EVIDENCE-BASED MASSAGE THERAPY



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Evidence-Based Massage Therapy

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CHAPTER OVERVIEW

1: Setting the Groundwork for Evidence-Based Massage



Evidence-based massage therapy is an approach based on three principles (best available evidence, clinical expertise and patient values).

Being a recognized treatment option for people in pain means the profession of massage therapy is moving into new formal settings. As this shift occurs, it is important that therapists adhere to evidence-based medicine and use critical thinking and research literacy skills. In the early 1990's David Sackett and Gordon Guyatt introduced evidence-based medicine (EBM) as the conscientious use of current best evidence in making decisions about patient care. It is a process intended to reduce the risk of harm and improve decision-making by emphasizing the use of evidence from well-designed research. This includes the use of logical reasoning and the gathering of ideas and knowledge from many overlapping disciplines.

- **Patient Values –** The needs and requests of your patient will influence your decision making. Therapists need to be able to hear the patient's values and create a working relationship with the patient. Shared-decision making will include developing a plan of care based on individualized goals and needs of the patient.
- **Research Evidence –** Research helps guide clinical decisions and to warn of known harm, the higher the quality of the evidence the more confident we can be as a therapist making an informed decision.
- **Clinical Expertise –** Clinical experience is used to create individualized treatment plans as patient presentation will vary on a case by case basis. Making sound decisions requires the clinician to assess the patient's personal, social, and clinical context and integrate this information with the values and preferences of the informed patient. The therapist will use his/her clinical expertise and allow the evidence to guide this process, rather than dictate it.

Key Takeaways

Evidence-based medicine integrates research evidence with clinical expertise and patient values to achieve the best possible patient management, while minimizing the potential for harm. The widespread adoption of evidence-based practice has led to improved healthcare and a cohesive approach essential for improving patient outcomes.

1.1: Critical Thinking and Evaluating Sources
1.2: New Page
1.3: Systematic Reviews of Massage Therapy

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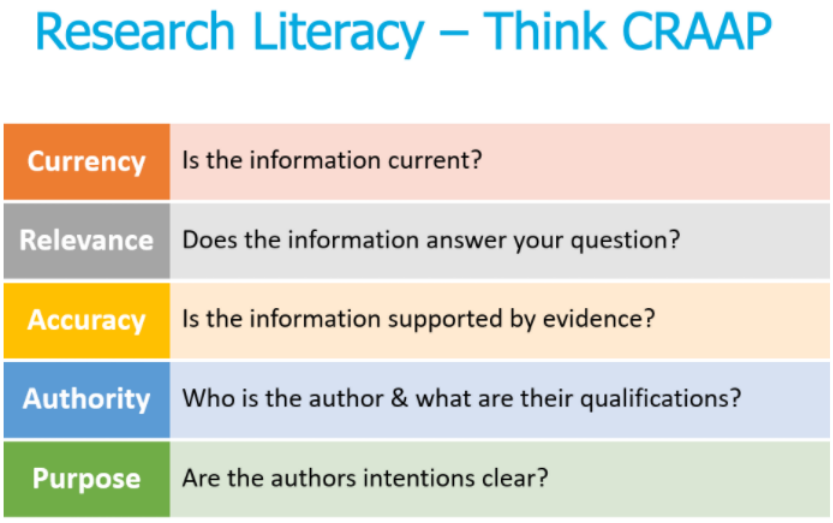
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1.1: Critical Thinking and Evaluating Sources

Bias has the potential to influence beliefs and decision-making. To help mitigate flaws in thinking there are several resources or methods you can use to process information and evaluate resources. In this text we use the CRAAP method of evaluating information, but there are several other tools that are just as useful.

