development

Erikson and Psychosocial Theory

One of the best-known theories of social development is the Eight Psychosocial Crises described by Erik Erikson.[1] Erik Erikson (1902-1994) believed we know what motivates us throughout life. We make conscious choices in life, focusing on meeting particular social and cultural needs rather than purely biological ones. For instance, humans are driven by the need to experience the world as a trustworthy place, feel we are capable individuals, believe we can contribute to society, and possess confidence in having lived a meaningful life. These are all psychosocial problems. Erikson divided the lifespan into 8 crises, usually called stages. Each stage or crisis consists of psychosocial tasks to accomplish. Erikson believed that an individual's personality takes shape throughout his lifespan in the face of life's challenges. According to Erikson, successful development involves positively dealing with and resolving the goals and demands of each crisis. If a person does not resolve a crisis successfully, it may hinder his ability to deal with later crises.

Definition: Psychosocial development

Erikson's theory that emphasizes the social relationships that are important at each stage of personality development. The lifespan is broken into eight stages, each with a major psychosocial task to accomplish or crisis to overcome.

Psychosocial Stages

1. Trust vs. mistrust (0-1 year): the infant must have basic needs met consistently to feel that the world is a trustworthy place.
2. Autonomy vs. shame and doubt (1 -2 years): mobile toddlers have newfound freedom they like to exercise, and they learn some essential independence by being allowed to do so.
3. Initiative vs. guilt (3 -5 years): preschoolers like to initiate activities and emphasize doing things "all by myself."
4. Industry vs. inferiority (6-11 years): school-aged children focus on accomplishments and begin making comparisons between themselves and their classmates.
5. Identity vs. role confusion (adolescence): teenagers try to gain a sense of identity by experimenting with various roles, beliefs, and ideas.
6. Intimacy vs. isolation (young adulthood): in our 20s and 30s, we make some of our first long-term commitments in intimate relationships.
7. Generativity vs. stagnation (middle adulthood): In our 40s through the early 60s, we focus on being productive at work and home and are motivated to feel that we've contributed to society.
8. Integrity vs. despair (late adulthood): we look back on our lives and hope to see that we have lived well and have a sense of integrity because we lived according to our beliefs.

The first 3 stages form a foundation for discussions on emotional and social development during the lifespan. These stages or crises can occur more than once: for instance, a person may struggle with a lack of trust beyond infancy under certain circumstances.

Definition: eight stages of psychosocial development

Erikson's stages of trust vs. mistrust, autonomy vs. shame/doubt, initiative vs. guilt, industry vs. inferiority, identity vs. role confusion, intimacy vs. isolation, generativity vs. stagnation, and integrity vs. despair

Crises of Infants and Preschoolers: Trust, Autonomy, and Initiative

From the day they are born, infants face a crisis (in Erikson's paradigm) about trust and mistrust. They are happiest if they can eat, sleep, and excrete according to their schedules, regardless of whether their schedules are convenient for their caregiver. Unfortunately, a young infant is in no position to control or influence a caregiver's scheduling needs, so the infant faces a dilemma about how much to trust or mistrust the caregiver's helpfulness. It is as if the infant asks "If I demand food (or sleep, or a clean diaper, etc.) now, will my caregiver be able to help me meet this need?" Hopefully, between the 2 of them, caregiver and child resolve this choice in favor of the infant's trust: the caregiver proves to be adequate in attentiveness, and the infant risks trusting the caregiver's motivation and skill.[1]

Caregivers who are consistently and appropriately responsive and sensitive to their infant's needs help the infant develop a sense of trust; the infant will see the world as a safe, predictable place. Unresponsive or inconsistent caregivers who do not meet their infant's needs can elicit feelings of anxiety, fear, and mistrust; the infant may see the world as unpredictable and unsafe. If infants are treated cruelly, or their needs are not met appropriately, they will likely grow up with a sense of mistrust for people in the world.[2]

As soon as the first crisis resolves, a new one develops over autonomy and shame. The child (now a toddler) may trust their caregiver, but their trust contributes to the desire to assert autonomy by taking care of basic personal needs, such as feeding, toileting, or dressing. At this stage of development, you will often hear toddlers say things like “me-do-it” as they exert their autonomy. Given the child's lack of experience in these activities, self-care is risky at first: the toddler may feed (or use the toilet, dress themselves, etc.) clumsily and ineffectively. The child's caregiver risks overprotecting the child by criticizing their early efforts unnecessarily, causing the child to feel shame for even trying.[1] Erikson believed that toddlers should be allowed to explore their environment as freely as safety permits, fostering their understanding of independence that later grows self-esteem, initiative, and overall confidence. If denied the opportunity to act on their environment (within developmentally appropriate measures), toddlers may begin to doubt their abilities, leading to low self-esteem and feelings of shame (Berger, 2005). Hopefully, the new crisis resolves in favor of autonomy through the combined efforts of the child to assert independence and of the caregiver to support the child.

About the time a child is of preschool age (3-5 years old) the autonomy exercised during the previous period becomes more elaborate, extended, and focused on objects and people other than the child. The child at an early education center, for example, may now undertake to build the "biggest city in the world" out of all available unit blocks, even if other children want some of the blocks for themselves. The child's projects and desires create a new crisis of initiative and guilt because the child soon realizes that acting on impulses or desires can sometimes negatively affect others: more blocks for one child may mean fewer for someone else. As with the crisis over autonomy, caregivers must support the child's initiatives whenever possible without making the child feel guilty for desiring to have or do something that affects others' welfare. By limiting behavior where necessary—but not limiting internal feelings—caregivers demonstrate support of this newfound ability to take the initiative. Expressed in Erikson's terms, the crisis resolves in favor of initiative.[1]

Criticisms of Erickson's Theory

Criticisms of Erikson's theory stem from his focus on stages and his assumption that completing one stage is a prerequisite for the subsequent development crisis (Marcia, 1980). His theory also focuses on the social expectations found in certain cultures, but not in all. For instance, the idea that adolescence is a time of searching for identity might translate well in the middle-class culture of the United States, but not as well in cultures where the transition into adulthood coincides with puberty through rites of passage and where adult roles offer fewer choices.[2]

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18.4: Overview of Social Cognitive Learning Theory

Social Cognitive Learning Theory

Social Learning Theory, or learning by watching others, was developed by Albert Bandura (1977). Social Learning Theory holds that portions of an individual's knowledge acquisition can be directly related to observing others within the context of social interactions, experiences, and outside media influences. Young children frequently learn behaviors through imitation: they learn by modeling or copying the behavior of others, especially when they do not know what else to do.[1] This is called observational learning. Bandura theorized that the observational learning process consists of 4 parts. The first is attention. To learn, one must pay attention to what one is observing. The second part is retention: one must retain the observed behavior in one's memory. The third part of observational learning, initiation, acknowledges that the learner must be able to execute or initiate the learned behavior. Lastly, the observer must be motivated to engage in observational learning (Bouton & Lang, 1960). Bandura's theory states that when people observe a model performing a behavior and experiencing its consequences, they remember the sequence of events and use this information to guide subsequent behaviors. Watching a model can also prompt the viewer to engage in previously learned behavior (Bandura, 1986, 2002).[2]



Figure **18.4.1**: Modeling behavior is a part of social development. ([3])

Do Parents Socialize Children or Do Children Socialize Parents?

Bandura (1986) suggests an interplay between environment and individual. People are not merely the product of their surroundings; instead, people influence their surroundings. There is also an interplay between personalities and how events are interpreted. This concept is called reciprocal determinism. An example of this might be the interaction between parents and children. Parents influence their child's environment, and children influence parents as well. Parents may respond differently with their first child than with their fourth. Perhaps they try to be the perfect parents with their firstborn, but by the time their last child comes along, they have very different expectations of themselves and their child. Our environment creates us, and we make our environment.[4]

Criticism of Social Cognitive Theory

One of the main criticisms of social cognitive theory is that it lacks unification: the different aspects of the theory appear disconnected. The theory is also so broad that not all its parts are fully understood or integrated into a single explanation of learning. It is limited because not all social learning can be directly observed, and it ignores maturation. Understanding how a child learns through observation and how an adult learns through observation is not differentiated, and developmental factors are not acknowledged.[2]

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18.5: The Early Months of Social Development

Early Social Development

Young infants seek relationships. They actively explore what they can do with their bodies, people close to them, and the environment. They are not empty vessels waiting to be filled with information, but rather "active participants in their development, reflecting the intrinsic human drive to explore and master one's environment" (National Research Council and Institute of Medicine, 2000 Core Concepts of Development). As seen in Figure **18.5.1**, their active engagement with the social and physical world works hand in hand with the care they receive from adults, especially when the adults are responsive to them.



Figure **18.5.1**: Actively engaging with the environment helps support social development. ([1])

Infants develop quickly by extending their abilities in all domains and creating more complex ways of relating to people and things. They send messages to adults in various ways and expect responses from adults. For example, when looking into the faces of adults, infants may see enlarged dilated pupils—a common sign of interest and pleasure—and, in response, they smile more (Hess, 1975). Children in the 3-to-4-month range show highly differentiated social-emotional behavior. By 3 months, infants learn to alter responses to adults according to how the adults respond to them: infants increase vocalizations when adults acknowledge these vocalizations with a smile, a vocal response, or light touch. The interest of others stimulates the infant's interest (Crick, 1984). [2]

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18.6: Relationships

Relationships and Social Development

Children's experiences of relationships contribute to their expanding repertoire of social skills and broadened social understanding. In these relationships, children develop expectations for specific people (for example, experiences that lead to secure or insecure attachments to parents), acquire knowledge of how to interact with adults and peers, and create a self-concept based on how others respond to them.[1] Relationships with parents, other family members, and caregivers provide critical context for infants' social development. Parents and caregivers are an infant's initial social partner, and the quality of this early caregiver-infant relationship has been linked to many different positive outcomes. Establishing close relationships with adults is related to children's emotional security, sense of self, and evolving understanding of the world around them. Interactions with adults are a frequent and regular part of infants' daily lives, and infants as young as 3 months of age have demonstrated the ability to discriminate between the faces of unfamiliar adults (Barrera & Maurer, 1981). By 4 months of age, a child's power in relationships, along with the impact of these relationships, is evident. Infants become more skilled at reading others' behavior and adapting their own behavior. They also gain skills to make themselves more engaging and effective socially. 4-month-olds will send clear messages, become quiet in anticipation as someone comes near to care for them, seek adults' attention with smiles and laughter, participate in extended back and forth interaction with others, and engage in simple social imitation.[2]

Close relationships with adults who provide consistent nurturance strengthen a child's capacity to learn and develop. These special relationships influence the infant's emerging sense of self and understanding of others. Infants use relationships with adults in many ways: for reassurance that they are safe, for assistance in alleviating distress, for help with emotion regulation, and for social approval or encouragement. These relationships play a crucial part in development across all domains. For example, parental responses to the infant's vocalizations support language development (see Tamis-LeMonda et al., 2014 for reviews) and direct gaze sharing between a parent and infant promotes connections and communication (Leong et al., 2017).[3]

Social Understanding

Remarkably, young children begin developing social understanding very early in life. Before the end of the first year, infants are aware that other people have perceptions, feelings, and other mental states that affect their behavior and that differ from their own mental states.[1]

Children begin to understand other people's responses, communication, emotional expression, and actions during the infant and toddler years. These developments include an infant's understanding of what to expect from others, how to act, and which social scripts are used for specific social situations. Recent research suggests that infants' and toddlers' social understanding is related to how often they experience adult communication about the thoughts and emotions of others (Taumoepeau & Ruffman, 2008).[2]

"At each age, social cognitive understanding contributes to social competence, interpersonal sensitivity, and an awareness of how the self relates to other individuals and groups in a complex social world" (Thompson, 2006, pg.26). Even in early infancy, social understanding is critical because of the social nature of humans (Wellman & Lagattuta, 2000).[2]

Responding to Infants' Cues as Part of Social Development Through Joint Attention and Social Referencing

Humans can actively engage with other people's mental states, such as when they enter situations of joint attention (Malle, 2022). Joint attention is described as the ability to coordinate visual attention with another person and then shift the gaze toward an object or event (Mundy, 1998); it does not require the gazer to be aware of the follower's reaction (Emery, 2000). The definition sounds more complicated than it is. If you point to an object around a 3-year-old, notice how you both check in, ensuring that you are *jointly* engaging with the object. Such shared engagement is critical for children to learn the meaning of objects: both their value (is it safe and rewarding to approach?) and the words that refer to them (what do you call this?). When I hold up my keyboard and show it to you, we are jointly attending to it, and if I say it's called "Tastatur" in German, you know that I am referring to the keyboard and not to the table on which it had been resting.[4]

Literature reports 2 main components of joint attention: (1) response to joint attention and (2) initiation of joint attention.

Responding to joint attention is the ability to shift visual attention following another's social cues such as gaze or pointing, whereas initiating joint attention is the ability to direct another person's attention through gaze or gestures with the aim of sharing an

experience (Seibert & Mundy, 1982). Responding to joint attention and initiating joint attention are considered interrelated aspects of joint attention, emerging at different times during development (Mundy et al., 2007). Responding to joint attention usually develops between 6 and 9 months of age, whereas initiating joint attention starts approximately at 9 months of age with significant variability across individuals.[5]



Figure **18.6.1**: Example of joint attention as both man and infant look at the same object. ([11])

Social Referencing

Young children begin developing social understanding very early in life. Before the end of the first year, an infant is aware that other people have perceptions, feelings, and different mental states affecting their behavior.[1] An understanding that other mental states differ from the infant's own can be readily observed in the phenomena of social referencing. [1] Social referencing is the tendency of an infant to gather information from a caregiver to regulate his behavior in an ambiguous situation (in which the infant does not have enough information to decide how to react) (Fawcett & Liszkowski, 2015; Schieler et al., 2018; Stenberg, 2009; Striano et al., 2006; Walden and Kim, 2005; Zarbatany and Lamb, 1985). Social referencing emerges around 7 to 10 months of age and forms a foundation for social learning and social appraisal in adulthood (Walle et al., 2017).[1]

In social referencing, an infant looks to a trusted caregiver's face when confronted with an unfamiliar person or situation (Feinman, 1992). If the caregiver seems calm and reassuring, the infant responds positively as if the situation is safe. If the caregiver looks fearful or distressed, the infant is likely to react with wariness or distress because the caregiver's expression signals danger. Infants display remarkable insight and awareness: even though they are uncertain about the unfamiliar situation, the caregiver is not. By "reading" the emotion in the caregiver's face, infants can learn about whether the circumstance is safe or dangerous, and how to respond. [1]

In the past, developmental scientists believed infants were egocentric—focused on their perceptions and experience—but research now indicates the opposite is true. From an early age, infants are aware that people have different mental states, which motivates them to figure out what others are feeling, intending, wanting, and thinking, and how these mental states affect their behavior. Infants are beginning to develop a theory of mind, and although their understanding of mental states begins very simply, it expands rapidly (Wellman, 2011)Social understanding grows significantly as children's theory of mind develops.[1]

How do these achievements in social understanding occur? Young children are remarkably sensitive observers of other people. They make connections between their emotional expressions, words, and behavior to derive simple inferences about mental states (e.g., concluding that what Mommy is looking at is in her mind) (Gopnik, Meltzoff, & Kuhl, 2001). This connection is especially likely to occur in relationships with people the child knows well, consistent with the ideas of attachment theory. Growing language skills give young children words with which to represent these mental states (e.g., "mad," "wants") and talk about them with others. Through conversation with their caregivers about everyday experiences, children learn much about people's mental states from how adults talk about them ("Your sister was sad because she thought Daddy was coming home.") (Thompson, 2006). Developing social understanding depends heavily upon children's everyday interactions with others and their careful interpretations of what they see and hear.[1]

Disturbances in Infant-Caregiver Relationships: Maternal Depression and Infant and Toddler Social Development

Infants repeatedly participate in daily, interactive routines with their primary caregivers, most often their mothers. An infant is typically in tune with the emotional signals in their caregivers' voices, gestures, movements, and facial expressions. Maternal depression compromises the infant and mother's ability to mutually regulate the interaction. Most commonly, depression impacts the relationship through 2 interactive patterns observed in depressed mothers: intrusiveness or withdrawal. Intrusive mothers display a negative affect and disrupt the infant's activity. The infant experiences anger, turns away from the mother to limit her

intrusiveness, and internalizes an angry and protective coping style. Withdrawn mothers are disengaged, unresponsive, affectively flat and do little to support the infant's activity. Infants cannot cope with or self-regulate this negative state and develop passivity, withdrawal, and self-regulatory behaviors (e.g., looking away or sucking on the thumb) (Hart et al., 1998; Tronick, 1989).

Infants and toddlers of depressed mothers can develop serious emotional disorders such as infant depression and attachment disorders (Luby, 2000). Early mental health disorders might be reflected by delayed development, inconsolable crying, or sleep problems. Older toddlers may exhibit aggressive or impulsive behavior. In early care and education settings, children with social and emotional problems tend to have a hard time relating to others, trusting adults, being motivated to learn, and calming themselves to tune into teaching—all necessary skills to benefit from early educational experiences. Studies reveal the long-lasting effects of maternal depression. Older children of mothers depressed during infancy show poor self-control, aggression, poor peer relationships, and difficulty in school (Embry & Dawson, 2002). These problems increase the likelihood that the child will be placed in special education, held back to repeat a grade, or drop out of school. Each of these problems can prevent a child from reaching optimal development, result in missed opportunities for success over the child's lifespan, and impose increased costs to society (Onunaku, 2005).

When Relationships Cause Damage: Abuse and Neglect

It is challenging to know how much child abuse occurs. Infants cannot talk, and toddlers and older children who are abused usually do not tell anyone about the abuse. They might not define it as abuse, they might be scared to tell a trusted adult, they might blame themselves for being abused, or they might not know with whom they could talk about their abuse. Whatever the reason, children usually remain silent, making it very difficult to know how much abuse occurs. Up-to-date statistics on the different types of child abuse in the United States can be found at the U.S. Children's Bureau website .[7]

All types of abuse are complex issues, especially within families. There are many reasons people may become abusers- poverty, stress, and substance abuse are common characteristics shared by abusers, although abuse can happen in any family.

Children who experience abuse or neglect are at risk of developing lifelong social, emotional, and health problems, particularly if neglected before the age of 2. However, it is essential to note that not all children who experience abuse and neglect will have the same outcomes. There are many ways to foster stable, permanent, safe, secure, nurturing, loving care for children affected by adverse childhood experiences.

Trauma-Informed Care

Traumatic experiences can significantly alter a person's perception of themselves, their environment, and the people around them. As traumatic experiences accumulate, responses become more intense and have a greater impact on functioning. Ongoing exposure to traumatic stress can impact all areas of people's lives, including biological, cognitive, and emotional functioning, as well as social interactions, relationships and identity formation. Because people who have experienced multiple traumas do not relate to the world in the same way as those who have not had these experiences, they require services and responses that are sensitive to their unique experiences and needs.[9]



Figure **18.6.1**: An infant is held and comforted by adults([12])

Toxic stresses, such as abuse and neglect, are strongly linked to poor health outcomes across one’s lifespan and trauma-informed care is one approach to caregiving based on these effects. Caregivers in trauma-informed care strive to understand children’s behavior in the context of previous traumas they have experienced. Trauma-informed care for infants and toddlers begins with first recognizing the prevalence and potential impact these stresses can have during the first 3 years. Caregivers also provide supportive

care, enhancing children's feelings of safety and security, to prevent their re-traumatization in a current situation that may potentially overwhelm their coping skills.[10]

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[5] Billeci, L., Narzisi, A., Campatelli, G. *et al.* Disentangling the initiation from the response in joint attention: an eye-tracking study in toddlers with autism spectrum disorders. *Is licensed CC BY*

[6] Ehli S, Wolf J, Newen A, Schneider S and Voigt B (2020) Determining the Function of Social Referencing: The Role of Familiarity and Situational Threat. **(CC BY)**.

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18.7: Social Development Through Play

Play and Social Development

Play is a valued process, not only for enjoyment and leisure but also for learning. Through play, children develop a sense of identity and an understanding of their social and cultural worlds. Children use play to explore and understand cultures, communities, and friendships (Paris, Beeve, & Springer, 2021). We gain a lot through playing, not just as children but also as adults. Play involves the mutual, sometimes complex, coordination of goals, actions, and understanding. For example, as infants, children get their first encounter with sharing (of each other's toys). Through these experiences, children develop friendships that provide additional security and support to those offered by their parents.[1]

Different Theories of Play

Cognitive theories presented a significant shift in theorizing about play by directing research toward the development of children's thinking processes and intellectual development. Piaget's (Piaget, 1962) developmental theory suggests that children progress through a series of distinct phases in their thought processes. According to his theory, children engage in types of play that mirror their current level of cognitive development. The role of play is to help them consolidate and practice recently acquired concepts and skills to prepare the child for the next spurt in learning and development. Vygotsky (1978) also believed that play has several roles in cognitive development. However, he differed from Piaget in maintaining that, when children play before they become actualized in real-life situations, they reveal potential new abilities. By creating their own scaffolding, children stretch themselves in areas like self-control, cooperation, memory, language use, and literacy by using private speech to direct, control, and structure their play interactions (Bodrova & Leong, 1996). According to Vygotsky (Vygotsky, 1978), play promotes development by serving as a scaffold within the child's proximal development zone, helping them attain higher levels of functioning. Bruner (Bruner, 1972) focused on how childhood play contributes to problem-solving abilities that are important later in life. He argued that the means are more important than the ends when playing; children do not worry about accomplishing goals, which allows them to experiment with novel combinations of objects and behaviors that they are unlikely to try if under pressure to achieve a goal. Therefore, play promotes flexible problem solving, making it adaptively advantageous in human development and evolution.[2]

Stuart Brown (2010) argues that play is evolutionary and has the following properties:

- Purposeless/done for its own sake
- Voluntary
- Inherent attraction
- Freedom from time
- Diminished consciousness of self
- Improvisational potential
- Continuation desire

Gray (2013) also provides a list of features to describe play (with some overlap of Brown’s list). His conceptualization maintains that play:

- Is directed and chosen by the child
- Is as an activity in which the focus is not the end-state or a goal, but the means itself
- Consists of a structure that comes from the minds of the players and not external constraints
- Is imaginative and separate from real life
- Involves mental non-stressed activity.[3]



Figure 18.7.1:Play of all kinds is beneficial ([8])

Parten's Stages of Play

Mildred Parten (1932) observed 2 to 5-year-old children and noted 6 types of play. She labeled 3 types as non-social (unoccupied, solitary, and onlooker) and 3 types as social play (parallel, associative, and cooperative). The list below describes each type of play. Younger children engage in non-social play more than older children; by age 5, associative and cooperative play are the most common forms of play (Dyer & Moneta, 2006).[1]

This list explains how children's play changes as they grow and develop social skills.

Unoccupied Play (Birth-3 Months): At this stage, an infant is making many movements with their arms, legs, hands, feet, etc. They are learning about and discovering how their body moves.



Figure 18.7.1: Newborn exhibits Unoccupied Play ([9])

Solitary Play (3 Months-2 Years): This is the stage when a child plays alone. They are not interested in playing with others quite yet.



Figure 18.7.1: Example of Solitary Play ([10]

Spectator/Onlooker Behavior (2 Years): During this stage, a child begins to watch other children playing but does not play with them.



Figure 18.7.1: Example of spectator/onlooker play. ([1])

Parallel play (2+Years): A child plays alongside or near others but does not play with them.



Figure 18.7.1: Example of Parallel Play ([10])

Associative play (3-4 Years): When a child starts to interact with others during play, but there is not a large amount of interaction at this stage.

Cooperative Play (4+ years): When a child plays together with others and has an interest in both the activity and other children involved in playing.



Figure 18.7.1: Example of Cooperative Play ([11])

Regardless of the differences in approaches and definitions, what contemporary theories have in common is the belief that play mirrors development. As the child grows and matures, play's appearance, function, and implications may change.

Infants gradually learn to identify commonalities with others and engage in social interactions. The development of such abilities relies on the personal experiences shared between people in specific contexts (Liebal et al., 2013). Social play may offer vibrant opportunities for children to acquire joint attention skills. Throughout the first year of life, during play especially, together infants and their caregivers begin to construct social games, such as peek-a-boo (Bruner & Sherwood, 1976; Fantasia et al., 2014; Gustafson et al., 1979;). Social attention is a crucial ability for the emergence of play situations. Social attention allows children to focus on other

people's characteristics such as facial expressions, gaze direction, gestures, and vocalizations. When the direction of another's attention has been identified (for example, through gaze following or point following), we can shift our attention to focus simultaneously on the same external object or event as our partner (Bourjade, 2017).[5]

Play as Interaction with Peers: Building Friendships

Interactions with peers provide the context for social learning and problem solving, including the experiences of social exchanges, cooperation, turn-taking, and the demonstration of the beginning of empathy.[6] In peer relationships, children learn to initiate and maintain social interactions with other children. They also develop skills for managing conflicts, such as turn-taking, compromise, and bargaining. Before the age of 1, infants not only react emotionally to their peers' emotional states but also engage with them in simple forms of interaction involving behaviors within their motor abilities. For example, Vandell and Wilson (Vandell, 1987) showed that interactions between infants become increasingly reciprocated from 6- to 9-months, as reflected by the presence of turn-taking.[7]

In order to foster adaptive social development, it is important to understand the factors contributing to establishing relationships with peers, such as empathy and prosocial behaviors (Howes, 1992; Sebanc, 2007; Vandell, 1980). Evidence suggests that before their first birthday, infants are sensitive and respond to their peers' emotions, which could represent potential precursors of empathy and prosocial behaviors (Decety, 2010; Decety, 2012; Geangu).[7]

Social interactions with peers also allow older infants to experiment with varying roles in small groups and in different situations, such as relating to familiar versus unfamiliar children. Interactions are stepping stones to relationships.[6] Over time, infants develop close relationships with children they know, such as other children in the family, childcare setting, or neighborhood. Relationships with peers provide young children with the opportunity to develop strong social connections.

Toddlers' relationships with their peers have many positive developmental outcomes later on, including higher levels of emotional mental health and school success (Ladd, 1987; Tomada, 2005; Taylor, 1994; Vandell , 2000). A toddler's ability to empathize with her peers, to comfort and to share toys with them, increases her chances of becoming a friend or preferred play partner.

Young children's expression of positive and negative emotions may play a significant role in developing social relationships. Positive emotions appeal to social partners and enable connections to form, while problematic management or expression of negative emotions leads to difficulty in social relationships (Denham & Weissberg, 2004). In Fabes' 2001 study, children who used emotion-related words were better liked by their classmates (Fabes et al., 2001).[6]

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18.8: Conclusion

Conclusion to Social Development

Although closely linked with emotional development in most infant/toddler development discussions, social development is worthy of its own exploration: significant milestones in social development occur for infants and toddlers. A caregiver's understanding of the foundations of social development plays a critical role in supporting and developing each social milestone.

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CHAPTER OVERVIEW

19: Supporting Social and Emotional Development in Group Care

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19.2: Overall Influence of Care on Development

19.3: Practices Supporting Social-Emotional Development

19.4: Physical Environments Supporting Social-Emotional Development

19.5: Conclusion

19.6: References

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19.1: Introduction

Introduction to Supporting Social and Emotional Development in Group Care

Today's infants spend more time in care than any other time in history. Caregivers must spend time intentionally supporting the social-emotional development of infants and toddlers. Research indicates that the ways teachers interact with children is crucial in determining how they develop. (Curby and Brock, 2013) Early relationships are essential for healthy social-emotional development in infants. The most fundamental need of infants and toddlers is to have close, nurturing relationships that help them build a sense of emotional security.[1] Because of the social and relationship-based nature of young children's learning, responsive caregiving supports the foundation for most other learning in young children. (Jarvis, 2020).

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19.2: Overall Influence of Care on Development

The Research

Previous research shows that children's early experiences in outside-home care promote the development of both disadvantageous and favorable developmental outcomes, depending on the total amount, the quality, and the timing of the childcare exposure (Maccoby and Lewis, 2003; Belsky, 2006; Vandell et al., 2010; Huston et al., 2015; Brownell and Drummond, 2018). Conclusions from the prior evidence in early childhood education and care tend to vary depending on the age of the child. For children aged 0–3 years, the research evidence is mixed, with some studies indicating benefits for outside-home care, some reporting negative effects, and some studies finding no effects at all (Melhuish, 2015). Several studies have shown that a high level of cumulative time spent in outside-home childcare, especially before the age of 4.5 years, is related to elevated levels of aggression, assertiveness, and disobedience in adolescence (Belsky, 2006; Vandell et al., 2010; Huston et al., 2015). By contrast, some studies have found that center-based childcare in the infant and toddler years may contribute to the development of social competence and prosocial behavior (Brownell and Drummond, 2018) or lower levels of later emotional or behavioral difficulties compared to informal childcare (Gomajee et al., 2017). Numerous studies have explored the benefits of center-based childcare, preschool and other forms of group-based care for children 3 years and older (Melhuish, 2015). Overall, previous findings suggest that the effects of early childcare depend on the child's developmental preparedness for outside-home care (e.g., metacognition and 'theory of mind' in the early years; Wellman et al., 2001; Chatzipanteli et al., 2014), as well as the characteristics of the care environment (such as quality of care). At age 3, children typically have not developed sufficient knowledge or skills to engage in social interaction without constant adult guidance (Rubin and Pepler, 1995; Huston et al., 2015). High quality, structural features in an early care environment (e.g., group size and/or child-to-staff ratio, and training, permanence, sensitivity and responsiveness of caretakers) have been raised as one major explanation for findings where center-based childcare may be beneficial even when the child is less than 3 years old (Brownell and Drummond, 2018).[1]However, high quality, center-based childcare can be challenging to achieve and maintain, which places more pressure on the child's developmental preparedness to cope in the care environment.

Most often, center-based care from ages 0 to 3 (or even up to 4.5 years) has been seen as a risk for a child's later social development (Belsky, 2006; Vandell et al., 2010). Yet some studies have shown that if center-based daycare is of sufficient quality, it may do no harm or even be beneficial for the socio-emotional development of children under the age of 3 (Gomajee et al., 2017; Brownell and Drummond, 2018). It is possible that due to the limited self-control, theory of mind, and language capabilities of a young child, the quality of childcare (e.g., peer group sizes and adult-to-child ratio) tends to matter more in the toddler years than in the preschool years, regardless of the form of care. This may explain why previous findings with children aged 0–3 years vary more than with older children: the benefits of group-based outside-home care for later development is more evident (Melhuish, 2015). Children closer to preschool age can cope in groups more independently than toddlers, likely making them less dependent on the quality of care.[1

[1] Oksman E, et.al.,(2019) Associations Between Early Childcare Environment and Different Aspects of Adulthood Sociability: The 32-Year Prospective Young Finns Study. *CC BY*.

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19.3: Practices Supporting Social-Emotional Development

Supporting Social-Emotional Development

During the first 4 months of life, babies begin to engage with the world and its people (Advances in Applied Developmental Psychology 1995). Infants' motivation to seek relationships and build knowledge drives them to move their bodies, focus their attention, and send and receive signals (the basis for development and learning in all domains). Their active engagement with the social and physical world works hand in hand with the care they receive from adults, especially when the adults are responsive to them.[1]

Noticing and responding during this rapid developmental period can be challenging for caregivers. To be in tune with young infants, adults need to know when an infant wants a social response and when an infant is making a discovery through individual exploration and observation.[1]



Figure **19.3.1**: Caregivers should spend time closely observing infants to help support their Social-Emotional Development. [1]

Early care centers must establish policies and practices to support responsive caregiving, so infants learn to regulate their emotions and to develop a sense of predictability, safety, and responsiveness in their social environments. The importance is so great that research experts have broadly concluded that, in the early years, "nurturing, stable and consistent relationships are the social-emotional development key to healthy growth, development, and learning" (National Research Council and Institute of Medicine 2000, p. 412). High-quality relationships increase the likelihood of positive outcomes for young children. Professionals working in childcare settings can support the social–emotional development of infants and toddlers in various ways: interacting directly with young children, communicating with families, arranging the physical space in the care environment, and planning and implementing curriculum.

Emotions drive early learning. Infants and toddlers are active, curious learners who experience pleasure when receiving a positive response from a nurturing adult or when making a discovery. This pleasure motivates children to continue engaging in positive interactions, exploring, and learning. The emotional responses of infants and toddlers communicate their interests and needs. It is important for caregivers to read infant and toddler cues to pick up on learning interests and meet needs. By reading emotional cues, caregivers determine whether to engage in interaction with a child or wait quietly to see what the child will do next. Emotional cues let teachers know if children are ready for more interaction, want more complexity added to their play, or are tired and need quiet time. Responsiveness to a child's emotional cues strengthens the teacher–child relationship and creates new possibilities for the child's learning in the social–emotional domain and in all other developmental domains.[2]

Children are learning from their interactions with caregivers every moment of every day. Through relationships with children, educators provide an environment in which children can learn and thrive in the company of a trusted adult. Caregiving routines offer essential social experiences and support for infants and toddlers because they happen regularly and consistently. By

experiencing and participating in these routines, children learn what it means to be nurtured in a caring way. Children also learn to engage in reciprocal, responsive interactions in supportive relationships with adults.



Figure **19.3.1**: Routine care, such as diaper changes, are great ways to build relationships and support social-emotional development. [3]

Caregivers should understand how important adults are for modeling, demonstrating affection and responsiveness to the needs of young children, and teaching interaction attitudes and skills.[1]

- Consider what is culturally appropriate for the child and include non-verbal gestures (such as a warm smile, a wave hello, a reassuring touch, and eye contact) that convey "you are welcome here."
- Notice and acknowledge prosocial behavior.
- Create a prosocial environment: model prosocial interactions, create cozy areas for 2, provide opportunities for children to cooperate and help others, and create small groups for stories and meals.
- Recognize children's signals, cues, unique temperaments, likes and dislikes. (Early Childhood Learning and Knowledge Center, 2018; *Interactions matter*, 2016)
- Create a program with predictable daily routines.
- Model behavior, attitudes and healthy emotional responses in interactions with children and other adults.
- Establish developmentally and culturally appropriate expectations for children's behavior, especially concerning self-control and self-regulation.
- Narrate for children what they are observed doing and expressing, providing language to describe their thoughts and feelings and to clarify others' feelings.
- Provide specific feedback to children about their efforts, reinforcing their choices that support learning and linking their actions to outcomes.
- Coach and guide children's behavior by using positive, respectful phrasing and tone to prompt problem solving and to give brief instructions and reminders.
- Help infants and toddlers understand emotional cues (facial expressions, body language, tone of voice). This can be fostered by allowing the children to play freely with their peers (learning through experience), or by modeling your own thought processes by thinking out loud ("I wonder what it means when Hayden is crying?") (Paris et.al., 2021)
- Create a positive environment that allows infants and toddlers to explore freely, in which they often hear "yes" and seldom hear "no."
- Provide materials that relate to feelings and emotional expressions such as books, stories and songs about feelings.

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19.4: Physical Environments Supporting Social-Emotional Development

Supporting Social-Emotional Development in Environment Design

Childcare centers must also consider how the environment can be designed to support social-emotional development. If the environment is set up to make it easy for children and caregivers to make eye contact and communicate with each other, caregivers can be emotionally and physically available to children and the children can develop a secure base for learning. Care routines are more emotionally satisfying in environments that are arranged for interaction and the children's participation. The environment influences everyone's moods—children and teachers alike—and the amount of stress experienced in the childcare setting. An environment with ample fresh air, peaceful colors, different kinds of lighting, places to move freely, and easy access to play materials promotes a sense of calm that allows children and teachers to focus on exploring and learning together.[1]



Figure **19.4.1**: An environment with natural light can be a great way to support emotions. [2]

Caregivers can arrange the physical environment in many ways to scaffold and support peer interactions and relationships. Environments should provide spaces for small groups of children to explore materials and each other. Non-mobile infants who cannot physically move closer to peers or see peers should be placed on their backs, 1 to 3 feet apart at various times during the day so they can see and hear each other.[1]



Figure **19.4.1**: Infant Environment

Additional Environment Suggestions to Support Social-Emotional Development:

- Provide soft, easy-to-hold toys which allow infants and toddlers to give and take toys with other children.
- Create individual, small group, and open spaces in the environment.
- Offer places where children can feel "alone" (e.g., individual cardboard boxes, carpeted riser boxes, cubby spaces).
- Provide small areas where a child can be with 1 or 2 friends and open spaces where groups of children can gather.
- Make a collection of small cards with each child's picture.
- Stock multiples of popular toys so children can engage in parallel and associative play (this also reduces peer conflict).

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19.5: Conclusion

Conclusion to Supporting Social-Emotional Development in Group Care

Caregivers offer an incredible gift by recognizing and giving appropriate responses to an infant's early developmental achievements. This attention communicates that the infant's path is progressively moving along and is understood and supported. It lays the foundation for the young infant's emerging emotional security and attachment relationships, which are essential for learning and development throughout the early years.[1]

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CHAPTER OVERVIEW

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20.1: Introduction

Introduction to Attachment and Reciprocal Relationships

Some of the most rewarding experiences in people's lives involve developing and maintaining close relationships. For example, some of the most significant sources of joy include falling in love, starting a family, being reunited with distant loved ones, and sharing experiences with close others. And not surprisingly, some of the most painful experiences in people's lives involve disrupting critical social bonds, such as separation from a spouse, losing a parent, or being abandoned by a loved one.

Why do close relationships play such a profound role in human experience? Attachment theory is one approach to understanding the nature of close relationships. In this section, we review the origins of the theory, the core theoretical principles, and how attachment influences human behavior, thoughts, and feelings across the life course.[1]

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20.2: Attachment Theory

Bowlby

Attachment theory was developed initially in the 1940s by John Bowlby, a British psychoanalyst who attempted to understand the intense distress experienced by infants who had been separated from their parents. Bowlby (1969) observed that infants would go to extraordinary lengths to prevent separation from their parents or reestablish proximity to a missing parent. For example, he noted that children who had been separated from their parents would often cry, call for their parents, refuse to eat or play, and stand at the door in desperate anticipation of their parents' return. At the time of Bowlby's initial writings, psychoanalytic writers held that these expressions were manifestations of immature defense mechanisms operating to repress emotional pain. However, Bowlby observed that such expressions are common to many mammalian species and speculated that these responses to separation might serve an evolutionary function.[1]

Phases of Attachment

According to Bowlby, there are 4 phases of attachment (table 1[2]). Infants and Toddlers go through stages or milestones similar to physical, cognitive, and language development stages.

Bowlby Phases of Attachment

Stage	Age	Characteristics
Pre-attachment Phase	Birth - 6 weeks	The innate signals attract the caregiver (grasping, gazing, crying, smiling while looking into the adult's eyes). When the baby responds positively, the caregivers remain close by. The adults encourage the infants to remain close as it comforts them. Babies recognize the mother's fragrance, voice, and face. They are not yet attached to the mother and don't mind being left with unfamiliar adults as they have no fear of strangers.
Attachment in Making	6 weeks to 6 to 8 months	Infants respond differently to familiar caregivers than to strangers. The baby would smile more to the mother, babble to her, and become quiet more quickly whenever picked by the mother. The infant learns that their actions affect the behavior of those around them. They tend to develop a "Sense of Trust" where they expect the caregiver's response when signaled. They do not protest when they get separated from their caregiver.
Clear Cut	6 to 8 months - 18 months - 2 Years	The attachment to a familiar caregiver becomes evident. Babies show "separation anxiety" and get upset when an adult they rely on leaves them. This anxiety increases between 6 -15 months, and its occurrence depends on the temperament and the context of the infant and the behavior of the adult. The child would show signs of distress if the mother leaves, but with the supportive and sensitive nature of the caretaker, this anxiety could be reduced.
Formation of Reciprocal Relationship	18 months to 2 years	With the rapid growth in representation and language by 2 years, the toddler can understand a few factors that influence the parent's coming and going and predict their return, leading to a decline in separation protests. The child can negotiate with the caregiver to alter their goals via requests and persuasions. The child depends less on the caregiver along with age.