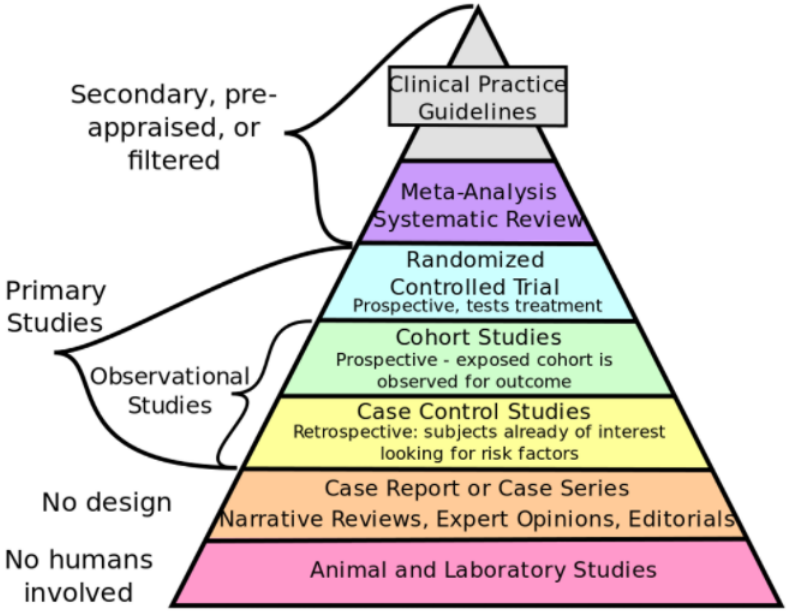
The CRAAP Method of Evaluating Sources

In the age of 'new media' and 'fake news' it is important to be able to critically evaluate information. If you are unsure of the validity of what you are reading, **The CRAAP Method** is a simple acronym that will simplify the way you evaluate information.



The CRAAP test is a test to check the reliability of sources across academic disciplines.

The Hierarchy of Scientific Evidence



Evaluating research involves ranking studies based on their methods. Meta-Analysis and systematic reviews sit at the top of the pyramid, followed by randomized control trials and observational studies. Expert opinion and anecdotal experience are ranked at the bottom.

Key Takeaways

The hierarchy of evidence pyramid provides an overview of diverse types and levels of scientific research. Systematic reviews sit at the top of the pyramid, followed by randomized control trials and observational studies. Expert opinion and anecdotal experience are ranked at the bottom. If you are unsure of the validity of what you are reading, **The CRAAP Method** is a simple acronym that will simplify the way you evaluate information.

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1.2: New Page

Informed consent ensures clients understand a therapeutic approach fully before giving consent to begin. This also includes a discussion about the possible risks and benefits of receiving treatment, for the adult population adverse effects are often mild and transitory. Most common intervention-related adverse effects include increased pain and discomfort, aching muscles, headache, and tenderness (Skelly et al., 2020). Informed consent should involve a two-way flow of information and should include a clearly defined treatment plan. Shared decision-making will play a role in establishing a treatment goal, in doing so the patient and the clinician can work together to establish a clear consensus regarding the intended goals of treatment (Hoffman et al., 2014; Hoffman et al., 2020).

Effective communication is fundamental for informed consent and shared decision-making. In order to provide understandable and accessible information clinicians should avoid the use of medical jargon and embrace the use of educational resources and visual aids to enhance patient understanding (Muscat et al., 2020; Wittink & Oosterhaven, 2018). During the informed consent process therapists should include a discussion with the person about:

- the nature of the treatment;
- the expected benefits;
- risks and side effects;
- alternative courses of action;
- likely consequences of not having treatment; and
- their right to ask questions about the information provided and that assessment or treatment will be stopped or modified at any time at their request.

Key Takeaways

Informed consent and shared-decision making will include a discussion about the possible risks and benefits of receiving treatment. The therapist and patient will work together to develop a plan of care based on the individualized goals and needs of the patient.