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[2] https://www.gracepointwellness.org/82-parenting/article/10118-infancy-emotional-and-social-development-social-connections

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20.3: Attachment Behavior vs. Attachment Bond

Behaviors and Bonds

While Bowlby focused on phases of attachment, Mary Ainsworth (a student of Bowlby) believed attachment is a secure base from which to explore. She found that adult attachment representations, the construct of how adults remember their own childhood experiences, might influence the attachment categorization of their children. In attachment theory, it is important to distinguish attachment behavior and attachment bond. Attachment behavior is behavior on the part of the infant that promotes proximity to the attachment figure, such as smiling and vocalization (Carlson & Sroufe; Cassidy). Attachment bond, however, is described by Ainsworth and Bowlby not as a dyadic and reciprocal relationship existing between the infant and his caregiver but rather as the infant's interpretation of his relationship with his mother (Cassidy). Evidence supports the positive influence of secure mother-child attachment on later development (Slade & Aber, 1992). A secure attachment system serves as a foundation for the expression of emotions and communication in future relationships, provides opportunities for self-regulation of affect (the ability to consider emotional processes before responding), and creates the potential for resilience (Belsky & Cassidy; Carlson & Sroufe; Cassidy; Karen, 1990).[1]



Figure **20.3.1**: The importance of secure attachments ([2])

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20.4: Ainsworth Strange Situation

The Experiment

Ainsworth continued studying the development of attachment in infants. Ainsworth and her colleagues created a laboratory test that measured an infant's attachment to their parent. The test is called The Strange Situation Technique because it is conducted in a context unfamiliar to the child and therefore likely to heighten the child's need for his or her parent (Ainsworth, 1979).[1]

During the procedure, which lasts about 20 minutes, the parent and the infant are first left alone while the infant explores the room full of toys. Then a strange adult enters the room and talks for a minute to the parent, after which the parent leaves the room. The stranger stays with the infant for a few minutes, and then the parent again enters, and the stranger leaves the room. A video camera records the child's behaviors during the session, which trained coders later code. The investigators were especially interested in how the child responded to the caregiver leaving and returning to the room, referred to as the "reunion." Based on their behaviors, the children are categorized into one of four groups. Each group reflects a different kind of attachment relationship with the caregiver. One style is secure, and the other three styles are referred to as insecure. [1]

- A child with a **secure attachment style** usually explores freely while the caregiver is present and may engage with the stranger. The child will typically play with the toys and bring one to the caregiver to show and describe from time to time. The child may be upset when the caregiver departs but is also happy to see the caregiver return.
- A child with a **resistant** (sometimes called ambivalent) **attachment style** is wary about the situation in general, particularly the stranger, and stays close or even clings to the caregiver rather than exploring the toys. When the caregiver leaves, the child is extremely distressed and is ambivalent when the caregiver returns. The child may rush to the caregiver, but then fails to be comforted when picked up. The child may still be angry and even resist attempts to be soothed.
- A child with an **avoidant attachment style** will avoid or ignore the mother, showing little emotion when the mother departs or returns. The child may run away from the mother when she approaches. The child will not explore very much, regardless of who is there, and the stranger will not be treated much differently from the mother.
- A child with a **disorganized/disoriented attachment style** seems to have an inconsistent way of coping with the stress of the strange situation. The child may cry during the separation, but avoid the mother when she returns, or the child may approach the mother but then freeze or fall to the floor. [1]

The Strange Situation Technique

Stages	Event	Secure	Insecure-Avoidant	Insecure-Resistant	Insecure-Disorganized
1	Exploration with caregiver in the room	Explores freely	High exploration, but unfocused	Stays close to caregiver	Chaotic exploration
2	Stranger enters room and talks with caregiver	May interact with stranger	Indifferent to stranger	Afraid of stranger when caregiver present	Afraid or uncertain about stranger
3	Caregiver leaves room and child is left alone with stranger	May be upset when caregiver leaves	Not upset when caregiver leaves	High distress when alone with stranger	Unpredictable (may be upset or not)
4	Reunion with caregiver	Happy to see caregiver return	Ignores or avoids caregiver	Ambivalent: wants contact with caregiver but is upset at them	Reacts to return of caregiver with distress

How common are the attachment styles among children in the United States? It is estimated that about 65 percent of children in the United States are securely attached. Twenty percent exhibit avoidant styles, and 10 to 15 percent are ambivalent. Another 5 to 10

percent may be characterized as disorganized (Ainsworth, Blehar, Waters, & Wall, 1978).[1]



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20.5: Contact Comfort

Harlow's Research

When Bowlby was initially developing his attachment theory, there were alternative theoretical perspectives on why infants were emotionally attached to their primary caregivers (most often, their biological mothers). Bowlby and other theorists, for example, believed that there was something important about the responsiveness and contact provided by mothers. Other theorists, in contrast, argued that young infants feel emotionally connected to their mothers because mothers satisfy more basic needs, such as the need for food. The child comes to feel emotionally connected to the mother because she is associated with the reduction of primary drives, such as hunger, rather than the reduction of drives that might be relational in nature.[1]

In a classic set of studies, psychologist Harry Harlow placed young monkeys in cages that contained two artificial surrogate "mothers" (Harlow, 1958). One of those surrogates was a simple wire contraption; the other was a wire contraption covered in cloth. Both of the surrogate mothers were equipped with a feeding tube so that Harrow and his colleagues had the option to allow the surrogate to deliver or not deliver milk. Harlow found that the young macaques spent a disproportionate amount of time with the cloth surrogate as opposed to the wire surrogate. Moreover, this was true even when the infants were fed by the wire surrogate rather than the cloth surrogate. This suggests that infants' strong emotional bond with their primary caregivers is rooted in something more than whether the caregiver provides food per se. Harlow's research is now regarded as one of the first experimental demonstrations of the importance of "contact comfort" in establishing infant-caregiver bonds.[1]



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20.6: Internal Working Models of Attachment

Creating a Model of Attachment

As research accumulated showing the long-term effects of the quality of attachment between young children and their caregivers, researchers became very interested in why — as in "Why does attachment at an early age predict later aspects of social, emotional, and cognitive development?" They began exploring possible mediating mechanisms to answer this question, looking for the pathways through which attachment exerts its effects. Research has uncovered several mechanisms, including neurophysiological pathways (e.g., children in securely attached dyads have lower levels of stress reactivity), but among the most interesting are young children's (and the later older children's, adolescents', and adults') internal working models of close relationships (Crittenden, 1999; Dykas & Cassidy, 2011; Main, Kaplan, & Cassidy, 1985).[1]

As attachment develops, day-to-day interactions between infant and caregiver form the basis of the infant's internal working model – a set of beliefs and expectations they build about the availability and reliability of their attachment figures (Sherman, Rice, & Cassidy, 2015). These internal working models are constructed starting at a very young age, about the age of four months, as soon as children can mentally represent their experiences. It is as if over the first few years of life infants are "taking mental notes" about how these important relationships function, and the effects of these expectations can be seen in the ways infants wait after sending out distress signals to see if their caregiver is on the way or they need to escalate their communications. The specific, repeated experiences babies have with their caregivers become more generalized and internalized over time, indicating whether the attachment figure can be counted on for dependable comfort and protection in times of distress and serve as a secure base from which the infant can explore the world. This internal representation then informs what types of behavior can be expected from others, i.e., whether a person will pick them up when they are upset or should be turned to for comfort when sad.[1]

As children start to interact and form relationships with others, like other family members, preschool teachers, and peers, their internal working models form the basis of their expectations for how people will respond to them and therefore shape their behavior in relationships. Negative experiences with one caregiver may, for example, create the expectation that people are not to be trusted. So young children are less able to be their authentic selves or reach out to others when they are upset and need comfort. Because these internal working models influence children's behavior, they may shape the quality of their subsequent relationships, all the way up until adolescence and young adulthood (Allen & Miga, 2010). For example, adolescents with insecure-resistant internal working models may show ambivalence about close romantic relationships, both intensely wanting them and being resentful about how their needs are being met (Mikulincer, Shaver, Bar-On, & Ein-Dor, 2010).[1]

Though these internal representations tend to stay somewhat stable for children with secure attachments, they can continue to grow and change as children age and gather more social experiences. For example, consistent, warm, and caring interactions with other attachment figures, such as grandmothers or preschool teachers, have the power to change those beliefs allowing children to rework a negative internal working model into a positive one. Internal working models can be reworked at any age, as children encounter family members, neighbors, teachers, or other adults who provide high-quality care. For adolescents, close and caring friendships can provide opportunities to reconsider and expand their understanding of relationships. The good news is that, as adults, we can become aware of our internal working models of relationships and see how we may be bringing things from previous relationships into subsequent ones in ways that are causing us problems. Then we can intentionally rework our expectations about others in ways that make it easier for us to form secure relationships with our friends, romantic partners, and eventually our children.[1]

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20.7: Support for Caregivers

Caregivers and Attachment

Sometimes parents need help in responding consistently to their infant's needs. A positive and strong support group can help a parent and child build a strong foundation by offering assistance and positive attitudes toward the newborn and parent. In a direct test of this idea, Dutch researcher van den Boom (1994) randomly assigned some babies' mothers to a training session in which they learned to better respond to their children's needs. The research found that these mothers' babies were more likely to show a secure attachment style than the mothers in a control group that did not receive training.[1]

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20.8: Attachment and Culture

Culture

In the years that have followed Ainsworth's ground-breaking research, researchers have investigated various factors that may help determine whether children develop secure or insecure relationships with their primary attachment figures. Some cultural differences in attachment styles have been found (Rothbaum, Weisz, Pott, Miyake, & Morelli, 2000). For example, German parents value independence, and Japanese mothers are typically by their children's sides. As a result, the rate of insecure-avoidant attachments is higher in Germany, and insecure-resistant attachments are more elevated in Japan. However, these differences reflect cultural variation rather than actual insecurity (van Ijzendoorn and Sagi, 1999). [1]

One of the critical determinants of attachment patterns is the history of sensitive and responsive interactions between the caregiver and the child. In short, when the child is uncertain or stressed, the ability of the caregiver to provide support to the child is critical for their psychological development. It is assumed that such supportive interactions help the child learn to regulate their emotions, give them the confidence to explore the environment and provide them with a safe haven during stressful circumstances.[2]

It is essential to note that the attachment theory work of Bowlby and Ainsworth focused on Westernized caretaking ideals in their determination of healthy, secure attachment. What is considered "ideal" in Westernized culture is not necessarily prioritized in other cultures. Sensitivity and caution are required in determining if observed attachment patterns are adaptive within the child's environment.[2] Overall, secure attachment is the most common type of attachment seen in every culture studied thus far (Thompson, 2006). [1]

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20.9: Attachment and Separation Anxiety

Separation Anxiety

All children and teens feel some anxiety. It is a normal part of growing up. Separation anxiety is normal in very young children. Nearly all children between 18 months and 3 years old have separation anxiety and are clingy to some degree.[1]

Even securely attached toddlers find separation challenging. Separation anxiety can be seen in many forms. As caregivers or parents, we might see it in various ways. Some characteristics that infants and toddlers may experience are :

- Tears at drop off
- Asking to be held during transition times or for long periods throughout the day
- Extra clingy during transitions
- Challenges with nap, diapering, mealtime
- Night terrors during sleep at home, or calling out a parent's name during sleep
- Intense reactions and behaviors to situations that would not normally impact them.

How to support children during separation anxiety

Age	Developmental Stage	What You Can Do
Birth to 8 months	Although infants recognize a voice, face, smell, and caregiving style, as long as their needs are being met they can easily be comforted by another caregiver.	A new caregiver may not immediately be able to read a baby's unique cues for attention, diaper changes, and hunger. The caregiver can observe the baby with the parent to learn as much as possible about how they communicate needs.
8 months to 2 years	During this stage of development, it is expected that separation anxiety begins, and children may become frightened and upset when their parents leave.	Reminding children that mommy or daddy always comes back can help ease fears. Transitional objects such as a special blanket or soft, snuggly toy can also alleviate anxiety. Providing experiences that focus on sensory exploration can be calming when children are distressed.
2 to 5 years	Preschoolers usually handle separation reasonably well, but life stresses like a new sibling, problems in the family or a new caregiver can trigger separation anxiety.	Sometimes children cope by regressing to earlier behavior like tantrums, thumb sucking, or baby talk. Reading children's books with separation themes can help your children with their feelings. Providing opportunities for children to role-play using puppets can help them work through their feelings of fear or sadness.

How to support children during separation anxiety[1]

[1] https://www.cedars-sinai.org/health-...-children.html

[1] Children's Home Society of California - Family Education Program - Separation Anxiety Easing the transition from home to child care - www.chs-ca.org

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20.10: Attachment Disorder

Reactive Attachment Disorder (RAD)

Another attachment pattern is reactive attachment disorder (RAD). Students with RAD typically have serious aggression problems, often hurting others and showing little empathy or remorse. Safety-seeking behaviors, anxiety, and depression are characteristic of the condition and an inability to be genuinely affectionate with others or develop strong connections. Students with RAD feel the need to be in control and may demonstrate bossy, argumentative, and defiant behaviors. Reactive attachment disorder is a mental health disorder diagnosed according to the criteria in the Diagnostic and Statistical Manual of Mental Disorders: DSM-5 (American Psychiatric Association [APA], 2013). Here it is characterized as a stress-related disorder that can only be caused by a lack of adequate care (social neglect) during childhood. Children with RAD demonstrate withdrawn, internalizing type behaviors. RAD is only diagnosed in children and must be evident within the first five years of life.

RAD is a deficit in the child's capacity to manage their feelings. If we think about RAD from the perspective of the child with it, characteristics could be described as follows:

- *I do relationships and conflict poorly because my social, emotional, and behavioral skills are ineffective in my interactions with others. My difficulties' frequency, duration, and intensity in many settings set me apart.*
- *Why am I like this? My need for comfort, nurturing, and connection as a baby/young child were not met. My world is or has been one of neglect, fear, and hurt. As a result, I cannot articulate my feelings and thoughts.*
- *I threaten, I throw tantrums; I am aggressive, I am demanding of your attention, I am manipulative, charming, and angry. Behaving like this is the only way I can control relationships. (Flaherty, 2011)*[1]

Remember that it is not our place to diagnose but to understand. Regardless of the type of attachment difficulty a child may have, they all need:

- Safety
- A caring adult who will be there
- Emotional support
- Understanding
- Behavior support
- Routines and consistency

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CHAPTER OVERVIEW

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21.1: Introduction

Introduction to Temperament

Perhaps you have spent time with several infants. How were they alike? How did they differ? How do you compare your siblings or other children you have known well? Have you heard stories from your parents or grandparents about what you were like as a baby? If you have any videos of yourself as a baby, what do they depict about how you thought about the world? You may have noticed that some infants seem to be more comfortable, friendly or in a better mood than others and that some are more sensitive to noise or more easily distracted. These differences may be attributed to temperament. Temperament refers to innate neurophysiologically-based characteristics of infants, including mood, activity level, and emotional reactivity, noticeable soon after birth.[1]

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21.2: Overview of Temperament

Overview

It is estimated that 40–60% of the observed variability in personality is due to temperament characteristics or traits (Cloninger et al., 1993; Bouchard, 1994; Loehlin et al., 1998; Robins, 2005) (Fisher, Island, Rich, Marchalik, and Brown 2015). Temperamental traits are biologically based characteristics present early in life that contribute to individual differences in regulating and modulating emotion, attention, behavior, and motor activity (Rothbart, 1981, 2007; Gartstein and Rothbart, 2003) (Spinelli, Fasolo, Shah, Genovese and Aureli, 2018). Temperament is an inherited pattern of cognition, emotion, motivation, and behavior; it is influenced by experience (Terracciano et al., 2005; Roberts and Mroczek, 2008) but is mainly stable across the lifespan (Bouchard, 1994; McCrae et al., 2000; Roberts and DelVecchio, 2000). According to Rothbart et al. (2000), “temperament arises from our genetic endowment. It influences and is influenced by the individual's experience, one of the outcomes is the adult personality." Although some theorists argue that there is no rigid distinction between personality and temperament (McCrae et al., 2000), elements of temperament traditionally include behavioral dispositions from childhood to adulthood, observable in preverbal infants and generalizable to non-human animals (Rothbart et al., 2000; Clark, 2005)) (Fisher, Island, Rich, Marchalik, and Brown 2015). Because development emerges through bidirectional interactions between the infant and his environment (Sameroff, 1975), temperament can influence how the infant receives and responds to stimuli in his environment, impacting subsequent development. [1]

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[1] Fisher HE, Island HD, Rich J, Marchalik D and Brown LL (2015) Four broad temperament dimensions: **doi: 10.3389/fpsyg.2015.01098** is licensed **CC BY**

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21.3: Temperament Dimensions

Dimensions of Temperament

In a landmark study in 1956, Chess and Thomas (1996) evaluated 141 children's temperament based on parental interviews. Referred to as the New York Longitudinal Study, infants were assessed on 9 dimensions of temperament.[1] Behaviors for each one of these traits are on a continuum. These traits include:

- Activity level
- Rhythmicity (regularity of biological functions)
- Approach/withdrawal (how children deal with new things)
- Adaptability to situations
- Intensity of reactions
- ·Threshold of responsiveness (how intense a stimulus must be for the child to react)
- Quality of mood
- Distractibility
- Attention span
- Persistence

The Temperament Chart explains these traits in more detail.[2]

Temperament Traits Chart

Dimensions	Typical Behavioral Indicator	The Child...
Activity Level refers to the general level of motor activity when one is awake or asleep. Motor activity involves large and small muscle movements like running, jumping, rolling over, holding a crayon, picking up toys, etc.	High Activity	is squirmy and active.
	Low Activity	prefers less noise and movement.
Distractibility is the ease with which one can be distracted; or conversely, his level of concentration or focus.	High Distractibility	is very distracted by discomfort, noticing even small signals such as hunger, being sleepy, etc.
	Low Distractibility	can handle discomfort, does not seem very bothered at all.
Intensity refers to the energy level of one's emotional response, both positive and negative.	High Intensity	has strong or intense positive and negative reactions.
	Low Intensity	has muted emotional reactions.
Regularity relates to the predictability of biological functions such as eating, sleeping, etc.	Highly Regular	has predictable appetite, sleep, and elimination patterns.
	Irregular	has unpredictable appetite, sleep, and elimination patterns.
Sensitivity describes how responsive one is to physical stimuli such as light, sound, and textures.	High Sensitivity	is sensitive to physical stimuli, including sounds, tastes, touch, and temperature changes; is a picky eater; and has difficulty sleeping in a strange bed.
	Low Sensitivity	is not sensitive to physical stimuli, including sounds, tastes, touch, and temperature changes; can fall asleep anywhere; and tries new foods easily.
Approachability is one's initial response to new places, situations, or things.	High Approaching	eagerly approaches new situations or people.
	Low Approaching	is hesitant and resistant when faced with new situations, people, or things.
Adaptability describes how easily one adjusts to changes and transitions.	High Adaptability	requires very small amount of time to feel ok in new situations.
	Low Adaptability	may cry or stay close to a caregiver before approaching a new situation.
Persistence relates to the length of time one continues in activities in the face of obstacles.	High Persistence	continues with a task or activity in the face of obstacles and does not get easily frustrated.
	Low Persistence	moves on to a new task or activity when faced with obstacles and gets frustrated easily.
Mood is one's tendency to react to the world primarily in a positive or negative way.	Positive mood	reacts to the world in a positive way and is generally cheerful.
	Serious Mood	reacts in an observant, sometimes more

Dimensions	Typical Behavioral Indicator	The Child...
		serious way and tends to be thoughtful about new situations.

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21.4: Temperament Styles

Types of Temperament

Thomas, Chess, Birch, Hertzig, and Korn found that these broad patterns of temperamental qualities are remarkably stable through childhood.[1] Based on the infants' behavioral profiles, most infants can be categorized into 3 general types of temperament.:[2]

Table Types of Temperament

Types of Temperament

Type	Percentage	Description
Easy	40%	- Able to quickly adapt to the routine and new situations - Remains calm - Easy to soothe - Usually in a positive mood
Difficult	10%	- Reacts negatively to new situations - Has trouble adapting to routine - Usually negative in mood - Cries frequently
Slow-to-warm	15%	- Low activity level - Adjusts slowly to new situations - Often negative in mood

The percentages do not equal 100% as some children could not be placed neatly into one of the categories.[3] Approximately 65% of children fit one of the patterns. Of the 65%, 40% fit the easy pattern, 10% fell into the difficult pattern, and 15% were slow to warm up. Each category has its strength and weakness, and one is not superior to another.[4] Children's long-term adjustment depends on the fit of their temperament with the nature and demands of the environment in which they find themselves. Caregivers' responses appear to be more important than child temperament.[5]

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21.5: Goodness of Fit

The Importance of Fit

An important aspect of Thomas & Chess's (1977) research considers the interaction of child temperament with caretaker personality and parenting style. They proposed that a match between the needs of a child's temperament with parental care would enhance the healthy development of self-regulation and the child's sense of self. This critical balance is known as goodness of fit. [1] A caregiver's ability to accurately read and work well with a child determines the goodness of fit between the child's temperament, parenting and caregiving. The goal for parents and caregivers in an infant or toddler center is to provide a good fit or match, meaning their styles align well and communication and interaction can flow. Temperamentally active children can do well with parents who support their curiosity but could have problems in a more rigid family.[2]

This goodness of fit between child temperament and parental demands and expectations can cause struggles. Rather than assuming discipline alone will improve children's behavior, temperament knowledge may help a parent, teacher, or other caregiver gain insight to work more effectively with a child. It is helpful to view temperamental differences as varying styles rather than 'good' or 'bad' behavior. For example, a persistent child may be difficult to distract from forbidden things such as electrical cords, but this persistence may serve her well in other areas such as problem-solving.[3]

What is most beneficial about the goodness of fit concept is that it does not require adults and children to have matching temperaments. The parent or caregiver does not have to change who they are; they can alter or adjust their caregiving methods to positively support their child's natural way of responding to the world. For example, if a child is highly active, a caregiver may pack extra activities in the diaper bag for waiting times at visits to the doctor, grocery store, etc. For a child who needs some extra time in approaching new activities, giving the child time to adjust and feel safe sets them up for more success. [4]

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21.6: Temperament, Culture, and Environment

Factors Effecting Temperament

Thomas and Chess also studied temperament and environment. One sample consisted of white middle-class families with high educational status; Puerto Rican working-class families made up the other sample. They found several differences. Parents of middle-class children were more likely to report behavior problems before the age of 9, and the children had sleep problems. This report may be because children start preschool between the ages of 3 and 4. De Vries (1974) followed Masai (tribe in East Africa) infants and mothers for several years during a period of famine. The researcher found that Masai infants who were more demanding were more likely to survive during periods of environmental stress than infants who were more docile. The researcher suggested that infants who were more aggressive and demanding – or in temperament terms, more difficult – were more likely to be fed and have their needs met than docile infants who might have been easier to ignore. The findings from these cross-cultural studies of temperament demonstrate how interaction between ecology, temperament, and culture impact an individual.[2]

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21.7: Temperament and Language Development

The Influence of Language on Temperament

The developmental role of temperament has been primarily studied in the social-emotional domain, where it is usually associated with external and internal problems, challenging behaviors (i.e., Ullsperger et al., 2016; Rubin et al., 2017), and social competence (i.e., Baer et al., 2015; Penela et al., 2015). However, temperament also plays a role in language acquisition and partially accounts for the variability in how much language a child has and how language is acquired (e.g., the age of the first word and rate of vocabulary development and syntactic emergence) during the first 2 years of life (Bates et al., 1991; Lieven, 1997). Research in the language domain focused on caregiver (typically parents) contributions, with a large portion looking into the mother's quality and input of language. These studies find consistent results on the impact of those factors on infant language outcomes (see Soderstrom, 2007 for a review). Fewer studies exist on how a child contributes to language development, such as the influence of temperamental traits on language acquisition. One potential explanation for the differences in available research studies is the failure to consider an approach (Sameroff, 1975) which includes both the child's contributions to language development (i.e., temperament) and the caregiver's role (e.g., quality of the maternal input).[1]

The first year of life is characterized by the rapid emergence of the infant's ability to decode the streams of speech directed to them and begin to associate sounds with symbolic meaning. Two characteristics based on temperament, attentional control and the capacity for self-regulation, are thought to support or inhibit language development (Canfield and Saudino, 2016). However, research has not universally agreed on this point. Infants who demonstrated better attentional abilities also demonstrated higher language comprehension at the end of the first year (Dixon and Smith, 2000; Morales et al., 2000) and greater language vocabulary at 21 months (Dixon and Shore, 1997; Dixon and Smith, 2000; Salley et al., 2013). These findings suggest that greater sustained attention to the environment might facilitate a child's abilities to focus on events rich in language, contributing to vocabulary development. However, other research yielded contradictory findings (Kubicek and Emde, 2012; Pérez-Pereira et al., 2016). These disparities indicate a need for additional research. Overall, the literature suggests that greater expressions of positive affect may foster more significant social exchanges in infancy (a critical period of language development), helping facilitate language development in the infant and toddler period (See Pérez-Pereira et al., 2016, Morales et al., 2000, Laake and Bridgett, 2014, Slomkowski et al., 1992 and Kubicek and Emde, 2012). Another body of literature suggests that a difficult temperament is adversely associated with language development. McNally and Quigley (2014) found that infants rated as having a more difficult temperament at 9 months had lower global language scores at 3 years of age, with similar associations demonstrated for infants at 21 months of age (Dixon and Smith, 2000; Salley and Dixon, 2007). One potential explanation contends that an infant's difficult temperament may interfere with his ability to control the attention needed to process language-relevant information, affecting his development during a critical period of language acquisition. [1]

Despite research suggesting an association between emotion regulation and language development, additional literature has demonstrated contradictory findings. Some studies have failed to find an association between the negative affect in infancy (e.g., distress to limitations scale and difficult temperament) and language competencies in the toddler years (Dixon and Smith, 2000; Morales et al., 2000; Westerlund and Lagerberg, 2008; Canfield and Saudino, 2016). Adding to the complexity of the association between emotion regulation and language, Moreno and Robinson (2005) found that greater expressions of joy and greater expressions of anger at 8 months were associated with better expressive language at 30 months. This study indicates that emotional expression (both positive and negative) may facilitate language development by providing opportunities for the infant to develop language through exchanges with her caregiver (Molfese et al., 2010).[1]

These contradictory findings suggest that while attentional and emotional temperamental aspects may play a role in fostering interactions that enhance language development, further research is needed to clarify the association between attention, emotion regulation, and development of language competencies.[1]

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[1] Spinelli M, Fasolo M, Shah PE, Genovese G and Aureli T (2018) The Influence of Early Temperament on Language Development: The Moderating Role of Maternal Input. CC BY.

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21.8: Temperament and Later Personality

Continuing Influences

Parents gaze into the faces of their newborn infants and wonder "What kind of person will this child become?" They scrutinize their baby's preferences, characteristics, and responses for clues of a developing personality. Temperament is a foundation for personality growth, but it is not the whole story. Although temperament is biologically based, it interacts with the influence of experiences from the moment of birth (if not before) to shape personality (Rothbart, 2011). Temperamental dispositions are affected by the support level of parental care, and personality is shaped by the goodness of fit between the child's temperamental qualities and the characteristics of the environment (Chess & Thomas, 1999). For example, an adventurous child would find goodness of fit and supported personality growth with parents who regularly take her on weekend hiking and fishing trips. Much like the other facets of social development, personality results from the continuous interplay between biological disposition and experience.

Personality develops from temperament in other ways (Thompson, Winer, & Goodvin, 2010). As children mature biologically, temperamental characteristics emerge and change over time. A newborn is not capable of much self-control, but temperamental self-regulation changes become more apparent as brain-based self-control capacities advance. For example, a newborn who cries frequently doesn't necessarily have a grumpy personality; over time, with sufficient parental support and an increased sense of security, the child might be less likely to cry.

Personality is made up of many other features besides temperament. Children's developing self-concept, motivations to achieve or socialize, values and goals, coping styles, sense of responsibility and conscientiousness, and many other qualities are encompassed in personality. Biological dispositions and the child's experiences with others (particularly in close relationships) both guide the growth of individual characteristics.

Personality development begins with the biological foundations of temperament but becomes elaborated, extended, and refined over time. The newborn whose parents first gazed upon him becomes an adult with depth and nuanced personality.[1]

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21.9: Conclusion

Conclusion to Temperament

In psychology, temperament broadly refers to consistent individual differences in biologically based behavior and is relatively independent of learning, a system of values, and attitudes.[1] Temperament doesn't change dramatically as we grow up. Positive traits can be enhanced, and negative traits can be channeled; however, the child's underlying reaction style is unlikely to change. If we are lucky, we learn how to work with and manage our temperamental qualities.[2]

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21.10: References

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CHAPTER OVERVIEW

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22.1: Introduction

Introduction to Influences on Development

A child's relationships with family members shape how he experiences relationships outside the home. "What young children learn, how they react to events and people around them, and what they expect from themselves, and others are deeply affected by their relationships with parents, the behavior of parents, and the environment of the homes in which they live" (Shonkoff and Phillips 2000).[2]

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22.2: Socialization and Enculturation Agents

The Girl in the Window

In the summer of 2005, police detective Mark Holste followed an investigator from the Department of Children and Families to a home in Plant City, Florida to investigate a neighbor's statement concerning a shabby house on Old Sydney Road. A small girl was observed peering from one of its broken windows. The report seemed odd because no one in the neighborhood had seen a young child in or around the home, which had been inhabited by a woman, her boyfriend, and two adult sons for the past three years.

Who was the mystery girl in the window?

Upon entering the house, Detective Holste and his team were shocked. It was the worst mess they'd ever seen, infested with cockroaches, smeared with feces and urine from both people and pets, and filled with dilapidated furniture and ragged window coverings.

Detective Holste headed down a hallway and entered a small room. He found a little girl staring into the darkness with big, vacant eyes. A newspaper report later described the detective's first encounter with the child: "She lay on a torn, moldy mattress on the floor. She was curled on her side . . . her ribs and collarbone jutted out . . . her black hair was matted, crawling with lice. Insect bites, rashes, and sores pocked her skin . . . She was naked—except for a swollen diaper. … Her name, her mother said, was Danielle. She was almost seven years old" (DeGregory 2008).

Detective Holste immediately carried Danielle out of the home, and she was taken to a hospital for medical treatment and evaluation. Through extensive testing, doctors determined that, although she was severely malnourished, Danielle could see, hear, and vocalize normally. Yet she wouldn't look anyone in the eyes, didn't know how to chew or swallow solid food, didn't cry, didn't respond to stimuli that would typically cause pain, and didn't know how to communicate either with words or simple gestures such as nodding "yes" or "no." Likewise, although tests showed she had no chronic diseases or genetic abnormalities, the only way she could stand was with someone holding onto her hands, and she "walked sideways on her toes, like a crab" (DeGregory 2008).

What had happened to Danielle? Simply put, neglect. Only the basic requirements for survival were fulfilled in Danielle's care. Based on their investigation, social workers concluded that she had been left almost entirely alone in rooms like the one in which she was found. Without regular interaction—the holding, hugging, talking, explanations, and demonstrations given to most young children—she had not learned to walk or speak, eat or interact, play, or even understand the world around her. From a sociological point of view, Danielle had not been socialized.

Socialization is the process through which people are taught to be proficient members of society. It describes how people come to understand societal norms and expectations, accept society's beliefs, and be aware of societal values. Socialization is not the same as socializing (interacting with others, like family, friends, and coworkers); it is a sociological process that occurs through socializing. As Danielle's story illustrates, even the most basic human activities are learned. Physical tasks like sitting, standing, and walking had not automatically developed for Danielle, and without socialization, Danielle hadn't learned about some material cultural norms of her society: for example, she couldn't hold a spoon, bounce a ball, or use a chair for sitting. She also hadn't learned about her nonmaterial culture, such as its beliefs, values, and norms. Danielle didn't understand the concept of family and didn't know cultural expectations for using a bathroom for elimination. Most importantly, she hadn't learned to use the symbols that make up language, through which we learn about who we are, how we fit with other people, and the natural and social worlds in which we live.

Sociologists have long been fascinated by circumstances like Danielle's—in which a child receives sufficient human support to survive but virtually no social interaction—because they highlight how much we depend on social interaction to provide the information and skills needed to be part of society or develop a "self."[1]

Socialization occurs in societies big and small, complex and straightforward, preindustrial and industrial. It happens in the United States, Brazil, Saudi Arabia, and Indonesia.[2] Families teach children, both directly and by example, how to behave and how the world works. Eurocentric cultures encourage children to use socially expected norms such as "thank you." They teach kids how to dress appropriately for the culture in which their family is living. They introduce children to religious beliefs and the rituals that go with them. They even teach children how to think and feel. This uniquely human form of learning, where the cultural tools for

success are passed from one generation to another, is called enculturation. Enculturation agents are individuals and institutions that shape individual adaptions to a specific culture to ensure growth and effectiveness.[3]

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22.2.1: Agents of Socialization and Enculturation

Institutional sources of socialization and enculturation are called agents of socialization. The first of these, the family, is undoubtedly the most important agent of socialization for infants and young children.[1]

The Role of Culture

Families and their children are interconnected with cultural communities. Each family has beliefs, values, and expectations rooted in cultural traditions that also reflect unique perspectives of the family. No two families follow cultural rules precisely the same way, and most families are connected to and influenced by multiple cultures. Williams and De Gaetano (1985) describe culture as a way of life of a group of people, including shared views of the world and social realities, values and beliefs, roles and relationships, and patterns or standards of behavior. Through culture, children gain a sense of identity, belonging, and beliefs about what is important in life.[2]

Much cultural knowledge is transmitted implicitly. "Before the start of formal education, children begin to acquire competencies and skills that the cultural group considers important for maturation and independence as an adult. Sometimes this is conveyed directly through intentional teaching by the family. These skills are often absorbed indirectly through select experiences provided in family life. For example, an older child may learn to take care of a younger one just by watching her mother or an older sibling".[2]

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22.2.1.1: Parents and Families

Those Closest to Us

Families bring unique traits and qualities to the parenting relationship, including a parent's age, gender identity, personality, developmental history, beliefs, knowledge about parenting and child development, and mental and physical health. Personalities also affect parenting behaviors.[1] Differences in caretaking reflect differences in parenting goals, values, resources, and experiences.[2] Parents who are more agreeable, conscientious, and outgoing are warmer and provide more structure to their children. Parents who are more agreeable, less anxious, and less negative support their children's autonomy more than anxious and less agreeable parents.[3]

Parents' developmental histories (their experiences as children) also affect parenting strategies. Parents may learn parenting practices from their parents; for example, fathers whose own parents provided monitoring, consistent and age-appropriate discipline, and warmth are more likely to provide this constructive parenting to their children (Kerr, Capaldi, Pears, & Owen, 2009). Patterns of negative parenting and ineffective discipline also appear from one generation to the next.[1] Regardless of parents' specific choices, families play a pivotal role in exposing a child to early cultural learning. Many researchers believe that parents/families serve as the single, most crucial enculturation agent in any child's life.[2]

Family Functions

Many family functions mirror parenting tasks, goals, and responsibilities. It is important to understand how family functions and parenting tasks impact each other. The following is a list of somewhat universal family functions (almost all families worldwide have some of these in common).[1] :

- Economic support: providing basic needs, such as food, shelter, clothing, etc.
- Emotional support: providing love, comfort, intimacy, companionship, nurturing, belongingness, etc.
- Socialization of children: rearing children, parenting, helping children function to the best of their abilities within their society
- Control of sexuality: defining and managing when and with whom (e.g., marriage) sexuality occurs
- Procreation: contributing to the continuation of society and offspring
- Ascribed status: providing a social identity (e.g., social class, race, ethnicity, kinship, religion, etc.) (Hammond, Cheney, Pearsey, 2015)

While some parenting priorities are culturally universal, many childrearing values and habits are culture-specific. Culture-specific influences on caretaking choices can be subtle or overt and promote a narrative of what parents "ought" to do to successfully raise their children. For example, American parents are encouraged to enculturate a sense of independence and assertiveness in children, while Japanese parents prioritize self-control, emotional maturity, and interdependence (Bornstein, 2012). Every society places expectation on caretakers as enculturation agents to raise their young in ways that promote culture-specific goals and expectations. [2]

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22.2.1.1.1: Parenting Theories

Parenting Theories

Parenting has gained ample research attention from various scientific areas. Many theories emphasize the vital role of parenting in child development. When studying parenting, researchers use different strategies considering parenting practices, parenting dimensions, or parenting styles. Parenting practices can be defined as directly observable, specific behaviors parents use to socialize with their children (Darling and Steinberg 1993). For example, parenting practices intended to promote academic achievement show involvement by attending parent-teacher meetings or regular supervision of children's homework. Other parenting practices include positive reinforcement, discipline, or problem-solving.

Definition: Parenting Practices

directly observable, specific behaviors parents use to socialize with their children

Rather than focusing on specific parenting practices, other researchers identified overarching parenting dimensions seen in relationship modeling. Most scientists agree on at least two broad dimensions of parenting, labeled parental support and parental control. Parental support is the affective nature of the parent-child relationship, indicated by showing involvement, acceptance, emotional availability, warmth, and responsivity (Cummings et al. 2000). The parental support dimension has been related to positive development outcomes in children, such as the prevention of alcohol abuse and deviance (Barnes and Farrell 1992), depression and delinquency (Bean et al. 2006), and externalizing problem behavior (Shaw et al. 1994).[1]

The parental control behavioral dimension consists of parenting behavior that attempts to control, manage or regulate child behavior, either through enforcing demands and rules, disciplinary strategies, control of rewards and punishment, or through supervisory functions (Barber 2002; Maccoby 1990; Steinberg 1990). Appropriate behavioral control has been considered to affect child development positively. In contrast, insufficient (e.g., poor parental monitoring) or excessive behavioral control (e.g., parental physical punishment) has been commonly associated with negative child developmental outcomes, such as deviant behavior, misconduct, depression, and anxiousness (e.g., Barnes and Farrell 1992; Coie and Dodge 1998; Galambos et al. 2003; Patterson et al. 1984). This parental behavioral control refers to control over the child's behavior; parental psychological control pertains to the parent's attempt to manipulate children's thoughts, emotions, and feelings (Barber 1996; Barber et al. 2005). Due to the manipulative and intrusive nature of psychological control, this type of control has almost exclusively been associated with negative developmental outcomes in children and adolescents, such as depression, antisocial behavior, and relational regression (e.g., Barber and Harmon 2002; Barber et al. 2005). The three parenting dimensions (support, psychological control, and behavioral control) have been labeled as distinct concepts that are interrelated. (Barber et al. 2005; Soenens et al. 2012).[1]

Other researchers have taken a different approach in studying parenting by emphasizing that specific combinations of parenting practices impact child development rather than separate parenting practices or dimensions (e.g., Baumrind 1991; Maccoby and Martin 1983). This approach examines which patterns of parenting practices occur within the same parent and how these patterns—commonly labeled as parenting styles—relate to children's development. It focuses on configurations within individuals rather than a variable–centered approach that focuses on relationships among individuals (Magnusson 1998).[1]

Baumrind's Parenting Styles

Baumrind (1966, 1967, 1971) is a pioneer of research in parenting styles. She introduced three parenting styles to describe differences in typical (she used the term normal) parenting behaviors: the authoritarian, authoritative, and permissive parenting styles. Baumrind (1971) suggested that authoritarian parents try to shape, control, and evaluate their children's behavior based on an absolute set of standards. In contrast, permissive parents are warmer, less controlling and grant more autonomy. Baumrind considered an authoritative parenting style to fall between those two extremes.



Video Transcript

Maccoby and Martin: Demandingness and Responsiveness

In the 1980s, Maccoby and Martin (1983) attempted to bridge Baumrind's styles and parenting dimensions, focusing their research efforts primarily on the configuration of parenting styles. Based on the combination of two dimensions – demandingness and responsiveness – they defined four parenting styles: authoritative (i.e., high demandingness and high responsiveness); authoritarian (i.e., high demandingness and low responsiveness); indulgent (i.e., low demandingness and high responsiveness); and neglectful (i.e., low demandingness and low responsiveness). These parenting dimensions are similar to parental support and parental behavioral control. Based on Maccoby and Martin's work, Baumrind (1989, 1991) expanded her classification with a fourth parenting style: the neglectful parenting style.[1]

This work consistently demonstrated that children of authoritative parents had the most favorable development outcomes; authoritarian and permissive parenting was associated with negative developmental effects, while results for children of neglectful parents were the poorest. Other researchers have also replicated these associations.

- authoritative parenting style is associated with positive developmental outcomes in youth, such as psychosocial competence (e.g., maturation, resilience, optimism, self-reliance, social competence, self-esteem) and academic achievement (e.g., Baumrind 1991; Lamborn et al. 1991; Steinberg et al. 1994).
- Findings regarding permissive/indulgent parenting have inconsistently yielded associations with internalizing (i.e., anxiety, depression, withdrawn behavior, somatic complaints) and externalizing problem behavior (i.e., school misconduct, delinquency), and also with social skills, self–confidence, self–understanding and active problem coping (e.g., Lamborn et al. 1991; Steinberg et al. 1994; Williams et al. 2009; Wolfradt et al. 2003).
- An authoritarian parenting style has consistently been associated with adverse developmental outcomes, such as aggression, delinquent behaviors, somatic complaints, depersonalization, and anxiety (e.g., Hoeve et al. 2008; Steinberg et al. 1994; Williams et al. 2009; Wolfradt et al. 2003).
- Children of neglectful parents have shown the least favorable outcomes in multiple domains, such as lacking self-regulation and social responsibility, poor self-reliance and social competence, poor school competence, antisocial behavior and delinquency, anxiety, depression, and somatic complaints (e.g., Baumrind 1991; Hoeve et al. 2008; Lamborn et al. 1991; Steinberg et al. 1994).[1]

Criticism of Baumrind

Although Baumrind's classifications have greatly influenced parenting research, three issues have been overlooked. We'll look at the first two now and explore the influence of culture later. The first issue relates to the psychological control dimension, which is currently considered the third parenting dimension. Initially, Baumrind paid little attention to the role of psychological control

because her control dimension solely referred to parental socializing practices aimed at integrating the child into the family and society (Darling and Steinberg 1993). In her later work (1971, 1989, 1991), Baumrind incorporated aspects of psychological control. Limited research (e.g., Pereira et al. 2008; Wolfradt et al. 2003) has identified four parenting styles that match the theoretically distinct styles. Within these parenting styles, psychological control coincided with behavioral control levels in the authoritarian parenting style.

When Parenting Styles Don't Align in a Family

Existing research provides little insight into the coexistence of different parenting styles and their collective impact on child development. Although Baumrind included both parents in her studies, she assigned a pre-defined parenting style to each one separately. In some studies (1991), data was limited to mothers when both parents were assigned a different parenting style; in others (1971), families were entirely excluded. Baumrind, along with general research on parenting styles, paid less attention to the impact of joint parenting styles on child development (Martin et al. 2007; McKinney and Renk 2008; Simons and Conger 2007). Children in two-parent/two-unit households are influenced by the combined practices of multiple people (Martin et al. 2007), and some studies have shown that family members can differ in their parenting styles (Conrade and Ho 2001; McKinney and Renk 2008; Russell et al. 1998). When research considers how families' parenting styles combine, it aligns more closely with the real experiences of children growing up in two-parent households. Only this kind of approach can shed light on possible developmental effects (Martin et al. 2007). For example, Simons and Conger (Conger 2007) found that having two authoritative parents was associated with the most favorable outcomes in adolescents; additionally, one parent's authoritative parenting style generally buffered the less effective parenting style of the other parent. Similarly, McKinney and Renk (2008) suggested that in late adolescence, perceiving one parent as authoritative while the other parent offered a different parenting style partly buffered emotional adjustment problems.[1]

Culture and Parenting Styles: What Baumrind Missed

Several studies demonstrate the influence of culture on parenting practices (Nair and Murray 2005) and parental authority and family relationships following cultural or gender differences [Zhang 2006)] Some research suggests the influence of parenting styles differs across ethnic groups [Dwairy M 2004a,b]. Parental authority depends on various factors, including social context, social classes, and cultures. Culture may affect the maternal and paternal roles and control [Albert, Trommsdorff and Mishra, 2004]. Some research has found that maternal control gives the feeling of security and acceptance to Indian adolescents but not German adolescents (Eman and Abdel,2017) . While many children reared in European-American cultures fare poorly with too much strictness (authoritarian parenting), children raised in Chinese cultures often perform well, especially academically Chao, R. K. (1994). Rozumah (2009) argues that parenting styles depend on the cultural context of the society, claiming Asian cultures are more collectivist than Western societies: the parenting outcomes valued in collectivist groups may form the basis for authoritarian parenting and be deemed more appropriate when compared with other parenting styles. These results are consistent with former results reported among the Palestinians in Israel [Dwairy M 2004a,b], but seem to contradict other findings concerning more strictness and oppression toward females than males in Arab societies (The Arab Woman Developmental Report, 2003). In a study of parenting styles of Egyptian adolescents [Dwairy and Menshar, 2006)], researchers found that parenting styles among Arabs are not as distinct as in the West. The three original parenting styles are not on a linear continuum where authoritarian and permissive styles exist at points on either side. Many studies using Baumrind's parenting prototypes found that most of their samples do not fit into any of the four styles [Marcus (1990 , Kim and Rohner, (2002)] (Eman and Abdel,2017).

Influences of Child Characteristics

Parenting is bidirectional. Not only do parents and caregivers affect their children, but children influence their parents or guardians.[2] A child’s characteristics, such as gender identity, birth order, temperament, and health status, can affect child-rearing behaviors and roles. For example, an infant with an easy temperament may enable families to feel more effective, as they can easily soothe the child and elicit smiling and cooing. On the other hand, a cranky or fussy infant can elicit fewer positive reactions from family and may result in parents feeling less effective.[Eisenberg et. al., 2008] Over time, parents and families of more difficult children may become more punitive and less patient with their children [Clark, Kochanska,, & Ready,2000) Kiff, Lengua, & Zalewski, 2011]. Many parents who have a fussy, difficult child are less satisfied with their relationships and have more significant challenges in balancing work and family roles.[Hyde, Else-Quest, & Goldsmith 2004).] Thus, child temperament is one of the characteristics that influences how parents and families behave with their children. Research also demonstrates that some parents talk differently

with their children based on their child's gender identity, such as providing more scientific explanations to their sons and using more emotion words with their daughters [Crowley, Callanan, Tenenbaum, & Allen, 2001].[3]

Influences of Family Structures

The family is central in children's lives because children learn about themselves and the world around them through experiences with their families. "Family member" is used here to define the people primarily responsible for a child, including parents, extended family members, guardians, and foster families. Family structures, processes, and functions must be assessed to understand family members' roles in child outcomes.[Hammond, Cheney and Pearson, 2015].[3]

"Family structures" delineate household members related by blood or legal ties; this concept typically assumes there is at least one child younger than 18 residing in the household. Specific structures include two-parent, one-parent, and living with neither parent (e.g., grandparents or other relatives rearing a child, families providing foster care, or children living in institutionalized settings), blended families, single-parent plus partner families (cohabiting couples, for example), multigenerational families, binuclear families, and adoptive families.

The U.S. Census Bureau utilizes these definitions of family structures:

Nuclear family: a child lives with two married, biologically related parents and only full siblings if siblings are present.

Cohabiting families: a child's parent lives with at least one opposite-sex, non-related adult. This additional adult may or may not be the child's biological parent.

Same-sex cohabiting/married families: a child's parent lives with at least one same-sex, non-related adult. The additional adult may or may not be the child's biological parent.

Stepfamilies and blended families (terms used interchangeably): children who live in a household formed through remarriage resulting in children living with one or no biologically related parents. The presence of a stepparent, stepsibling, or half-sibling designates a family as blended [United States Census Bureau, 2019].[1]

Caregivers of infants and toddlers need to learn the diversity of the child's family structure and roles when welcoming children and their families into the program. Henderson and Mapp (2002, 10) highlight the importance of family by recognizing that "all family members, siblings, grandparents, aunts, uncles, and fictive kin who may be friends or neighbors, often contribute in significant ways to children's education and development." It is essential for families to give information about important people and their relationships with each other and the child. Questions like, "Tell me about your family?" and "Who are the important people in your child's life?" will be more valuable than "What is the mother's name?" and "What is the father's name?" Family-centered care also recognizes the teacher's and program's roles in helping build networks and sustainable communities of support for families. These communities can support families years after leaving the infant and toddler program.[5]

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22.2.1.2: Families with Less Economic Support or Resources

Poverty

Poverty is a multidimensional, relational, and dynamic phenomenon, clearly illustrated through many definitions and indicators generated during the last 200 years by disciplines such as economy, sociology, political science, and anthropology (Spicker et al., 2006). In general, there are three main approaches to considering poverty: (a) as a material condition in which needs, a pattern of deprivations, and limited access to resources are the main components; (b) as an economic circumstance, in which standards of living, inequality, and the economic position are the main components; and (c) as a social circumstance, in which lack of basic security, exclusion, dependency, and social class are the most referred components.[1]

Contemporary literature surrounding poverty suggests the following as the most critical protective/risk factors:

- prenatal maternal health (i.e., nutrition, exposure to environmental toxic agents and drugs, stressors)
- perinatal health (e.g., prematurity, birth weight)
- quality of early attachment
- environmental stressors at home and schools
- parenting and care styles
- early cognitive and learning stimulation at home, care centers, and schools
- parental and teachers' mental health
- developmental disorders
- family financial stress
- access to social security and health systems; community resources
- lack of social mobility
- the social, political, and economic crisis
- family, social, and cultural expectations about child development (e.g., discrimination, stigmatization, exclusion)
- natural disasters (Bradley and Corwyn, 2002; Yoshikawa et al., 2012; Lipina, 2015; Ursache and Noble, 2016).

In addition, evidence suggests that the influences of poverty on cognitive development are due to the compilation of risk factors, the accompaniment of adversities, the individual's susceptibility to family and social environments, and the duration of the exposure (NICHD Early Child Care Research Network, 2005; McLaughlin et al., 2014; Wagmiller, 2015).[1]

Since the mid-20th century, several researchers designed and implemented different intervention programs to reduce the negative impacts of poverty on cognitive and emotional regulation. These efforts have emerged simultaneously within the humanities, social, and health sciences. This type of intervention program demonstrates that, given the multidimensional nature of childhood poverty and development, any intervention aimed at optimizing the conditions and opportunities for the development of children who live in poverty requires the same type of complexity. This involves designing multiple intervention modules that incorporate actions for children, families, teachers, civil organizations, and governments and developing the genuine integration of different conceptual and methodological perspectives.[1]

The rights to adequate nourishment, housing, education, and health care are listed in the UN General Assembly (1948, §§25–26). These rights are contested in different political systems and cultural contexts where there is a tendency to deny these rights as a social responsibility and, instead, explain poverty as a personal failure of the person afflicted (e.g., Feagin, 1972, 1975, and the review by Hunt and Bullock, 2016). Poverty is not regarded universally as unequal access to social benefits. These individualistic views are common in North America and South America, where the problem of poverty is immense, compared to western and northern Europe, where social views on poverty are more dominant. Countries and political systems accepting these rights as a shared social responsibility are among the countries most successful in combatting poverty, social violence, and insecurity [e.g., the Scandinavian countries (cf. Eurostat, or the World Bank Global Poverty Overview)].[1]

Evidence from neuroscience renders the individualistic way of explaining poverty as a personal failure absurd. For example, an infant does not choose which social context to be born. When the infant's brain is prevented from healthily developing due to poverty and its surrounding social conditions (lack of adequate nourishment, housing, childcare, schooling, health care, etc.), it is not a question of personal failure. Parents cannot be held entirely responsible for an environment that does not provide each child with the means of healthy development. Neuroscientific evidence reveals how poverty may breach human rights and how it may

prevent a child's possibility of ever enjoying them. It is a crucial discovery of how poverty may cause problems in the very prerequisites for attaining development.[1]

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22.2.1.3: Infants in Kinship or Foster Care

Other Types of Care

Foster care is a system in which a minor is placed into a group home (residential childcare community, treatment center, etc.), or private home of a state-certified caregiver (referred to as a foster parent), or with a state-approved family member. The child's placement is usually arranged through the government or a social service agency. The institution, group home, or foster parent is typically compensated for expenses unless the child is placed with a family member.(Wikipedia,202)].[1]

The foster care system has been around for years. According to The National Foster Parent Association, the United States foster care system developed from the English Poor Law of 1562. This law stated that children from poor homes would enter indentured services until they reached an age they could care for themselves. Children in foster care are often abused or neglected somehow, and the risk of repeated abuse is very high. Foster care is considered a short-term intervention and usually the last resort: immediately after removal, reunification is attempted to bring the child back to their family.[2]

Disruptions in family and school change are factors that affect children in foster care more than their peers (Tordön, et al. 2020). Findings indicate that children exposed to early adverse childhood experiences in general [Minnis , Rabe-Hesketh , and Wolkind, n.d) and, more specifically, children placed in foster care have a heightened risk of attachment difficulties [Minnis , Everett , Pelosi , Dunn, and Knapp, 2006; Boris, Hinshaw-Fuselier, Smyke, Scheeringa, Heller, and Zeanah,2004]. Attachment difficulties have been related to other mental health problems among foster and adopted children [Millward, Kennedy, Towlson, and Minnis, 2006; Kočovská et al., 2012] (Lehmann, Havik, and, Havik, 2013). In one study by Lewis et al. (2007) on adopted children with and without the experience of placement instability, the authors found associations between instability in early placements and adverse effects on social-emotional development (Tordön, et al. 2020)

Children placed in foster care are also exposed to a range of other risk factors [Rutter, 1998]. Adverse childhood experiences, such as psychological and physical abuse and neglect, parental substance abuse, and mental illness, all increase the risk of physical and mental health problems and health risk behaviors [Repetti, Taylor, and Seeman, 2002; Essex, Klein, Miech, and Smider, 2001; Felitti et al., 1998; Gilbert, Widom, Browne, Fergusson, Webb, and Janson,2009; Turner, Finkelhor, and Ormrod, 2006; Flaherty and Sege, 2005]. Older age at placement, frequent placement changes, number of placements, and persistent adverse events after placement pose additional risks for these children [Tarren-Sweeney,2008; Jones et al.,n.d]. However, few studies have examined whether such risk factors show specific associations with certain types of mental disorders [McMahon, Grant, Compas, Thurm, Ey,2003] (Lehmann,Havik, and Havik et al.,2013).

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22.3: Providing and Supporting Culturally Sensitive Care

Culturally Sensitive Care

A person's approach to nurturing infants and toddlers reflects one's values. "Every aspect of how parents and teachers care for, educate, and think about young children is embedded in cultural perspectives and beliefs. How you respond when children cry, how you decide it is time for them to eat, what you define as healthy and as sick, what you believe are appropriate clothes to wear, how you express love, what you expect to do for children, and what you expect them to do on their own are examples of the millions of ways that culture affects who we are as people, parents, and teachers" (Keyser 2017). Familiar values may be considered natural, whereas unfamiliar values may feel different or wrong. Interactions involving differing cultural norms can create feelings of confusion, discomfort, curiosity, and judgment, as each person often feels their norms are "right". When children enter care, children and families may be navigating an unfamiliar cultural context. During this process, caregivers need to maintain an open, interested demeanor with each individual and family to learn about their unique culture.

Suppose an infant or toddler caregiver begins to feel uncomfortable with a family's practice with their child or the family's request for a certain type of care. This presents an opportunity for the infant or toddler caregiver to think about their values, cultural influences, and how the family's values might be equally important and relevant in their cultural context. When learning about other cultures, it is important to suspend judgment: to separate understanding of cultures from judgments of their values. "If judgments of values are necessary, as they often are, they will thereby be much better informed if they are suspended long enough to gain some understanding of the patterns involved in one's familiar ways as well as in the sometimes-surprising ways of other communities" (Rogoff 2003). If teachers use these situations to grow in understanding and appreciation of multiple perspectives, they will more deeply understand their own and others' cultural influences.[1]

Learning about others' cultures takes time, interest, respect, communication, and observation. Since many cultural beliefs are learned implicitly, infant and toddler caregivers may not be experienced in articulating them. When a parent picks up her child from the blanket and hands him to you to say goodbye, she may not be able to verbalize "I feel more comfortable knowing that I am physically giving you my baby to care for when I leave. I can't just leave when he is alone on the floor." This creates an opportunity for an infant and toddler caregiver to pick up on the parent's cue and hold the baby for goodbye or ask the parent next time "Would you like me to hold Leo so he can say goodbye to you?" When childcare centers ask parents to write down their cultural practices on intake forms, parents often do not know what to write or what this means. One effective way to learn about and uncover cultural practices is to ask parents about familiar routines and respectfully probe more deeply if the routines are different from the early learning and care culture (Tonyan 2015).[1]

The early childhood profession in the United States has historically emphasized that young children be set on a path toward independence and encouraged to care for themselves as early as possible. Encouraging older babies to feed themselves reflects the profession's emphasis on independence, while many families value interdependence more than independence. This value can be observed in the ways children are taught to help one another and to respect the needs of others (such as staying at the table until everyone is finished). Early learning and care programs have begun to modify program practices and policies to weave the concepts of both interdependence and independence into the fabric of care.[1]

In circumstances when an infant or toddler caregiver cannot incorporate a family's request or preference for care into the center's practices, it is still possible to demonstrate respect for the family's culture. For example, a caregiver might say to the child: "I know you love to sleep in your swing at home. Your papa tells me how contented you are sleeping there. At school, I will help you nap, too. We can rock a little, and then I'll put you in your comfy bed and pat your back." The caregiver may tell the parent "Thanks Tomas for letting me know how you help Benji sleep at home. It may take him a few days to learn a new way to go to sleep here, but I'll be sure to help him with a little extra rocking so it won't feel so different, and we can check in every day to see how it is going."[1]

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22.4: Influences of Language, Culture and Caregiving

Language

Language is an important transmitter of culture and an essential component of a child's identity (California Department of Education 2016, I/T Guidelines).. From the beginning of life, children learn the sounds of their family's language or languages and engage in interactions rooted in their family's culture. Supporting language development is critical because a child's home language develops hand in hand with all other domains. Responsive infant and toddler programs create a climate of respect for each child's culture and language. An essential part of being culturally and linguistically responsive is valuing and supporting each child's use of home language as they acquire English. Inviting parents to use their home language in the care setting, read to children, or do activities in their home language conveys to families that their culture and language are a vital part of the curriculum.[1]

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22.5: Creating Positive Caregiver Parenting Relationships

Connection Between Caregivers and Parents

The relationship between the family and the caregiver is critical. For a family, the experience of entering an infant or toddler setting may be highly emotional. Family members often experience anxiety separating from their child and may feel conflicted about leaving their child.

Caregivers actively promote attachment between a child and her family. Learning about each child's unique family, particularly the family members and others who care for the child, supports the child's significant relationships. When a child has a disability or other delay, early interventionists may also have a role in the care process. The teacher is the bridge connecting the child and family during the day: the more the teacher partners with the family in supporting attachment with their child, the more successful the child will be in the program. This collaborative relationship between families and caregivers benefits children in many ways. The quality of the relationship, the ease of two-way communication, and the mutual respect of expertise give both families and caregivers the information necessary to provide the best care and education for the child. It communicates to the child that their world is working in synchrony. The more respect and comfort shared between families and teachers, the more comfortable and secure the child is.

The nature of relationships between programs and families has changed significantly. Historically, teachers and caregivers saw their role with parents as providing parent education and parent involvement opportunities, both more deficit-driven than strengths-based. Currently, there are more strengths-based and collaborative approaches to the program–family relationship. These approaches include family-centered care, transformative family engagement, and a pedagogical approach from educators in Reggio Emilia, Italy. They believe that "the participation of the families is just as essential as is the participation of children and educators" (Edwards, Gandini, and Forman 1998, 21).[1]

The concept of family engagement (versus parent involvement) recognizes all members of a child's family (not just parents) and emphasizes the importance of the reciprocal relationship between families and schools. Program staff must be aware that family participation in both the program and the home can take on many forms and depend on each family's unique characteristics (Halgunseth et al. 2009). Family engagement occurs when there is an ongoing, reciprocal, and strengths-based partnership between families and early care programs (Halgunseth et al. 2009).[1]

Principles of family engagement include:

- encouraging and validating family participation in decision-making related to their children's education;
- consistent, two-way communication through multiple forms that are responsive to a family's linguistic preference;
- collaboration and exchange of knowledge;
- collaboration between families and programs in creating learning activities in the home and community;
- creation of a home environment that values learning;
- collaboration between families and teachers in establishing home and school goals for children;
- support and training for education professionals in creating a comprehensive system for promoting family engagement (Halgunseth et al. 2009).[1]

The teachers in Reggio Emilia, Italy, also support the idea that family engagement, collaboration, and the sharing of mutual expertise strengthen the program for children, families, and teachers. "The ideas and skills that the families bring to the school and, even more importantly, the exchange of ideas between parents and teachers favors the development of a new way of educating and helps teachers to view the participation of families not as a threat but as an intrinsic element of collegiality and as the integration of different wisdoms" (Edwards, Gandini, and Forman 1998).[1]

Families know the child's and family's history and significant events; the child's personality, routines and schedules; important relationships; style of exploring and learning; ways of communicating; disabilities; and health history. Taking time to understand important family knowledge is key to supporting infants’ and toddlers' healthy psychological and physical growth. Equally important is the communication to the family letting them know about their child's day, sharing updates and information about the day, communicating moments when their child is thinking about them, and recognizing the loving interactions you see between the child and parent.[1]

Struggles and Challenges in Building Partnerships

There are times when caregivers struggle to find a way to respect and build trust with a family. The teacher may feel like family members are not trying, do not understand their child, are not responsive to their child's cues, or care for their child in inappropriate ways. An infant or toddler caregiver needs to determine if the child is safe, but it is also important to understand the family along a developmental and cultural continuum. When we think about child development, we expect an infant to go through specific steps in learning. We do not expect him to walk before he can turn over. If we think about families along a similar developmental continuum, we may be better able to partner with them from a strengths-based perspective. For example, suppose a family is not reading their child's cues but is clearly excited to have a baby. In that case, you could acknowledge the love: "It is so clear how much you love your baby. I can see it in your eyes" and you could make a small observation: "I notice when you move from one side of the stroller to the other that Sammy is watching you. He is so observant." In this way, you are using a strengths-based approach to leverage a new perspective for the parent. Sometimes differences of opinion arise between the program and a family about how to care for children. Addressing these differences often provides opportunities for teachers to learn and grow together with families. Teachers must initiate conversations with family members to learn their thoughts about caring for their child. Even when a family belongs to the same cultural community as the teacher, the teacher's perspective may differ from the family, as each person interprets cultural rules and expectations differently.[1]

When issues arise involving cultural differences, educators can use the three-step procedure of Acknowledge, Ask, and Adapt. To acknowledge is to communicate awareness of the issue, convey sincere interest and responsiveness, and involve the family in seeking a joint solution. To ask is to learn about the parent's precise point of view by restating what the parent is saying and paying attention to verbal and nonverbal responses. To adapt is to work with family members toward a solution by searching for areas of joint agreement and negotiating on the crucial issues (adapted from Virmani and Mangione 2013, 72–5).[1]

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22.6: Conclusion

Conclusion to Influences on Development

The quality of interactions between parents and children, teachers and children, and parents and teachers matter to infants and toddlers (Virmani and Mangione 2013). Learning and development happen within the context of children's relationships with their families and teachers and the relationships between their families and teachers. Parents and teachers both play a central role in children's learning. The relationships children form in their early years are critical to successful learning and development throughout their lives. Educators of young children can engage with the family, culture, language, and community when building programs and developing relationships. Learning how to build authentic collaboration, two-way communication, reflective practice, and strong communities of support with families enables teachers to honor and leverage the resources and multiple perspectives of the parent community.[1]

Through a welcoming relationship, the child's teachers begin to understand the family's perspectives, strengths, needs, routines, hopes, and expectations. As educators, when we understand there are many successful ways to care for and educate children, we can collaborate with parents to better understand the diversity of cultural perspectives through dialogue, listening, collaboration, and sensitive observation.[1]

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CHAPTER OVERVIEW

23: Caregiving Practices- Primary Care

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23.1: Introduction

Introduction to Primary Care

High quality care and education for infants and toddlers begins with relationship-based care (Mangione, 2006). Primary caregiving is a relationship-based practice and is the practice of assigning each child (and family) to a caregiver who will serve as the primary source of information and care for the child. Primary caregiving enables caregivers to develop deep relationships with children and their families and offers opportunities to provide individualized care and interactions during daily routines and experiences. This focused care by a familiar adult can provide infants and toddlers with a sense of predictability and security that comes with knowing each child's unique needs and preferences. [1]



Figure **23.1.1**: Focused care is a benefit of a primary care system. ([2])

Primary caregiving does not mean that caregivers care only for their small group of children to the exclusion of the other children in the group. Rather, it means that each caregiver, to the extent possible and practical in a group care situation, cares for and responds to children's routine care needs (e.g., eating, toileting, diapering, sleeping) who are assigned to them. However, caregivers also work as a team and rely on each other as backup when they are not able to work directly with their particular children. For example, if a caregiver is busy changing one child's diaper, the other caregivers in the room still continue to provide care for the other children until their primary caregiver returns. Another reason why primary caregiving should be conceptualized as a team effort rather than exclusive care, is when a primary caregiver is not able to work (e.g., sickness, vacation, etc.,). It is imperative for all the caregivers to have respectful relationships and establish trust with all of the children, even those children outside of their primary care assignment. Of equal importance, parents and other family members know who has primary responsibility for their child; this can strengthen the parent-caregiver relationship and communication between home and the childcare program. [3]

While primary caregiving is a common practice in the U.S., it is not a commonly implemented practice worldwide, even in highly-developed countries. In Singapore, for example, primary caregiving is not frequently practiced with infants and toddlers (Ebbeck et al., 2015). However, in a different study with parents of children under three years of age in Singapore, most parents expressed wanting to have their child cared for by the same caregiver and parents in programs that did implement primary caregiving reported high levels of satisfaction with the practice (Ebbeck, Yim, Ho & Sharma, 2022).

Despite the strong recognition of the importance of primary caregiving from organizations such as Zero to Three, the Program for Infant and Toddler Care (PITC) and the National Association for the Education of Young Children (NAEYC), there is very little empirical evidence directly investigating primary caregiving as a practice (Lee, Shin & Recchia, 2016). The research that is used to justify the importance of primary caregiving comes mainly from empirical explorations into the development of attachment. Since primary caregiving is a practice that encourages the development of a secure attachment between caregivers and children, it is often assumed that primary caregiving would also support the positive developmental outcomes associated with secure attachment (Bernhardt, 2000; Lally & Mangione, 2017).



Figure **23.1.1**: Primary Care allows for focused care. ([2])

[1] "Individualizing care for infants and toddlers - part 1" from Head Start ECLKC is in the public domain.

[2] Image from "Individualizing care for infants and toddlers - part 1" from Head Start ECLKC is in the public domain.

[3] "Individualizing care for infants and toddlers - part 1" from Head Start ECLKC is in the public domain.

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23.2: Attachment and Primary Caregiving

Attachment

Attachment theory was developed by John Bowlby in the 20th century to understand an infant's reaction to the short-term loss of their caregiver (Bowlby, 1969). Bowlby proposed that children are pre-programmed from birth to develop attachments and maintain proximity to their primary attachment figure(s), who was typically their mother but could be any person assuming the role of caregiver for that child. He used the term 'attachment' in a conscious effort to move away from deficit terms such as 'dependency' and 'over dependency', which were historically used to explain what Bowlby coined as 'attachment behaviors' (Bowlby, 1969). Defined as 'seeking and maintaining proximity to another individual' (Bowlby, 1969), attachment behaviors allow infants and toddlers to stay close to their attachment figure by either demonstrating signaling behaviors such as crying and smiling, or approach behaviors such as following and clinging (Ainsworth & Bell, 1970). [1]

The research on attachment relationships has important implications for supporting the implementation of primary caregiving. The first year of life is considered a critical period for attachment development and infants and toddlers require a secure base in childcare settings, in addition to the home setting, to develop secure attachments (Lee, 2016). It is critical that caregivers understand the importance of secure relationships and their impact on children's future wellbeing. Instead of a single primary attachment figure, children need access to consistently available attachment figures who can include a combination of their mother, father or paid caregiver(s) (Brown et al., 2022; van IJzendoorn et al., 1992). As a result of a network of attachment figures, children's secure base is maintained when separating from a specific attachment figure. [1]

Decades of longitudinal research have supported the notion that individual differences in children's attachment security to primary caregivers are of critical importance for children's social, emotional, and cognitive development. Several meta-analyses suggest that variations in attachment security are associated with individual differences in a range of child outcomes: higher attachment security (as compared to insecurity) is associated with better social competence (Groh et al., 2014, 2017), emotion understanding (Cooke et al., 2016), quality of peer relationships (Pallini et al., 2014), language competence (Van IJzendoorn, Dijkstra & Bus, 1995), as well as fewer internalizing (Groh et al., 2012, 2017; Madigan, Atkinson, Laurin & Benoit, 2013) and externalizing behavior problems (Fearon et al., 2010; Groh et al., 2017). Furthermore, attachment security during the first three years of life is related to later brain development (Hidalgo et al., 2019; Leblanc et al., 2017; Leblanc, Dégeilh, Beauchamp & Bernier, 2022; Moutsiana et al., 2015).

[1] Wilson-Ali et al., (2019). Multiple perspectives on attachment theory: Investigating educators' knowledge and understanding. *Australasian Journal of Early Childhood*, *44*(3), 215-229. CC by NC 4.0

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23.3: Conclusion

Conclusion to Primary Caregiving

If high quality care and education for infants and toddlers begins with relationship-based care (Mangione, 2006), then primary caregiving is a critical practice for all childcare programs to adopt and support. Primary caregiving encourages the development of a secure attachment, which is related to various positive developmental outcomes. Furthermore, primary caregiving can strengthen the relationship between caregivers and parents.

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CHAPTER OVERVIEW

24: Caregiving Practices- Small Group Size and Low Ratios

24.1: Introduction

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24.1: Introduction

Introduction to Small Group Size and Low Ratios

Infancy and toddlerhood are critical years in shaping children's developmental trajectories (Gilkerson et al., 2018). Research has shown that high quality early childhood programs can enhance child development (Davies et al., 2021; Narea, Arriagada & Allel, 2020; Orri et al., 2019); therefore, it is important to identify aspects of programs that are key factors in supporting children's development. Group size and the ratio of caregivers to children are two aspects of structural quality identified as key quality indicators by various organizations such as the American Academy of Pediatrics (AAP), National Association for the Education of Young Children (NAEYC) and the Program for Infant and Toddler Care (PITC) (Donoghue et al., 2017; Lally, 2009; National Association for the Education of Young Children, 2005). [1]



Figure **24.1.1**: Small groups allow for more focused care. ([2])

[1] Perlmanet al., (2017). Child-staff ratios in early childhood education and care settings and child outcomes: A systematic review and meta-analysis. *PloS One*, *12*(1), e0170256. CC by 4.0

[2] Image from Head Start ECLKC is in the public domain.

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24.2: Small Groups

Defining Small Groups

Small groups means not exceeding the recommended number of infants and toddlers per room. PITC recommends between 6 to 12 infants and toddlers in one room, depending on the age of the children (Weinstock et al., 2012). In general, the younger the children, the lower the total number of children per room. For same-aged groups of infants under eight months of age, PITC recommends a maximum of six infants. For same-aged groups of children between 8 to 18 months of age, PITC recommends a maximum of nine children. For same-aged groups of toddlers between 18 to 36 months of age, PITC recommends a maximum of twelve children. For mixed-aged groups with children between birth to thirty-six months, when at least one child is 24 months, PITC recommends a maximum of eight children. The maximum group size recommendations from AAP are slightly different from PITC and they distinguish between family child care programs and center-based programs with group size recommendations (American Academy of Pediatrics, 2019). [1]

Recommendations for group size and ratio for same-aged groups

Age	Group Size	Adult:child ratio
Birth to 8 months	6	1:3
8 to 18 months	9	1:3
18 to 36 months	12	1:4

[2]

Recommendations for group size and ratio for mixed-aged groups.

Age	Group Size	Adult:child ratio
Birth to 36 months	8	1:4

[3]

Many infant and toddler programs do not meet the recommendations for small groups. Figure# shows the percentage of infant and toddler programs that met group size guidelines (National Institute of Child Health and Human Development, 2006). Programs were most likely to meet group size recommendations with three year old children (63%) and least likely to meet recommendations with children ages 1½ through 2 years of age at 25% and 28% respectively. When children were six months of age, 35% of programs met the guidelines.

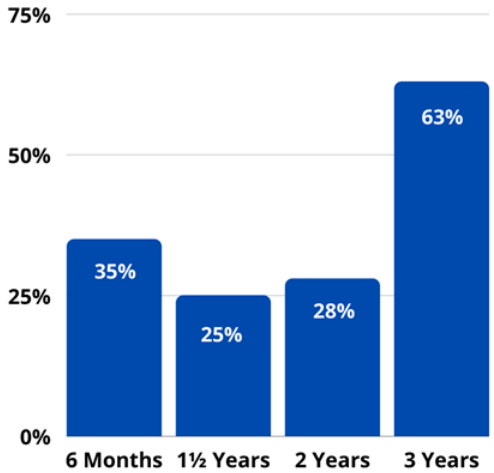


Figure **24.2.1**: Percentage of programs meeting recommended guidelines for group size. 6 months = 35%, 1.5 years=25%, 2 years= 28%, 3 years = 63% ([4])

[1] Weinstock et al., (2012). Evaluation of the Program for Infant/Toddler Care (PITC): An on-site training of caregivers. Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education is in the public domain.

[2] Image by Todd LaMarr is licensed under CC by 4.0

[3] Image by Todd LaMarr is licensed under CC by 4.0

[4] Image by Todd LaMarr is licensed under CC by 4.0

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24.3: Low Ratios

Ratios

The number of caregivers assigned to a group of children refers to the adult-to-child ratio. A low ratio means not exceeding the recommended number of adults assigned to a group of infants and toddlers. For infants from birth through twelve months of age, AAP recommends a ratio of 1:3—one caregiver assigned to every three infants in a class (American Academy of Pediatrics, 2019). The AAP recommends a ratio of 1:4 for toddlers between the ages of 13 to 35 months—one caregiver assigned to every four toddlers in a class. These ratio guidelines from the AAP are supported by PITC's recommendations which suggests either a 1:3 or a 1:4 ratio, depending on the age of the children—with a lower ratio for younger children (Program for Infant and Toddler Care, 2022).

Many infant and toddler programs do not meet the recommendations for adult-to-child ratios. Figure# shows the percentage of infant and toddler programs that met ratio guidelines (National Institute of Child Health and Human Development, 2006). Programs were most likely to meet ratio recommendations with three year old children (56%) and least likely to meet recommendations with children ages 1½ through 2 years of age at 20% and 26% respectively. When children were six months of age, 36% of programs met the guidelines.

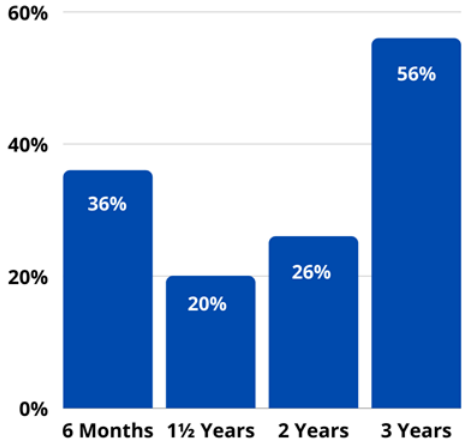


Figure **24.3.1**: Percentage of programs meeting recommended guidelines for adult-to-child ratio. ([1])

[1] Image by Todd LaMarr is licensed under CC by 4.0

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24.4: Benefits of Small Groups and Low Ratios

Why Small Groups and Low Ratios?

It is important to distinguish between research studies that focus on infants and toddlers (birth to 36 months) and studies that focus on children older than three years of age. Research findings on the associations between adult-to-child ratios and developmental outcomes have been contradictory with older children. In the preschool years, some studies show that better ratios are associated with improved child outcomes while other studies have found weak or no benefits (Francis & Barnett, 2019; Perlman et al., 2017; Pianta et al. 2005). In contrast, most studies with infants and toddlers find beneficial outcomes for small groups and low ratios (for exceptions see Blau, 2000 and Slot, Leseman, Verhagen & Mulder, 2015). Thus, this body of research emphasizes that the care and education of infants and toddlers should be considered distinct from the preschool years and that small groups and low ratios may be more important during the first three years, especially for infants (American Academy of Pediatrics, 2019; De Schipper, Riksen-Walraven & Geurts, 2006). [1]

Overall, small groups and low ratios are linked with better outcomes for infants and toddlers (Howes, Phillips & Whitebook, 1992). Small groups and lower ratios are associated with warmer and more responsive interactions (Burchinal, Cryer, Clifford & Howes, 2002; Early Child Care Research Network, 2006; Phillipsen, Burchinal, Howes & Cryer, 1997; Vandell, 1996). Sensitive relationships between caregivers and infants is more common in classes with smaller groups (Barros et al., 2016). Research has found that as the ratio of infants to caregivers increases, the quality of care between caregivers and children decreases (Leach et al., 2008; Rentzou & Sakellariou, 2011). For example, with higher ratios of infants, caregivers are less able to provide quality interactions that are sensitive and responsive (Pessanha et al., 2017; Thomason & La Paro, 2009). Caregivers show more positive affect and are less restrictive of toddlers' actions when ratios are low (Howes, 1983; Thomason & La Paro, 2009). In programs with a high ratio, toddlers are more likely to show behavior challenges (Kohl et al., 2020). Lastly, low ratios are related to greater infant language abilities. Specifically, small groups with a ratio of one caregiver to three infants had greater language abilities than groups with more than three infants per one caregiver (Burchinal, Roberts, Nabors & Bryant, 1996; Burchinal et al., 2000). When ratios are low, caregivers engage in more conversations and complex play with toddlers (Howes & Rubenstein, 1985). [2]

[1] Perlmanet al., (2017). Child-staff ratios in early childhood education and care settings and child outcomes: A systematic review and meta-analysis. *PloS One, 12*(1), e0170256. CC by 4.0

[2] Løkken et al., (2018). The relationship between structural factors and interaction quality in Norwegian ECEC for toddlers. *International Journal of Child Care and Education Policy, 12*(1), 1-15. CC by 4.0

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24.5: Conclusion

Conclusion to Small Groups and Low Ratios

As we strive to provide the highest quality care and education for infants and toddlers, it is imperative that we implement practices that promote optimal quality. Small group size and low ratios are two practices that child care programs can implement to improve quality as most research has found both practices to be related to positive developmental outcomes.

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CHAPTER OVERVIEW

25: Caregiving Practices- Continuity of Care

25.1: Introduction

25.2: Continuity of Care as a Caregiving Practice

25.3: Conclusion

25.4: References

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25.1: Introduction

Introduction to Continuity of Care

Children develop more rapidly during the first three years than any other time during development. To support this rapid development, infants and toddlers deserve respectful and nurturing relationships with their caregivers because optimal learning happens within positive relationships. This section will introduce the practice of continuity of care, describe how it is implemented into group care programs and summarize its benefits.

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25.2: Continuity of Care as a Caregiving Practice

Implementing Continuity of Care

Continuity of care refers to the practice of primary caregivers and children staying together for as long as possible, preferably for the children's first three years (McMullen, 2018). Classrooms, materials and supplies may all change as the children become older, but the one constant is the relationships. Thus, continuity of care is a caregiving practice with relationships at the center, with the goal of creating and deepening relationships between caregivers and children and caregivers and families. Continuity of care contrasts the common practice of moving infants and toddlers to new classrooms based on their age and/or attainment of skills (Cryer, Hurwitz & Wolery, 2000).



Figure **25.2.1**: Continuity of Care allows deeper relationships to form. ([1])

There are three ways that programs can create continuity of care systems. Programs may choose a system based on space, materials and resources, staff expertise, and parent and community needs: [2]

1. Group mixed-age infants and toddlers together by having the same primary caregivers work with classes of mixed-age infants and toddlers. The environment should include equipment and materials based on children's ages (the age range depends on the current children), interests, needs, and skills. As children move up into preschool, newly enrolled infants or toddlers are added. The same teachers remain in the classroom. Figure **25.2.1** shows an illustration depicting this continuity of care system. In classroom 'A' a primary caregiver has a mixed-age group of both infants and toddlers. When the children are old enough to attend preschool, they then move to a new preschool class, classroom 'B', and new infants and toddlers are enrolled into classroom 'A'. [2]



Figure **25.2.1**: Continuity of care system #1. ([1])

2. Keep children of similar age together with the same teacher. As children grow older, the children and caregivers all move to a more age-appropriate space. In this arrangement, teachers work with different age groups over several years. Figure **25.2.1** shows an illustration of this continuity of care system. In classroom 'A' the teacher is with a group of infants. As the infants grow, the teacher and children move to a new more age-appropriate room. Classroom 'B' shows the same teacher and children as in classroom 'A', but now the children are older and they are all in a new classroom together. [2]

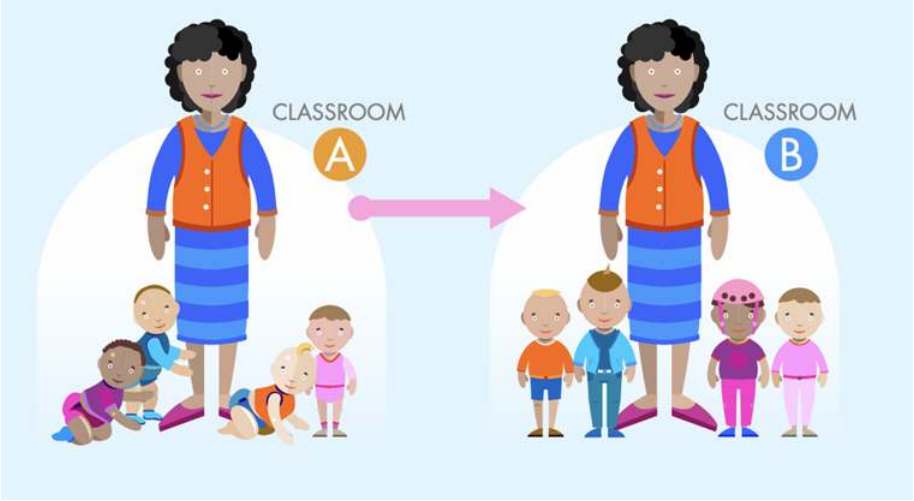


Figure **25.2.1**: Continuity of care system #2. ([2])

3. Another continuity of care system involves children, of similar age, remaining with the same primary caregiver in the same room. As the children grow older, they stay in the same room with their caregivers, but the caregivers adjust the environment and materials as children's abilities and interests change. Figure **25.2.1** provides an illustration. In classroom 'A', the caregiver and infants are in an age-appropriate room. As the children grow, rather than change rooms, the classroom is adjusted to be age-appropriate for their developing abilities and interests. In this way, the children and caregiver can remain together and stay in the same classroom overtime. [2]



Figure **25.2.1**: Continuity of care system #3. ([1])

Continuity of care is rooted in attachment theory research that supports the importance of consistent and secure relationships between caregivers and children, especially infants and toddlers. A classic study by Helen Raikes (1993) is strong evidence for the benefits of continuity of care. Raikes found that the longer infants remained with the same primary caregiver, the more likely the children were to develop a secure attachment. Specifically, of the infants who stayed with the same caregiver for over one year, 91% of them had a secure attachment, compared to infants who stayed with the same caregiver for 9 to 12 months (67% had a secure attachment) and 5 to 8 months (50% had a secure attachment). Toddlers in continuity of care classrooms are rated by their caregivers as having fewer challenging behaviors (Ruprecht, Elicker & Choi, 2016). Having a consistent and stable caregiver supports the development of a strong attachment between children and their primary caregivers (Barnas & Cummings, 1994). Infants and toddlers with more caregiver stability scored higher on social skills later in Kindergarten (Bratsch-Hines et al., 2020). Indeed, both parents and caregivers report that one of the main benefits of continuity of care is the increase in knowledge caregivers receive of individual children by working with them for a longer period of time (McMullen, Yun, Mihai & Kim, 2016).

Continuity of Care Benefits

Continuity of care not only benefits the relationship between caregivers and children, but also the relationship between caregivers and the children's families. More time together means caregivers and families can potentially develop a deeper understanding of each other with a trusting relationship enriched through experiences over time. Indeed, parents report how continuity of care creates a caregiver-parent relationship of trust and open communication (McMullen, Yun, Mihai & Kim, 2016). Both caregivers and parents reported that their experience with continuity of care created a mutual respect for each other and they both perceived their relationship more as a partnership (McMullen, Yun, Mihai & Kim, 2016).



Figure **25.2.1**: Infants and toddlers in a mixed-age classroom. ([1])

Not only are there research supported benefits for implementing continuity of care, there are also research supported concerns for not implementing it. When infants and toddlers are transitioned into a new classroom, they exhibit increased distress and anxiety (Cryer et al., 2005; Field, Vega-Lahr & Jagadish, 1984; O'Farrelly & Hennessy, 2014; Schipper, IJzendoorn & Tavecchio, 2004). Other research emphasizes that transitioning from an infant to a toddler class may be experienced differently for each child and is greatly influenced by caregivers (Recchia, 2012; Recchia & Dvorakova, 2012).

Despite many organizations promoting the importance of continuity of care, few infant and toddler group care programs actually implement it as a practice (Aguillard, Pierce, Benedict & Burts, 2005; Choi, Horm & Jeon, 2018; Cryer, Hurwitz & Wolery, 2000). Research has revealed that programs accredited by NAEYC (National Association for the Education of Young Children) were just as unlikely to be practicing continuity of care as group care programs without an NAEYC accreditation (Aguillard, Pierce, Benedict & Burts, 2005). In a large national study with Early Head Start infant and toddler programs, only 29% of children experienced two years of continuity of care (Choi, Horm & Jeon, 2018). Thirty-four percent of children experienced changing primary caregivers at least once while 37% of children experienced changing primary caregivers between two to six times. Caregivers express both benefits and challenges associated with implementing continuity of care (Hegde & Cassidy, 2004; Longstreth et al., 2016). Most of the challenges caregivers express about continuity of care can be reduced and/or solved when accurate information is shared and with strategic planning (Garrity, Longstreth & Alwashmi, 2016; Longstreth et al., 2016; McMullen, 2017; Recchia & Dvorakova, 2018).

[1] Image by PublicDomainPictures on Pixabay.

[2] "Head Start Tip Sheet: Continuity of Care" is in the public domain.