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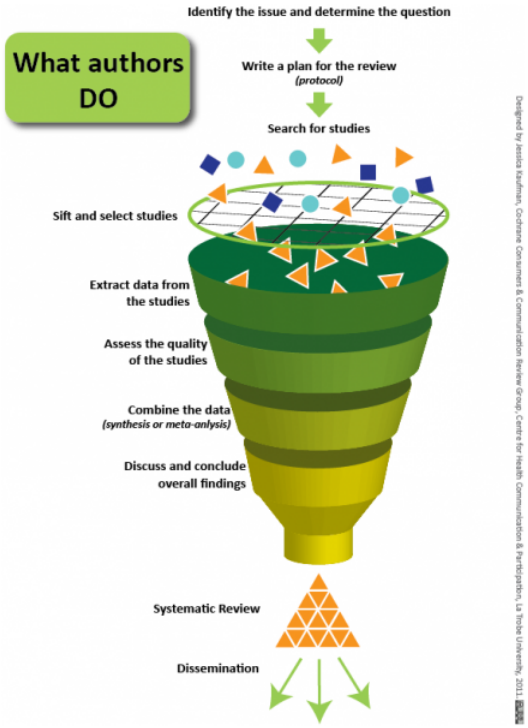
1.3: Systematic Reviews of Massage Therapy

Massage Therapy – The Science is Emerging

Systematic reviews are used as part of an evidence-based model of care to help identify and evaluate existing research for a specific topic. Conducting a systematic review is a complex process. This specific type of research requires multiple research experts each with their own specialized background to collaborate and analyze all the existing research available for one specific topic.

First researchers will pick a topic – for example we could say, 'the use of massage therapy for low back pain'. Then the researchers comb through research databases to find studies from around the world carried out on that specific topic. After the search is completed the articles are evaluated based on a predefined inclusion criteria. Then articles are separated by those that meet the pre-defined criteria and those that do not meet the predefined criteria.

The research articles that meet the pre-defined criteria are then individually screened for potential biases. There are several ways that biases sneak into research, for massage therapy one of the primary sources of bias is due to therapist and patient blinding (this is hard to control for). In addition to evaluating studies for potential biases, researchers are looking for potential harms, and treatment effect size. Essentially, does this treatment work, and how does it compare to a placebo/sham intervention.



Healthcare Triage: Systematic Review and Evidence-based Medicine



A List of Systematic Reviews of Massage Therapy

Twenty years ago, there was a limited number of systematic reviews of massage therapy, since 2005 there has been a steady increase in the quality and number of systematic reviews of massage therapy.

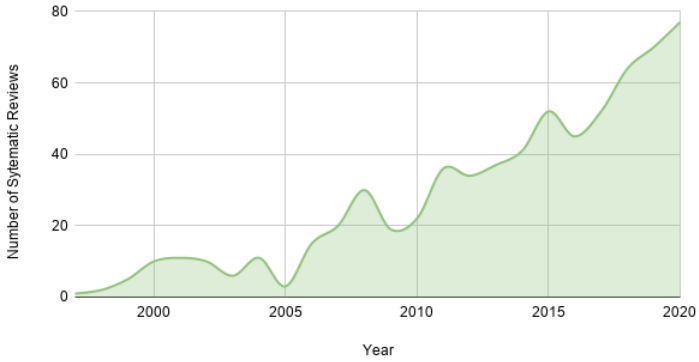


Figure 1.3.1 Systematic Reviews of Massage THerapy (1997-2020)
Graphical representation of the steady increase in number of systematic reviews.

Improvement in Quality & Quantity

Based on these systematic reviews massage therapy has a growing body of evidence supporting its effectiveness in reducing pain and improving health-related quality of life in a variety of health conditions and rehabilitation, including but not limited to:

- Chronic Pain (Busse et al., 2017; Crawford et al., 2016; Skelly et al., 2020)
- Low Back Pain (Chou et al., 2017; Qaseem et al., 2017; Brasure et al., 2019; Skelly et al., 2020)
- Neck Pain (Chou et al., 2018; Côté et al., 2016; Skelly et al., 2020)
- Headaches and Migraines (Busse et al., 2017; Côté et al., 2019)
- Temporomandibular Disorder (Martins et al., 2016; Randhawa et al., 2016)
- Shoulder Pain (Hawk et al., 2017; Steuri, et al., 2017; Pieters et al., 2020)
- Carpal Tunnel Syndrome (Huisstede et al., 2018)
- Lateral Epicondylitis (Sutton et al., 2016)
- Arthritis (Nelson et al., 2017)
- Hip Osteoarthritis (Cibulka et al., 2017; Skelly et al., 2018)
- Knee Osteoarthritis (Busse et al., 2017; Newberry et al., 2017)
- Plantar Fasciitis (Fraser et al., 2018)
- Lateral Ankle Sprain and Chronic Ankle Instability (Martin et al., 2021; Powden et al., 2017)
- Surgical Pain Population (Boitor et al., 2017; Boyd et al., 2016; Chou et al., 2020; Kukimoto et al., 2017)
- Symptom Burden of Critically Ill Adults (Thrane et al., 2019)
- Cancer-Related Fatigue (Hilfiker et al., 2018)
- Cancer-Related Pain (Boyd et al., 2016; Calcagni et al., 2019)
- Fibromyalgia (Busse et al., 2017; Skelly et al., 2020; Yuan et al., 2015)
- Delayed Onset Muscle Soreness (Davis et al., 2020; Dupuy et al., 2018; Guo et al., 2017)
- Postpartum Maternal Sleep (Owais et al., 2018)
- Pain Management in Labour (Smith et al., 2018)
- Antenatal Anxiety and Depression (Hall et al., 2020; Smith et al., 2019)
- Hypertrophic Scarring (Ault et al., 2018)
- Palliative Care (Armstrong et al., 2019; Zeng et al., 2018)
- Reducing Symptoms of Depression in People with Dementia (Watt et al., 2021)
- Dementia (behavioral & psychological symptoms) (Leng et al., 2020; Margenfeld et al., 2019; Watt et al., 2019)
- Parkinson's Disease (motor and non-motor symptoms) (Angelopoulou et al., 2020)

Key Takeaways

Massage therapy is a clinically-oriented healthcare option, that is increasingly being used alongside standard medical care to help manage a number of symptoms. This chapter highlights systematic reviews and meta-analyses that support the use of massage therapy.

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CHAPTER OVERVIEW

2: Theories and Treatment Strategies



A wall painting found in the tomb of the highest official after the Pharaoh - Ankhmahor. This wall painting is dated back to 2330 B.C

For thousands of years, people with illnesses and disabilities were treated with various methods of massage, the history of which varies from country to country. Ancient Babylonia, Assyria, China, India, Greece and Rome all practiced some form of massage. One of the oldest accounts is in Egypt in the tomb of Akmanthor, in this tomb there is a painting dating back to 2330 BC that depicts two men having work done on their feet and hands.

Another historical account is in Homer's Iliad and the Odyssey where "massage with oils and aromatic substances is mentioned as a means to relax the tired limbs of warriors and a way to help the treatment of wounds". The use of massage for therapeutic purposes originated in a pre-scientific era and some of the reasoning once used to explain the effects do not make sense in the light of what we know today. As such we should aim to update some of our explanations and align it with current medical practice.

Before diving into effects and outcome it is important to establish clearly defined terminology. In this book massage and massage therapy have two different definitions

- **Massage** is a patterned and purposeful soft-tissue manipulation accomplished by use of digits, hands, forearms, elbows, knees and/or feet, with or without the use of emollients, liniments, heat and cold, hand-held tools or other external apparatus, for the intent of therapeutic change.
- **Massage therapy** consists of the application of massage and non-hands-on components, including health promotion and education messages, for self-care and health maintenance; therapy, as well as outcomes, can be influenced by: therapeutic relationships and communication; the therapist's education, skill level, and experience; and the therapeutic setting.

These definitions were established by a group of international therapists and researchers (Kennedy et al., 2016). Here we see the contemporary practice of massage therapy defined as a multi-modal approach that includes, but is not limited to classical massage, Swedish massage, myofascial mobilization, instrument-assisted soft tissue mobilization (IASTM), cupping, joint mobilization, strain-counterstrain, neuromuscular therapy, muscle energy techniques, neural mobilizations, manual lymphatic drainage, and education. Each treatment approach in massage therapy may vary and despite being called different names, most of these techniques have similar effects and outcomes outlined in the chart below.