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25.3: Conclusion

Conclusion to Continuity of Care

Continuity of care is a caregiving practice that has the potential to greatly benefit children, their families and caregivers. By keeping children and caregivers together for as long as possible (ideally through the first three years), respectful, trusting and secure relationships can be deeply formed. Although few group care programs implement continuity of care, by sharing accurate, research-based information and through strategic planning, more programs can strive toward this important caregiving practice.

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CHAPTER OVERVIEW

26: Caregiving Practices- Routines

26.1: Introduction

26.2: Care Routines

26.3: The Daily Schedule

26.4: Tips for Creating Developmentally Appropriate Daily Schedules

26.5: References

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26.1: Introduction

Introduction to Routines

Consistent routines, activities that happen at about the same time and in about the same way each day, provide comfort and a sense of safety to young children. Whether it is time to play, time for a snack, a nap, or a loved one to return, knowing what will happen next gives babies and toddlers security and emotional stability.

—Zero To Three (2010, p. 2)

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26.2: Care Routines

Defining Routines in Care

Caregiving routines—arrival and departure, feeding, meals and snacks, diapering and toileting, dressing, and napping—provide a framework for the infant/toddler day. Routine care is far from routine. A significant amount of individualization occurs during routines; they offer caregivers and family child care providers many opportunities to observe and understand each child's ways and preferences and support development and learning across the domains(HHS, ACF, OCC, NITCCI, Infant/Toddler Curriculum and Individualization).[1]

During routine care, infants and toddlers have adults' undivided attention as they focus on meeting children's needs and getting to know them (Koralek, Derry, Amy Laura Dombro, and Diane Trister Dodge,2005). Routines offer opportunities to build relationships with each infant and toddler that promote attachment and trust. These are developmental milestones that are critical for children's sense of security and willingness to explore people and objects in their environments. Routines involve children's bodily needs, very intimate care, and potentially different perspectives from that of the family, so they should be highly individualized; in group care settings, each infant's and toddler's routine care is based on his or her own readiness and timetable for feeding, diapering and toilet learning, and sleep (Zero to Three, 2008). [1]

How the routine is carried out and when the routine occurs should be closely coordinated with children's families so that care is consistent between home and the program. Because these routines are so individualized, they should be carried out by the child's primary caregiver whenever possible. Families in home-based programs may individualize routine care for their infants and toddlers according to a combination of children's needs, family schedules, and cultural beliefs and practices. Home visitors can work collaboratively with families to address topics such as using routine care times to support their child's development and learning and changing routine care practices as children get older An important part of individualizing routines is using rituals. People often use the terms rituals and routines interchangeably, but they are not the same. According to Gillespie and Petersen, routines are "repeated, predictable events that provide a foundation for the daily tasks in a child's life . . . Individualizing a routine means that the sequence is the same but the actions and timing may vary to accommodate the needs of individual children"(Gillespie, Linda, and Peterson, 2012 p. 76). Rituals, in general, are "special actions that help us navigate emotionally important events or transitions in our lives as well as enhance aspects of our daily routines to deepen our connections and relationships" (Gillespie, Linda, and Peterson, 2012 p. 76). For infants and toddlers, a ritual is "a special practice that helps a child accept aspects of a routine, even an individualized routine, that are stressful" (Gillespie, Linda, and Peterson, 2012 p. 76). Rituals that adults develop with children and use at home or in group care can ease emotionally loaded situations such as separations (including going to sleep), feeding and meal times, and learning to use the toilet.[1]

Coordinating routine care between home and program may sometimes be challenging. Caregivers attitudes and beliefs about how routines should be carried out may differ from what families believe and do.

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26.3: The Daily Schedule

The Importance of Schedules

Many states require child care programs to have written daily schedules. The National Association for the Education of Young Children (NAEYC) encourages practices in which "the curriculum guides the development of a daily schedule that is predictable yet flexible and responsive to individual needs of the children" (NAEYC, 2015, p. 9). How do you develop a daily schedule for a group of infants and toddlers who are each on their own timetable? This is an important question because infants and toddlers have not yet developed the ability to manage their own feelings and behavior. For infant and toddler care caregivers, creating a daily schedule that is based on responsive care routines makes good sense. Early learning researchers widely agree that adults can best support early learning when a child's interests are central to the learning experience (Shonkoff & Phillips, 2000).[1]

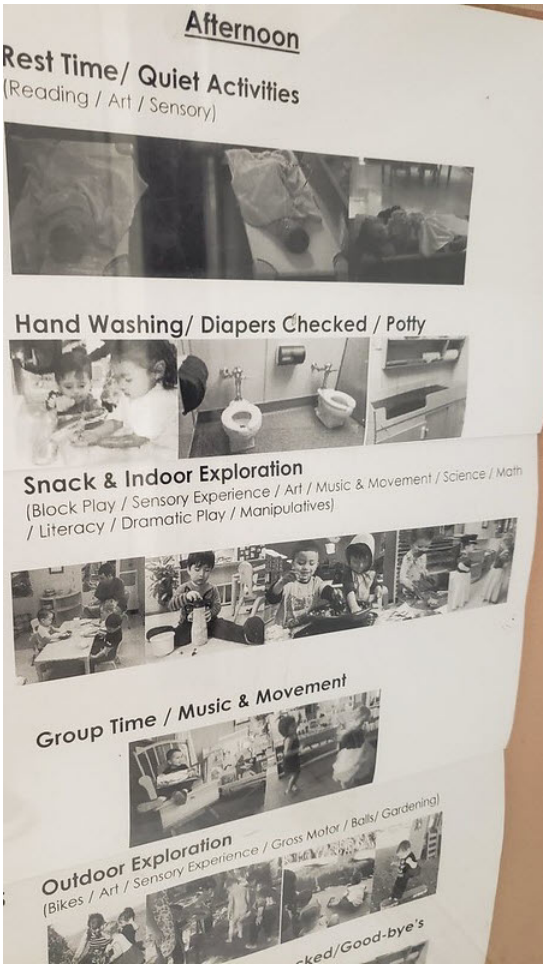


Figure 26.3.1: Afternoon schedule of Rest Time/ Quiet Activities in the reading/Art/Sensory area. Handwashing/Diapers Checked in the bathroom. Snack and Indoor exploration in the Block play/Sensory experiences/Art/Music and Movement/Science/math/Literacy/Manipulatives. Group Time/ Music and Movement and then Outdoor Exploration with bikes/art/sensory experiences/gross motor/balls/gardening. ([1])

The daily schedule orders the events that take place each day. It outlines how the daily events are expected to flow, the order in which they happen, and for how long (although not necessarily the exact times).

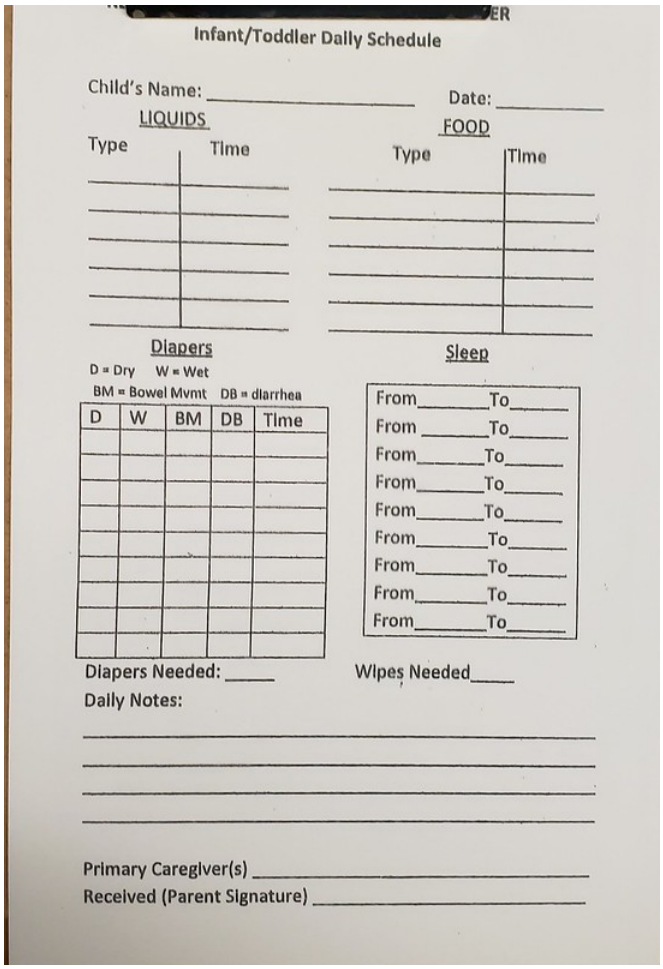
Schedules are important because they :

- provide consistency and predictability, which help infants and toddlers develop a sense of trust and security;
- give caregivers, family child care providers, and home visitors a framework for planning and making good use of time spent with children; and

- provide a link between home and school, and reassure families, especially those whose children are in group care, about what their children are doing during the day. [1]

As you incorporate the unique care routines and rhythms of each infant and toddler in your care, you can begin to create individualized daily schedules, which is an important basis of high-quality caregiving (Raikes & Edwards, 2009). Keep in mind, to respond to changing individual needs of infants, it's important to allow room for flexibility during the day. Anything too rigid will create undue stress for babies and tension for the caregivers who try to adhere to a set plan. For example, very young infants, who are on their own sleep schedules, may sleep through outside time and be ready to play and engage while the older infants nap. This does not mean there is no order or system; you are still making sure that all the daily care routines are happening. However, if one infant needs to eat or sleep sooner than others, you can adapt. Maybe a 2-year-old with a new baby brother at home needs a little more cuddle time than he did last week. Or an infant needs breathing treatments at certain times in the day and you have adjusted the schedule to read books to him and other toddlers during his therapy.[1]

While consistency and predictability are important characteristics of schedules, flexibility is just as important. This means that schedules can be modified in the moment to meet individual children's needs or group needs, take advantage of "teachable moments," and maintain a consistent and an unhurried pace. Schedules can also be modified in the long term as children's needs and abilities change over time. [1]



Infant/Toddler Daily Schedule

Child's Name: _____ Date: _____

LIQUIDS

Type	Time

FOOD

Type	Time

Diapers

D = Dry W = Wet

BM = Bowel Mvmt DB = diarrhea

D	W	BM	DB	Time

Sleep

From_____To_____
From_____To_____
From_____To_____
From_____To_____
From_____To_____
From_____To_____
From_____To_____
From_____To_____
From_____To_____

Diapers Needed: _____ Wipes Needed_____

Daily Notes:

_____

_____

_____

_____

Primary Caregiver(s) _____

Received (Parent Signature) _____

Figure **26.3.1**: A paper infant/toddler daily schedule for caregivers to fill out. Form includes p lace for Liquid type and time, Food type and time, Diapers changed when, and sleep schedule. The form also includes the option to record if diapers or wipes are needed and daily notes home. A place for caregiver signature and parent signature are at the bottom. ([1])

Other characteristics of schedules, in particular for group care settings, include:

- major events occurring in the same order every day;
- sufficient time for routine care and transitions from one event to the next;

- balance between active and quiet times;
- opportunities to be alone, with a familiar adult, and with small groups of children; and
- opportunities to spend time outdoors.

Infants follow individualized schedules for sleeping, eating, diapering, and playing. A one-size-fits-all schedule would not be appropriate for them. This means that caregivers and family child care providers will likely have as many schedules as they have infants. For example, at any given time, one infant may be napping, another getting her bottle, and a third playing with a soft block on the floor.23 Families are primary sources of information about when their children eat, nap, are most active, and so on; in culturally consistent care, the timing of these caregiving routines and awake times for play in a group care setting should match as closely as possible to when they occur at home. Cultural continuity, particularly for young children, allows for uninterrupted development of children's self-identity. Managing these individual schedules requires some planning. Knowledge about individual children can help staff predict when each child may get tired, get hungry, or need a diaper change; in turn, staff can take steps to prepare, such as get diapering supplies or cots out in advance or coordinate care responsibilities with another adult. [2]

Schedules for toddlers in group care may be more consistent and group oriented. For example, toddlers may eat meals together, go outside together, take naps at the same time, and come together for short times in small groups for stories, music, and movement experiences. Caregivers and family child care providers may create simple visual schedules with photos or drawings that show the daily events and when they occur to help children understand what happens and when. However, toddlers, still have individual timetables for routine care as well as times when they need to be away from the group or one-on-one with a familiar, trusted adult. Honoring toddlers' individual schedules and home culture is as important as honoring infants' schedules and home culture. Family input continues to play a central role.[2]

One important aspect of the daily schedule is transitions. Infants and toddlers experience many transitions (changes) during the day, for example, between routines and experiences, arrivals and departures, and going outside to play and coming back in. Home visits include transitions, too! Each child experiences and handles transitions differently; change is harder for some children than for others, so transitions can be some of the most challenging times of the day. Infants and toddlers rely on adults to provide a sense of safety and continuity as they experience change; individualizing transitions is one way to provide the stability infants and toddlers need.

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26.4: Tips for Creating Developmentally Appropriate Daily Schedules

Tips for Creating Developmentally Appropriate Daily Schedules

The following are characteristics of a schedule for infants and toddlers that supports responsive, individualized care. These ideas can help you create a daily schedule that is responsive and sensitive to each infant and toddler in your setting.[1]

Provide Consistency

Predictable daily routines support young children in knowing what to expect and what is expected of them, leading to fewer disruptive behaviors. Daily routines should flow in a consistent way that allow infants to focus on their play and learning. Opportunities to explore and practice skill-building allow children to build confidence in their abilities (Harms, Clifford, & Cryer, 1998).[1]

Include Experiences That Meet Individual Needs

This is particularly important for infants and toddlers who are not yet able to regulate their own needs and bodies to accommodate a group schedule. Regular caregiving routines such as diapering, sleeping, and feeding should happen when each child needs them, rather than going by the clock or a strict schedule (EHS NRC, 2014; Harms et al., 1998; NAEYC, 2015).

Provide Opportunities and Interactions to Foster Physical, Social, and Emotional Growth

You can support development in all areas during everyday interactions and activities. Consider an infant's diaper change. During this routine care you can support her social and emotional development by giving one-on-one attention that includes eye contact, smiling, talking about what is happening in the moment, and pointing out things that are familiar to the child (for example, "Oh! I see you're wearing your Bear diaper this morning. You like it when your mama gets the Bear diapers for you, don't you?"). In this simple exchange, the caregiver is not only supporting the child's social and emotional development but language and cognitive development as well (EHS NRC, 2014; Harms et al., 1998; NAEYC, 2015).[1]

Allow Long Amounts of Time for Free Play

Children learn through play (Fromberg & Gullo, 1992; Ginsburg, 2007; Meltzoff, Kuhl, Movellan, & Sejnowski, 2009; Piaget, 1962). Self-directed play gives children opportunities to practice what they have observed and learned about their world, test new ideas, and build skills in all areas of development. When children come together to play, it should be driven by their desire to be together, even if it means being near each other and doing separate things. Caregiver-initiated, whole-group experiences such as song time, dancing, or reading books can work well for older toddlers if they can choose whether or not to participate. Group gatherings should be limited in time, flexible, and account for the individual interests of all children. For example, in a family child care home with several toddlers, many of them like to be near the caregiver while she sings. One child goes to the book corner when this happens and she peeks over the shelves at the group. The child's mother has said that, at home, her little girl sings all of the songs, but in child care, she does not actually join the group until several months later, when she is ready (Harms et al., 1998; NAEYC, 2015).[1]

Provide Time and Support for Transitions

A well-designed schedule for infants and toddlers includes thoughtful transitions that support children as they move from one area of focus to another. Transition times are important and give many learning opportunities, just like every other part of the child's day (Harms et al., 1998; NAEYC, 2015).

Common transition times during a child's day in care include:

- Pick-up and drop-off times;
- Meal times;
- Diaper changes and toileting;
- Nap times;
- Movement from indoors to outdoors; and
- Joining or leaving group experiences (for older toddlers only).

Sample Schedules

On the following pages are two examples of written daily schedules for infants and toddlers, which are designed to be flexible and responsive to individual children. One includes times, and the other is organized by sections of the day. They both highlight the importance of less structure and more open time during the day for exploration and play. This open flow of the day allows caregivers to meet individual needs as they arise; interactions and experiences happen in the natural course of the day.[1]

Sample A: Infant and Toddler Schedule (Without Times)

Care routines such as diapering, toileting, naps, and mealtimes will be based on individual needs. Older toddlers are invited to have meals together.

Parents: Please let us know how your child is doing, and if you have any concerns, questions, or comments. We are listening!

- **Early day**
  - Diapering, naps, and mealtime as needed
  - Greetings and check-ins: We ask about how each child slept, ate, his or her mood, and any other details.
  - Exploration of materials/objects; sensory table or tray discovery
  - Reading and exploring books
  - Movement and free exploration and interaction
  - Outdoor stroller walk or play in yard
- **Midday**
  - Diapering, naps, and mealtime as needed
  - Quiet music, reading, and low lights
  - Exploring materials, objects, and books
  - Movement and free exploration and interactions
  - Outdoor play, including push toys, climbing equipment, and soft spaces on blankets or sand
- **Late day**
  - Diapering, naps, and mealtime as needed
  - Reading and exploring books
  - Exploring materials, loose parts, and objects
  - Movement and free exploration and interaction
  - Outdoor play
  - Goodbyes: We share observations of the child's day as well as details about meals, naps, diapering, and toileting.

Sample B: Infant Daily Schedule (With Times)

Mealtimes, diapering, and sleeping will be based on individual needs. We will adjust the schedule throughout the day to respond to your child's interests and needs, as well as to the weather conditions.

- **7:00–8:30: Arrival and greeting.**
  - Welcome families and learn about how the children are doing.
- **8:30–9:30: Outside time.** Possibilities include the following:
  - Exploring and following interests, such as touching leaves and talking about trees, clouds, and birds;
  - Snuggling, talking, and reading books together in the fresh air;
  - Listening and singing to rhythms; and
  - Rolling, climbing, and crawling.
- **9:30–11:30: Floor-time play.** Toys and objects available to explore.
  - Touching and feeling books and textures;
  - Talking, cuddling, and rocking;
  - Listening and singing to rhythms; and
  - Rolling, climbing, and crawling.

- **11:30–12:30: Sensory exploration.**
  - Materials with different textures, sounds, and colors.
- **12:30–2:30: Floor-time play.** Toys and objects available to explore.
  - Exploring and following interests, such as soft dolls, shakers, and stacking toys;
  - Touching and feeling books and textures;
  - Talking, cuddling, and rocking;
  - Listening and singing to rhythms; and
  - Rolling, climbing, and crawling.
- **2:30–3:30: Outside time.** Possibilities include the following:
  - Exploring and following interests, such as touching leaves and talking about trees, clouds, and birds;
  - Snuggling, talking, and reading books together in the fresh air;
  - Listening and singing to rhythms; and
  - Rolling, climbing, and crawling.
- **3:30–5:30: Floor-time play and departure.**
  - Review the day with parents, share observations, and provide information as needed.

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26.5: References

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CHAPTER OVERVIEW

27: Inclusive Caregiving

27.1: Introduction
27.2: Overview
27.3: What Programs Can Do To Be Inclusive of All Children
27.4: Learning about Individual Children
27.5: Promoting Inclusive Practices
27.6: Successful Inclusion of Children with Special Needs
27.7: How to Make Adaptions to Materials to Meet the Needs of an Infant or Toddler
27.8: Collaborating for Inclusion
27.9: Inclusive Play
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27.1: Introduction

Introduction to Inclusive Caregiving

When caregivers think about inclusive caregiving, many people assume children with known or diagnosed special needs. Inclusive caregiving is for all children that have different abilities or privileges. Developmental delays can happen from genetic abnormalities, birth trauma, accidents, or several known or unknown reasons. The most important aspect of inclusive caregiving is remembering the human behind needs. Inclusion means that a child with sensory challenges, even if it is not yet diagnosed, should be given the effort and time to make their environment the best and most conducive. For example, as a caregiver, you notice that one of your children does not want to go to the sensory table, does not like to finger paint and shies away from any messy play. Although interested, something is stopping them from engaging. What can a caregiver do for a child like this to allow them to have access to all aspects of the classroom? Meet them where they are at! Try putting the playdough in a plastic bag for the child to explore. Put paint in a plastic bag! Use gardening gloves in messy play. This is one example of inclusivity. [1]

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[1] Chapter 15: Families of Children with Special Needs or Special Health Care Needs by Krischa Esquivel; Emily Elam; Jennifer Paris; and Maricela Tafoya is licensed under a CC BY.

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27.2: Overview

Overview of Inclusive Care

Children with disabilities or other special needs refer to children with a specific diagnosis and children who do not have a diagnosis but whose behavior, development, or health affect their family's ability to maintain child care services. The disability or special need may be as mild as a slight speech delay or as complex as a mixed diagnosis of motor challenges, vision impairment, and cognitive delays.[1] Special health care needs include a variety of conditions such as birth defects, neurological disorders, and chronic illnesses that can be life-threatening or impact daily living (e.g., cancer, sickle cell disease [or anemia], cystic fibrosis, hemophilia, AIDS, diabetes, juvenile rheumatoid arthritis)[2]

Families of children with disabilities or other special needs have the same need for childcare as other families. However, families of children with disabilities or special needs often find the search for quality and affordable child care a more significant challenge as they face the reluctance of many child care providers to enroll their children. This situation makes it all the more important that child care providers strive to include all children in their programs not to increase the immense challenges that such families already face.[3]

Only about 10 percent of eligible infants and toddlers with developmental delays nationwide receive early intervention services, which are widely agreed to reduce delays and lessen the adverse effects of risk factors and disabilities on learning and development. California serves fewer children than the national average. Challenges arise from spotty screening, tenuous linkages to referral and evaluation, and the intricacies of crossing multiple agencies—sometimes without the knowledge of English—for families. [4]

Following the Individuals with Disabilities Education Act (IDEA), children ages 3-21 are entitled to a free, appropriate public education (FAPE) in the least restrictive environment (LRE). LRE requires that, to the extent possible, children with disabilities should have access to the general education curriculum, along with learning activities and settings available to their peers without disabilities. Corresponding federal legislation applied to infants and toddlers (children birth to 3) and their families specifies that early intervention services and supports must be provided in "natural environments," generally interpreted to mean a broad range of contexts and activities that generally occur for typically developing infants and toddlers in homes and communities.[5] [6]

Children with disabilities or other special needs and their families must be included in quality early childhood education programs that are the natural environments of their typically developing peers. Children learn from their interactions with other children and their surroundings while creating a sense of security and self-esteem from caring relationships with program providers and staff. Everyone benefits from quality early childhood education programs that provide inclusive care. Children who have a disability or special need get to know and interact with typically developing peers, while their families benefit from programs and services they need to achieve their parenting goals. Children who are typically developing benefit when they have the opportunity to get to know peers who are atypically developing in the classroom. Everyone has the opportunity to learn about other human beings regarding their strengths and challenges.



Figure **27.2.1**: *Children of all abilities should be included in high-quality ECE classrooms.* (*[1]*)

Children and families want to be accepted and included in their community regardless of ability. They want to belong. But the kind of belonging they desire goes beyond simply "being together." They want full, unconditional membership in family and

community. As Norman Kunc, a disability rights advocate, said so eloquently, "When inclusive education is fully embraced, we abandon the idea that children have to become 'normal' to contribute to the world. Instead, we search for and nourish the inherent gifts in all people. We begin to look beyond typical ways of becoming valued members of the community and, in doing so, begin to realize the achievable goal of providing all children with an authentic sense of belonging."[6]

Children with disabilities or other special needs may present unique challenges, but the care they need is very similar to any child. Children with special needs spend most of their time doing what other children do. They have the same curiosity, desire to play, and need to communicate as their peers do. Childcare providers providing developmentally appropriate childcare, which is individualized to meet the needs of every child, already have many of the skills needed to serve children with disabilities or other special needs.[7]

Infant and toddler caregivers may be involved with families at the time when children's disabilities and developmental concerns are first identified and as interventions begin. This process can be emotional for families, but child care providers can offer valuable insight and be supportive partners. They can play a key role by working with children, families, and other professionals in the early intervention process. A caregiver who actively participates in children's development, learning, and growth supports families in important ways.[8]

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27.3: What Programs Can Do To Be Inclusive of All Children

Implementing Inclusive Practices

Most children identified by special education professionals as having a disability have delays in learning and communication (over 70 percent of children from birth to age 14). Children who learn differently or have language delays commonly manifest special needs through their behavior in group settings. Early childhood educators can provide a language-rich environment and make accommodations based on the knowledge of the individual child.[1]

There are fewer children with more significant disabilities such as intellectual disabilities (formerly referred to as mental retardation), physical and mobility impairments, or multiple disabilities. Children with significant disabilities are likely to receive specialized services that may support success in a childcare setting. Children eligible for and who receive early intervention or special education services have individual plans with goals and strategies for caregivers and providers to use. For children under age three, the plans are called individualized family services plans (IFSPs); for children over age three, the plans are called individualized education programs (IEPs). When these plans are developed, early childhood educators can be essential members of an IFSP or IEP team.[1]

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27.4: Learning about Individual Children

Each Child is Unique

Information about a specific disability may give an early childhood educator ideas for how to support a child. However, when serving an individual child, the provider should focus on the child's needs, not the disability or its label. A child with cerebral palsy, for example, may walk with leg braces, use a wheelchair, have minor physical symptoms, or demonstrate a delay in using language. The possible variations within this one label are tremendous, indicating that no single label or diagnosis can provide enough information about a particular child. Early childhood educators need to learn beyond a textbook definition and ask questions with sensitivity and understanding—particularly in talks with parents.

Early childhood educators can go forward setting a tone of welcome and understanding. When a family member shares a child's diagnosis, a good follow-up question is often "And how does that affect _____'s development?" This approach can help assure a family member that the child care provider is sincerely concerned about the child's success and is interested in providing appropriate, individually tailored care. The response from the parent will help the child care provider determine what accommodations might be needed, what other questions may be appropriate to ask, and whether specialists are involved or needed. [1]

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27.5: Promoting Inclusive Practices

Inclusion in the Classroom

Inclusion embodies the values, policies, and practices that support the right of every child and their family, regardless of ability, to participate in a broad range of activities and contexts as full members of families, communities, and society. The desired results of inclusive experiences for children with and without disabilities and their families include a sense of belonging and membership, positive social relationships and friendships, and development and learning to reach their full potential. The defining features of inclusion that can be used to identify high-quality early childhood programs and services are:[1]

- Access – providing access to a wide range of learning opportunities, activities, settings, and environments
- Participation – even if environments and programs are designed to facilitate access, some children will need additional individualized accommodations and support to participate fully in play and learning activities with peers and adults.
- Supports – an infrastructure of systems-level supports must be afforded to those providing inclusive services to children and families.[13]

Even if children with disabilities are not currently enrolled in an early childhood education program, educators can still promote inclusive practices. One way is to have pictures, books, and materials that present children with disabilities in a general setting. How people are alike and different naturally arises in an early childhood education setting; a caregiver can take advantage of these opportunities to discuss them. Language use is also critical in developing an atmosphere of inclusion. The best practice is to use "person-first" language when one is talking about people with disabilities. This practice simply means putting the person before the disability: "a child with autism spectrum disorder" rather than "an autistic child."[2]

Exploring inclusion with families, colleagues, and children will suggest other ways to expand inclusive practices. For example, planning staff discussions on specific changes in philosophy, attitudes, and practices goes far toward including children with special needs in a childcare setting. Outside the immediate early childhood education program setting, adults with disabilities in a community might contribute to a care provider's expanding knowledge of issues related specifically to inclusion and to disabilities in general.[2]

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27.6: Successful Inclusion of Children with Special Needs

Making Inclusion Work

As each child is unique, so is each early childhood education program. There is no magic formula for making inclusion work beyond the creativity, energy, and interest that most early childhood educators already bring to their work. Their uniqueness notwithstanding, every program can include children with disabilities successfully. And each makes it work child by child, day by day. A "can-do" attitude among the teachers helps to provide the necessary energy for coming up with solutions to the inevitable challenges. It also helps to have an enthusiastic attitude toward making inclusion work rather than simply fulfilling a legal obligation.[1]

Some children need small changes to the curriculum or minor support to get the most out of certain activities. These sorts of things may consist of fairly simple accommodations, such as providing a special place or quiet activity for a child who cannot participate in large-group activities or making available a special snack for a child who needs to eat more frequently than the typical meal or snack schedule.[1]



Figure **27.6.1**: *Individual children's needs will help you decide what adaptations you need to make.* ([2])

Other children may require more specific adaptations that might not be readily apparent. A variety of community resources can help determine what those might be. The family, for example, is always the first and most important guide for what a child might need; after that, an area specialist or a local workshop might be. Beyond the immediate community, a world of literature in books, periodicals, and Websites devoted to disabilities and inclusion can inform an early childhood educator about appropriate adaptations for a child with a particular condition or need.[1]

Programs that begin with a high-quality, developmentally appropriate foundation; a positive attitude on the part of the care provider; appropriate adult–child ratios; supportive administrators; and adequate training for the provider will be in a good position to creatively solve problems for a child with disabilities or other special needs, exactly as it does for children who are typically developing. If a child already has an established diagnosis, trained intervention personnel may be available to assist in this process. One of the biggest roles of a care provider is to facilitate a sense of belonging and inclusion. Several helpful strategies are as follows:

- Start with the assumption that all children are competent.
- Adapt the environment so that it is developmentally appropriate, challenging, and fits the needs and interests of each child.
- While there may be a need to support a child's mastery of a specific skill, keep the whole child in mind, particularly the child's social-emotional experience.[1]

Consider the following questions when adapting an activity for a child with special needs:

- Does the child have an opportunity to be in control of the learning experience?
- Is there a balance between adult-initiated learning and child-initiated learning?
- Can the child make choices while learning the skill?
- Is the child able to initiate their own efforts to practice the skill, with support given by the child care provider?
- Is the child gaining self-confidence and showing the joy of accomplishment while learning?
- Is there room in the activity for the child to make discoveries?

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27.7: How to Make Adaptions to Materials to Meet the Needs of an Infant or Toddler

Materials and Inclusion

Choosing toys and materials carefully is essential, because the right toys and materials can give children with disabilities a chance to be engaged and to experience success. For infants and toddlers, child care providers typically offer a variety of toys, such as blocks, stacking or nesting cups, and simple shape sorters or puzzles designed for very young children to use. Also, including materials that encourage sensory exploration by using smells, sounds, sights, and textures enhances children's learning and development.[1]

Depending on the individual needs, some toys or materials might require simple adaptations to support the child's ability to use them. For example, attaching hook-and-loop fasteners (Velcro), large knobs, or handles may make it easier for a child with visual or physical-motor special needs to play with blocks or puzzles. Similarly, adding fabric or tabs to the edges of cardboard book pages can make it easier to turn pages. Of course, it's essential to be mindful of potential choking hazards when considering modifying materials.[1]

These are just a few simple and inexpensive strategies to ensure that all children can use materials successfully. Fortunately, family members and specialists familiar with an individual child's development are also a great source of information and ideas for making simple adaptations to support the child's success. Many toys and materials for infants and toddlers already have some of the simple adaptations mentioned above.[1]

Assistive technology can support a child's ability to participate actively in his or her home, childcare program, school, or other community settings. Using electronic toys, switches, or other devices in your child care environment may help an infant or toddler to take part fully in activities. Switches allow children who have limited hand function or muscle control to operate toys or materials that they could not play with otherwise. Sometimes a very young child will need equipment for positioning, such as a specialized chair or stander. Assistive technology and adaptations should be listed in the Individual Family Service Plan (IFSP) if a child has one.[1]

Thinking about how a child with special needs will explore and use your child care environment gives you a chance to consider the strengths of your environment and enhance it as needed.[1]

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27.8: Collaborating for Inclusion

Working Together

Early childhood educators may need to expand how they reach out to families and link with specialists to meet the needs of children with differing abilities and learning characteristics. These two groups of people have vital information to share and can serve as resources to support children in a program. Their suggestions invariably enrich efforts at inclusion. Specialists themselves may even be able to visit a care facility and offer some on-site guidance.



Figure **27.8.1**: *Collaboration provides valuable support and insight.* (.*[1]*)

Providing inclusive early childhood education does not mean a caregiver—or even a group of caregivers—has to do the work alone. Everyone has a role to play. The primary role of an early childhood educator is to nurture and support the child's development in a loving and caring manner. Partnerships formed with other adults caring for the child—the parents, health-care providers, or specialists—can complement the efforts of all concerned, especially when everyone concentrates on a particular strength. When the expertise of many are combined, ideas develop and strategies emerge better than those any one person could have developed alone. The result is the essence of true collaboration.[2]

For collaboration to be successful, the following elements are essential:

- Respect for the family's knowledge and experience with the child. They are the first and best resource and should be included in planning and implementing care of their child.
- Clear and regular communication, both informal or planned meetings.
- Time is reserved for collaboration, recognizing that everyone is likely to be pressed for time.
- Everyone has an investment and active involvement.
- Collaborative efforts to provide the appropriate assessments and support services for the child.

More information about identifying children with special needs and providing inclusive care can be found in the publication *inclusion Works* by the California Department of Education.[2]



Figure **27.8.1**: *All children need to be able to participate in the early childhood education environment fully*. [2]

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27.9: Inclusive Play

Inclusion and Playing

The literature points out that young children move from less complex types of play, such as solitary play, to more complex, partner-dependent types of play, such as parallel play, associative play, or cooperative play (Rubin et al., 1976; Jamison et al., 2012). Typically, developing children can progress from simple to more complex types of play without special teacher support. However, children with disabilities may experience restrictions in attending and in being engaged in activities requiring more complex levels of social play (Sigafoos et al., 1999). They may need adequate support from their environments to spend more time engaged in more complex social interactions with their peers. Literature shows that the social development of children with disabilities and their later social success can be significantly influenced by early interventions targeting social play between children with disabilities and their typically developing peers (Ivory and McCollum, 1999; Craig-Unkefer and Kaiser, 2002; Guralnick et al., 2006). As key elements of children's social environments, both peers and teachers can actively facilitate participation in all types of social play. In fact, beside children's characteristics, a diversity of environmental factors which can affect children's social play are highlighted in the literature, namely classroom characteristics (e.g., toys characteristics, the existence of learning/activity centers), and the types of teacher interactions (Ivory and McCollum, 1999; Guralnick et al., 2006).[1]

[1] Coelho V and Pinto AI (2018) The Relationship between Children's Developmental Functioning and Participation in Social Activities in Portuguese Inclusive Preschool Settings. *Licenced* **(CC BY)**.

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27.10: Specific Considerations

Autism Spectrum Disorder -ASD

During the last two decades, research has made tremendous progress with regard to early identification and diagnosis of ASD. As a result, in many cases, ASD can now be reliably diagnosed between 18 and 24 months of age (Ozonoff S, Young GS, Landa RJ, Brian J, Bryson S, Charman T, et al, 2015). Advances in best practices related to early identification are reflected in a 2006 policy statement published by the American Academy of Pediatrics (2006), asserting that Primary Care Providers (e.g., family physicians, pediatricians) administer formal screening tests during every well-child visit scheduled at 18 and 24 months, independent of known risk factors or reported concerns. Moreover, Primary Care Providers are urged to promptly refer children for Early Intervention services as soon as ASD is seriously considered as a possibility for diagnosis.

Among the children with a documented clinical ASD diagnosis, children's median age at first diagnosis was 51 months. The median age of children's first comprehensive developmental evaluation was 40 months, with 44% being first evaluated at or prior to 36 months, and 37% being first evaluated later than 48 months.

The intersection between (1) the complex ECE system in the US, and (2) characteristic delays in ASD diagnoses has important implications for children's access to inclusive ECE environments. On one hand, many children who are eventually diagnosed with ASD are enrolled in ECE programs prior to receiving a formal diagnosis. Thus, ECE teachers serve as an important source of social and professional support during a time when parents begin to recognize concerns about their child's social-communication development, navigate the diagnostic process, and begin to access ASD-specific resources. ECE teachers begin to implement individualized instruction and classroom adaptations prior to children's ASD diagnoses in many instances. On the other hand, because most children with ASD do not receive their formal ASD diagnosis until they are 4 years of age or older, the Pre-K and kindergarten years are often the first realistic opportunity for implementing formal special education services in inclusive classroom settings.[1]

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[1] Siller M, Morgan L, Wedderburn Q, Fuhrmeister S and Rudrabhatla A (2021) Inclusive Early Childhood Education for Children With and Without Autism: Progress, Barriers, and Future Directions. Is licensed CC B

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27.11: Conclusion

Conclusion to Inclusive Caregiving

Teachers will have children in their classrooms with diagnosed and undiagnosed special needs, including those related to their health. Early childhood programs have legal obligations to provide inclusive programs and inclusion benefits for everyone involved (children with special needs, their peers that do not have special needs, families, and teachers).

Having a solid foundation in developmentally appropriate practice, which includes the importance of learning about and meeting the needs of each individual child, goes a long way to providing inclusive early education. Support, accommodations, and collaboration are essential to providing inclusive early childhood education programming.[1]

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27.12: Additional Resources

Additional Resources for Inclusive Caregiving

Complete self-assessment of inclusive practices in your program using a checklist such as one listed here:

- Checklists for Providing/Receiving Early Intervention Supports in Child Care Settings: Use these checklists to assess your practices to promote learning and development. Provided by the Family, Infant and Preschool Program Center for the Advanced Study of Excellence in Early Childhood and Family Support Practices; part of the J. Iverson Riddle Developmental Center.
- Inclusion Planning Checklist: Center-Based Early Care and Education Programs: Review this checklist for suggested ways to create responsive and effective inclusive environments in child care centers. Provided by SpecialQuest Birth–Five: Head Start/Hilton Foundation Training Program.
- Using the Head Start Parent, Family, and Community Engagement Framework in Your Program: Digital Markers of Progress: Track your program's progress in promoting effective family engagement to support positive outcomes for families and children's development and learning with this tool based on the Head Start Parent, Family, and Community Engagement Framework and Performance Standards.

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CHAPTER OVERVIEW

28: Indoor Environment

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28.1: Introduction

Introduction to Indoor Environment

The environment in which infants and toddlers spend their days is often overlooked and requires the same level of attention as all other aspects of care. Health and safety concerns need consideration, but planning must also prioritize how the environment fosters, supports, and encourages building and sustaining relationships.

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28.2: The Impact of Our Environment

Environment Effect

Are there certain places you like to visit? A favorite restaurant, a sporting arena, or a good friend’s home? What qualities of those places make you feel welcome or secure? What makes you want to go back? Thinking about these places, you might remember the people around you, the room's color, the presence of sunlight, sounds and smells, furniture, accessories, or temperature.

Now consider places you don’t like to spend time. Maybe the dentist’s office, the airport or a noisy restaurant. What makes these environments less pleasant for you? In some settings, we feel relaxed and comfortable. In others, we feel tense, overwhelmed, and confused. The environment has a powerful effect on us. It influences how we feel, what we do, and the ways we respond. Some of us dislike places where we feel we cannot control or predict our experiences. In some spaces, we may feel we don’t belong or are not appreciated.

Just like adults, infants and toddlers are affected by their environments, even if they cannot tell us directly how they feel. It is our job as caregivers to ensure learning spaces make infants and toddlers feel welcome, secure, and ready to learn. (The Ohio State University for the US Department of Defense’s Office of Family Policy/Children and Youth, 2021)

A childcare environment is one of the child's most valuable teachers and impacts every facet of a program. Research conducted with the Early Childhood Environment Rating Scale (ECERS) (Sylva et al. 2010) and the Classroom Assessment Scoring System (CLASS) (Howes et al. 2008; Mashburn et al. 2008) indicates physical environment, social-emotional climate, and social interactions all influence a program's overall quality: high-quality physical environments enhance young children's well-being and development. All environments communicate messages. In childcare programs, these messages may convey caregivers' beliefs and values about young children, how children learn, the role of families, and the importance of community. A program’s environment should convey to all children that they belong and are safe. [1]

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28.3: Key Environment Elements

What to Include

There is substantial agreement internationally about what is essential in providing for children's developmental needs in center-based childcare (e.g., Lamb and Ahnert 2006). Universally recognized core elements required for children's positive development are: safe and healthy care settings, developmentally appropriate stimulation and opportunities for learning, positive interactions with adults, and the promotion of individual emotional growth and positive relationships with other children (Cryer et al. 2002) (Verner et.al, 2016). Spaces for infants and toddlers can be organized to support a variety of exploration and routines. Most often, the arrangement of play spaces supports different types of learning and experiences, such as: (Lally, Stewart, and Greenwald 2009)

- Small-muscle activity
- Sensory perception
- Large-motor activity
- Creative expression

Additionally, caregivers need space for infant and toddler routines: greetings, departures, eating and feeding, sleeping, diapering, and toileting.

Other areas of exploration to consider when creating an environment include block play, fantasy play, multilevel areas, quiet areas to explore books, and cozy areas (WestEd, n.d.). Dividing the room into areas creates an organized and meaningful environment.



Figure **28.3.1**: Infant Environment (Image by Community Playthings is used with permission)

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Not only do the types of experiences an environment supports need consideration, but the infant and toddler environment should also:[1]

- Ensure safety
- Promote health
- Provide comfort for children and adults
- Be convenient for children and adults
- Be child-sized
- Maximize flexibility
- Encourage movement
- Allow for choice
- Ensure accessibility

These concepts help programs focus on the overall impact of the entire environment on infants, toddlers, and the adults who care for them.[2]

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28.4: Key Environment Elements

Safety

Creating spaces for infants and toddlers that ensure safety is one of the most important considerations when designing an environment. Safe settings enable infants' and toddlers' freedom of exploration and support their developing sense of self. For health and safety reasons, it is essential that eating, food preparation, sleeping, and diapering areas are separate from play areas.



Figure **28.4.1**: Toileting and Kitchen area should be separate for health and safety ([1]

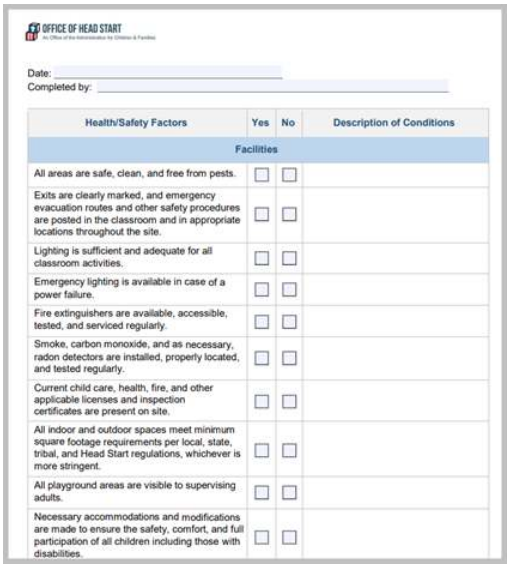
Safe environments allow a caregiver to spend less time monitoring infants' and toddlers' safety and frees them up to spend more time on interactions and building relationships. When the environment constantly causes a caregiver to move the infant to a safer location, the child's learning and engagement are interrupted. Instead, set the environment to allow freedom of movement and engagement without excessive restrictions.