Table 2.0.1 Overview of Massage Therapy Techniques

Commonly Used Techniques	Swedish massage (effleurage, petrissage, percussion, vibration, friction), Joint mobilization (grades 1-4) Neural mobilization (nerve gliding, nerve flossing, sliders and tensioners) Neuromuscular therapy and muscle energy techniques Strain counterstrain and positional release Lymphatic drainage techniques Golgi tendon organ techniques Rocking and shaking Triggerpoint techniques (static compression, pin & stretch, muscle stripping) Myofascial mobilization (muscle stripping, skin rolling)
Safety Considerations	Patient comfort: Always treat client within the agreed upon pain tolerance Treatment related adverse effects: discomfort, increase of pain aching muscles, headache, and tenderness; reports of increased pain Underlying pathologies: Varicosities, uncovered opening or recent cut, contagious skin lesion, hemophilia or anticoagulant medication, deep vein thrombosis, congestive heart failure, etc. Red flags: Refer patients to the appropriate health-care professional if a serious underlying pathology is suspected (e.g., cauda equina syndrome, spinal fracture, malignancy, and spinal infection).
Effects & Outcomes	Decrease pain perception Increase range of motion Decrease muscle spasm Increase local circulation Sensory motor integration (Whole-person integration) Stimulate the parasympathetic nervous system to promote relaxation & wellness Enhanced body and postural awareness

Key Takeaways

As the body of knowledge to support the use of massage therapy to help alleviate the musculoskeletal disorders associated with everyday stress, physical manifestation of mental distress, muscular overuse and many persistent pain syndromes continues to grow, understanding the basic science behind what we do enable us to apply this work to a number of conditions. Treatment approaches in Massage Therapy may vary, but each therapeutic encounter involves some overlapping principles. This book will conceptualize the main domains of an evidence-based framework for Massage Therapy using recent scientific research.

2.1: Massage Therapy: An Evidence-Based Framework
2.2: Pain Education
2.3: Neural Mobilization
2.4: Myofascial Release
2.5: Myofascial Trigger Points
2.6: Joint Mobilization
2.7: Thermal Applications: Heat & Cold
2.8: Exercise and Physical Activity

2.9: Transcutaneous Electrical Nerve Stimulation (TENS)
2.10: Instrument Assisted Soft Tissue Mobilization
2.11: Stretching and Foam Rolling
2.12: Elastic Therapeutic Tape
2.13: Therapeutic Ultrasound
2.14: Cupping Therapy
2.15: Medical Acupuncture
2.16: Mindfulness-Based Interventions

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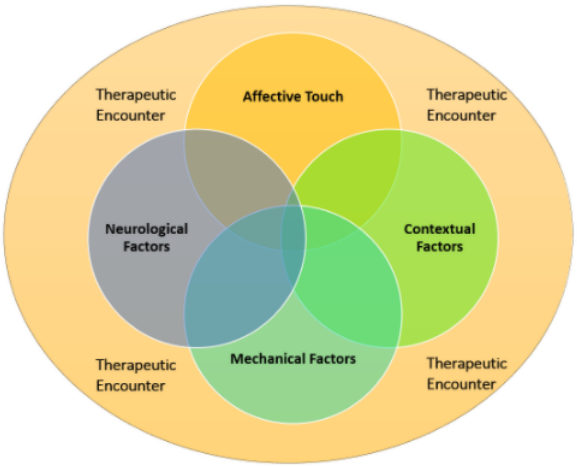
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2.1: Massage Therapy: An Evidence-Based Framework

Massage therapists want to help people, and part of our approach requires having a clear message of who we are and the value we offer. Adopting an evidence-based framework offers a solution, as it can provide a cohesive message of our nature and value. An evidence-based framework is an interdisciplinary approach to clinical practice used throughout healthcare. By adopting this approach, massage therapists will ensure that healthcare professionals consider the complex interplay between physiological and psychological factors that massage therapy affects.

Treatment approaches in massage therapy may vary, but each therapeutic encounter involves some overlapping principles. This book highlights the main principles of an evidence-based framework for massage therapy using recent scientific research.



Massage Therapy: An Evidence-based Framework

Schematic representation how physiological and psychological factors interplay in a complex manner.

Affective Touch: Therapeutic massage is a source of safety, comfort, and relief

Socially appropriate interpersonal touch has been shown to stimulate the release of neurochemicals (endogenous opioids and oxytocin) associated with relaxation and pain relief (Chen et al., 2020; Rapaport et al., 2012; Vigotsky et al., 2015; Walker et al., 2017). Massage therapy has been shown to influence cortisol levels, but the effect is small and, in most cases not clinically significant (Moyer et al., 2004; Moyer et al., 2011). In general, a reassuring therapeutic encounter, in which a patient is provided with compassionate touch, provides the patient with a safety message. This can result in reduced physiological and behavioral reactivity to stressors and improved mood/affect.

> "We will experience pain when our credible evidence of danger related to our body is greater than our credible evidence of safety related to our body. Equally we won't have pain when our credible evidence of safety is greater than our credible evidence of danger"- Lorimer Moseley

Contextual Factors: A person-centered clinical experience enchances the natural healing capacity of the body

It has long been known that the way a clinician presents both themselves and their treatment, is tied to health-related outcomes – this is known as the contextual factors of a therapeutic encounter (Rossettini et al., 2018). Creating an environment for healing involves providing a person-centered clinical experience that embraces the placebo response and the natural healing capacity of the body (Ellingsen et al., 2020; Kaptchuk et al., 2020)

In essence, behaviors and interactions with patients facilitate a relaxation response that will help to influence health-related outcomes; the magnitude of a response is influenced by expectation, learning processes, personality traits, and mindset (Rossettini et al., 2020).

> "By definition, CFs (Contextual Factors) are physical, psychological and social elements that characterize the therapeutic encounter with the patient. CFs are actively interpreted by the patient and are capable of eliciting expectations, memories and emotions that in turn can influence the health-related outcome, producing placebo or nocebo effects." – Rossettini et al., 2018

Mechanical Factors: Therapeutic massage influences tissue and cell physiology

Researchers have investigated the effect of soft-tissue massage on cellular signaling and tissue remodeling; this is referred to as mechanotherapy. Geoffrey Bove a researcher at the University of New England has conducted research examining the effect of modelled manual therapy on repetitive motion disorders and the development of fibrosis. One study published in *The Journal of Neurological Sciences* showed soft-tissue massage prevented the deposition of collagen and transforming growth factor beta-1 (TGF beta 1) in the nerves and connective tissues of the forearm (Bove et al., 2016). This was recently followed up by a study published in the prestigious journal *Pain* showing that by attenuating the inflammatory response (with modelled massage) in the early stages of an injury, they were able to prevent the development of neural fibrosis (Bove et al., 2019).

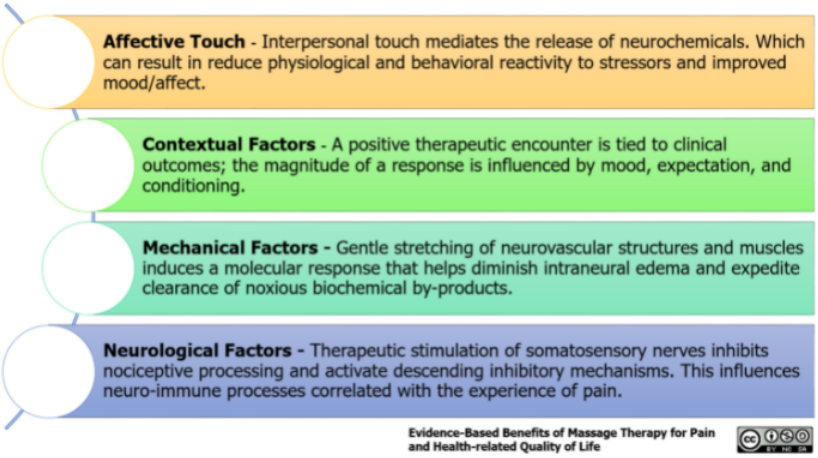
Research demonstrated that massage therapy (effleurage in particular) has a modest effect on local circulation and perfusion both in the massaged limb and in the contralateral limb (Monteiro Rodrigues et al., 2020). Furthermore, a recent joint research effort between Timothy Butterfield of the University of Kentucky and researchers at Colorado State University demonstrated that modelled massage enhanced satellite cell numbers (Miller et al., 2018; Hunt et al., 2019). This was in addition to earlier research from Butterfield and his collaborators at the University of Kentucky, which proposes the idea that mechanical stimulation prompts a phenotype change of pro-inflammatory M^1 macrophages into anti-inflammatory M^2 macrophages (Waters-Banker et al., 2014). Taken together the increase in satellite cell numbers and reduction in inflammatory signaling may improve the body's ability to respond to subsequent rehabilitation (Van Pelt et al., 2021).