Figure **28.4.1**: Two infant environments with well-defined areas and freedom of choice for infants. ([2])

As infants and toddlers move around and explore their environment, they will move toys from place to place. As a result, the floor is often strewn with toys. Be mindful that, when toys are scattered, infants' investigation might be interrupted, stopped, or create a potential hazard. Caregivers should periodically pass through the environment, remove items not being engaged with, and return them to designated storage areas. This practice maintains a safe and inviting play space and keeps toys accessible to the infants.[3] With older infants and toddlers, building in time for children to help with cleanup before transitioning to another activity supports responsible caretaking of their environment.

Keeping the environment safe and in adherence to specific licensing regulations and restrictions can be difficult, if not impossible, to keep in memory. Checklists allow regular safety assessments of indoor and outdoor environments. This documentation helps caregivers keep track of these details and maintain a safe environment.[4]



OFFICE OF HEAD START

Date: _____

Completed by: _____

Health/Safety Factors	Yes	No	Description of Conditions
Facilities			
All areas are safe, clean, and free from pests.	☐	☐	
Exits are clearly marked, and emergency evacuation routes and other safety procedures are posted in the classroom and in appropriate locations throughout the site.	☐	☐	
Lighting is sufficient and adequate for all classroom activities.	☐	☐	
Emergency lighting is available in case of a power failure.	☐	☐	
Fire extinguishers are available, accessible, tested, and serviced regularly.	☐	☐	
Smoke, carbon monoxide, and as necessary, radon detectors are installed, properly located, and tested regularly.	☐	☐	
Current child care, health, fire, and other applicable licenses and inspection certificates are present on site.	☐	☐	
All indoor and outdoor spaces meet minimum square footage requirements per local, state, tribal, and Head Start regulations, whichever is more stringent.	☐	☐	
All playground areas are visible to supervising adults.	☐	☐	
Necessary accommodations and modifications are made to ensure the safety, comfort, and full participation of all children including those with disabilities.	☐	☐	

Figure **28.4.1**: Health and Safety Screener ([4]

An easy way to create a safe environment and foster relationship building is to meet appropriate group size and child-to-adult ratio limits (Gonzalez-Mena, & Widmeyer Eyer, 2012). Smaller group sizes and lower child-to-adult ratios create and maintain a safe environment for all infants and toddlers.[5] As a baseline, California has licensing requirements to ensure the safety of children in early childhood programs. In California, community care licensing states that infant centers serving children from birth to age 2 need to have a minimum ratio of 1 fully qualified infant teacher to 4 infants. In a room with more than 4 infants, up to a maximum of 12 infants, there must be 1 fully qualified teacher responsible for the direct care and supervision of a maximum of 4 infants. If a fully qualified teacher supervises aides, each aide can be accountable for the direct care and supervision of a maximum of 4 infants. (*Teacher-to-Child Ratios in Child Care Centers* 2016) Many programs go beyond minimum state requirements to ensure children's safety and prevent accidents and injuries.[6]

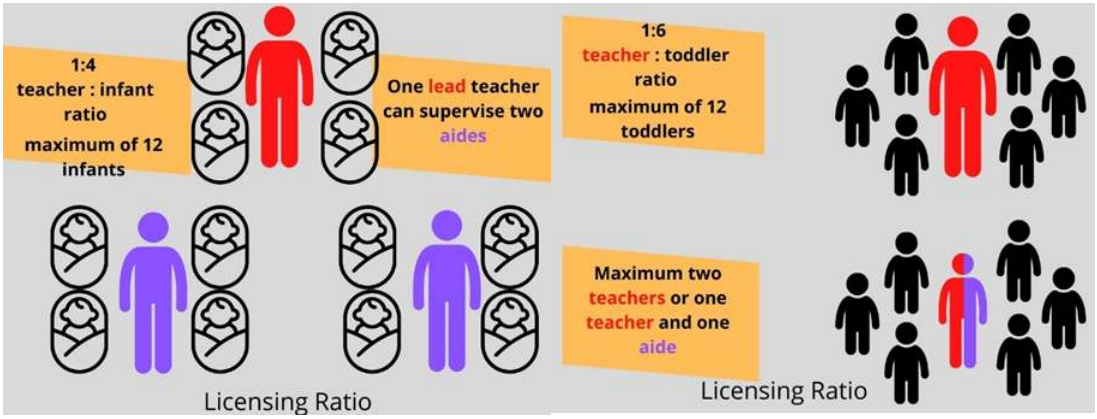


Figure **28.4.1**:Licensing Ratio Infant Room[1]

Figure **28.4.1**: Licensing Ratio Toddler Component [1]

The Program for Infant Toddler Care recommends ratios of 1 adult to 3 or 4 children and a total group size of 6 to 12 children, depending on their ages. The guiding principle is the younger the child, the smaller the group (*Small Groups in Center-Based Programs* n.d.). A helpful resource for research-based recommendations for group size and ratios is Caring for Our Children FOURTH EDITION National Health and Safety Performance Standards Guidelines for Early Care and Education Programs by the National Resource Center for Health and Safety in Child Care and Early Education, and the Head Start Program Performance Standards.[5]

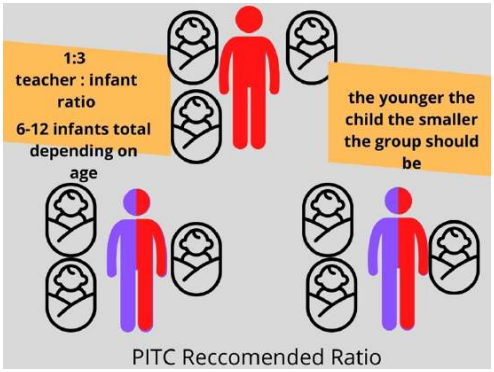


Figure **28.4.1**: PITC Reccomended Ratio. ([1])

Safety Of Equipment, Materials, And Furnishings

Equipment, materials, furnishings, and play areas should be sturdy, safe, in good repair, and meet the recommendations of the Consumer Product Safety Commission (CPSC). While not an exhaustive list, programs should attend to the following safety hazards:

- Openings that could entrap a child's head or limbs
- Elevated surfaces that are inadequately guarded
- Lack of specified surfacing and fall zones under and around climbable equipment
- Mismatched size and design of equipment for the intended users
- Insufficient spacing between equipment
- Tripping hazards
- Components that can pinch, sheer, or crush body tissues
- Equipment that is known to be hazardous
- Sharp points or corners
- Splinters
- Protruding nails, bolts, or other parts that could entangle clothing or snag skin
- Loose, rusty parts
- Hazardous, small parts that may become detached during normal use or from reasonably foreseeable abuse of the equipment and that present a choking, aspiration, or ingestion hazard to a child
- Strangulation hazards (e.g., straps, strings, etc.)
- Flaking paint
- Paint that contains lead or other hazardous materials
- Tip-over hazards, such as chests, bookshelves, and televisions

Plastic bags that are large enough to pose a suffocation risk, as well as matches, candles, and lighters, should not be accessible to children. [7]

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[3] California Department of Education (CDE Press). *Development Foundations: Social-Emotional Development* . Is used with permission

[4] Office of Head Start and Office of the Administration for Children and Families. (n.d.). Health and Safety Screener: is in the public domain

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28.5: Key Environment Elements- Health

Health

A healthy environment decreases the possibility of contracting and spreading illness and enhances infants' and toddlers' overall well-being (Lally, Stewart, & Greenwald, 2009).[1]

Health concerns must be an integral part of routine care practices, such as washing hands, using gloves, and washing toys. Even well-designed environments that meet the highest standards still require an attentive caregiver to remain healthy. In some cases, staff may need training on the specialized procedures for the health care needs of a child or on making special physical accommodations.[2] Programs should follow a routine schedule of cleaning, sanitizing, and disinfecting. Cleaning, sanitizing, and disinfecting products should not be used near children, and adequate ventilation should be maintained during use.[3]



Figure **28.5.1**: Washing hands must be part of routine care to maintain a healthy environment. ([1])

[1] U.S. Department of Health & Human Services: Administration for Children and Families. (n.d.). Nurturing Environments. is in the public domain.

[2] California Department of Education. (2019). *Infant/Toddler Learning and Development Program Guidelines, Second Edition.* Sacramento: California Department of Education. Is used with permission.

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28.6: Key Environment Elements- Lighting and Comfort

Lighting and Comfort

An infant/toddler program should utilize a mixture of lighting. Incandescent lighting provides softer light and can be used to focus on areas of learning. Lamps, skylights and natural lighting from windows provide additional lighting options. If fire code allows drape fabric over bright lights to reduce their effect, especially in areas where infants are staring up at lights.



Figure **28.6.1**: Natural lighting creates a warm comfortable environment (Image by Jenny Allen is used with permission)



Figure **28.6.1**: Overhead light[1]



Figure **28.6.1**: Small Lamp[1]



Figure **28.6.1**: Lamp in Toddler Classroom [1]

Comfort

A comfortable environment everyone can enjoy contributes significantly to a program's quality. Arrange furnishings and equipment so that adults can comfortably observe, supervise, and interact with infants.[2]

Although the focus of supportive learning environments for infants and toddlers is on the children, it is essential to create a physical space supportive of educators who spend much of their day on the floor interacting with infants. (The Ohio State University for the US Department of Defense's Office of Family Policy/Children and Youth, 2021) When caregivers can sit comfortably on the floor, attention is spent engaging in responsive interactions with infants and toddlers rather than finding a comfortable position.[3]



Figure **28.6.1**: Creating a comfortable space ([4])

A comfortable environment where adults and children can relax encourages teachers to sit with infants and creates an atmosphere conveying emotional and physical safety to all. Offer places for children and adults to snuggle, like a glider or rocking chair or couch, where adults can hold children in their laps for comforting and quiet interactions.[1]



Figure **28.6.1**: Caregiver finds a comfortable place to read with toddlers on the ground. ([1])

Having 1 or 2 adult sized chairs in the room (e.g., a rocker or a sofa chair) can visually communicate to family members (who may be less comfortable in a kid-sized environment) that they are welcome. These adult chairs can serve as a space where family members can read a book to their child during pick-up or drop-off times, provide space for mothers to visit and nurse, and help build a home-like atmosphere in the room. Remember, children's own homes are not all child sized. (The Ohio State University for the US Department of Defense's Office of Family Policy/Children and Youth, 2021)



Figure 28.6.1: Create a comfortable place for caregivers to join activities. [1]



Figure 28.6.1: A comfortable space for caregivers and parents [6]



Figure 28.6.1: A comfortable space for caregivers and parents ([1])

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28.7: Key Environment Elements- Convenience

Convenience

Organizing the environment so adults, infants, and toddlers can easily access play materials helps infants and toddlers realize they can do things on their own. It empowers children to try out ideas and use new materials. When organizing for easy use, think about storing similar materials together. Similar materials are things that go together or are necessary for certain activities. For example, baby dolls could be stored near blankets or other dramatic play items like play dishes and spoons. Soft blocks could be stored near objects like nesting cups or stacking rings so that infants and toddlers can combine these materials in their exploration.

For example:

- Storing books on a shelving unit that allows children to see the entire front covers may ignite greater interest in reading and make it easier for children to choose a book that sparks their interest.
- Storing simple wooden puzzles on a puzzle rack makes it easier for children to select a puzzle and return it to its place when they finish playing.



Figure **28.7.1**: Shelving with open front to encourage interest [1]



Figure **28.7.1**: Books on a low shelf encourage infants to engage with the books[1]

Storage types, including bins, baskets, and containers, affect how easily children can access materials and put them away.



Figure **28.7.1**: Tissues boxes allow easy access to materials. [3]



Figure **28.7.1**:Open basket also allows easy access to materials.[3]

Storage bins should be without lids for any materials children need to access themselves. They should be made of lightweight material (e.g., plastic vs. metal) and not too large or too heavy so that children can handle them independently. Clear plastic bins allow children to see the materials inside easily. Use containers that are large enough to accommodate materials without tipping over. Baskets should be free of anything that could poke or scratch children and woven tight enough so the contents cannot fall out through the holes.



Figure **28.7.1**: Open shelves with open baskets make access easy for infants and toddlers[3]



Figure **28.7.1**: Open Bins creates opportunities for easy access. [3]

Storage space for adult personal items (e.g., purse, coat) may help reduce safety concerns of both parents and caregivers. If possible, caregivers should have a quiet area (e.g., lounge) to spend breaks and recoup their physical and emotional energy. Such space can also be used for private conversations between caregivers and parents. (The Ohio State University for the US Department of Defense's Office of Family Policy/Children and Youth, 2021) Some environments might be limited in space: program managers and caregivers will need to think creatively about storage space for personal belongings or areas to recuperate.



Figure **28.7.1**:Locked personal storage areas ([3]

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28.8: Key Environmental Elements- Meeting Individual Needs- Child Size and Flexibility

Individual Needs- Child Size and Flexibility

Caregivers must create a flexible environment that is easily arranged to meet infants' individual needs and preferences.[1] Infants and toddlers grow and develop quickly and at their own pace. Environments must meet their current developmental needs, as well as emerging skills, while keeping in mind the appropriateness and safety of the space and furniture. The space and furnishings should come together to create a learning environment tailored to meet the needs of developing infants and toddlers.



Figure **28.8.1**: Toddler Environment. ([2])

Caregivers can support the natural desire of infants and toddlers to actively explore their environment with their whole bodies by knowing the progression of developmental milestones. This knowledge helps caregivers better understand and predict what interactions, materials, and experiences will be safe, engaging, and most supportive to promote learning and development.



Figure **28.8.1**: Environment with active exploration opportunities. ([3])

Evaluating the environment and making appropriate changes is an ongoing process that addresses infants' and toddlers' unique needs and values their developing skills and interests. An example of a flexible environment includes low chairs and tables where toddlers can eat or work on simple art projects or puzzles. These features allow easy movement and create flexible spaces.



Figure **28.8.1**: Low tables and chairs meet the developing needs of infants and toddlers.[1]



Figure **28.8.1**: A low table allows access to infants of difference development needs. [4]

The infant and toddler childcare environment is "… never determined once and for all. Planning, arranging, evaluating, and rearranging is an ongoing process as caregivers strive for quality and find what works best for them and for the children as they grow and change" (Gonzalez-Mena & Eyer, 2012, p. 285).



Figure **28.8.1**: Large foam blocks can be configured to provide access to a wide range of developmental needs. ([4])

Family childcare can be an excellent example of creating flexible environments to meet the needs of various development abilities and chronological ages while accommodating the adults who utilize the space.

Commitment to ongoing reflection and adaptation enhances the quality of infant and toddler spaces and supports children's continual exploration and learning (Bergen, Reid, & Torelli, 2009)[1]

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28.9: Key Environmental Elements- Movement And Choice

Movement And Choice

Like adults, infants and toddlers become frustrated when they cannot easily move through an environment or find what they need. Infants and toddlers learn about and experience life through sensory and motor explorations. They touch, taste, smell, observe, and move in the world around them to make meaning and build concepts. The floors, ceiling, lighting, walls, and furniture all contribute to the learning of infants and toddlers. To fully benefit from the environment, infants and toddlers require safe freedom of uninhibited movement as much as possible throughout the day. Freedom of movement supports children's growth by allowing space for practicing physical skills as they need and want. (Lally, Stewart, & Greenwald, 2009). [1]

An environment allowing infants and toddlers to move around freely helps them fully explore the space and do what comes naturally, including crawling, scooting, running, climbing, jumping, and walking. Caregivers should avoid placing infants in restrictive devices, such as swings, bouncy seats, or highchairs for extended periods (or at all if possible). Restrictive devices inhibit natural movement and prevent children from using their muscles to roll, scoot, and pull themselves up.



Figure **28.9.1**: Restrictive devices are not recommended for use in group care ([2])

Clear pathways for infants and toddlers allow them to move easily through the room while also creating a defined space for protected exploration. The furnishings and equipment should allow a variety of movement choices so infants can crawl through, pull up on and, as they develop physical skills, climb on and jump off.[3]



Figure **28.9.2**: Large foam blocks provide various movement opportunities. ([4])

Soft, thick floor coverings, such as vinyl mats, help mobile infants feel comfortable moving on the floor.



Figure **28.9.3**: Large plastic mats provide additional comfort for infants moving on the floor.



Figure **28.9.4**: Soft mats on the floor create more comfort for mobile and non-mobile infants. [5]

Adding unique and exciting features such as tunnels encourages further motor skills and exploration development.



Figure **28.9.5**: A tunnel with plastic balls adds fun and playful experiences. [6]



Figure **28.9.6**: Add tunnels for more movement opportunities. ([7])

For toddlers, slopes, stairs, or small ladders allow the opportunity for safe vertical movement. Offering infants and toddlers a variety of choices throughout the day helps them stay safely interested and engaged.[8]

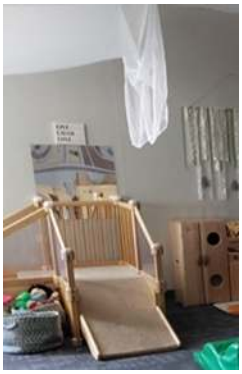


Figure **28.9.7**: Provide ramps for additional movement opportunities.[4]



Figure **28.9.8**: Stairs and slides create additional movement choices. [9]

A positive environment allows children to move freely without hearing "no" as they explore, make choices and interact with their surroundings.[10] Young children can follow their interests and develop their abilities within an environment that is respectful and

encouraging of them.[1] When children feel supported and engaged in an “environment of yes”, they are less likely to exhibit behaviors that are challenging to adults.[11]

For infants and toddlers, every aspect of the world is exciting and engaging. Environments should support them in discovering that they can find and use materials independently. When infants and toddlers spend their days in a well-organized environment with clear choices, they find fascinating materials and can concentrate their efforts on exploring and learning. Storing materials on low, open shelves lets children see the materials available, make a choice, and return the item with less adult support. As soon as children can creep or crawl to materials, they should be encouraged to select and access the materials they are interested in playing with on their own. (The Ohio State University for the US Department of Defense’s Office of Family Policy/Children and Youth, 2021) A disorganized or overstimulating environment creates difficulty for infants and toddlers to focus on a particular environmental aspect. Too many options can be overwhelming.

Arrange the environment so that infants and toddlers can concentrate on the things that interest them. Creating a space that protects young infants from the movement of older children allows exploration with confidence. Well-defined areas protected from traffic patterns let toddlers play without interruption. It is also essential to consider ways to provide appropriate risk-taking opportunities as young children seek out challenges as they grow and learn.[1]



Figure **28.9.9**: Consider adding a low bench outside for additional movement opportunities. ([4])

When children learn to use signs and symbols in their environment it promotes independence. Caregivers support independence by carefully labeling objects and the places where things belong. The best labels use written words plus pictures or parts of the object (like a puzzle piece on a shelf that contains wooden puzzles). Labeling not only helps children learn to access toys and eventually clean up independently, but it also creates a print-rich environment. Caregivers discover they give fewer directions and reminders when appropriate labels are used. When children can engage independently with materials, caregivers have more time for interacting and expanding learning opportunities.



Figure **28.9.10**: Use labels [4]



Figure **28.9.11**: Label shelves with both words and pictures.[4]

[1] California Department of Education. (2019). *Infant/Toddler Learning and Development Program Guidelines, Second Edition.* Sacramento: California Department of Education. Is used with permission.

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[10] The California Infant/Toddler Curriculum Framework by the California Department of Education is used with permission (2012)

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28.10: Key Environmental Elements- Engagement

Engagement

Offering items of beauty or wonder in the classroom invites infants' and toddlers' exploration and engagement by using provocations. A provocation is a picture, experience, or item that provokes thought, interest, questions, or creativity (Edwards, 2002). Provocations can help "provoke" young children to use, think about or see materials in new ways. A good classroom design provides options to incorporate provocations easily. Inspiration for provocations will often come from children's current interests or emerging developmental skills (e.g., crawling or grasping).

Provocations could be:

- **Pictures**: Including pictures of their interests can help extend the exploration of specific concepts and send the message that children's ideas are valued. Use photos of authentic items as much as possible. In conjunction with personal storage and children's artwork, photos also communicate that this space belongs to the children.
- **An event or experience**: For example, nature walks outdoors or a classroom "picnic."
- **Books**: Strategically placing books relevant to children's current interests throughout the room can change play and engagement. For example, a book on construction sites next to the blocks.
- **Items from nature**: This can include items collected from outside, such as leaves, pinecones or a vase of fresh flowers.
- **Simple changes in the display**: For example, a child-safe mirror on the floor for children to see themselves as they crawl over it, or doll babies in dramatic play with small bowls and spoons are an invitation to the older infants and toddlers to "feed" the dolls. Display changes can also include rearranging climbing equipment to offer new challenges or incorporating different textures and colors on the floor.



Figure **28.10.1**: Example of Loose Parts[1]



Figure **28.10.2**: Example of Loose Parts ([1])



Figure **28.10.3**: Example of Loose Parts ([2])



Figure **28.10.4**: Example of Loose Parts[2]

Provocations guide, help, and inspire infants and toddlers to engage with certain materials or spaces. However, they should never dictate what children do or how they engage with the materials. For example, perhaps some empty paper towel tubes and scarves are set up for children to explore by pushing the scarves through the tubes, but instead, the children enjoy throwing the scarves in the air and watching them fall (The Ohio State University for the US Department of Defense's Office of Family Policy/Children and Youth, 2021).

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28.11: Key Environmental Elements- Welcoming Families

Welcoming Families

An open-door policy that encourages families to come into the room and interact with their children and the caregivers sends the message that families are always welcome.

Ask family members about ways to help the program feel more like home for their children.[1] The environment and materials should reflect the cultural and linguistic diversity of the children and families served. It is crucial for teachers and program leaders to consciously consider the cultural context of their environments and the cultural messages their program sends. Staff and families can work collaboratively to create familiar settings and experiences for the children.

Programs can create a climate of respect for each child's culture and language through authentic, meaningful connections to the young children's experiences in their homes and communities. Environment design is a critical piece of this objective. These genuine connections enhance learning and a sense of belonging, especially for culturally diverse children. All aspects of the program, including the environment, must reflect or represent the families' cultures, customs, and languages (including the teachers, other staff, and volunteers).

Some ways to create an inclusive environment include (but are not limited to):

- Displaying family artifacts and pictures of the family members' unique talents (for example, musical or artistic) prominently throughout the environment
- Incorporating environmental print that reflects the languages of the children into learning activities and routines
- Ensuring play materials, room decorations, and celebrations reflect the various backgrounds of the children in the program and other racial and ethnic groups in the community
- Choosing materials that reflect the cultures and languages of children and families enrolled in the program by displaying photographs of the children and families to reflect families' homes and everyday lives.[1]

Welcoming families should also include providing a comfortable space for nursing mothers to feed their babies. For some centers, a genuinely private space might be difficult to create. Communicating with nursing mothers about areas close by, even an administrator's office, lets mothers know they are welcome, and the program supports the choice to breastfeed.

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28.12: Supporting Development

The environment needs to be safe, support health, be comfortable and convenient, and support development across domains.

Sensorimotor Development

Infants and toddlers learn about and experience life through sensory and motor explorations. They touch, taste, smell, observe, and move through the world around them to make sense of it. Children from birth to 3 years of age live directly through their senses. Therefore, the environment in which infants and toddlers are placed has a tremendous impact. —Lally, Stewart, & Greenwald, 2009, pp. 1.[1] An environment supportive of sensorimotor development includes areas of diverse physical exploration: vertical spaces, small spaces and multi-height obstacles to navigate. Caregivers must go beyond using sensory tables and allow children full body exploration of the environment using their senses. As infants and toddlers move around the environment, caregivers should talk with the child about the use of their senses in exploring and invite the infant or toddler to explore materials or substances using their senses.



Figure **28.12.1**: Sensory development can be supported in the outdoor environment as well as the indoor environment. ([2])

Language And Communication Development Through Literacy-Rich Environments

Arrange the environment to make it easy for infants to communicate with adults, look at books, listen to stories from books, engage in fingerplays, sing, and participate in other activities. By using low shelves, dividers, and other furniture, children can view one another easily to foster communication between peers and teachers.



Figure **28.12.1**: Easily accessible books support a literacy-rich environment ([3]



Figure **28.12.1**: Low seating next to accessible books encourages literature engagement ([4])

Efforts to foster communication and language development also promote emergent literacy in infants and toddlers. It is essential to provide a learning environment that offers easily accessible and age-appropriate books: creating an environment where books are readily available means infant and toddler caregivers can model engaging in books as part of the curriculum. When infants are interested in looking at books with their teachers, it is important for teachers to embrace such opportunities.[5]

Cognitive Development

When preparing an environment to support cognitive development, consider novel items, provocations, predictability, and familiarity. Infants enjoy searching for favorite and familiar toys. Finding everyday items gives them a sense of predictability and competence, the feeling of "I know this!" or "I know where to find that." Infants also enjoy new, inviting objects to pique their curiosity. Provide a primary selection of toys each day, and store the toys in consistent, predictable, and labeled locations in indoor and outdoor play environments; this will help the infants know where to find specific toys. Rotate new items into the play areas regularly to support curiosity. Base the rotation of play materials on careful observation and documentation of infants' play rather than a predetermined schedule. Use interesting arrangements to engage and extend the learning of a curious toddler.[5]

Social-Emotional and Relationship Development

Environments affect everyone to varying degrees. Spaces may influence infants and toddlers more than older children and adults since young children cannot change their environment or move to another area (Lally, Stewart, & Greenwald, 2009).

The spaces a child inhabits introduce the places where people feel welcome, meet, rest, and eat. When these places are familiar ones, similar to the child's home, the environment can help an infant feel safe and connected to the place.

A well-designed environment sets the tone for intimacy that will strengthen the quality of relationships and interactions.[6]

Making thoughtful and careful decisions about a child’s surroundings creates a nurturing, relationship-supporting environment in center-based and home-based childcare settings. Creating an environment that promotes respectful and responsive relationships is crucial to infants' and toddlers' growth and development.[7] Young children develop unique relationships with teachers and rely on these relationships for security and support in the learning environment.[8] Including pictures of the children and their families, providing personal storage space, and displaying children’s artwork communicates to infants and toddlers the space belongs to them. When hanging pictures or adding decorative touches, place them at the children’s eye level to reinforce that they are valued members of the classroom space. Consider taping photos to the floor so mobile infants can see them as they move through the room. (The Ohio State University for the US Department of Defense’s Office of Family Policy/Children and Youth, 2021)



Figure **28.12.1**: Framed pictures are excellent ways to highlight children's families in accessible ways. ([3])



Figure **28.12.1**: Create documentation in your environment at eye levels in accordance with their intended audience. ([3])

Another aspect of a relationship-supporting environment is a home like atmosphere. Young children spend many hours in the program setting. Therefore, it should become a home away from home: a place of community and togetherness. Children are more likely to feel they can be themselves and have a sense of belonging when their classroom environment is like their homes. Family childcare homes already provide this atmosphere and do not look like miniature childcare centers. [7]

There are many ways to add personal touches to a classroom to create a home like feel.

- Use light and color to create a pleasing, calming and inviting effect. Create natural or soft lighting with windows or lamps. Spending extended periods of time in the presence of bright lights and bright colors can be overwhelming.
- Use fabric and other sound-absorbing materials to reduce unwanted noise.
- Utilize soft furniture, such as a couch or large armchair.
- Incorporate nontoxic plants.
- Decorate with throw pillows or cushions, area rugs and repurposed furniture.
- Display family photos of the children and staff.
- Use inexpensive frames to hang children's artwork on the walls.
- Decorate in neutral paint colors

In addition to places for privacy and quiet areas



Figure **28.12.1**: Home like infant environments. [9]

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28.13: Division and Definition of Space

When designing an infant or toddler classroom or family childcare program, it is crucial to create defined, purposeful spaces.

Learning Areas

A learning area within an infant-toddler room creates nurturing learning experiences, with each area supporting different developmental domains. Examples might include an area for climbing or grasping to assist with gross or fine motor development or a section for exploration of specific ideas (e.g., a block area to explore cause-and-effect and balance). Although learning areas may primarily support specific development or interests, we know that infants learn holistically in all domains. Learning areas should include exciting possibilities, while also serving multiple functions. Sensory exploration by infants and toddlers will happen in all care and learning areas and need not be contained to a specific area with that label. In addition, a cozy book area provides young children with early literacy experiences and provides a quiet, calm space to relax alone or with a caregiver. The learning environment should be accessible and adaptable for children with disabilities and other special needs.

Some examples of learning areas:

- Reaching, grasping, and kicking areas (various hanging materials)
- Climbing area (stairs, platforms, risers, low cubes)
- Mirror area
- Blocks, building, and construction area
- Soft toy area
- Books and language areas
- Dramatic play area (play kitchen, dress-up materials)
- Messy area (art and expressive materials, sand and water table)
- Sound area (chimes, instruments, music, CDs and player)
- Sensory area (scented items, natural materials)



Figure **28.13.1**: Create easily accessible art areas. ([1])



PageIndex{2}\): sensory area for toddlers with a variety of objects. ([2])



Figure **28.13.3**:A mirror by loose parts is an additional way to create provocation of loose parts. ([3])

Carefully consider the arrangement of neighboring learning areas. It can be helpful to place quieter learning areas next to one another or near the napping space. Anticipating how infants and toddlers may want to use materials between areas offers them freedom to move materials from one learning area to another. This also gives infants and toddlers the opportunity to take charge of their learning and make their ideas come to life. For example, moving a dinosaur from the block area to the dramatic play area to be "washed" in the play sink offers toddlers a way to express their budding imaginations.



Figure **28.13.4**: Use light tables with a variety of objects to future sensory interest. ([1])

For rooms with only young infants, setting up specific learning areas may not be appropriate, as the entire room forms the learning area for infants. However, caregivers should offer various experiences and materials for infants and toddlers and rotate materials or

rearrange spaces as children’s developmental needs change. Providing too many materials at one time may overstimulate children.



Figure **28.13.5**: Infant environment. ([5])

Even though caregivers create learning areas, infants and toddlers love to explore and should be allowed the freedom to carry toys and materials from one area of the room to another. Rather than limit movement between spaces, recognize the value in these behaviors and find ways to support this natural exploration of materials and space. Exploring and moving materials is an excellent topic for creating documentation for analysis and reflection when creating curriculum. What trends are observed in the movement of materials from one area to another? What do the infants and toddlers do with the moved materials? [6]

Display Areas

Children's art can be displayed in ways that communicate "This is a child's place" and "You belong and what you create is valued." Displays of children's art should be aesthetically pleasing and at their eye level, without making the environment overstimulating or visually cluttered. When documentation panels are displayed at infant and toddler eye level, they allow infants and toddlers the opportunity to revisit their learning in a format that is easy to visually observe and provides visual prompts for caregivers to have conversations revisiting the experience. Viewing documentation invites curiosity and confidence as infants and toddlers revisit their work and contemplate their accomplishments (Malaguzzi,1998).



Figure **28.13.6**: Many infant and toddler furniture makes it easy to add documentation to it at eye-level. ([7])

Entrance and Family Communication Area

Design an environment that displays interest in and respect for all the families in the program. It is essential to talk with families every day at drop-off and pick-up times to exchange information about their children's experiences at home and in the program. Support open communication by having a space in the environment for each child, such as a cubby, bin, or clipboard. In the parent area (or a place that is easily accessible), provide daily notes for families that describe how their children's meals, naps, diapering/toileting, and play occurred throughout the day. Space for parents to leave notes (if there isn't an opportunity to share information in person) can also be included.

Create a space to post important information for families, such as a class calendar, parenting tips, or photos of children exploring in the program. In center-based care, a bulletin board somewhere in the room or in the hallway outside the room is a great place to post this information.

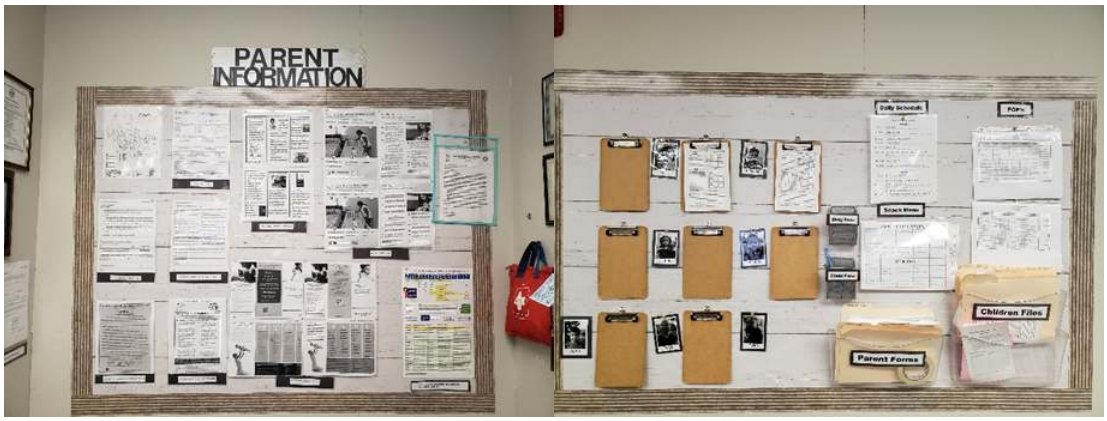


Figure **28.13.7**: Various ways to communicate with families. [7]

Family childcare providers might use a refrigerator door or hang a whiteboard near the front entrance.

Whether family childcare or center-based care, place communication areas away from the flow of traffic, where families can easily see them and talk with staff and other families without interrupting or interfering with the exploration of other infants and toddlers in the room.[8]

Sleeping and Napping

Napping spaces must feel safe, secure, and peaceful like the bedroom in a home. Separate napping places from areas where large-motor activities occur, preferably in spaces with limited traffic. Different sleeping areas, within line of sight of caregivers, for young infants help keep their schedules while still being monitored.



Figure **28.13.8**: A separated nap area with clear line of sight. ([7])

Inside areas should be well ventilated. Use a dimmer switch to turn the lights down low or off if possible. In rooms that do not allow for differentiation of lighting, explore safe ways to cover or dim the lights above sleeping areas.

To create a more home like and peaceful space, include some plants and soundless hanging mobiles in the area for children to view. In some cases, a radio or white-noise machine can mask traffic, construction, or other significant noises that interfere with sleep.

If utilizing an outdoor napping space, select a well-shaded area.

Have mats, cots, or cribs that feel cozy and comfortable, and are child sized. A firm, fitting mattress in a sturdy crib, in which all pillows, fluffy quilts, comforters, sheepskin, stuffed toys, and other soft products are removed, reduces risk factors for Sudden Infant Death Syndrome (SIDS) in young infants under 8 months old. Each infant and toddler should have a spot to sleep. Label cribs or find a consistent area for a toddler to nap. Allowing toddlers to sleep in the exact location each day helps support routine and clear expectations of the routine. Toddlers will know where to go and when it's time for a nap. Port-a cribs save space but are not very sturdy. Cots made to stack and store, or mats work well for toddlers.



Figure 28.13.9: Label cots for health and safety. ([7])

When covered with a blanket, cots are comfortable. If the sleeping area is part of a large room, set it off from activity areas with a divider at least 4 feet high. When permitted by fire codes, fabric banners hung from the ceiling can act as soft walls. A corner works best because there are 2 existing walls to work with. Use many fabrics – cushions, pillows, blankets, quilts – to absorb sound. Put up wall hangings but keep colors and patterns neutral and low-key. Storage for bedding must be accessible but out of children's reach. The best storage has compartments, each labeled with the child's name and big enough for the child's blanket, favorite toy, and sheet. *Lally, Steward, and Greenwald,*



Figure 28.13.10: Second set of sheets labeled with child's name under the shared crib. ([7])

Diapering and Toileting Areas

The diapering and toileting area should contain changing tables, sinks, and storage for supplies. Toileting is something children learn to do for themselves when developmentally appropriate for their unique timeline. The diapering and toileting setup will make that learning easy or difficult. Store all the diapers and needed supplies nearby. Include a foot-operated, motion-sensitive wastebasket next to the diaper changing area lined with a plastic liner for easy disposal. Diapering surfacea should be about 36 inches high. Make the surfaces easy to wash to help keep it germ-free. Supplies for cleaning and disinfecting should be readily available but out of reach of children.

When using diaper table paper, keep the roll at the end of the changing surface so the old piece is easily thrown away. Clean and disinfect the surface, then roll out a new piece. The whole diapering setup needs to be close to a sink to promote handwashing and must also be separate from the food preparation area. Diaper tables should have a 3-inch lip to prevent an infant from rolling off the table.



Figure **28.13.11**: Diapering area with separate detached sink, storage area above for each child's changing supplies. ([7])

If toddlers are using bathrooms with toilets, child sized toilets are preferable. Although flush toilets are preferred, “potty areas” also work if they are in a well-ventilated place near a bathroom with running water and away from the food area. Toileting sites must be easily accessible to supervise toddlers. Provide more than 1 potty as 2 or 3 toddlers can sit on potties simultaneously; the children can interact and learn from each other. Do not clean potties in the same sink where handwashing occurs. Instead, empty used potties into a toilet and wash in a utility sink. Keep toilet paper, paper towels, liquid soap, handwashing facilities, and sanitizing supplies near the potty.



Figure **28.13.12**: Steps add access for different developmental needs. ([7])

When toddlers use a bathroom, they must have a teacher with them. The bathroom should be out of bounds or locked when not in use to keep toddlers from playing in there. Bathrooms with half walls provide a sense of privacy while allowing teachers to supervise visually both inside and outside of the bathroom area. Half walls also provide a visual connection for other children when their primary care teacher cares for another child. The toileting area is often neglected when setting up the environment. Small touches can make this area inviting and friendly. Create an attractive and cheerful toileting area for toddlers; this may be a space they spend a lot of time in if they are potty training. Put pictures on the wall and use color to brighten the area (Lally, Stewart, and Greenwald 2009).

Mealtime

Eating areas for toddlers who can feed themselves encourage the development of fine motor skills. When planning these areas, use preventative measures to ensure safe and healthy experiences for infants and toddlers.

Design an area for meals that includes appropriately sized furniture for infants and toddlers as well as comfortable seating for caregivers, and nursing mothers. When arranging this area, consider what feels comfortable holding a child, feeding her a bottle, and sitting next to her at a table while she feeds herself.[8]



Figure 28.13.13: Family eating style. ([4]

Eating areas require accessible storage and easy-to-clean surfaces. Children need low, comfortable places to eat. Arrange a place for caregivers to sit with children while they eat. Low tables for up to 4 children work well and can be used for arts and crafts activities at other times. Consider tables that stack or fold out from the wall: they can be used for mealtimes, then stored away to enlarge the play space.

Young infants should be fed one at a time in the infant caregiver's arms in a comfortable adult sized chair with necessary items nearby on a table or shelf.



Figure 28.13.14: Lap feeding can be more comfortable for young infants. ([9])

Several options are available for feeding older infants. Ideally, meals and snacks are served at a child sized table with small chairs and stools. When an infant begins to climb onto and sit on the stools, it is a sign that they are ready for low tables that they can get into and out of on their own. Leave a stool in the play area so infants can practice getting on and off.

For mobile infants, use child sized tables and chairs. A table for infants aged 12 to 18 months should be about 12 to 14 inches high. Toddlers need a table 16 to 18 inches tall to comfortably sit and eat, as well as to stand while engaging in messy play. When toddlers are seated, their feet should touch the floor. If their feet cannot touch the floor, the children will not feel stable while sitting and will have trouble using their hands and arms easily. Tables should be below chest height.

Toddlers will enjoy sitting in groups of 2 to 4 at small tables. Serve the food family style unless toddlers bring their lunches. When children and adults eat together, they engage in social time, helping to strengthen and support relationships.



Figure 28.13.15: Toddlers enjoy exhibiting their growing independence and skills through self-feeding. ([1]

Natural wood tables sealed with a high gloss coating are easy to clean. Sturdy chairs or backless stools are best to allow infants to move easily and independently during mealtime. Backless stools work well for mobile infants and toddlers who can approach the stool from the back and straddle it in a comfortable wide-legged position. Legless cube chairs take up a lot of space but can also be

used for other purposes when turned over. Stackable chairs or stools also allow for a more flexible environment (Lally, Stewart, and Greenwald 2009).

Places for Privacy

Constantly being with other people for many hours each day can be emotionally draining for anyone, but it is especially so for infants and toddlers who are still developing the ability to regulate their emotions and calm themselves. Like adults and older children, infants and toddlers sometimes need time and space to break from the group. This need for privacy can be met by offering spaces limited to 1 or 2 children. A cozy corner with pillows, soft toys or books, or a quiet play area can help children calm themselves. Create these private spaces while still ensuring good visibility and children's safety. (The Ohio State University for the US Department of Defense's Office of Family Policy/Children and Youth, 2021)



Figure **28.13.16**: Small private area. ([5])

Storage And Shelves

Infant and toddler learning spaces require a lot of materials. Toys, books, and other resources are regularly rotated in and out of active use. It is essential to plan for at least 4 kinds of storage in an infant and toddler learning space: open storage infants and toddlers can easily access, closed storage for caregiver materials, personal storage for belongings, and display storage for children's art and work (Dodge et al., 2010).

- Open storage: For materials that are in active use, caregivers should carefully label and store them on open, easily accessible shelves. Open storage will help children build independence, and toddlers can avoid frustration when they easily find what they want and need.
- Closed storage: Tools such as adult office supplies, cooking utensils, or cleaning fluids need to be stored securely when not in use. Designate and carefully label secure locations for these items; doing so helps caregivers maintain inventory and ensure children's safety.
- Personal storage: Infants and toddlers also need individual spaces for personal things, such as diaper bags, clothing, supplies, and creations. Space for favorite items (e.g., stuffed animal, favorite blanket) can help infants and toddlers feel secure. When spaces are easily accessible for toddlers, they can retrieve personal items when needed.Even if young infants cannot access a personal space independently, individual spaces personalize the learning environment and help parents feel confident their children are treated and cared for as individuals with unique qualities and needs.
- Child display: Storing and displaying artwork and portfolios sends powerful messages to children about the value of their work.