Neurological Factors: Therapeutic massage stimulates specialized sensory receptors

Therapeutic massage is processed by specialized sensory receptors located in cutaneous and subcutaneous structures. Specialized mechanoreceptors located in cutaneous and subcutaneous structures are what informs the body about the type of touch they are receiving, there are five major types of mechanoreceptors that massage therapists should be aware of:

- Two of these are located in the superficial layers of the skin: Merkel cells and Meissner corpuscles.
- Two receptors, Pacinian corpuscle and Ruffini endings, are found in the subcutaneous and deeper tissue layers.
- The fifth type of mechanoreceptor are the recently discovered C-tactile fibers that play a specific role in transmitting the pleasurable properties of touch (they also play a role in affective touch mentioned prior).

Massage therapy is a form of peripheral somatosensory stimulation that can modulate the activity of neuro-immune (peripheral, cortical, subcortical) processes correlated with the experience of pain. Through a process of gently stretching muscles, neurovascular structures and investing fascia nociceptive processing associated with tissue damage (actual or perceived) is modifiable in such a way that the pain subsides. Preferential sites for stimulation are associated with areas rich in specialized sensory receptors such as Merkel cells, Meissner corpuscles (superficial layers of the skin), Pacinian corpuscles, Ruffini endings (joint capsules & subcutaneous tissue) and C-tactile fibers which play a role in the singling of affective aspects of human touch.



Building of Effective Patient-Provider Relationships

Massage therapy is a form of peripheral somatosensory stimulation that can modulate the activity of neuro-immune (peripheral, cortical, subcortical) processes correlated with the experience of pain (Bialosky et al., 2018). By activating ascending and

descending inhibitory systems, massage therapy may be able to mitigate the transition, amplification and development of chronic pain.

Massage therapy is a clinically-oriented healthcare option that can improve quality of life for patients with a variety of conditions. The responses to massage therapy are multifactorial, even if the mechanisms of action have not yet been fully elucidated. There is evidence that in terms of clinical responses to massage therapy affective touch, contextual factors, mechanical factors, and neurological factors are likely to play a role.

How Manual Therapy Works - From Physiotutors



Key Takeaways

With respect to the multidisciplinary treatment of musculoskeletal disorders massage therapy has a desirable safety profile and it is a health care option that is effective, economical, and accessible. Understanding the basic science behind massage therapy and the guiding principles of adaptability enables massage therapists to think flexibly about what is going on, both in terms of specific and nonspecific effects. Based on available evidence the best way to describe the effects of massage therapy, is not in a single unified response, but as a collection of interconnected adaptive responses within the nervous system and soft tissue structures. A biopsychosocial framework of health and wellness helps put into context the interconnected and multidirectional interaction between physiology, thoughts, emotions, behaviors, culture, and beliefs. In terms of clinical responses to massage therapy there are a couple of proposed mechanisms of action, including but not limited to: affective touch, contextual factors, mechanical factors, and neurological factors.

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2.2: Pain Education

The Human Body is Complex and Adaptable

The human body is not a simple structure, but rather a complex and adaptable network of overlapping systems. We must move from the myth of a simple biomechanical framework, or pathoanatomical model of trying to fix the structure, to understanding the complexity of a biopsychosocial framework and how all the systems within the body interact to experience all types of pain. The “no pain, no gain” mindset is being changed.

Increasingly, research shows that attributing the experience of pain solely to poor posture, minor leg length discrepancies, vertebral misalignment and other structural abnormalities is an oversimplification of a complex process (Green et al., 2018). Even in the case of degenerative changes in the knee, shoulder, and spine several landmark studies have shown that tissue tears revealed on imaging are a part of normal aging (Culvenor et al., 2019; Girish et al., 2011; Sihvonen et al., 2018). This disconnect between tissue damage seen on imaging and clinical presentation often creates confusion for both patients and clinicians. As a result, the medical community has moved on from a traditional biomechanical framework into a biopsychosocial framework.