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28.14: Supporting Special Needs Children

Supporting Special Needs Children

Learning materials should be accessible to all children, including those with physical or sensory disabilities. When young children are supported in movement and sensory exploration, they learn about themselves and the environment. Program leaders should turn to family members and specialized service providers for guidance on appropriate ways to make environmental adaptations that support the full participation of all children. Caregivers may need to consider the physical space or pathways within learning areas to ensure that infants or toddlers with physical disabilities can easily move around and participate, and caregivers can comfortably move them throughout spaces and join with them. All children, but particularly children with social or behavioral needs or specific developmental disabilities, may benefit from a designated area where they can easily access materials that help them soothe themselves and where they can spend some minutes alone. (The Ohio State University for the US Department of Defense's Office of Family Policy/Children and Youth, 2021)

All children within a program benefit from opportunities to play alongside peers with diverse abilities; they learn the essential values of inclusion, empathy, respect, and acceptance.[1]

Family members may have disabilities or other delays as well: adjust and accommodate adults as needed.



Figure **28.14.1**: A toddler and preschooler with cochlear implants. ([1])

To support access to the environment for infants and toddlers:

- Plan developmentally appropriate environments, interactions, and experiences for all children.
- Arrange alternative opportunities to move for children with physical challenges.
- Communicate with family members and specialized service providers involved with the family about the proper use of adaptive equipment or alternative movement opportunities for a child with a disability or other delay.
- Avoid the use of restrictive equipment that limits children's free movement and isolates them from other children.
- Represent diversity of abilities whether children with identified delays are enrolled in the program or not.[1]

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28.15: Conclusion

Conclusion to Indoor Environment

The teacher's intentional design of the learning environment increases opportunities for children to have engaging and meaningful interactions with adults and peers. Along with interactions, learning experiences, and routines, the learning environment is central to infant and toddler caregivers' planning and implementation of curriculum.[1]

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CHAPTER OVERVIEW

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29.1: Introduction

Introduction to Outdoor Environment

Research shows that today's young children spend less time outdoors engaging in active play and exploring the natural world (Clements, "Status of Outdoor Play," 68; Ginsberg, "*No Child Left Inside*," 3–5; Hastie and Howard, "Prescription for Healthy Kids"; The Henry J. Kaiser Family Foundation, "*New Study*"; Thigpen, "Outdoor Play: Combating Sedentary Lifestyles," 19–20). Researchers have identified several reasons for this decline, including:

- Adult fears about crime and safety
- Increased use of television, computer games, DVDs, and smartphones and tablets with digital media
- More time spent indoors in structured activities
- Childcare arrangements with limited free time
- Loss of natural habitats

An increasing number of educators, health/mental health professionals, and other child advocates agree that this trend adversely affects young children's health and development. Richard Louv, a child advocacy expert, worries that children are disconnecting from the natural world, a condition he calls "nature deficit disorder" (Louv, 2008) According to his research, nature deficit disorder contributes to a rise in obesity, depression, and attention disorders. As young children "spend less and less of their lives in natural surroundings, their senses narrow, physiologically and psychologically ...." (Louv, Introduction).

Whether children live in urban, suburban, or rural communities, the outdoor world provides new opportunities to observe, discover, and learn. In an outdoor environment, children's cognitive capacity to appreciate beauty, express creatively, and perceive sensory patterns and variety expand to all new heights. (Torquati & Barber,2005)[1]

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29.2: Benefits of Outdoor Play and Exploration

Why Outside?

Early childhood education research has established the importance of learning through direct experiences (Torquati, J., & Barber, J., 2005). Theorists such as Montessori and Waldorf offer direct educational practices at their centers (Hutchison, D. 1998). The philosophy of the schools of Reggio Italy and Howard Gardner also understood and expounded upon the complementary nature of science and the aesthetic experience of young children (Edwards, C., L. Gandini, & G. Forman. 1998., Gardner, H. 1999).

Outdoor play and exploration benefit children in many ways. Researchers have identified some general positive outcomes (Moore Marcus; 2008 White, 2004), including:

- Increased creativity and imagination
- Development of a sense of wonder, which is an essential motivator for lifelong learning
- Increased social interactions between children
- Enhanced opportunities to make decisions, solve problems and collaborate with peers, which also promote language and communication skills
- Improved awareness, reasoning, and observation skills
- Positive effects on children's ability to focus and pay attention [1]

Health Benefits of Spending Time Outdoors

There is strong evidence that young children experience significant health benefits from spending time outdoors. For example:

- Young children are more likely to engage in the kinds of vigorous, physical play that strengthens their hearts, lungs, and muscles because they tend to play harder and for more extended periods outside (Thigpen, 2007).
- Regularly spending time outdoors increases opportunities for infants and toddlers to crawl, toddle, walk, climb, and run freely. In addition to improving large motor skills, vigorous physical activity improves children's overall fitness level.
- Spending time outdoors strengthens young children's immune systems. They experience fewer illness-related absences from childcare when they have daily opportunities to play outside (Sennerstam,2007)
- Spending time outdoors provides access to vitamin D (Einstein College of Medicine, 2009). There is increasing concern that infants, toddlers, and older children are deficient in vitamin D. This vitamin is necessary for calcium absorption and strengthening teeth and bones.
- Spending time outdoors positively affects young children's sleeping patterns. Natural sunlight helps regulate and balance sleep-wake cycles (Dewar, 2008).
- Children who play outdoors are less likely to be nearsighted. Direct exposure to the bright, natural light of the outdoors may stimulate developing eyes in important ways, such as "maintaining the correct distance between the lens and the retina—which keeps vision in focus" (Aamodt and Chang, 2011).
- Time spent outdoors provides children with protection against life stressors and helps them develop a general sense of peace and well-being (White,2004).
- There is some evidence that playing in the dirt exposes children to a specific type of bacteria that may reduce anxiety and improve the ability to learn new tasks (American Society of Microbiology, 2009). The Outdoor Curriculum

Spending time outdoors every day is a rich and vital part of the curriculum for infants and toddlers. From the very beginning, young children satisfy their curiosity by exploring with their senses. Being outside "presents a new world of sights, sounds, smells, and tactile experiences"(Thigpen,2007).[1]

Social and Emotional Benefits of the Outdoor Environment

Infants and toddlers learn to play together when they take turns using pails and shovels, share a ride in a wagon, and chase each other. Through direct, hands-on experiences, young children learn to be gentle with living things and each other. "Deep bonds can form between children or child and adult when they share experiences with nature. When children have daily opportunities to care for plants, trees, animals, and insects, they practice nurturing behaviors that help them interact in kind and gentle ways with people as well." [2](Rosenow,2011;4.)

Gross Motor and Fine Motor Benefits of the Outdoor Environment

Because outdoor play spaces are often more varied and less structured than indoor spaces (Burdett and Whitaker, 2005), infants and toddlers have more freedom of movement to develop their gross motor skills in novel ways. These may include crawling or rolling on grassy hills, standing and balancing on bumpy or unlevel surfaces, and jumping over puddles and sidewalk cracks. Small-motor muscles develop as children use a pincer grasp to pick up and fill containers with natural objects and materials or hold paintbrushes as they paint walls with water (Trister et al., 2015; Post et al., 2011). Children develop perceptual skills as they move their bodies through space in different ways and at different speeds and as they observe the world from different perspectives (e.g., lying on their backs on a blanket, standing on top of a hill, or swinging back and forth in a swing) (Post et al., *Tender Care and Early Learning*, 253).[1]

Cognitive Benefits of the Outdoor Environment

Contact with the outdoors helps infants and toddlers learn concepts such as cause and effect and problem-solving. As they practice dressing and undressing, infants and toddlers learn which clothes to wear for different types of weather. (Trister Dodge et al., *The Creative Curriculum*, 180.) They understand that the sun dries puddles and melts snow and that wind makes things move. Infants and toddlers learn important science concepts as they explore and discover the properties of natural objects and materials. STEM topics such as science, technology, and math are reinforced as children notice how things are the same and different, experiment with using tools (e.g., shovels and sticks), and predict whether and where they will see worms after it rains.

Language and Literacy Benefits of the Outdoor Environment

As adults talk or sign with infants and toddlers about the outdoor environment, infants and toddlers learn new words; as they begin to talk, they use those words to identify interesting things they see and ask questions. Noticing and discriminating sounds is a foundational skill for later literacy development. In the outdoor environment, infants notice different sounds and learn to identify and tell them apart. Books take on an extended role when adults help children connect ideas in books with real-life experiences, such as comparing fictional animals with live animals outdoors. (Trister Dodge et al., *The Creative Curriculum*, 180). Adding books and other resources to the indoor environment helps create curiosity and connect indoor and outdoor environments (Torquati, J., & Barber, J. 2005).

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29.3: Considerations for Creating Safe and Stimulating Outdoor Play Spaces

Safe but Stimulating

It is important to know what makes a good outdoor play space for infants and toddlers. Outdoor play spaces should be treated as an extension of the indoor environment. Suitable outdoor play spaces:

- Provide safe and stimulating places to play and explore
- Accommodate the differing needs, skills, and interests of young infants, mobile infants, and toddlers, including those with suspected delays and identified disabilities
- Support nurturing adult-child interactions
- Accommodate adult needs for comfort
- Reflect staff and family beliefs, values, and culture
- Incorporate natural elements and native plant life

Easy access to the outdoors is desirable to accommodate the daily rhythms of toddlers. Access to a playground allows caregivers to respond to a child's changing needs, but in many centers, time on the playground is rigidly scheduled and may not accommodate the toddlers' needs. Programs can individualize their outdoor play spaces: caregivers, other staff, and even families consider what they want infants and toddlers to experience in the outdoor space. They decide on the materials, equipment, and other design elements that support these experiences. Whether programs modify an existing space or create a new one, designing outdoor play spaces provides an excellent opportunity to involve families and collaborate with local resources and partners. Programs may find partnership opportunities with agricultural extension agencies, plant nurseries, landscape professionals, playground architects, artists, civic organizations, and businesses.

Center-based outdoor play spaces should be designed according to the guidelines in the most recent edition of the *Public Playground Safety Handbook* from the U.S. Consumer Product Safety Commission (CPSC). Home-based programs that provide socialization spaces with outdoor areas or public playgrounds during socializations may also look at the Public Playground Safety Handbook for relevant information. Family childcare providers who have backyards can review *Outdoor Home Playground Safety Handbook*.

All programs can review relevant sections of the Caring for Our Children (CFOC) special collection, *Caring for Infants and Toddlers in Early Care and Education (I/T)*.

A Closer Look at Safety Considerations

Safety is perhaps the most common concern that interferes with active participation in outdoor play. Infants and toddlers are budding scientists. They actively investigate the world using their senses and appear to possess no fear when exploring with their hands, mouths, or bodies. Infants and toddlers are just beginning to understand what is and is not safe and how to protect themselves. They need responsible adults to minimize outdoor health and safety risks and eliminate the most dangerous hazards so they can explore and play safely.

Risk and Challenge

As caregivers consider safety, it is important to realize that no one can eliminate every possible risk. Minor bumps, cuts, scrapes, and bruises are commonplace. Some risk-taking is important and necessary for young children's growth and development. (Almeras, *Creating a Nature-Based Culture*, slides 34–36.) Risk-taking teaches young children what is and is not possible. It also sets the stage for managing challenging situations later in life. What is considered safe or unsafe depends partly on children's ages and developmental levels (e.g., sand is deemed safe for toddlers but not for young infants, even with close supervision).

Reducing risk does not mean limiting play equipment or enforcing rules that restrict young children's movement or ability to explore the environment. An ideal outdoor play space encourages children to challenge themselves while also presenting little risk for injury: ideally, an area with high challenge but low risk. Studies show high challenge, low risk playgrounds are the best at promoting the goals of outdoor learning. Children get more physical activity; develop better physical, cognitive, and social skills, including respect for others; and are happier and more resilient. (Farmer, et al., "Change of School Playground Environment on Bullying: A Randomized Controlled Trial.")

Outdoor Policies

Balancing outdoor play and exploration with safety means first implementing active supervision for all children, then reaching a common understanding with all adults of what it means to keep infants and toddlers healthy and safe while providing appropriate challenges. This includes identifying the benefits of risk-taking and defining reasonable risks.

Here are examples of what to include in outdoor policies:

- Requirements related to Active Supervision (U.S Department of Health and Human Services, Administration for Children and Families, Office of Head Start, *Active Supervision.*) are essential in keeping children safe outdoors. For example, caregivers need to:
- Maintain a 1:4 staff-child ratio at all times.
- Use mobile phones or walkie-talkies to communicate between adults outdoors and indoors quickly and easily and, if necessary, emergency services.
- Position themselves to see and hear children and use the time to observe children and engage with them rather than visiting with each other. During socialization, parents should interact one on one with their child.
- Continually scan the outdoor play space to know where everyone is and what they are doing, and count children frequently, especially during transitions to and from the outdoor space.
- Use what they know about each child's interests and skills to predict what they will do.
- Create challenges children are ready for and support them in succeeding.
- Offer different levels of assistance or redirection depending on each child's needs.

Weather-related policies define when it is acceptable to take children outside. Outdoor experiences can occur in all kinds of weather conditions, including rain, snow, heat, cold, and wind, if common-sense precautions and safety procedures are taken. For example:

- Monitor air quality. Some air quality levels pose significant health and safety risks for young children and adults.
- Do not take children outside when there are blizzards, lightning, thunderstorms, or extremely hot or cold temperatures.
- Know the appropriate types of child and adult clothing for different weather conditions. Whenever possible, provide extra outdoor clothing for children and adults. The lack of proper clothing often reduces the time spent outside rather than the weather condition itself. (Williams, "Exploring the Natural World," 21).
- Use shade, sunscreen, and protective clothing for infants younger than 6 months, bug repellent, and other protective substances.
- Ensure safe, sanitary water play and sandboxes.
- Arrange appropriate storage of medications when children are outdoors (e.g., EpiPens® and inhalers for children with allergies and asthma). Medications should always be readily accessible.
- Identify steps for handling insect bites and stings.
- Research what to include in outdoor first aid kits.

In addition to outdoor policies, there are other important safety practices and procedures to consider. [1]

Weather

To stay up to date on current conditions:

- Check the Air Quality Index at http://airnow.gov and subscribe to EnviroFlash. This service from the U.S. Environmental Protection Agency and state or local environmental agencies provides daily emails about local air quality. Poor air quality can negatively affect children with asthma and other special health care needs.
- Check the forecast for the UV Index to limit exposure to the sun on days when the Index is high.
- Sign up to receive hourly weather forecasts from the National Weather Service on a computer or mobile phone.

Sunscreen

Children need protection from the sun's harmful ultraviolet (UV) rays whenever they're outdoors. Shade and sunscreen protect children from sun exposure and can help to reduce the risk of some skin cancers.

According to the Centers for Disease Control and Prevention (CDC), even a few significant sunburns can increase the risk of skin cancer later in life. (Centers for Disease Control and Prevention (2016). Make Summer Safe for Kids. Retrieved from

https://www.cdc.gov/family/kids/summer/index.htm) The American Academy of Pediatrics recommends the following guidelines (American Academy of Pediatrics (2015). Sun Safety: Information for Parents About Sunburn & Sunscreen. Retrieved from https://www.healthychildren.org/English/safety-prevention/at-play/Pages/Sun-Safety.aspx) regarding sun safety and the selection and application of sunscreen:

- If possible, use play areas that provide shade to help children stay cool.
- Protect infants under 6 months from direct sunlight by keeping them in a shady spot under a tree, umbrella, or stroller canopy.
- Limit children's sun exposure between 10 a.m. and 4 p.m. when UV rays are the strongest.
- Encourage families to dress children in cool clothing such as lightweight cotton pants and long-sleeved shirts. A hat will protect their faces, ears, and the back of their necks.
- Obtain written permission from children's parents/guardians to use sunscreen with an SPF (sun protection factor) of at least 15. Choose a broad-spectrum sunscreen to screen out UVB and UVA rays
- Apply sunscreen at least 30 minutes before going outdoors to allow ample time for absorption into the skin. Children will need sunscreen reapplication every 2 hours if they are outside for more than an hour and more frequently if playing in the water.
- For children older than 6 months, apply sunscreen to all exposed areas, including children's ears (if they are wearing a cap instead of a hat).
- For children younger than 6 months, use sunscreen on small body areas, such as the face and the backs of the hands, if protective clothing and shade are not available.

Hydration

Toddlers and preschool children cannot regulate their body temperatures well and need additional water when hot. Provide regularly scheduled water breaks to encourage all children to drink during active play, even if they don't feel thirsty. Caregivers may offer additional breast milk or formula to infants as water is not recommended, especially for infants younger than 6 months of age, see CFOC Standard 4.2.0.6.

Water Safety

Water play is a favorite activity for many young children throughout the year. Families may ask about opportunities for children to engage in outdoor water play during the summer months. CFOC does not recommend using portable wading pools as they do not permit adequate sanitation control and promote the transmission of infectious diseases. Sprinklers, hoses, or small individual water basins are safer alternatives than wading pools. Always use active supervision when children play in or around water.

If using water tables, ensure staff clean and sanitize the water tables and use toys safely. All children should wash their hands before and after play. It is best to provide an individual basin for children with cuts, scratches, or open sores on their hands.

Insects and Insect Repellent

Protect children and adults from insect bites by checking for and removing insect nests under slides, in bushes, and in the ground. Ensure there is no standing water near play areas for mosquitoes to lay their eggs. Check for ticks after outdoor play. The CDC provides instructions about Tick Removal. To prevent insect bites on children, programs may consult with their local health department, Health Services Advisory Committee, or a childcare health consultant about using insect repellant when local insects are likely to carry diseases. Obtain written permission from children's parents/guardians before applying insect repellant and follow the instructions on the label. These products often use different levels of a chemical called DEET. "The AAP recommends that repellents should contain no more than 30% DEET when used on children. Insect repellents also are **not recommended** for children younger than 2 months." (American Academy of Pediatrics (2012). Choosing an Insect Repellent for Your Child. Retrieved from https://www.healthychildren.org/English/safety-prevention/at-play/Pages/Insect-Repellents.aspx).

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29.4: When Availability of Outdoor Play Space Is an Issue

Finding Space

Outdoor play and exploration experiences may take place in different spaces and areas. However, some programs face challenges with limited or lack of outdoor play space or few safe places to go. In these situations, it is especially important to provide infants and toddlers with experiences connecting them with nature and opportunities for active outdoor play and exploration.

Although there may be no easy answers, it is still important to determine what outdoor accommodations might be reasonable and appropriate for programs and families with less-than-ideal circumstances. Here are some possible options: Greenman and Lindstrom, *Caring Spaces, Learning Places*, 299; Greenman et al., *Prime Time*s, 298, 322

- Use sidewalks as paths for wheeled toys and equipment.
- Use sides of buildings as art walls.
- Provide "loose parts" to transform the space.
- Add logs, tree stumps, and smooth boulders to create new spaces and encourage large motor experiences.
- Use neighborhood resources such as recreation centers, parks, open fields, and school or public playgrounds. Create a "playground-in-a-box" (e.g., a wheeled utility cart filled with blankets, a parachute, milk crates, balls, and other toys and equipment to take to more open space).
- Take children on short outings using wagons, buggies, and strollers. Allow children who can walk to do so for at least part of the time, so they get the benefit of physical exercise.
- Locate and use community gardens.
- Plant nonpoisonous flowers in boxes or create small gardens in washtubs that are safely accessible to children and adults (American Academy of Pediatrics; American Public Health Association; National Resource Center for Health and Safety in Child Care and Early Education; and Maternal and Child Health Bureau, Department of Health and Human Services, *Caring for Our Children* (CFOC), "Even Plants Can Be Poisonous.").
- Hang bird feeders, wind chimes, and banners where children can see them.
- Bring nature inside. Consider putting buckets or other containers outside when it rains or snows, and then bring them in to see how much was collected. When possible, open windows (no more than 4 inches and use safety guards) to allow fresh air to come in. Provide safe, age and developmentally appropriate natural objects and materials for infants and toddlers to explore. These can include pinecones, small tree cookies (i.e., cross-sections of branches that show growth rings), twigs, leaves, snow, dirt, acorns, rocks, and shells. Closely supervise these explorations: it is developmentally appropriate for very young children to put objects in their mouths. Things considered safe for older toddlers to explore are not safe for younger children.
- Draw children's attention to natural events they can see through the window, such as rain, snow, lightning, or wind blowing trees or leaves. Invite children to touch windowpanes to see if they are warm or cold. Point out and describe changes in outdoor conditions (e.g., how the amount of shady or sunny places changes depending on the time of day or how the light changes when clouds cover the sun).

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29.5: Strategies for Maximizing Outdoor Learning Opportunities for Infants and Toddlers

Using Outdoor Time Wisely

The outdoors offers rich learning opportunities for infants and toddlers. Whether in outdoor play spaces, backyards, parks, or on front stoops, these opportunities take shape and place through relationships and interactions between caring, supportive adults and children. Infants and toddlers take their cues from the significant adults in their lives. They are more likely to respond positively and explore the outdoor environment when adults plan for, model, and support those explorations. Because staff and families play an essential role in connecting infants and toddlers to nature and the outdoors, program leaders must consider ways to facilitate and strengthen adult engagement with outdoor play and exploration.

Loose Parts

Caregivers can use "loose parts" Dempsey and Strickland, "Why to Include Loose Parts"; Greenman et al., *Prime Times*, 297 to enhance outdoor play opportunities for infants and toddlers. The term refers to "easily moved materials that children may use while playing." Dempsey and Strickland, "Why to Include Loose Parts." For infants and toddlers, loose parts are toys and materials that are safe, not fixed in place, and can be used in many ways. They are materials that children collect, put together, mix, separate, stack, fill and dump, and line up. Indoor toys, equipment, and materials brought outside are considered loose parts, as are natural materials such as tree cookies, stones, twigs, seedpods, leaves, water, and sand. Other ideas for loose parts include:

- Fabric
- Containers
- Polyvinyl chloride (PVC) pipes
- Sponges
- Wagons
- Small sleds
- Plastic milk crates
- Backpacks
- Wide, sanded boards that are short enough for toddlers to pick up, carry, or drag

Loose parts are important for several reasons. Dempsey and Strickland, "Why to Include Loose Parts." They:

- Encourage children to manipulate the environment and provide opportunities for creativity and problem-solving.
- Provide children with age-appropriate materials. Because these materials can be used in a variety of ways, each age group uses the materials in different and appropriate ways.
- Add novelty into the outdoor play environment. This is important for cognitively higher levels of play, such as symbolic play.
- Foster a wide variety of play behaviors, such as dumping and filling; lifting, moving, and carrying; and pretend, parallel, and cooperative play.

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29.6: Create a Program Culture that Supports Outdoor Play and Exploration

Culture and the Outdoors

One way to build support and understanding of the importance of outdoor experiences is to develop a philosophy statement describing the program's beliefs. [1]Almeras, *Creating a Nature-Based Culture*, slides 24, 32. A defined philosophy statement and policies supported by program leadership can guide program practices by providing a framework for planning and teaching. Consider the following process for developing a philosophy statement.

- Ask for input from staff and families. Provide information and resources as needed to facilitate the conversation.
- Involve staff and families in writing and reviewing the statement to increase consensus and support.
- Once a statement is finalized, translate the statement into families' home languages. Post the information where families and staff can see it. Consider including it in newsletters and other documents that describe the program.
- Share and discuss the statement during new staff and family orientations, staff and parent meetings, home visits, and group socialization.[1]

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29.7: Conclusion

Conclusion to Outdoor Environment

Outdoor play and exploration matter to infants and toddlers. Time spent outdoors helps them connect with and develop an appreciation for the natural environment. It offers crucial health and developmental benefits and valuable experiences that are simply not available indoors. With thoughtful planning and supportive practices and policies, programs can provide infants and toddlers with opportunities for active outdoor play, nature exploration, and connections with trusted adults in many ways, even in circumstances that are less than ideal. Working together, EHS and MSHS leaders, staff, and families can offer rich learning opportunities that support children's development and build a foundation for engaging with and learning from nature.[1]

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29.8: References

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CHAPTER OVERVIEW

30: Observation and Documentation - The Key to Intentional Teaching

To provide children with a safe and nurturing learning environment and to maintain program effectiveness, teachers must incorporate observation, documentation and assessment into their daily routines. To truly be effective, teachers must develop skills and strategies that are grounded in best practices. In this chapter you will be presented with information that highlights how observation and documentation can be used as a key strategy to ensure intentional teaching. You will examine the initial steps to take to becoming a skilled observer, and you will reflect on how to objectively document the interactions that you see and the conversations that you hear. It is important to note that becoming a skilled observer takes time and practice, and that learning how to incorporate observation, documentation and assessment into your regular routines and daily duties requires some thoughtful consideration.

30.1: The Role of Observation

30.2: Becoming a Skilled Observer

30.3: Observations can be Spontaneous or Planned

30.4: Questions you may want to ask yourself as you plan your next observation

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30.1: The Role of Observation

Observations are conducted every day in early childhood classroom environments. Teachers are constantly surveying the environment and completing safety checks to make sure the equipment and materials are safe for the children to use. Teachers also perform daily health screenings to ensure their children are healthy enough to participate in program activities. Beyond the standard safety check and health screening, teachers have many other important tasks and duties that they must do in order to maintain a copacetic classroom environment. Intentional teachers use their observations to plan and implement curriculum, set up engaging learning environments, monitor the children's social interactions, track behaviors, communicate with families, and assess each child's progress and development. Essentially, observations help teachers be more accountable. By conducting regular observations intentional teachers can:

1. Evaluate program effectiveness
2. Evaluate teacher effectiveness
3. Make improvements to ensure quality practices
4. Plan and implement developmentally appropriate curriculum
5. Measure and assess a child's development
6. Develop respectful family partnerships
7. Understand the cultural practices and family structure
8. Select effective learning strategies to support and accommodate the diverse needs of children
9. Ensure ethical conduct and professional standards of practice
10. Teach with confidence

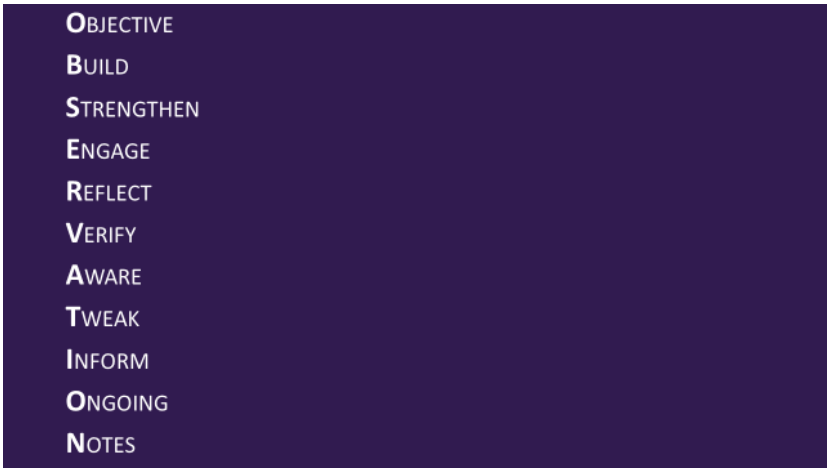


Figure 1.1: COC OER [1]

Pin It! Observation

Observation is defined as "the process of gathering information about objects and events using senses of sight, smell, sound, touch and taste, noticing specific details or phenomena that ordinarily might be overlooked" (CDE, 2016 p. 64).[2]

If we want to understand children, we must first watch them and listen to them. Then, we must try to make sense of what we observed and give it meaning. The role of observation is to provide teachers with information and evidence that they will need to make informed decisions on how to best support the children in their care. With each observation, you will get a glimpse into a child's developing mind. Not only will you see a child's personality emerge, you will be able to see what a child can do. As you watch your children, you will see how they problem solve when conflicts arise and how they cope with the stress from being in a group setting. You will learn about their individual needs and their cultural practices. When you watch children closely, their interests and abilities are revealed. With each observation, you will gain useful insight that will help you become an intentional teacher.

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30.2: Becoming a Skilled Observer

To truly observe a child, you must be present, knowledgeable, inquisitive and intentional. With every observation, you will sharpen your skills as you learn how to effectively gather objective evidence and detailed data.

Be present: To capture all the individual mannerisms, subtle social nuances, non-verbal body language and dynamic conversations that occur throughout the day you must be attentive, focused and ready to go at any given moment. Children move fast. When we blink, we are bound to miss some little detail or precious moment, that's a given. Being present takes considerable effort and careful planning.

Be knowledgeable: Understanding the core concepts of early childhood education is extremely important if you are to set reasonable expectations and plan developmentally appropriate learning experiences. Familiarizing yourself with child development theories will help you understand and appreciate why children do what they do. Learning about the key principles in early care and education will provide you with a solid foundation and a wide range of instructional strategies to support a child's development.

Be inquisitive: Think of yourself as a researcher. Your primary mission is to investigate the children in your care by routinely gathering evidence, using a variety of observation methods and tools. As a good researcher you will need to ask some thoughtful questions. These questions will guide you as you plan purposeful observations and as you select your method of observation. Here are some sample questions you may ask yourself: What activities interest Max? How many times did Stevie hit today? What skills did Hazel master today with this activity, and what skills need further support? How long did Zoey stay engaged while playing in the sandbox? What milestones will this activity support? By a sking thoughtful questions, you will learn more about the children in your care and you will do a better job at supporting each child's individual needs. Rather than fixating on a child's behavior, in time you will begin using focused observations to try and figure out the reasons why a child acts the way they do.

Be intentional: As you organize learning experiences, set up the classroom and outside environment, assess children's developmental progress, engage in activities, and interact with your children and families – you must have a thoughtful plan of action in place. "Intentional teaching means that everything you do as a teacher has a specific goal and purpose" (Gordon & Browne, 2016 p. 103). Even as spontaneous situations arise, intentional teachers must make the most of teachable moments. Intentional teachers conduct regular observations and gather objective documentation data to be accountable for the actions they take, the plans they generate and the assessments they make.

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30.3: Observations can be Spontaneous or Planned

Spontaneous observations occur all the time. Whether teachers are actively engaged with their children during an activity or in the background cleaning up after an activity, teachers have numerous opportunities to see and hear some wonderful developments as they randomly occur. According to Piaget, children require long uninterrupted periods of play and exploration so that they can discover things for themselves. If we truly believe that children are capable of socializing, problem solving, and creating complex systems with rules, then we can successfully use spontaneous observations to capture a child's development as it unfolds naturally.

As intentional teachers, we can also appreciate when teachable moments arise unexpectedly. These golden moments are noteworthy as well. For example, as we witness a child attempting to master a milestone, we may provide some verbal support or guidance to scaffold the child's learning. For example, when Abraham is becoming frustrated with not being able to get a piece of his puzzle to fit, a teacher might ask, "What happens when you turn the piece around?" During spontaneous situations, we must remember to simultaneously make mental notes so that we can later write down and reflect on a more formal plan of action that can be later used to help the child achieve their developmental goals.

Let's review the advantages and disadvantages associated with spontaneous observations**.**

- ***Advantages:*** Being in the moment allows you to enjoy your children, and children appreciate your presence. When you are present, you can celebrate a child's success or provide positive reinforcements to help them master major milestones. While being spontaneous, you can focus on the child's interests and pose thoughtful questions to extend and enrich their learning experience. When a teacher keeps a low profile, a child is less likely to be self-conscious or nervous.
- **Disadvantages**: The longer you wait to document your spontaneous observation evidence, the harder it will be to remain objective and recall the vital details which is important when tracking behaviors or assessing development. Also, the more time that passes, the more difficult it will be to access accurate data. For example, by not documenting the children's dialogue or capturing their key quotes in a timely manner, you may find it difficult to remember their actual word choices and use of vocabulary which is essential for assessing a child's expressive language development.

Let's now discuss focused or **planned observations**. Becoming a skilled observer takes practice. At first you may be slightly overwhelmed with trying to incorporate an official observation time into your already busy schedule. You may struggle with finding that delicate balance between knowing when to interact with your children and realizing when to step back and observe. Once you do observe, you might be surprised by the amount of evidence you have collected on each child. What's more, you will have to sift through all the evidence, and that can be both time consuming and exhausting. Since your time is limited and you cannot possibly observe everything, incorporating a planned observation will help you navigate through your busy day and you will be able to gather more specific evidence (Grouland & James, 2013).

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30.4: Questions you may want to ask yourself as you plan your next observation

When should I observe?

From the moment a child walks into their classroom until the time they leave, opportunities to learn are occurring. Some observations will happen spontaneously, while others will be scheduled. To see a child's full potential, you will need to observe at various times throughout the day. For example, some children are slow-to-warm and it may take them some time to get acclimated before they can fully engage and interact with others. If a child is slow -to-warm, the morning drop-off may not be the best time to document their social development. You will want to track them throughout the day, at various times (including transition times and snack/meal times), to get a full picture of who they are and what they can do.

Where should I observe?

Many times, observations are centered around structured, teacher-directed activities. This is, in fact, a perfect time to witness what major milestones a child has mastered. However, observing a child while they are exploring in the dramatic play area (*inside*) or while they are in the sandbox area (*outside*) can prove to be just as enlightening. During child-directed play or open exploration, you will no doubt be able to document many of the developmental skills as suggested in the DRDP or Rating Scales, especially how they communicate, cooperate, solve dilemmas and create. Because children can play and learn differently while they are inside as compared to when they are outside, it is necessary to observe in both environments. Likewise, it is important to observe in all activity areas and play spaces.

What observation method should I use?

Use a variety of methods to record and document your children. You will want to "try out" several tools and techniques to find your "go to" method. Because each tool has a specific purpose or focus, using a variety of methods will provide you with sound documentation data to better understand the whole child's development. Note: In the next chapter, you will examine the various tools and techniques more closely.

Who should I observe?

You will want to observe each child as individuals, and you will want to track group interactions. Becoming aware of who is in your class is necessary if you are going to create a caring classroom community and respectful learning environment. Look for those who are the leaders in your group; find out who needs more one-to-one support and who are your helpers; watch for who plays with who. This insight can help you organize peer scaffolding opportunities which can free up some of your time. As a gentle reminder, sometimes we connect with certain children for one reason or another, and other times a child may challenge us. Either way we need to regularly observe each child with an open mind and an open heart, and we need to look at children with a clear lens that is free of bias. Each child needs your attention; each child has unique gifts; and each child needs your support.

What is the focus of my observation, what am I looking for?

With focused observations, there usually is a specific goal in mind. For example, you might want to know what milestones a child has mastered. For that, you would use a developmental checklist to "check-off" all the skills the child was observed doing. Maybe you want to learn what the child's interests are and what they like to play with. For that, you can use a frequency count to tally up all the areas and activities the child used during that observation. Keep in mind that you can observe several skills and competencies across multiple domains during one observation. For example, one day you might set out a math activity and the children are expected to create patterns using colorful beads and pipe cleaners, While they work and play, you can listen to the children's conversations as they describe the patterns they are making; and you can note their fine motor development based on how well they string the beads onto the pipe cleaner; you can also see how they shared space and materials with their peers. Although this was a math activity, many other areas of development can be observed.

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30.5: The Role of Documentation

One of the cornerstones of a high-quality early care and education program is the practice of observing, documenting and assessing children's development. According to NAEYC (2009), in order to make formative decisions that will guide what goes on in the classroom, there needs to be an organized system in place to collect information. When we record our observations and collect data, we "hold in memory the actions, nonverbal communication, or comments that seem to be significant to children's thinking" (California Preschool Program Guidelines, 2015 p. 46). When we document children's learning and collect key artifacts, we create tangible evidence that we can share with the children and their families, along with administrators and stakeholders. There are many ways you can record and document children's learning. In fact, you should attempt to utilize several methods as part of your regular observation routines.

To collect and record data you can use the following methods :

- running records
- anecdotal notes
- checklists
- frequency counts
- learning stories
- time or event samples
- work samples
- taking photos, videotaping, or audio recordings

To store your documentation

To safely store your collected data, you will need to have an organized system in place. Portfolios are a popular strategy used by intentional teachers. To create a portfolio, you can use a binder or notebook, a file or accordion-style folder, or a cardboard box. As you collect observation evidence for each child, it is vital that you date everything so you can organize it chronologically. This will help you track each child's progress throughout the school year more efficiently. Portfolios help you construct a well-rounded and authentic picture of each child in your class. Knowing the "whole child" you are better equipped to build on each child's individual interests, and you are more apt to plan developmentally appropriate activities.

Each child should have their own portfolio. A well-organized portfolio will contain observations and artifacts of children's work that are collected at different time periods throughout the school year. It is recommended that you include some type of documentation that highlights each developmental domain. For example:

- **Gross Motor**: Take photographs of your child while they are engaged in outside activities like running, jumping, climbing, riding a bike or playing in the sandbox.
- **Fine Motor**: Keep a checklist of when your child learns to button, zip, and tie his shoes. Include work samples of their cutting, coloring, painting, and samples of emergent writing
- **Social-Emotional**: Write anecdotal notes when your child engages in open-ended, child-directed play. Take note of how they share and cooperate with others. Do a frequency count to see which centers your child chooses to spend their time in and tally their play patterns to see if they prefer to play alone or with others.
- **Cognitive**: Chart a science experiment and take photos. Photograph a completed puzzle. Use a video camera to record a child as she builds a block bridge. And, as she explains her process and she had to figure out all the steps to take so that the bridge wouldn't fall down – be sure to record that too.
- **Literacy and Oral language**: Save writing examples to track how the child writes her name. Include illustrations of stories they love and the stories they write themselves. Write down quotes in your running record or make audiotapes of conversations during circle time.
- **Creative expression**: Videotape your child while playing in the dramatic play area or while performing a dance during music and movement. Photograph a clay creation, painting or block tower.

To be clear, it isn't the amount of documentation you collect for each portfolio that matters, it's the quality of information you gather. Portfolios tell a story of the whole child. There should be a beginning, middle, and an end. Each work sample, anecdotal

note, checklist, frequency count and learning story should be used to showcase how a child processes information, develops relationships, and learns while playing.

To document children's learning

Whether you collect evidence through spontaneous or planned observations, you will use your documentation to ultimately assess a child's learning, growth, and development. With well-organized documentation, intentional teachers can effectively communicate with a child's family, using the evidence and artifacts they have collected over time. Families appreciate being able to see their child's progression and how they interact with others. Families also enjoy seeing the types of activities their child engages in during a typical day at school. Here are a few ways documentation can be used to showcase a child's learning, growth and development:

- rating scales and formal developmental assessments
- daily progress reports
- documentation boards

Pin It! Ten Teacher Tips When Gathering your Documentation

1. Date – this is key in tracking development over time
2. Time – start time and end time
3. Setting – note the location (indoor or outdoor; center or play area)
4. Purpose – what is the intended goal
5. Note the child (or children) who are involved in the activity
6. Record only the facts – Write down exactly what you see and hear
7. Be as concise (to the point) as you can
8. Record the facts in the order as they occur
9. Be descriptive and provide vivid details -create a visual picture so others can "see" what is happening
10. Be specific and avoid vague or general terms – this is helpful when you go back to review your dat

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30.6: Objective versus Subjective Observation Evidence

Intentional teachers must learn how to write objective observations. As you observe, it is best to write down all that you see and hear, and report just the facts. It takes practice to learn how to separate facts from opinions. Here are some helpful tips for you to review:

Table **30.6.1**: Objective Observations vs. Subjective Observations

Objective Observations	Subjective Observations
Objective observations are based on what we observed using our senses, we record exactly what we see, hear, taste, touch, and smell	Subjective observations are often influenced by our past events, personal experiences and opinions, and can be biased based on our cultural backgrounds
Objective information is based on the facts we gather. If we don't see it, we don't report it. We report only details and provide vivid descriptions	Subjective information is based on our opinions, assumptions, personal beliefs, prejudice feelings or can be based on suspicions, rumors and guesses
Results are more likely to be valid and reliable from child to child	Results are often inconsistent and vary from child to child
Objective Terms that can be Used: Seems to be; Appears to	Subjective Words to Avoid: Just; because; but; always, never; can't; I think; happy, smart, helpful, pretty, angry, shy, likes, loves, hates, sad

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30.7: Recognizing Your Biases

Google the word bias and this is what pops up: “prejudice in favor of or against one thing, person, or group compared with another, usually in a way considered to be unfair.”

Biases, we all have them. Biases stem from our upbringing. Every interaction and every experience we have had has shaped who we are. To some degree, our biases influence our beliefs and behaviors, they sway our attitudes, and they affect our personalities. Because our biases are so ingrained into who we are, it would be unrealistic to simply say “ignore your bias.” Therefore, a valuable exercise might be to do a self-check and examine your own biases. Look for those biases that are “triggers.” More specifically, think about the behaviors, temperamental traits, and moods that make you feel uncomfortable, frustrated, or annoyed.

It is important to note, that we might not be fully aware of all our biases. For example, when a child says, “give me some milk!” Our first response might be “Ummm, how do you ask?” We might not realize that manners (or lack of them) can make us react in a judgmental way. What’s important to recognize is that how we feel about the child’s behavior can taint how we see them. What’s more, our biases can influence how we gather our observation evidence. As intentional teachers we have to recognize our biases so we can treat all children with the respect that they deserve. According to NAEYC’s Code of Ethical Conduct and Statement of Commitment (2011),

> P-1.3—We shall not participate in practices that discriminate against children by denying benefits, giving special advantages, or excluding them from programs or activities on the basis of their sex, race, national origin, immigration status, preferred home language, religious beliefs, medical condition, disability, or the marital status/family structure, sexual orientation, or religious beliefs or other affiliations of their families (p. 3).

So as not to lose our objectivity, it is important to keep an open heart, an open mind, and a clear lens. Rather than letting a child’s behavior trigger you, look beyond their behavior, look beyond your bias. Focus on collecting objective observation evidence and use that data to reflect on what might be causing that behavior. Consider ways that you can support the child through redirection, modeling, scaffolding or positive reinforcements. As intentional teachers, one of our primary roles is to empower children, and to build meaningful relationships by creating warm, caring environments (Epstein, 2007).

Pin It! Common Mistakes to Avoid When Writing Observation Evidence

- Making Conclusions : Billie can’t do anything by himself because he is the youngest in a large family and they do everything for him; Sharon’s parents are getting a divorce, so she is sad
- Making Assumptions : Annie never shares; Denise always hits Thomas
- Labeling : Rosie is mean ; Jeff is such a good boy
- Comparing : Tommy can’t ride the bike as well as Sam; Zoey was the best listener at circle time
- Focusing on Feelings or Emotions : Max looks so sad today; Jax looks so happy as he slides down the slide
- Adding Opinions : Martha really likes playing dress up, she is in the dramatic play area every day; Suki is shy and never says anything during circle time.

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30.8: Ethical Guidelines when Observing Children

Every day, teachers observe, record and capture essential moments in a child's development. The evidence and artifacts that are gathered are then used to plan curriculum and assess development. Although we have highlighted the importance of gathering work samples and observation evidence as a key element to be an intentional teacher, we must also consider the perspective of the child. In the article "Who is Watching? Thinking Ethically about Observing Children" the authors highlight some of the ethical tensions that can arise within early childhood settings when trying to balance the rights of children, the responsibilities of teachers and the role of a student who is training to be a future teacher.

In most classrooms, a typical day includes teachers grabbing their cameras to take snapshots of the children in their care so that they will have ample documentation. Consider this - does the teacher's presence change the context of the child's experience? Does the thought of being monitored make the child behave any differently? How does the child feel about having their picture taken? Are teachers becoming overly concerned about capturing children in precious moments, rather than being engaged in teachable moments? As a "student" who is learning to observe and document a child's development it is important for you to consider the following guidelines when observing children:

- Take every precaution to maintain confidentiality and to ensure privacy
- Remember to ask if it is OK to take photographs of children and their work
- Understand that children have the right not to take part in activities
- Be respectful and keep a reasonable amount of space between you and the child so as not to interfere with their play and learning
- Be attuned to children's body language, temperament and styles of communication
- See each child as a unique individual who has their own perspective, set of feelings, interests, and way of socializing, along with their own cultural context, belief system, and values
- Be upfront and inform children about the purpose of your observation visit if you are approached
- Share information with the child about what you have observed when appropriate
- Write quotes down just as they were said without adding context, or trying to rationalize what the child may have meant
- Be aware that photos and observation data should be collected in a non-intrusive manner
- Ensure that observation evidence and photos are used only for the purposes intended
- Handle photos and data with care and sensitivity, and always store information securely
- Realize that a child's reactions, behaviors and conversations may not be what you expect and therefore you should refrain from being judgmental or tainted by your cultural biases

By following these guidelines, you are providing the children you observe with the respect they deserve while ensuring their dignity and safety. The centers and programs where you are observing are trusting you to act with integrity while you are at their site observing their children. Lastly, families will appreciate that you have their child's best interest at heart.



Figure 30.8.1: Observing the world through a different lens. (Public Domain; Andrew Seaman on Unsplash)

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30.9: Observation and Documentation Dos and Don’ts

Whether performing a planned or spontaneous observation here are some helpful tips to ensure you are recording quality evidence:

Table **30.9.1**: Observation and Documentation Do’s and Don’ts

Observation and Documentation DOs:	Observation and Documentation DON’Ts
1. Note the date, time, setting, 2. Note the child (or children) involved 3. Record only the facts – in a concise (to the point) manner 4. Record the facts in the order as they occur and exactly as you see it 5. Collect vivid details and quotes 6. Use a variety of Observation Methods 7. Observe with an open heart, an open mind and a clear lens, free of bias 8. Be attentive and alert, and use all your senses 9. Note what the child CAN DO rather than what he cannot do 10. Keep a low profile and respect the children’s space while they are playing	1. Do not interfere or pressure the children to perform 2. Do not assume or state your opinion while recording evidence 3. Do not record anything you do not see 4. Do not label behaviors, actions or feelings 5. Avoid using subjective, bias or judgmental terms 6. Avoid using exaggerations and conditional words 7. Do not summarize information 8. Avoid using generalizations or vague terms

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30.10: Conclusion and References

To become a skilled observer takes time and practice (Gronlund & James, 2013). You will need to figure out your rhythm so that you can incorporate observation and documentation into your regular routine. As an intentional teacher, you will want to plan systematic observations so that you can document each child's unique qualities, interests, developmental strengths and needs, as well as uncover their cultural practices, approaches to learning and play preferences throughout the school year. As you gather evidence you will want to be as objective as you can be, and you will have to recognize your biases. As you collect your documentation on each child, you will want to organize it in a chronological manner and store it safely. Lastly, be sure to observe every child in your class, be aware that some children may catch your attention more than others for one reason or another. In the next chapter, we will examine several observation tools and techniques that you will want to use as part of your regular observation routine to ensure high-quality practices.

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CHAPTER OVERVIEW

31: Quality Counts

The need for high-quality childcare continues to be a topic of interest as more and more families enter the workforce and more and more children need care. Every week, families from all socioeconomic backgrounds drop their children off at some type of childcare. According to the National Institute for Early Education Research, “In the United States, 76% of children ages three to four, receive education and care from someone other than a parent.” (NIEER, 2002). With so many children needing childcare, researchers and policymakers are tasked with figuring out how to best support the next generation of preschoolers. In this chapter, we will address the need for high-quality in early care and education as means to reduce the achievement gap between children from low to high socioeconomic families. We will also compare standard industry practices to what the field of early care and education recognizes as high-quality practices. Lastly, we will review some of the current observation methods, tools and techniques that can be used to ensure programs are implementing quality practices. [4]

31.1: Closing the Achievement Gap

31.2: Not all Preschool Programs are Alike

31.3: Process Quality and Structural Quality

31.4: A Look at Standard Industry Practices

31.5: The Role of the Teacher in High-Quality Practices

31.6: A Look at High-Quality Practices

31.7: Measuring High-Quality in Early Care and Education Classrooms

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31.1: Closing the Achievement Gap

Decades of research on early child development has determined that “When it comes to early care and education programs, quality is critical,” (Wechsler, Melnick, Maier & Bishop, 2016, p.1). It is suggested that thoughtfully designed preschool programs can impact and influence a child’s future learning outcomes. Not only are there short-term benefits, based on data collected from quantitative research projects (e.g. Perry Preschool, the Abecedarian Project, and the Chicago Child-Parent Centers), there are long-term benefits as well. More specifically, children from low-income homes who attended high-quality preschool programs showed higher achievement scores - especially in math and reading, as compared to their counterparts who were not able to attend a quality preschool. Furthermore, children who were enrolled in high-quality programs were less likely to be placed in special education, less likely to be retained or held back a grade, and it was noted that they were more likely to graduate from high school. [5]

Unfortunately, due to limited funding opportunities and financial restraints, there are many families who cannot afford to send their child to a high-quality preschool. “This lack of access to high-quality early childhood education perpetuates the achievement gap, evidenced by the fact that only 48 percent of low-income children are ready for kindergarten, compared to 75 percent of moderated – or high-income children” (p. 3 Center for American Progress). This data reveals that the achievement gap is problematic on many levels. Moving forward we must consider how we, as advocates and educators, can lessen the achievement gap so that all children, no matter their socioeconomic status, can get a smart start. To find possible solutions to this dilemma, let’s take a closer look at and compare standard industry practices to what the field of early care and education regards as high-quality practices . [6]

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31.2: Not all Preschool Programs are Alike

As more and more children need childcare, families are faced with a tremendous task of finding “the right preschool program.” When choosing a center, some families may contemplate certain factors like cost and affordability, hours of operation and availability, and location. Some families, on the other hand, may consider the school philosophy, the education and experience of teachers, the environment and daily activities, as well as the curriculum model and guidance policies. As you can see, there are numerous possibilities to consider. Families must also decide on whether to send their child to a state-funded or faith-based program, a family childcare or a traditional preschool setting. No matter what type of program a family chooses, in the state of California all childcare centers must be licensed by the California Department of Social Services and comply with Community Care Licensing Title 22 regulations. For the purpose of this text, in order to demonstrate that all preschools are not alike, we will refer to “ standard industry practice ” as any state licensed childcare program and we will refer to “ high-quality practice ” as any childcare center that undergoes regular assessments using tools and techniques that are above and beyond the standard industry practice .

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31.3: Process Quality and Structural Quality

Unlike standard industry practices, high-quality practices place an emphasis on promoting positive child outcomes. The key to a high-quality program is contingent upon what happens inside the classroom environment. Let's examine how both process quality and structural quality work together to influence positive outcomes for children.

Process quality refers to the types of interactions that occur throughout the day between the teachers, children, families, and administrators. Process quality also considers the types of materials that are available for the children to use, as well as the activities that children engage in throughout their day. Lastly, process quality takes into account the health, well-being and safety of the children. Structural quality on the other hand, refers to the features and characteristics of a program. More specifically, the class size, teacher-to-child ratios, teacher qualifications and experiences, teacher pay scale, along with the allotted square footage for play space define quality. Although process quality is thought to have a more direct impact on child outcomes as compared to structural quality , researchers and leaders in the field of early care and education agree that process and structural indicators are interrelated, and when combined together they promote the highest quality experiences.

For example, when groups are smaller, teachers tend to have more positive, supportive, and stimulating interactions with children. Warm and nurturing interactions are directly linked to children's social competence and future academic success, and such interactions are essential to high quality. Early childhood teachers who are more highly qualified and have smaller groups can more effectively provide individualized, responsive learning opportunities. Finally, higher teacher wages have consistently been linked to higher process quality. [8]

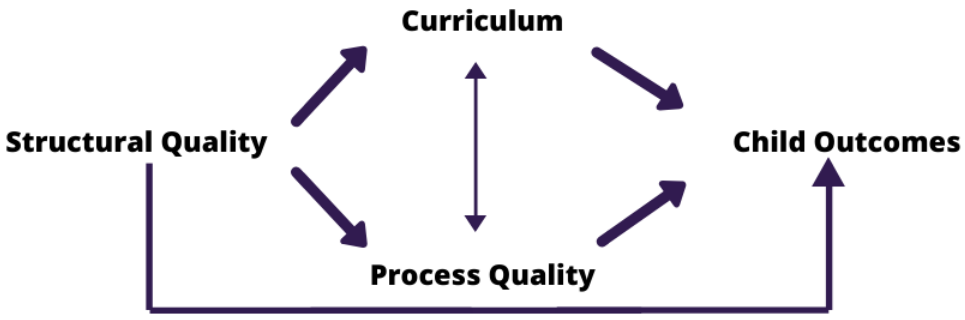


Figure 31.3.1: Structural Quality directly effects Child Outcomes [9]

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31.4: A Look at Standard Industry Practices

To legally operate a childcare program in California, a center must comply with certain licensing policies and procedures. These state regulations provide “a baseline standard and are primarily focused on protecting children from harm rather than on advancing child development and early learning,” (Workman & Ullrich, 2017, p. 3). In other words, Title 22 Regulations stipulate health and safety standards, space and square footage requirements, supervision standards, and teacher qualifications. Title 22 Regulations do not however, consider curriculum activities, age appropriate materials, or teacher-to-child interactions, nor does it address developmentally appropriate practices such as family culture and perspectives, child development theories, or principles and practices.

To ensure early childhood education programs are compliant with all state policies and procedures, a licensing analyst will conduct an annual inspection, or will evaluate a program as needed. Typically, the analyst will look at the center’s overall cleanliness and they will inspect both the indoor and outdoor environment to certify that the center is safe for the children. The analyst will confirm that the ratios are met, and that there is proper space and square footage available for each child to play and nap. The analyst will also conduct a spot check of the employee files to confirm teacher qualifications, and they will look through the children’s files to validate that the proper paperwork is signed and in complete order. To comply with state regulations and policies, a center director will need to download the California Code of Regulations, Title 22 administered by CDSS (Divisions 12 only) and follow all the mandated requirements. If any criteria are not met, the analyst will cite the program. The program will then be given a certain timeframe to rectify and correct the concern. The analyst will return to verify the problem has been fixed. Families who are considering a program can check the Community Care Licensing website to see if a center has received any “substantiated citations.” [7]

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31.5: The Role of the Teacher in High-Quality Practices

As mentioned above, the teacher plays a vital role in orchestrating high-quality practices. In high-quality classrooms, not only must teachers create a safe and nurturing space, they must intentionally set up the environment to support children's interests and individuality. California childcare programs serve a diverse population, therefore, an intentional teacher must also consider the cultural, linguistic, and socioeconomic status of each family enrolled in her class. The highly- qualified teacher has a deep understanding of child development, and with that knowledge she will provide appropriate materials and experiences to challenge the children in her care. In the chart below, we can see how teachers maintain high-quality practices.

Table **31.5.1**: Classroom Environments

Physical environment	The overall design and layout of a classroom, including the learning centers and play spaces, the age appropriate materials, and the child size furnishings
Social environment	The interactions that occur within the classroom between teachers, children, family members, center staff and administration
Temporal environment	The routines and daily schedules, the timing, sequence, and length of play time, the time spent indoors and outdoors engaged in child-directed and teacher-directed activities

Here are some considerations to incorporate quality practices into your classroom to promote responsive caregiving while supporting the physical, social, emotional and intellectual development of children:

Pin It! The Building Blocks of High Quality Early Childhood Education Programs [10]

1. Early learning standards and curricula that address the whole child, are developmentally appropriate, and are effectively implemented.
2. Assessments that consider children's academic, social-emotional, and physical progress and contribute to instructional and program planning.
3. Well-prepared teachers who provide engaging interactions and classroom environments that support learning.
4. Ongoing support for teachers, including coaching and mentoring.
5. Support for English learners and students with special needs.
6. Meaningful family engagement.
7. Sufficient learning time.
8. Small class sizes with low student-teacher ratios.
9. Program assessments that measure structural quality and classroom interactions.
10. A well-implemented state quality rating and improvement system.

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31.6: A Look at High-Quality Practices

One of the hallmarks of high-quality practices is the practice of continuously monitoring and evaluating a program's overall effectiveness for the purpose of accountability. Therefore, in addition to complying with state licensing regulations, high-quality programs may utilize noted assessment tools and resources (e.g. ECERS, CLASS, QRIS, NAEYC's Developmentally Appropriate Practice) to evaluate their center and staff. To guide high-quality practices, early childhood educators often look to the National Association for the Education of Young Children (NAEYC) to provide ethical pedagogy. NAEYC is a recognized professional organization committed to promoting quality early learning experiences for children, birth through age 8. Grounded by research and theory principles, NAEYC promotes best practices for children, families, teachers, administrators, stakeholders and policy makers. To ensure quality practices are being implemented, it is suggested that teachers follow NAEYC's Developmentally Appropriate Practice (DAP) Framework:

- Teachers encourage children to be active participants in their own learning
- Teachers set reasonable expectations based on what they know about a child's age and stage of development
- Teachers build on what children know using a variety of learning strategies, materials, meaningful experiences
- Teachers plan activities to support all aspects of development: social, emotional, physical and cognitive
- Teachers value each child's family, language, and cultural practices
- Teachers are aware of each child's interests, strengths, abilities and individual needs
- Teachers recognize play as a primary context in which young children learn
- Teachers establish warm, caring and respectful relationships with children, families and colleagues
- Teachers regularly assess the children's development and the environment, and they self-reflect on their own practices (Gordon and Browne, 2016, Beginning Essentials in early childhood education 3e)

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31.7: Measuring High-Quality in Early Care and Education Classrooms

One of the characteristics of a high-quality early childhood program is the practice of continuously monitoring children's development, along with the environmental setting and teacher interactions. By evaluating the overall performance in these key areas, teachers, administrators and families can reflect, make necessary changes and improvements to support all students and families. There are numerous tools on the market that evaluate program quality. For the purpose of this text we will focus on just a few tools that are highly recognized and most often used in California to monitor quality practices in preschool programs.

The Environment Rating Scales (ERS)

The Environment Rating Scale is a standardized assessment tool that can help caregivers, teachers, and administrators improve the quality of their program. The ERS measure process quality .

Process quality consists of the various interactions that go on in a classroom between staff and children, staff, parents, and other adults, among the children themselves, and the interactions children have with the many materials and activities in the environment, as well as those features, such as space, schedule and materials that support these interactions. Process quality is assessed primarily through observation and has been found to be more predictive of child outcomes than structural indicators such as staff to child ratio, group size, cost of care, and even type of care, for example child care center or family child care home . [11]

There are 4 Environment Rating Scales:

1. The Infant and Toddler Environmental Rating Scale (ITERS) for programs serving young learners aged 6 weeks to 30 months
2. The Early Childhood Environmental Rating Scale (ECERS) for preschool programs serving children aged 3-5 years
3. The School-Age Child Environmental Rating Scale (SACERS) for afterschool programs serving children aged 5-12 years
4. The Family Child Care Environmental Rating Scale (FCCERS) for family childcare programs serving children aged 6 weeks to 12 years.

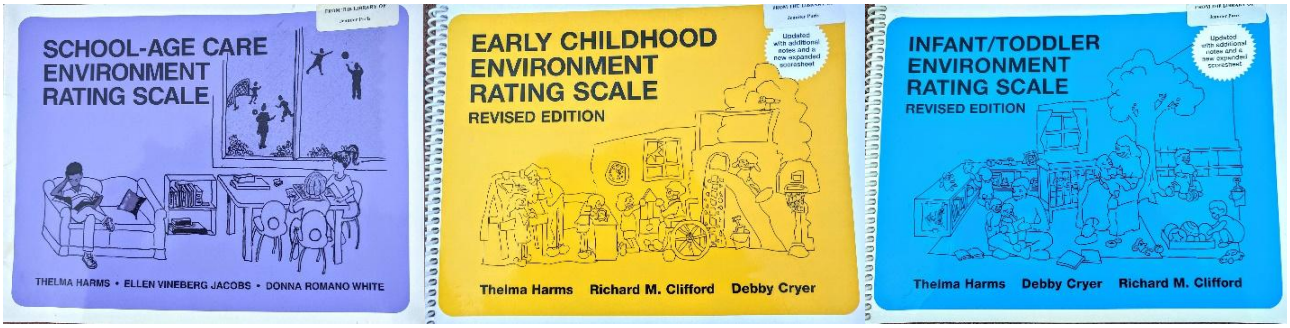


Figure **31.7.1**: Rating Scale Texts [12]

Why Use Environment Rating Scales

The scales are used in a variety of ways including for self-assessment by center staff, preparation for accreditation, and voluntary improvement efforts by licensing or other agencies. For example, in the United States:

- Several states, including California , Massachusetts, Montana, Mississippi, Kansas, Oregon, Kentucky, New Mexico, Georgia, Florida, Wisconsin, and Nebraska have also initiated quality evaluation and improvement programs using our scales. Each state is tailoring its use of the scales to its individual needs and resources.
- The state of Arkansas has trained personnel, who do assessments and provide training and technical assistance so that childcare centers and homes can increase their quality of care. Another innovative feature of the Arkansas program is that parents who select childcare facilities with an average of 4.5 or higher on our scales are eligible for two times the state childcare tax exemption. Thus, both parents and providers are being rewarded for quality improvements that benefit the children.
- The state of Colorado uses the scales in a variety of program improvement and evaluation projects. For example, Denver has a quality improvement program that uses on site consultation and training based on scale scores. Many of the centers participating in this program serve poor and minority children and their families. The state of Colorado is currently considering a tiered reimbursement system using the scales.

- North Carolina also currently uses scale scores as part of their 5-star rated license system. Centers and family childcare homes are awarded either one or two stars based on compliance with licensing standards. Programs may voluntarily apply for an additional three stars based on a set of quality measures including the licensing compliance record, teacher and director education, and the levels of process quality as measured by the appropriate environmental scale. Only the lowest level of licensing is mandatory. However, an additional fee is paid to the provider of subsidized care for each additional star earned voluntarily.
- The Oklahoma 3-star tiered license incorporates an evaluation with the scales in the second tier as a basis for quality improvement, and provides technical assistance based on scores for meeting accreditation standards. Tiered reimbursement is a part of this system.
- Tennessee is now initiating a rated license system, based on North Carolina's experience. In their system, however, program evaluation is not voluntary, but is required yearly to create a "Report Card" that must be posted with the license so childcare consumers have access to reliable information on the quality of childcare they are using for their children. Tiered reimbursement will also be tied to scores on the scale.
- All the US military services have been using the scales routinely in their center and family childcare homes for program improvement and monitoring. The military child development system was recognized by Executive Order in 1998 for its high quality.
- Our environmental rating scales are widely used by programs as they prepare for accreditation . This is due to the fact that our scales use a format with detailed levels of quality that provides a blueprint for gradual change. The content of our scales is completely supportive of the various credentialing and accreditation programs.

The ERS Tool

As suggested by ERS, in order to provide high-quality care and education experiences to all children and their families, a childcare program must provide for the three basic needs all children have:

- Protection of their health and safety
- Building positive relationships
- Opportunities for stimulation and learning from experience

Let’s take a closer look at how to use the Early Childhood Environmental Rating Scale (ECERS-3) for preschool programs serving children aged 3-5 years. The Scale consists of 35 items organized into 6 subscales: [13]

- Space and Furnishings
- Personal Care Routines
- Language and Literacy
- Learning Activities
- Interaction
- Program Structure

Within each subscale there are indicators that are arranged in a hierarchical order with basic needs at low levels and the more educational and interactional aspects at higher levels. The requirements for each indicator must be met before the next indicator is measured. If a requirement is not met, scoring then comes to a stop.

Scoring:

- 1 = inadequate
- 3 = minimal
- 5 = good
- 7 = excellent

Empirical Research

Empirical studies using the Early Childhood Environment Rating Scale – Revised (ECERS-R) tool have generally found positive associations between the quality of early childhood programs and child development.

The ECERS-R (1998) is the revised edition of the original ECERS (1980). It is currently being used in several major studies, including the Early Head Start Study (Mathematica Corporation), and Welfare, Children and Families: A Three City Study

(Columbia University, University of Chicago, and Harvard University). The original ECERS was used in the Head Start FACES study, in which over 400 classrooms are included nationwide. The preliminary results in all these studies show that the ECERS and the ECERS-R are performing very well.

Additionally, it should be noted that the ECERS and ITERS were used as the comprehensive quality measures in the National Child Care Staffing Study (Whitebook, Howes, & Phillips, 1989) and the Cost, Quality, and Child Outcomes Study (1995), the major studies of their time. The FDCRS was used in The Study of Children in Family Child Care and Relative Care (Galinsky, Howes, Kontos, & Shinn, 1994). In all of these studies, a relationship was found between higher scores on the ECERS and more positive child development outcomes in areas that are considered important for later school success. The effects of higher quality early childhood experiences have now been shown to last at least through the second grade of elementary school (Peisner-Feinberg, Burchinal, Clifford, Culkin, Howes, Kagan, Yazejian, Byler, Rustici, & Zelazo, 1999). Research is continuing to evaluate longer-lasting effects. [14]

ERS Strengths

The instrument has good test-retest reliability, high inter-rater reliability (Clifford et al., 2010), and many studies have demonstrated its predictive validity (Burchinal et al., 2008; Montes et al., 2005; Peisner-Feinberg et al., 2001). Furthermore, the results show that ECERS-R is a significant predictor of child development in two domains: physical health and well-being, and social competence.

ERS Limitation

While the ECERS-R is a useful tool to measure the quality of early childhood programs across various settings, there are some limitations. Because the Environmental Rating Scales were developed in the United States, the relevance to non-American cultural settings has been questioned (Dickinson,2006; Mathers, Singler,& Karemaker, 2012). Some have criticized that the ITERS-R scale places too much emphasis on the structural aspects of childcare (Sanders & Howes, 2013;Vermeer et al., 2008, while others are concerned that the Rating Scales fail to measure the interactions between the teacher and children and families, which is considered to be key quality factors in childcare (Bisceglia, Perlman, Schaack,& Jenkins, 2009; Helmerhorst et al., 2014).

Although the Environment Rating Scales are highly regarded, there has also been some considerable criticism. For example, a closer look at the items in the ECERS-R reveals that some items may be less relevant than others in our study's setting—poor, rural villages in Indonesia. Item 27 outlines the provision of TV, video or computers for classroom activities. Item 3 describes the provision of soft furnishings such as carpeted space and cushions for children's relaxation and comfort. While all of these provisions would be great to have, they are often unfeasible in rural, resource-constrained environments. In over 3 weeks of field observation, we rarely saw soft furnishings—sitting on the floor for children and adults alike is the norm in rural Indonesia – even when soft furnishings are available. We did encounter one center with a computer lab during piloting of the ECERS-R but this was a state-of- the-art center where not one but three international donors had channeled funding. [15]

ECERS FAQ Find:

- When was the first ECERS tool published?
- Who typically uses the ECERS tool?
- Who administers the assessment tool?
- How can teachers prepare for an assessment?
- When was the last time the ECERS tool was updated?
- How many measures are there in the ECERS?

The Classroom Assessment Scoring System (CLASS)

Research shows that all children benefit from high-quality instruction and classroom interactions, regardless of language status, race/ethnicity, or special needs (August & Shanahan, 2006; Bowman, Donovan, & Burns, 2001). When teachers provide individualized support and guidance to the children in their classrooms, they contribute to each child's social and emotional development, which has been linked to their overall physical development and academic achievement. The CLASS tool showcases various strategies that teachers can implement to promote quality interactions. It is important to note that class does not favor any curriculum model over another.

The CLASS tool differs from other measurement tools that may address the content of the physical environment, available materials, or a specific curriculum. Although the physical environment materials and curriculum are important, the CLASS tool focuses more on the context of how teachers directly interact, engage and communicate with the children in their classroom environment. CLASS measures cooperative and creative learning experiences and focuses on the teacher's role in allowing children to be active participants in their own learning. More specifically, CLASS promotes social justice and equity, and has "indicators" to assess how a teacher develops a sense of community and empathy for others. Not only must the teacher consider the tangible environmental elements, they must consciously incorporate quality interactions. Teachers must ask questions and engage in thoughtful conversations that emphasize back and forth dialogue rather than one and done responses. Teachers must extend the children's vocabulary and create opportunities where children can use their expressive language skills. Lastly, teachers must provide positive feedback to children throughout the day and allow children to make choices.

Why Use the Classroom Assessment Scoring System (CLASS)

As advocates and educators, we know that engaging interactions and well-designed environments form the foundation for optimal learning to occur. High-quality preschool programs should strive to incorporate the following:

- well-managed and well-organized classrooms with clearly defined spaces
- support systems to enhance children's social and emotional development
- a variety of instructional materials that stimulate children's thinking and curiosity
- opportunities for authentic interactions and meaningful conversations
- a balance of teacher-directed activities and child-directed activities
- enhanced language and literacy implemented throughout the day
- opportunities for movement and classroom spaces that support kinesthetic learning

Research findings from over 3,000 classrooms found that children who were in classrooms that received higher CLASS ratings showed greater gains in social skill, language, early literacy, and math development. Furthermore, after a decade of research, crucial conclusions were made that suggest using the CLASS tool can not only improve the effectiveness of an individual classroom, it can also improve the program as well. Let's look at some reasons as to why you might want to use the CLASS tool:

1. Effective teacher–child interactions are an active and crucial ingredient for children's social and academic development.
2. Children in ECE settings are not consistently exposed to effective teacher–child interactions.
3. Initial evidence suggests thresholds for effective teacher–child interactions, as measured by CLASS, in promoting children's learning and development.
4. Quality improvement efforts that focus explicitly on teacher–child interactions maximize impacts for children.
5. Carefully designed and implemented professional development support can improve the quality of teacher–child interactions

The CLASS Tool

The CLASS Tool is divided into 3 Domains: Emotional Support; Classroom Organization; and Instructional Support. Each Domain has several Dimensions (see the chart below), and each Dimension has several Indicators that provide detailed descriptors of how a teacher should interact (Note: the indicators for each dimension are not listed in the chart below.)

Table 31.7.2: CLASS Tool Domains

Emotional Support	Classroom Organization	Instructional Support
1. Positive Climate 2. Negative Climate 3. Teacher Sensitivity 4. Regard for Student Perspective	1. Behavior Management 2. Productivity 3. Instructional Learning Formats	1. Concept Development 2. Quality of Feedback 3. Language Modeling 4. 4. Literacy (optional)

Scoring

Scoring is based on a 7-point scale, with the "low range" being a score of 1 to 2, the "middle range" a score of 3 to 5, and the "high range" a score of 6 to 7. The higher the range in each dimension the better.

CLASS Strengths

The Classroom Assessment Scoring System (CLASS) tool is a systematic observation tool that can be used to measure the interactions between teachers and their children in typical classroom settings. The CLASS tool has also been used to assess classroom quality across diverse populations, including dual language learners (DLLs), children from migrant families, tribal populations, in addition to children with special needs and children with diverse cultural backgrounds (Downer et al., 2011). The CLASS tool is deemed both reliable and valid, and it provides preschool programs and individual classroom teachers with an opportunity to regularly monitor and evaluate themselves.

Formal assessments can be made by certified CLASS evaluators and the results are shared with the teacher and program with the intent of finding strategies on how to improve interactions. The tool can also be used informally. Teachers can review each domain, dimension and indicator, and then reflect on their own practices to find ways they can incorporate more intentional interactions.

CLASS Limitations

Even though every CLASS observer is formally certified, there will be small, systematic differences in their scoring. Some observers may tend to give slightly higher scores, while others may tend to be slightly more critical. Although slight differences fall within the threshold for "reliability," inaccurate results have been noted. One other limitation is that there is little emphasis on structural quality . More specifically, CLASS does not assess the physical environment or materials, and it is not designed to review program safety.

Additional Methods, Tools and Techniques to Ensure High-Quality Practices

Program Accreditation

Both the National Association for the Education of Young Children (NAEYC) (link: https://www.naeyc.org/) and the National Early Childhood Program Accreditation (NECPA) [16] (link: https://www.naeyc.org/accreditation) are nationally recognized agencies that set a standard of excellence for overall program quality. Programs that pursue accreditation must meet key criteria expectations in areas such as "the learning environment, teacher and child interactions, staff qualifications, professional development, and family engagement" (Center for America, 2017, p. 6). Both NAEYC and NECPA offer training, technical assistance, and consulting services to support early care and education programs that not only want to meet but exceed standard industry practices. Accreditation is a voluntary endeavor that requires programs to undergo a self-study as they prepare for the validation process. Programs that achieve accreditation status must be re-assessed every three years to demonstrate a continued commitment to high-quality practices.

The Quality Rating and Improvement System (QRIS)

The Quality Rating and Improvement System (QRIS) is a systemic approach to assess, improve, and communicate the level of quality in early care and school-age care programs. [17] The main purpose of the QRIS is to improve and standardize the quality of care in all facilities in the state, and to make childcare more accessible and affordable for families. In California, the QRIS is used to:

- Assess program quality comparably across provider types (publicly and privately funded, centers and family childcare homes) throughout the state
- Align program standards with early learning and practitioner standards
- Support continuous quality improvement for participating programs and their staff
- Provide families with information about program quality to assist them in making informed choices . [18]

The Caregiver Interaction Scale (CIS)

In the late 80's, Arnett released the Caregiver Interaction Scale (1989) to assess a global rating of caregiver sensitivity and responsiveness in both early care and education settings and family childcare environments. The tool focuses on caregiver / teacher emotional interactions and measures several items including sensitivity, harshness, detachment, and permissiveness. Items are rated on a 4-point scale. The scale has limitations as it captures only one aspect of process quality, and thus it is suggested that additional assessments be used to measure more structural dimensions.

NAEYC Position Statement on Importance of Environmental Assessments

The National Association for the Education of Young Children and the National Association of Early Childhood Specialists in State Departments of Education take the position that policy makers, the early childhood profession, and other stakeholders in young children's lives have a shared responsibility to:

- Construct comprehensive systems of curriculum, assessment, and program evaluation guided by sound early childhood practices, effective early learning standards and program standards, and a set of core principles and values: belief in civic and democratic values; commitment to ethical behavior on behalf of children; use of important goals as guides to action; coordinated systems; support for children as individuals and members of families, cultures, and communities; partnerships with families; respect for evidence; and shared accountability.
- Implement curriculum that is thoughtfully planned, challenging, engaging, developmentally appropriate, culturally and linguistically responsive, comprehensive, and likely to promote positive outcomes for all young children.
- Make ethical, appropriate, valid, and reliable assessment a central part of all early childhood programs. To assess young children's strengths, progress, and needs, use assessment methods that are developmentally appropriate, culturally and linguistically responsive, tied to children's daily activities, supported by Professional development, inclusive of families, and connected to specific, beneficial purposes: (1) making sound decisions about teaching and learning, (2) identifying significant concerns that may require focused intervention for individual children, and (3) helping programs improve their educational and developmental interventions.
- Regularly engage in program evaluation guided by program goals and using varied, appropriate, conceptually and technically sound evidence to determine the extent to which programs meet the expected standards of quality and to examine intended as well as unintended results.
- Provide the support, Professional development, and other resources to allow staff in early childhood programs to implement high-quality curriculum, assessment, and program evaluation practices and to connect those practices with well-defined early learning standards and program standards. [19]



Figure **31.7.2**: In the right environment children thrive [20]

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31.8: Conclusion and References

Research suggests that an enriched learning environment, along with meaningful interactions and experiences can significantly enhance a child's overall development (Center for American Progress, 2017). Not only do children deserve high-quality learning experiences, parents need the assurance of knowing that their children are in safe, healthy and nurturing environments. Unfortunately, providing high-quality early childhood education services can be particularly challenging especially for the estimated four million children who are living in poverty and considered at-risk. Thus, the achievement gap continues to be a concern and the quest for quality is ongoing. As early childhood educators, we must strive to regularly observe, collect data and assess our programs, and reflect on our teaching practices to be more proactive in our quest for quality. While a score is important to look at and improve on, it is not the end all, be all, it merely serves to guide our practices as it relates to a whole picture. Ongoing observation and documentation help to keep us informed of how to best serve the children and families in our care.

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CHAPTER OVERVIEW

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32.1: Introduction

Introduction to Documentation

A foundation for high-quality care includes using information collected through observation and documentation to assess infant and toddler development and support developmentally appropriate curriculum creation. According to NAEYC (2009), there needs to be an organized information collection system to guide classroom decisions. Caregivers' observation and the documentation created from those observations make infant and toddler learning visible (Rinaldi 2001), a concept first brought to light by the schools of Reggio Emilia, Italy. Through detailed descriptive notes, photos, recordings, and drawings, caregivers reflect on an infant or toddler's ideas, intentions, or feelings during play. When we document infant and toddler learning and collect key artifacts, we create tangible evidence to share with the infant and toddler, their families, administrators, and other stakeholders. Observing infants and toddlers at play reveals much about their process of information gathering and making sense of their world. Rinaldi (1994, 59) explains that young infants and toddlers "ask us to listen, to observe, and support them and to render them visible." Caregivers "render them visible" by recording what they see infants and toddlers do or say, then reflecting on and interpreting those observations. When infants and toddlers take action to explore different possibilities, they are testing their own hypotheses (Gopnik, Meltzoff, and Kuhl 2000; Gopnik 2009). Observing, reflecting, and creating documentation on infants' and toddlers' actions or a verbal toddler's explanations serves as a window into their curious and creative minds.[1]

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[1] Early Education and Support. Best Practices for Planning Curriculum for Young Children: The integrated nature of learning is in the public domain

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32.2: Getting Started

Where to begin?

There are different ways to begin documenting observations: there is no one-size-fits-all approach. Trying a few different strategies may be helpful, especially if you are new to the process. The structure of a program and individual preferences of caregivers can influence which documentation strategy fits best.

Whether you are doing a planned or spontaneous observation, keeping essential tools nearby supports successful implementation.

When possible, keep the following items close at hand:

- ***Something to write on***– paper, sticky notes, color-coded index cards, clipboard, notebook
- ***Something to write with*** – colored ink pens, sharpie markers
- ***Something to record with*** – photo camera, video camera, tape recorder

A caregiver must be poised to document as events occur. By carrying these items around in an apron pocket or placing them strategically around the room for quick access, a caregiver will always be within reach of useful tools for creating documentation. [1]

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[1] Office of Child Care: Child Care Technical Assistance Network, Infant/Toddler Resource Guide: Planning for Infants and Toddlers. Observation, Documentation, and Reflection

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32.3: Observation and Documentation While Participating

Being Present

One of the critical challenges for infant and toddler caregivers is observing and recording their observations while providing care. Learning how to address this challenge takes time and a sound support system. Caregivers can develop plans together for observing and recording behavior within the context of daily routines and events. Some caregivers take turns; others have systems such as cameras and note cards placed around the indoor and outdoor areas so they can take quick notes or photos in the moment. There are many ways to participate and observe at the same time. Infants and toddlers become accustomed to caregivers who take notes and photos; the process of observing and recording behavior becomes a regular part of daily routines. Documentation from caregivers who are involved daily with infants and toddlers is the most useful because the caregiver understands the infant's and toddler's context: everything from how the infant or toddler slept the night before to his current interests. Infant and toddler caregivers who observe regularly are better able to provide care and education that connects with each infant and toddler.[1]

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32.4: Types of Documentation

"We, as adults, feel the need to describe things to give words and categories to types of behaviors and dimensions of knowledge. We must be able to do this without separating the strands the infants have woven together" – Paola Cagliari

Exploring Documentation Options

There are many ways to record and document infant and toddler learning. Caregivers should utilize several methods as part of their regular documentation routines. The tools and strategies caregivers use to document force choices to be made: caregivers must take time to intentionally choose the best documentation tool for the intended communication. Infant and toddlers have the right to explain their creativity and their way of seeing the world. Caregivers must respect the different processes infants and toddlers use to build their knowledge and choose documentation with this in mind: it is crucial to find strategies to understand the processes of knowledge exploration and sustain, not suffocate, these processes (Cagliari, 2004).

The following methods are the most common for collecting and recording data:

Narrative or Open Methods

- Anecdotal notes
- Running records
- Daily log
- Home-School Journal

Closed Methods

- Checklists
- Frequency counts
- Time or event samples

Authentic Documentation

- Work samples
- Taking photos, videotaping, or audio recordings

Anecdotal Records

Anecdotal records (sometimes referred to as specimen records) describe what infants and toddlers do and say. They are brief, focused notes about one event or incident from an infant or toddler's day. The key to creating an anecdotal record is to concentrate on one specific event or activity. When creating an anecdotal record, capturing the beginning, middle, and end of a particular event is often referred to as the ABCs.

A= Antecedent: what happened before the event

B= Behavior: the specific behavior being captured

C= Consequence: what happened after the behavior

Anecdotal records offer a window of opportunity into an infant or toddler's actions, interactions, and reactions to people and events. When caregivers later analyze this collection of narratives, the anecdotal records can showcase an infant or toddler's progress over time. (University of Washington, EarlyEdU Alliance, 2020).

Running Records

The primary goal for running records is to "obtain a detailed, objective account of behavior without inference, interpretations, or evaluations" (Bentzen, 2009, p.112). Running records contain many elements of an anecdotal record but go further than one specific narrative. The details recorded in a running record contain elements resembling an ethnography. An ethnography is the in-depth study of everyday practices of people's lives: it produces a detailed description of the studied group at a particular time and location. These descriptions document the behavior or cultural event in question and the context in which it occurs (Scheib et al., 2021). These elements can also be present in a running record. The attitudes, perspectives, and motivations describe the entire

situation. Documenting the whole situation in a running record requires much more information than an anecdotal record (Swim & Douville-Watson, 2011). Good documentation includes the ability to close your eyes and “see” the images in your mind as they are described in the running record (Bentzen, 2009). This level of detail also applies to anecdotal records. To complete a running record, caregivers often schedule a day, time, and setting to observe a specific infant or toddler or group of infants and toddlers. Although not necessary, caregivers decide on the observation's purpose, reason, or focus (e.g., cognitive skills, social interactions, play patterns).[1]

In both an anecdotal record and a running record, a caregiver may create 2 separate categories in their documentation. One category contains the objective factual observation, while a separate section records the caregiver's inferences. Inferences are conclusions that an observer draws from the interpretation of objective observations. (Wittmer & Petersen, 2010)

Daily Logs

Most infant and toddler programs create daily logs for each infant and toddler. These logs usually contain information like feeding amounts and times, naps, and diaper changes. They can also include quick notes about milestone behaviors noticed, an activity the infant or toddler engaged in, or an overall synopsis of the infant or toddler’s day. Daily logs are not the place to comment on concerns or problem behaviors. Behaviors of concern are recorded on other forms of documentation, and if needed, a conversation occurs with the family at a scheduled time.

Individual Journals and Home-School Journals

The use of individual journals is great practice for creating consistent and consecutive records of events and development for an individual infant or toddler. Personal journals can be made from any materials: inexpensive composition notebooks are frequently implemented.

Caregivers should spend a few minutes at the end of every day jotting notes about the infant or toddler. These notes can replicate the daily log records or include more in-depth description. Caregivers do not need to record in every individual journal every day. A practice of spending a few minutes at the end of the day documenting in a few individual journals will make it possible for even the busiest of caregivers to create valuable documentation for assessment and curriculum development. Journals (and other forms of documentation) can also be used during family-caregiver conferences or move with the infant or toddler to the next classroom. Home-school journals contain the same elements as an individual journal, but also function as a communication tool to send information back and forth between school and home. Families are encouraged to write and respond to the caregiver's observations or notes (Swim & Douville-Watson, 2011). Home-school journals create involvement and connection for family members who might not otherwise have the opportunity to engage with the childcare center.

Checklists and Other Tools

Tools such as checklists and frequency counts quickly record information about the occurrence of specific behaviors or skills. A significant feature of these tools is that the behaviors or skills are already identified and defined. Caregivers record the observed behavior or skill by using check or tally marks or noting the date on which the skill or behavior was seen. (McAfee et al., 2016) These documentation tools are classified as closed types because they do not provide any details of the observation and should never be used exclusively for curriculum development or assessment purposes.

Documentation Panels

Documentation panels contain photos, transcripts of conversations, caregivers’ notes, and artifacts from one infant or toddler or a group of infants and toddlers (Klien, 2008). Documentation panels move beyond bulletin boards or art displays because they function as intentional communication (Tarini, 1997). They attempt to communicate the complexity of an infant or toddler's experience, as well as the learning taking place during those experiences (Helm & Beneke, 2003).

When documentation panels are displayed at infant and toddler eye level, they allow infants and toddlers the opportunity to revisit their learning in a format that is easy to visually observe and provides visual prompts for caregivers to have conversations revisiting the experience. Viewing documentation invites curiosity and confidence as infants and toddlers revisit their work and contemplate their accomplishments (Malaguzzi,1998). A documentation panel can display a variety of interactions visually: child/child, child/adult, and child/material (Klien, 2008). Artfully displaying the contents of a documentation panel serves as a visual archive of

an infant or toddler's learning for directors, parents, and community members to view easily (Helm, Beneke, & Steinheimer, 1998). Documentation panels draw parents into the classrooms and serve as a springboard for conversations (Saltz, 1997). For centers and family childcare organizations utilizing project-based curriculum, documentation panels provide the space to convey the infant and toddler's experiences and learning throughout the project (Kline, 2008). Caregivers may put a set of photographs side by side to show a sequence of actions or learning experiences. This technique sheds light on a wide range of learning (for example, an infant and toddler's understanding of routines or an infant and toddler's fine motor development). [2]

What to include on documentation panels:

- Photos of infants and toddlers demonstrating the skill you are explaining
- Narratives about the photos
- Sample of materials used
- Diagrams
- Procedures and processes for curriculum or project exploration
- Connections to assessment measures (i.e., DRDP measures)
- Children's quotes

When creating a board, think about the audience: the intended audience dictates the type of words and images used.

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[1] Peterson, G., & Elam, E. (2021). Observation and Documentation - The Key to Intentional Teaching. In *Observation and Assessment in Early Childhood Education* is licensed under CC BY.

[2] The California Infant/Toddler Curriculum Framework by the California Department of Education is used with permission

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32.5: Technology for Documentation

Tools of the Trade

Utilizing technology in established routines can make collecting evidence for observation much more efficient for busy caregivers. Photographs, video, and audio recordings can authentically capture infant and toddler explorations, investigations, play, and learning experiences in the actual moment.

With this type of documentation, caregivers can replay critical moments in an infant or toddler's day to look for specific interactions, play patterns, developmental milestones, struggles, accomplishments, and how infants and toddlers solve problems. Caregivers can also listen for language development by recording infant and toddler conversations with their peers. Technology provides opportunities for caregivers to share documentation with infants and toddlers in their classrooms.

There are numerous ways to incorporate technology into a classroom. Each center should develop its own protocol, policies, and procedures concerning the use of technology. What is permissible and not allowed should be clearly stated and known by all adults. Technology allows for easily sharing images and videos with the infant or toddler’s family, but some infants and toddlers require special protection from public transmission or display of their images. Infant and toddlers in foster care, protected custody, or part of more private families might be prohibited from how and where images are shown and shared.

Here are a few suggestions for integrating technology into observation and documentation practices:

- Use a camera, laptop, tablet, or smartphone to record observations and take pictures.
- Ask a toddler to tell a story, then type it up on a computer or use an audio recorder.
- Scan or make copies of an infant or toddler's work, such as drawings or writing, to create a visual timeline showing an infant or toddler's skill development over time.
- Use email or a communication app to post work samples.
- Take pictures of 3-dimensional work: for example, woodworking projects, block towers, sandcastles, and culinary creations.

Use a video camera to document how infants and toddlers progress with their developmental milestones in each domain. For example, look at playful interactions to track social-emotional development.

Cameras and media recorders, including smartphones and tablets, offer quick, efficient ways to document what infants and toddlers say and do. Before jumping into a technology purchase, make sure to consider the following:

- Family access to technology
- The length of audio and video clips: the longer the clip, the larger the file (large files take up precious storage space). Long audio and video clips also take more time to review and analyze later.
- Costs for:
- Buying cameras and recorders
- Equipment
- Software to download, store, play, and print files
- Film development (if not using a digital camera)
- Upkeep (e.g., batteries, repair)
- Time for other caregivers in the program to learn and train on new technology [1]

Advantages and Disadvantages of Technology for Documentation

Advantages

- Provides tangible/visible evidence that caregivers can use to track an infant or toddler's learning, growth, and development over time
- Provides enjoyment for parents seeing the work on display
- Captures authentic documentation, which is ideal for assessment
- Shows families how infants and toddlers learn through play
- Allows infants and toddlers to share insight into *how* they created the work sample and offer their perspectives as to *what* they were thinking (authentic evidence)

- Provides enjoyment to infants and toddlers seeing their work on display
- Offers empowerment to infants and toddlers by confirming their work is valued
- Allows easier observation of infants and toddlers in their natural settings

Disadvantages

- Requires large amounts of time
- Requires ample storage space
- Requires a financial investment in technology (camera, video, or audio recorder)
- Brings up concerns over confidentiality and privacy when using photos, audio, or videos

Organizing data with technology

Observation data can be conveniently stored on a computer, and each infant and toddler can have their own digital portfolio or file folder. Some caregivers use an app to organize observation evidence formally, and some schools may purchase a program that links families to daily observations. Electronic observation evidence can also be managed and stored by:

- Scanning, printing, and posting photos in the classroom
- Creating photo slideshows for family nights or as screensavers[2]

When saving recordings, include information relevant for identification (e.g., date and time, setting, names of infants, toddlers and adults, the routine or play experience during which the recording was made). This information will be important when reflecting on observations about each infant and toddler and individualizing care and curriculum. Photographs, video clips, and audio clips are excellent concrete tools for conveying to families what infants and toddlers know and do. [1]

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[1] Head Start | ECLKC under the U.S. Department of Health & Human Services, 2020. *Audio and Visual Recordings. Retrieved from Child Screening & Assessment:* is in the public domain.

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32.6: Key Concepts in Creating Documentation

Accuracy and Completeness

How important is accurate observation and documentation? If you were asked to write down one thing you did yesterday, how well would you remember the details of that moment? What if you were asked to write down a moment from one week ago today? Which of those memories would have more accurate details? Most would answer that recording a memory from yesterday would be more accurate and detailed than the record of an event from a week ago. Yet many caregivers try to document observations days or weeks after an event. Upcoming deadlines, such as a family conference or assignment due date, often prompt caregivers to sit down and create documentation from past observations. Unfortunately, waiting to record information diminishes accuracy and clarity.

Let's take this exercise further. What if you needed to write down a conversation from yesterday? From last week? From last month? Can you recall the details of what you said? Which memory would be most accurate: the one from yesterday, last week, or last month? How confident could you be of the accuracy of what was said?

Observation notes need to be accurate, objective and factual. Accurate observation notes include facts and details about the order in which they occur. Consider the following story about Gabriel (33 months), which occurs during a home visit. Here is the entire exchange:

"Gabriel and his mom are next to each other. Each one is building a tower using large plastic blocks. Gabriel builds his tower as tall as he is. He bumps into the tower with his arm. The tower falls over and knocks down the block tower that his mother built. Gabriel laughs and jumps up and down while clapping his hands. His mom laughs, claps her hands, and hugs Gabriel."

Here is what the caregiver documented:

"Gabriel builds a tower as tall as he is using large plastic blocks. He starts to laugh, jump up and down, clap his hands, and bumps into his tower, knocking it down and his mom's tower down, too."

This observation note created by the caregiver is not accurate. It contains facts out of order (laugh, jump up and down, clap his hands, and bump into his tower). It is also missing information (Gabriel and his mother are next to each other, each one is building a tower, Gabriel's mom laughs, claps her hands, and hugs Gabriel). Accuracy matters. Over time, inaccurate observation notes may lead to erroneous interpretations or misunderstandings of what an infant or toddler can do.

Here are additional tips to write accurate observation notes:

- Note the infant or toddler's name and the person making the observation.
- Note the date/time of the observation, setting (e.g., indoor/outdoor, routine, play experience), and other infants, toddlers, or adults involved.
- Use abbreviations, short phrases, symbols, drawn pictures, and other shorthand inventions to capture information quickly.
- Use phonetic spellings to capture vocalizations (e.g., buh-buh-buh-mmmm) and word attempts (e.g., "peez" for "please").
- Observe with a partner and then compare observations.[1]

Caregivers often document a behavior, but miss what happened before (antecedent) and what happened after (consequence). To capture an entire event, caregivers need to include the ABCs.

- **Antecedents** – Environmental events or stimuli that trigger a behavior
- **Behavior** – What people do, say, think or feel
- **Consequence** – Outcome of a behavior [2]

A Word About the Word Play

Educators love the word *play*, and it needs to be a more significant part of the vocabulary when teaching and planning the days with young infants and toddlers. However, play should rarely be part of documentation. What comes to mind if asked to describe an infant or toddler at play? It could include a few toddlers in the sociodramatic area pretending to cook dinner, an infant or toddler digging a hole in the sandbox, or a single infant stacking blocks or investigating a piece of fabric. If the word play were used to document each scene, information would be limited by saying “the infant played” because the details are missing. The word “play”

might fit as a generalization, but it doesn't provide curriculum development or assessment details. If a caregiver writes, "Javier was playing house," many details for later analysis are missing. However, if the caregiver writes, “Javier grasped the pot with his left hand. He clutched a wooden spoon firmly with his right hand and slowly mixed the pretend soup in a clockwise circle. Sarina walked over and handed Javier the spices and stated, ‘make the soup better,’” more visual details and information for assessment or curriculum development purposes are included. The second statement proves most effective because it describes the specific behaviors observed.

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[1] U.S Department of Health and Human Services ECLKC Child observation: The heart of individualizing responsive care for infants and toddlers is in the public domain

[2] Daffin, L. W. (2022). Module 5: Determining the ABCs of Behavior via a Functional Assessment . In *Principles of Behavior Analysis and Modification* (4th ed.) licensed under a CC BY NC SA

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32.7: Storing Documentation

To safely and securely store collected data, caregivers need an organized system in place: a system might be a filing cabinet, accordion file folder, or portfolio. There won't be a universal solution for containing documentation; each individual program requires its own unique system.

Portfolios

Caregivers often use individual portfolios to hold evidence of an infant or toddler's learning. A portfolio provides notes, photos, and work samples that demonstrate the infant or toddler's understanding of critical concepts and skills.[1] Portfolios can be created with a binder or notebook, a file or accordion-style folder, or a cardboard box. Unused pizza boxes with the infant or toddler's name printed on the end are an easy way to collect documentation for later organization. Including clear dates on documentation pieces allows for chronological organization at a later time.

A clear organization system helps track each infant and toddler's progress throughout the school year. Having dates on each piece removes concern over putting items in perfect order when pressed for time. Caregivers can go in later and organize chronologically. Portfolios allow caregivers to construct a well-rounded and authentic picture of each infant and toddler in their class. Knowing the whole infant and toddler better equips caregivers to build on each infant and toddler's interests and plan developmentally appropriate activities.

If utilizing portfolios, provide an individual file for each infant and toddler. A well-organized portfolio contains observations and artifacts of infant and toddlers' work collected at different periods throughout the year. Include documentation that highlights each developmental domain. For example:

- **Gross Motor:** Include photographs of the infant or toddler engaged in outside activities like running, jumping, climbing, riding a bike, or playing in the sandbox.
- **Fine Motor:** Use a checklist or other documentation of when the infant or toddler learns to button, zip, and tie his shoes. Include work samples of cutting, coloring, and painting.
- **Social-Emotional**: Utilize anecdotal or running records of infants and toddlers engaging in open-ended, infant and toddler-directed play.
  - Note sharing, taking turns, and cooperation with others.
  - Employ frequency count/event sampling to see in which centers infant and toddlers choose to spend their time, and tally play patterns to see if they prefer to play alone or with others.
- **Cognitive:** Chart a science experiment and take photos.
  - Use a video camera to record an infant or toddler as she stacks blocks. Record any explained process in the build.
- **Literacy and Oral language**: Save writing examples to track writing.
  - Write down quotes in an anecdotal and running record.
  - Make audiotapes of conversations during circle time.
- **Creative expression**: Videotape engagement in the dramatic play area.
  - Videotape dancing to music (this can also be excellent documentation for motor development).
  - Photograph a clay creation, painting, or block tower.

Portfolios tell the story of the whole infant or toddler. Each work sample, anecdotal note, checklist, frequency count, and photograph showcase how an infant or toddler processes information, develops relationships, and learns while playing.

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32.8: Documentation and Families

Partnerships

Documentation not only guides curriculum planning and provides evidence of an infant or toddler's learning, but it also offers an easy, effective way to engage families in participating in their child's learning plan. A note, photo, or work sample invites families to interpret the caregivers' observations and reflective planning.[1] Caregivers may combine photos with notes to create a book of an infant or toddler's learning experiences to share with the infant or toddler's family.

Families appreciate seeing their infant or toddler's progression, how they interact with others, and the types of activities their infant or toddler engages in. Families have the right to be part of the process taking place in the school (Cagliari, 2004). They are also an essential source of information during the reflection process. Families can answer questions and help interpret an infant or toddler's behaviors and interactions. They can continue to share what they have observed at home and the strategies that work for them. By including families in documentation reflection, the infant or toddler's family members will often add insights and a perspective that the caregivers may not have considered.[2] Regularly sharing observations and actively pursuing a family's input and perspectives on their infant or toddler gives caregivers fuller views of an infant or toddler as an individual. Discussing observations through documentation provides families the opportunity to work in partnership or take the lead in their infant or toddler's care and education. Sharing reflections on infant and toddler observations helps create a mutually respectful environment that promotes the infant's, toddler's and family's needs.[3]

The following example from volume 3 of the California Preschool Curriculum Framework (CDE 2013, 35) illustrates how caregivers use documentation to invite families to join them in work:

During the small-group face-drawing activity, Clayton was picking out pencils for his skin color when his mother arrived to pick him up. She knelt near the table as Connie read the name printed on the colored pencil that Clayton had selected. "This one says, sienna brown.' What do you think, Clayton?" Connie asked as she moved the tip of the pencil near his arm. "Is that your color?" Clayton smiled at his mother: "I'm sienna brown, mommy. Which one do you want to be?" A few minutes later, when Clayton was retrieving his things from his cubby, his mother confided in Connie how much she had enjoyed picking out her skin color with Clayton. She had been uncertain about how to talk with Clayton about skin color because she was of European-American background and Clayton's father was African American. Most of the family members living nearby were Caucasian. They discussed the possibility of doing an activity at the next parent meeting. All parents could explore the variety of flesh-toned colored pencils and even blend different tints of homemade play dough that they could take home to enjoy with their infant and toddlers.

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[1] Early Education and Support. Best Practices for Planning Curriculum for Young Children: The integrated nature of learning is in the public domain

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32.9: Reviewing and Reflecting on Documentation

Looking Back

"Reflection is a time to slow down, to see what can be learned if we take the time to carefully look at and listen to ourselves, and those with whom we work." (Parlakian, 2001, p. 16)

Once caregivers have observed and documented facts about each infant and toddler, they must do something with those facts. As part of ongoing infant and toddler assessment, caregivers review the facts and reflect on what they mean. When caregivers review anecdotal notes, photos, videos, or other samples, they piece together stories that portray the development of the infants and toddlers in their care. Caregivers may review multiple pieces of documentation (video recordings, notes, photographs, and so forth) to deepen their understanding of an individual infant or toddler. Observation notes might clarify why an infant or toddler is making rapid progress in one developmental domain while continuing to practice at about the same level of competency in another domain. [1] Caregivers consider what the information says about an infant or toddler's development, interests, and needs. The answers to these questions lead to individualized care and a supportive curriculum. [2]

Questions caregivers ask while reflecting on documentation might include:

- What developmental skill or activity does the infant or toddler appear to be working on?
- What strategies does the infant or toddler use to play with different toys?
- Does the infant or toddler engage with objects or people differently than he did a month ago? What has changed? What has not changed?
- Do my actions and the actions of other adults who interact with the infant or toddler affect the outcomes of the infant or toddler's experience? If so, how so?
- How does the information relate to goals for the infant or toddler? How does it relate to the family's goals?
- What other information do I need?
- What questions do I have for the infant or toddler's family? [3]

Caregivers who take time to reflect on the documentation created by their observations uncover infant or toddler's likes and dislikes, discover what makes the infant or toddler comfortable or uncomfortable, and notice how the infant or toddler approaches familiar and unfamiliar tasks and situations. This information enables caregivers to see and track trends in an infant or toddler's growth and development.

During the reflective process, interpreting the meaning of infant and toddler behaviors and interactions becomes essential. Ongoing observation and reflection on documentation offer insights into each infant and toddler, which deepen caregivers' understanding of each infant and toddler's development.

Reflecting Together

Caregivers share documentation with others to deepen understanding of infant/toddler thinking and learning. Interpreting an infant or toddler's thoughts, feelings, or ideas is vital for reflection and often most effective in partnership with co-teachers.[2] When caregivers interpret documentation, learning becomes explicit. Since documentation makes learning visible, caregivers need to work together to interpret that learning (Cagliari, 2004).

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32.10: Documentation as a Tool for Planning

Looking Forward

When caregivers observe, document, and interpret what they document, they generate ideas for supporting infants and toddlers to dive more deeply into an investigation. In doing so, the infant or toddler builds more complex, coherent concepts and master more difficult skills. Thoughtful planning begins with observing; documentation guides curriculum and provides evidence of the critical concepts and skills the young infant or toddler is building.[1]

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32.11: Documentation for Assessment

Assessment

Documentation provides evidence to support caregivers' observational assessments of infants and toddlers. Caregivers use their ongoing documentation of an infant or toddler's learning to complete assessment tools such as the DRDP. An observation, photo, or work sample, accompanied by the caregiver's interpretation, has the potential to reveal an infant or toddler's progress. By considering the integrated nature of an infant or toddler's learning, caregivers can interpret a single piece of documentation through several lenses when completing an assessment such as the DRDP.[1]

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32.12: Conclusion

Conclusion to Documentation

As caregivers gather and organize their observational data, they begin to see each infant and toddler for who they are as individuals and as members of the classroom community. With that information, intentional caregivers can set realistic expectations of what an infant or toddler can do.[1]

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[1] Peterson, G., & Elam, E. (2021). Observation and Documentation - The Key to Intentional Teaching. In *Observation and Assessment in Early Childhood Education* is licensed under CC BY.

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32.13: Reference

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CHAPTER OVERVIEW

33: Assessment

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33.2: Purpose of Assessment
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33.1: Introduction

Introduction to Assessment

Intentional caregivers engage in an ongoing process of observation, documentation, assessment, reflection, planning, and implementation of strategies to provide individualized, developmentally appropriate learning experiences. Increasing numbers of children with diverse backgrounds, including children with disabilities, participate in infant and toddler programs. Collaboration, time for reflection, planning, and communication are essential to extending the benefits of high-quality infant and toddler care to all children.[1]

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33.2: Purpose of Assessment

Why?

In early childhood settings, assessment is the process of obtaining information about various areas of children's development, learning, and progress. Ongoing assessment helps families and caregivers know how a child is progressing and helps teachers set goals and plan experiences for the program. As part of engaging in continuous quality improvement, programs assess infants' and toddlers' developmental progress and learning. [1]Caregivers must understand diverse assessment approaches, purposes, uses, benefits, and limitations.[2]

Caregivers use assessments for various purposes (Snow and Van Hemel 2008). In the Principles and Recommendations for Early Childhood Assessments (National Education Goals Panel 1998), 4 broad goals for early childhood assessment were established: [1]

· To promote learning and development of individual children

· To identify children who may have delays, disabilities, or health conditions

· To monitor trends in programs and evaluate program effectiveness

· To obtain benchmark data for accountability purposes at local, state, and national levels

Although a one-time, easily administered assessment may offer some information about children's development, it is better to use a variety of instruments and methods over time to gain a more comprehensive picture of development.[1]

Developmental Monitoring

Caregivers usually have primary responsibility for collecting information on children's learning and development. Continuous assessment provides feedback about children's progress and guides learning experiences.[1]

Caregivers should regularly add anecdotes, photos, and samples to a child's portfolio or file: this provides a basis for assessing each infant or toddler's developmental progress. These items provide evidence and information to complete formal assessments later, which produce profiles of each child's developmental progress. Assessments for developmental monitoring should occur on a regular schedule, such as every 4 or 6 months. Designing a schedule for each child or facility helps ensure this type of assessment occurs regularly. [3]

Assessment profiles give caregivers a general orientation for supporting each infant or toddler over weeks and months; they help the caregiver be sensitive to the next steps in each child's development and plan accordingly.[3]

Screening

Assessing children's development helps caregivers and family members identify children who need a referral for further assessment. The importance of gathering information from multiple sources applies to all children, but it is essential when assessing children with disabilities or other delays. Periodic assessment of children's development provides a firm basis for referral if a delay or disability is suspected.[1]

For children receiving services from other sources (such as therapy through insurance or special education through an Individual Family Services Plan or IFSP), work with family members to gather input from specialized service professionals. The specialized service professional may send reports to or talk directly with caregivers with the families' permission. Comprehensive development tests, such as the Bayley Scales of Infant and Toddler Development and the Mullen Scales of Early Learning, are often considered the gold standard in the developmental assessment of infants and young children [Walder, 2009]. These tests offer comprehensive information on a child's current developmental status, are administered directly with the child, and offer scores for the assessed areas (Albers,2006).

Briefer approaches to developmental assessments often function as screening instruments designed to identify children with developmental delays who require further assessment (Rydez,2005). Screening instruments will differ in whether they are based on direct assessment with the child or secondary reports [Fernald,et. al,2009; Macy,2012; Kvestad *et al, 2013)*

Curriculum

Curriculum planning requires caregivers to reflect on children's learning and plan strategies that foster children's progress in building knowledge and mastering skills.[3] Assessments offer insights for teachers planning appropriate learning environments and when or how to offer engaging materials to children. Assessment for curriculum planning, environment planning, and other early learning experiences is essential to ensuring high quality early learning and care programs. [1]

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33.3: Sources of Information

Where we get our Information

To fully understand a child's development, caregivers need information from many sources: teacher observations, parent reports, samples of work (or pictures of samples), and direct assessment (Snow and Van Hemel 2008). Gathering information from multiple sources informs a balanced view, reduces the chances of underestimating children's abilities, and provides the caregiver a basis for building upon a child's strengths.

Programs should clearly articulate how assessment methods are used to inform decision-making, planning, and program evaluation. Assessment policies and practices should ensure confidentiality and protect the privacy of children and families. Well-understood policies and procedures should also be in place for collaborating with specialized service providers, such as early interventionists. When considering information sources for assessment purposes, employing various methods and tools allows caregivers to regularly and consistently understand and document what children do, both individually and in groups.

Assessment Based on Observation and Documentation

Screening, observations, and frequent documentation are essential methods teachers use for understanding individual children and groups of children. Observations teachers make while interacting with infants inform the assessment process.[1] Documentation provides evidence to support caregivers' assessments of infants and toddlers, and tools such as the DRDP allow caregivers to use ongoing documentation of an infant or toddler's learning on assessments. An observation, photo, or work sample, accompanied by the caregiver's interpretation, can reveal evidence of an infant or toddler's progress. Considering the integrated nature of infant/toddler learning, caregivers can interpret a single piece of documentation through several lenses when completing an assessment instrument such as the DRDP (CDE 2016). For instance, a teacher may note that when she brings out a clean diaper during a diaper change, a child stops moving and points at the diaper until the teacher says the word "diaper," and then the child smiles and makes the sound "di." This observation could be used as the teacher determines whether the child is at the "Acting with Purpose" developmental level of the DRDP's "Communication and Language" measures.[2]

Authentic Assessment

Engaging in authentic assessment means choosing assessment tools that that reflect the everyday, real-life experiences of the young children involved (McAfee, Leong, and Bedrova 2004). Authentic assessment reveals the knowledge and skills of young children as they engage naturally with learning in the program and home settings. For dual language learners who typically use their home language to communicate, authentic assessment must include assessment in their home language and English (State Advisory Council on Early Learning and Care 2013, Paper 5 [Assessment]). When assessment is an ongoing practice, teachers and program administrators can make effective instructional adaptations that build on children's prior knowledge and support new learning for each child.[2]

When using observation as an assessment method, teachers should:

- Observe the behavior of the infants and toddlers throughout the entire day.
- Observe children when they are alone, with peers, family members, and teachers.
- Incorporate observation and assessment processes into daily routines and activities.
- Review assessments tool regularly and keep developmental themes in mind while observing the behavior.
- Hold conversations with toddlers about their experiences and their work. Listen to their thoughts and ideas and ask questions that encourage older toddlers to describe their thinking and problem-solving.
- Study the older toddler's work (projects, drawings, building, etc.) as part of gathering information about their development.
- Find a quiet place and set aside time to reflect on documentation and assessment information.
- Complete periodic assessments of each child using an identified assessment tool/process, and continue the process of observing, documenting, and reflecting.
- Track each child's developmental progress over time.
- Summarize assessment information on individual children in a form that can be easily used for curriculum planning.
- Include family members in the ongoing assessment process.

Collaborating with Families on the Assessment Process

Family members should participate in documenting their children's learning and development; they can review the assessment records with teachers and program leaders and plan learning experiences based on the assessment information. Family members need to be fully informed and aware of the different assessments done in the infant and toddler care setting. Seek information from family members about the child's behavior at home and other places outside the infant and toddler program. Collaborate with family members to clarify differences in observation or interpretation. If caregivers do not speak the child's home language, enlist the support of interpreters or translators who speak the family's language. When meeting with the family, provide concrete examples of the behavior or activity assessed to support understanding and clarity.[1]

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33.4: Types of Commonly Used Assessments

Caregivers should evaluate and select reliable, valid, and universally designed child observational assessments. Assessments must be developmentally appropriate, culturally and linguistically sensitive, and fully cover the diverse learning needs of children with disabilities or other delays. At the infant/toddler level, assessments should be broad in scope, including children's knowledge, skills, behaviors, temperaments, and health.[1]

Ages and Stages

The Ages and Stages Questionnaire 3 ed. (ASQ-3) is a widely used screening tool for infants and young children's development that assesses development in 5 domains: Communication, Gross Motor, Fine Motor, Problem Solving, and Personal Social [Squire et al., 2009]. Developmental areas covered by this screening tool include self-regulation, compliance, communication, adaptive functioning, autonomy, affect, and interaction with people. The ASQ system is initially a parent-completed questionnaire, but it may also be completed by a professional interacting with the child (Kvestad *et al, 2013)*. The ASQ-3 provides an opportunity to address parental concerns, educate parents on child development, and empower parents to advocate for their children. It identifies children at risk of having possible developmental delays, detects a child's strengths and needs, and can be used to predict future school-related challenges.[2]

Parental reports provide a risk of inaccuracy or overstatements regarding the child's development (Fernald et al., 2009). However, the ASQ system is developed and based on the conviction that families can provide information for proper assessments of their children. For instance, a study comparing the ASQ completion of low and middle-income parents in the US, followed by subsequent assessment by the Bayley Scales of Infant and Toddler Development, shows no differences in the accuracy of scoring in the 2 groups of parents. These results support the idea that parental completion of child development questionnaires gives reliable data in high-risk groups. [Squires et al., 1998; Kvestad *et al, 2013)*].

Developmental Profile (DRDP)

The DRDP for infants and toddlers consists of 29 items divided into 5 domains, covering approaches to learning/self-regulation, socio-emotional development, language and literacy, cognition, and physical development. The DRDP helps early educators observe, document, and reflect on the developmental progress of individual children. The Desired Results assessment system documents the progress made by children and families in reaching desired results and provides information to help practitioners improve childcare and development services.[1] As teachers gain familiarity with the DRDP, they find that they can use their daily observations to complete it without taking time out of their day for special attention to the forms.[3]

Environment Rating Scale (ERS)

The ERS assesses the quality of the learning environment. Teachers use the ERS to assess the quality of the interactions, space, schedule, and materials they provide to their group of children. The ERS is completed, summarized, analyzed, and considered in program improvement plans once a year. Teachers combine information gained from the ERS with other sources for long-term planning and continuous program improvement.[3]The ERS has a long history of use worldwide: the first use of the original ERS in the USA dates back more than 30 years ago (Harms and Clifford 1983). The Environment Rating Scales (ERS) were developed to evaluate process quality in early childcare settings. Process quality refers to children's experiences within the childcare environment, including their interactions with others, materials, and activities (Phillipsen et al., 1997). It is assessed primarily through observation and is more predictive of child outcomes than structural indicators of quality (such as staff-to-child ratio, group size, cost of care, and type of care) (Whitebook et al. 1989).[4]

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33.5: Assessment of Dual Language Learners

Language and Assessment

Because dual language learners develop their knowledge about the world in 2 languages, their skills and abilities are distributed across both languages. As such, assessments conducted in only 1 language will yield incomplete information and prohibit caregivers from addressing areas where growth should be supported or built upon. The recent NASEM report confirms this in its conclusion: "During the first 5 years of life, infants, toddlers, and preschoolers require developmental screening, observation, and ongoing assessment in both languages to support planning for individualized interactions and activities that will support their optimal development." (NASEM 2017, 423). Identifying the child's language status is crucial because it forms the basis for developing appropriate early learning and care.[1]

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33.6: Supporting Assessment

Assessment in the Classroom

Infant and toddler programs that support intentional teaching and care allocate time in teachers' schedules for individual and team reflection and planning.[1] Programs supporting assessment provide adequate time and space for family members and caregivers to reflect individually, as well as consult with co-teachers regarding observation and assessment information. This time and space to reflect needs to be separated physically and emotionally from caring for the children.[2]

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33.7: Concerns with Assessment

Look out for....

Informed assessment systems contribute to the overall quality of an infant and toddler program by providing teachers and families with valuable information about what children know and can do. However, when assessment systems do not consider developmental appropriateness or are not sensitive to the diverse learning needs of individuals or groups of children, there is a risk of making children uncomfortable or generating insufficient, inaccurate information. One of the most critical assumptions underlying the effective assessment of young children is that their development is continuing and complex.[1]

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33.8: Conclusion

Conclusion to Assessment

Screening, observation, and documentation are all assessment processes for gathering, interpreting, applying, and sharing information built upon children's previous experiences. They are essential tools for understanding children individually and in groups and for planning environments, curriculum, and other learning experiences. [1]With appropriate support, teachers can grow professionally through a continuous learning process and explore ways to respond to young children's learning interests and needs. [2]

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CHAPTER OVERVIEW

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34.1: Introduction

Introduction to Curriculum

At the heart of early childhood curriculum is the child who depends on adults to support and nurture exploration and learning. An appropriate curriculum for infants and toddlers provides guidance and strategies for supporting development and learning, engaging in responsive interactions to build relationships, and partnering with families. It is essential to consider what learning looks like in the minds of infants and toddlers. Children from birth to 5 do not build or acquire their knowledge and skills in domain-specific categories one domain at a time. They relate to each learning experience as a whole experience. They naturally cross the boundaries of domains and simultaneously build concepts related to social-emotional development, science, mathematics, language, social sciences, the arts, physical development, and health.[1]

A good curriculum leaves decisions about what this looks like to the caregiver implementing the curriculum. When it comes to curriculum, caregivers must:

- Have room to discover an infant or toddler's "individual curriculum" (e.g., the child's interests, motivations, and needs).
- Choose and offer experiences that match a child's (or small group of children's) interests and developmental level
- Use everything that happens as a learning opportunity, both planned/intentional and spontaneous.
- Create environments that reflect children and families served in the program.

A responsive, relationship-based curriculum supports child-initiated, child-pursued opportunities to individualize within the chosen or created curriculum

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[1] Early Education and Support Division, California Department of Education. (2016). *BEST PRACTICES FOR PLANNING CURRICULUM FOR YOUNG CHILDREN. The Integrated Nature of Learning*

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34.2: Foundational Concepts of Infant and Toddler Curriculum

What's most important?

Before exploring curriculum development, it is essential to understand the thinking around infants and toddlers. Most caregivers don't argue the fundamental rights of children, and the United Nations Convention on the rights of children created 54 articles around these rights. 3 articles below from the children's version of the document should be taken especially to heart by caregivers who work with children (UNICEF, 2009).

Article 3. Best interests of the child

When adults make decisions, they should think about how their decisions will affect children. All adults should do what is best for children. Governments should make sure children are protected and looked after by their parents or other people when this is needed. Governments should make sure that people and places responsible for looking after children are doing a good job.

Article 29. Aims of education

Children's education should help them fully develop their personalities, talents and abilities. It should teach them to understand their own rights, and to respect other people's rights, cultures and differences. It should help them to live peacefully and protect the environment.

Article 31. Rest, play, culture, arts

Every child has the right to rest, relax, play and to take part in cultural and creative activities.

As caregivers of young children, our beliefs about children affect we treat them, the care we provide, and the curriculum we chose or create. Does your belief about the capacity of infants and toddlers agree with Jerome Bruner when he says, "the child is not merely ignorant or an empty vessel, but somebody able to reason, to make sense, both on her own and through discourse with others" (Bruner, 1996)? Or do you have another structural belief which will guide you as you create curriculum?

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34.2.1: Relationships and Curriculum

Start with Relationships

The everyday interactions with infants and toddlers form the foundation for quality care. It is only within the context of secure, nurturing relationships with parents, family members, and other caring adults that healthy infant and toddler development and learning happen. Infants are biologically programmed to expect those in their world to care for them, protect them, and do so in a loving way. (Shonkoff & Phillips, 2000) Individualizing care and curriculum involves tailoring to each child's needs. No 2 infants or toddlers are the same; each child is unique, making a "one size" curriculum, experience, or interaction a poor fit for all infants and toddlers. Creating a custom fit curriculum requires observation, engagement with families, and knowledge of child development. This knowledge guides how caregivers interact and respond. Caregivers read each child's cues and react in nurturing ways. They also consider individual characteristics, such as the child's age, abilities, needs, and interests, as well as temperament, home language, and family culture.

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34.2.2: Temperament and Curriculum

Individual Differences

Understanding the unique differences of each infant and toddler helps caregivers build relationships with infants and toddlers and interact in ways that meet each child's needs. One of these individual differences is temperament. Temperament refers to behavioral "styles" that children are born with and describes how they approach and react to the world.[1] Temperament is crucial because it affects how infants and toddlers interpret and respond to the world around them. When planning and implementing curriculum for individual or groups of children, caregivers must consider the temperament of the infants and toddlers. When planning something messy or loud where a slow-to-warm child is present, how will the caregiver provide caring and respectful support structures that allow him to engage in the curriculum without feeling overwhelmed?



Figure **34.2.2.1**: Primary caregiving can help support sensory exploration for children with more reluctant temperaments. ([2])

In Figure **34.2.2.1** above, the relationship between the child and primary caregiver provides comfort so the infant with a more reluctant temperament can still engage with the experience.

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34.2.3: Play and Curriculum

The Importance of Play

Scientists who study how infants think and feel often describe them as small scientists: like their adult counterparts, infants constantly experiment and investigate to figure things out. ((Gopnik, Kuhl, & Meltzoff, The scientist in the crib: Minds, brains, and how children learn, 1999)) Infants spend their days actively gathering and organizing information about what objects and people are like, and they do much of this discovery through play. According to Gopnik, Meltzoff, and Kuhl (2000), infants actively build knowledge as they interact with the world around them. They try a variety of ways to act on objects and materials and, in doing so, experiment with and build concepts and ideas.

In the early twentieth century, scientists and theorists—such as Jean Piaget and Lev Vygotsky—developed widely studied theories to explain how infants acquire knowledge. Their theories are commonly encountered in many other early childhood areas of study. [1]

In most of these theories, infants actively construct concepts and build skills by interacting with objects and people, often occurring in the context of play. The body of research on the young infant's developing mind adds to our understanding of teaching and planning an infant's curriculum. Studies show infants are highly motivated to explore new materials and take on new challenges (Bowman, Donovan, and Burns 2000.) Moments often discounted as "just play" or as "fiddling around" are moments in which infants are actively learning (Hirsh-Pasek et al. 2009; Jones and Reynolds 2011; Zigler, Singer, and Bishop-Josef 2004; Elkind 2007.) While engaged in play, infants explore the physical properties of materials and the possibilities for action, transformation, or representation.[2] Capturing these moments of play through documentation and linking them to areas of development help other stakeholders understand the importance of play in development and as an integral part of curriculum.[3]

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34.2.4: Routines and Curriculum

The Importance of Routines

Caregiving routines (arrival and departure, feeding, meals and snacks, diapering and toileting, dressing, and napping) provide a framework for the infant and toddler day. A significant amount of individualization for curriculum occurs during routine care. Routines offer caregivers many opportunities to observe and understand each child's ways and preferences and support development. During routine care, infants and toddlers enjoy adults' undivided attention as the focus is on meeting children's needs and getting to know them. By taking advantage of these opportunities to build relationships with each infant and toddler, caregivers promote attachment and trust with the infants or toddlers in their care. These developmental milestones for trust and relationships are critical for children's sense of security and willingness to explore people and objects in their environment: a high level of trust is necessary for infants and toddlers to fully engage in the offered curriculum.[1]

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34.2.5: Curriculum and the Environment

Environmental Impact

The environment holds high priority when it comes to curriculum for infants and toddlers. In fact, the environment is such an important part of curriculum that Loris Malaguzzi, founder of the municipal preschools in Reggio Emilia, Italy, defined the environment as the third teacher. (BIERMEIER, 2015) Think about how materials are arranged within each area of a space: displaying materials at infants' and toddlers' levels makes them easily accessible, supports independent exploration, and allows the caregiver to follow the children's lead as they create their own curriculum. It is helpful to provide a few types of the same materials so that several children can play without taking turns, minimizing conflict. However, it is essential to avoid offering too many materials since a cluttered room can overwhelm children and create classroom management concerns as well. Regularly rotating materials creates a balance of familiar and new materials, which helps infants and toddlers maintain interest and enjoy age appropriate challenges. (Infant/Toddler Care Providers | Early Childhood Training and Technical Assistance System (hhs.gov))

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34.2.6: Curriculum as Experiences

Experiences or Activities?

Research shows that "much of how infants and toddlers learn best comes not from specific adult-directed lessons but from [adults] knowing how to maximize opportunities for each child to use natural learning inclinations." (Lally, 2000) These opportunities or experiences can be set up in a planned, purposeful way or occur in the moment as adults follow a child's lead and take advantage of teachable moments. These teachable moments will often happen during routine care, which is why routines form the core of many curricula in infant and toddler programs.

Experiences for infants and toddlers share some common elements regardless of the type of care:

- They focus on the way children relate to materials, adults, and each other.
- They are based on each child's developmental level and interests.
- They support children's development and learning in all domains.

Caregivers will typically organize experiences around:

- Stories and books
- Toys and gross motor equipment
- Creative arts such as music, movement, and art materials
- Imitation and pretending
- Sensory exploration (e.g., sand, water, tasting and preparing food)
- Outdoor play and exploration

Caregivers may offer one-on-one experiences for individual children; they may also provide experiences for a small group of children, offering individualized attention and support during the group experience.

The key to successful experiences, whether planned or spontaneous, one-on-one or with a small group, is having a deep understanding and knowledge of each child and family. This knowledge makes experiences meaningful and relevant to the child's development and learning, and results from ongoing observations, assessment, and engaging with families.[1]

Planning and carrying out appropriate experiences for infants and toddlers can sometimes be challenging. Even when experiences are based on a child's interests, abilities, and needs, the child may not respond as expected. Caregivers may be unsure of what to do when this happens. Planning experiences means "planning for possibilities." This idea is central to balancing planning with the flexibility necessary for successful infant and toddler care. Plans are helpful because they enable caregivers to stay organized and focused. However, infants and toddlers are unpredictable; caregivers often must modify an experience or abandon it and try it at a different time or on another day. It is more important to follow a child's lead than to stick to the planned experience. Additionally, a child's family may not be comfortable with an offered experience because of their beliefs, values, or life situations. Messy experiences, such as painting and playing with water or sand, and going outside (especially if it is windy or cold) are examples of experiences to which families may object.[1] Including families in the planning process and making them aware of the center's philosophy can be helpful in avoiding potential conflict.

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34.3: Curriculum for One- Individualizing the Curriculum

Individualizing the Curriculum

Planned interactions, routines, daily schedules, experiences, and environments that take into consideration families' culture, language, and goals for their children "appropriately support the unfolding development of each child at their unique pace."[1]

This unfolding development is a necessary part of a child's journey toward school readiness. Caregivers observe, document, reflect, interpret, plan, implement, and evaluate to individualize care that is responsive to each infant, toddler, and family. The process is illustrated as a cycle in the figure below.

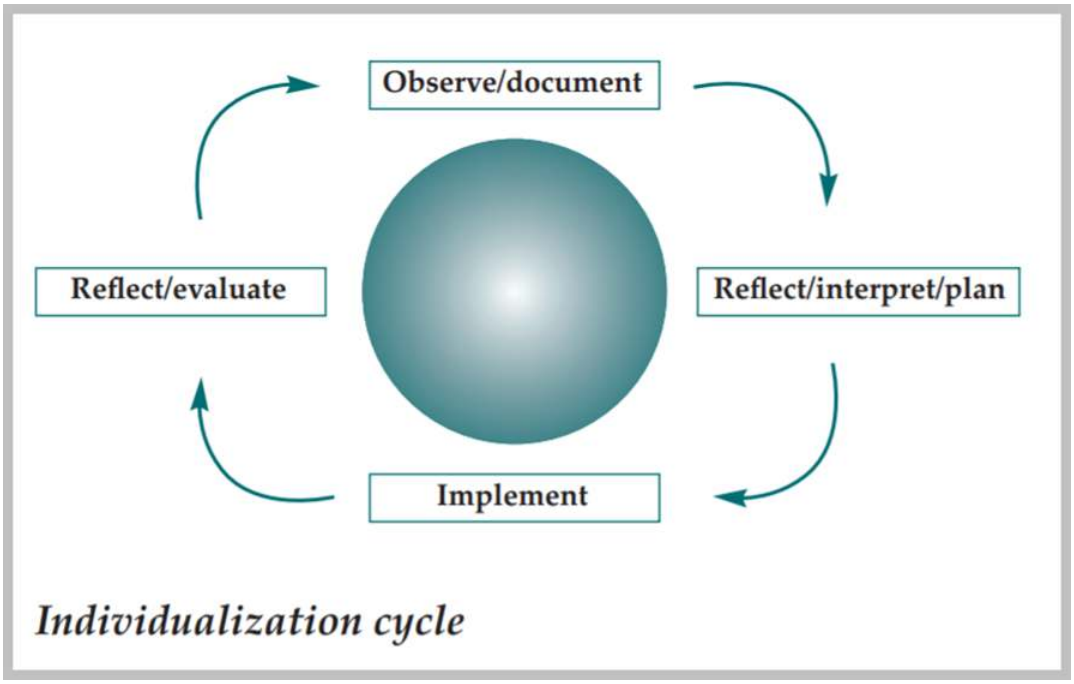


Figure **34.3.1**: The Curricilculum Individulaization Cycle. ([1])

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