The shift from a biomechanical framework to a biopsychosocial framework helps put into context the interconnected and multi-directional interaction between physiology, thoughts, emotions, behaviors, culture, and beliefs. Humans are complex and are composed of many overlapping systems, knowing how they interact is important for any therapist. The consensus is that structural abnormalities alone do not explain or necessarily predict pain. The reason people experience pain differently is in part is due to differences in genetics, depression, emotional stress, history of physical trauma and sensitization of the nervous system (Green et al., 2018).

Correlation Doesn’t Prove Causation

There is often a weak correlation between radiographic findings and symptoms – Several landmark studies have shown tissue tears revealed on imaging are a common finding in patients who are asymptomatic. This disconnect between tissue damage seen on clinical imaging and clinical presentation is part of normal aging and unassociated with pain. One study illustrates this concept well is a systematic review published in 2015, it provides important data demonstrating that degenerative changes can exist on a spinal magnetic resonance imaging and people can have no pain.

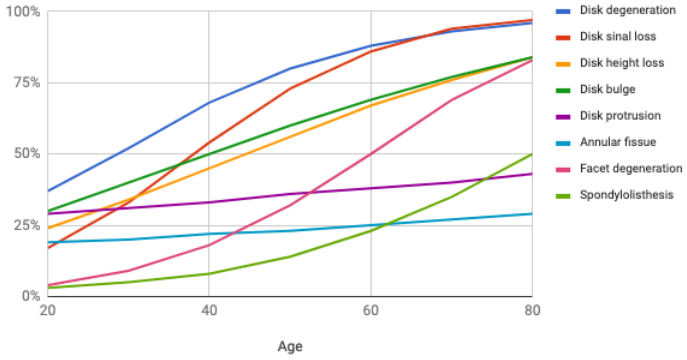
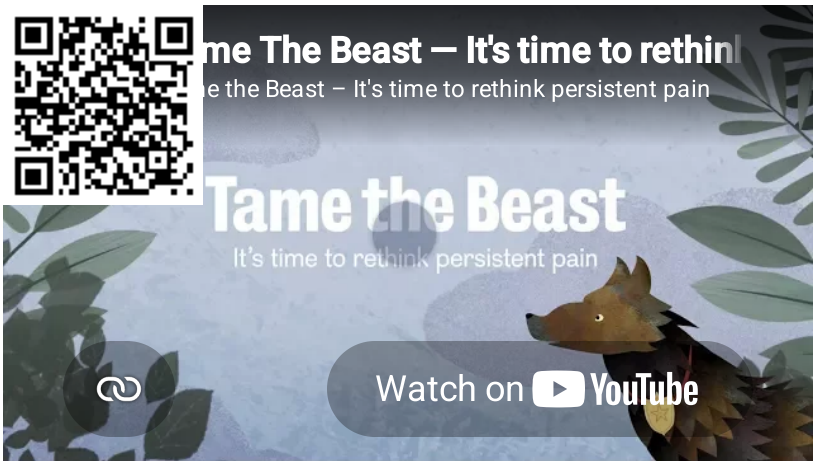


Figure 2.2.1 Age-Specific Degenerative Spine Imaging Findings in Asymptomatic Patients - Brinjikji et al. 2015
"Imaging findings of spine degeneration are present in high proportions of asymptomatic individuals, increasing with age. Many imaging-based degenerative features are likely part of normal aging and unassociated with pain. These imaging findings must be interpreted in the context of the patient’s clinical condition.” (Brinjikji et al., 2015).

Tame the Beast - It's time to rethink persistent pain



The Placebo Response and The Therapeutic Encounter

The way a clinician presents themselves and their treatment has influence on therapeutic outcomes. The magnitude of a response may be influenced by mood, expectation, and conditioning, this is often referred to as the placebo response. The placebo effect isn't a single phenomenon, it involves overlapping cortical, subcortical, and emotional responses. Any therapeutic encounter can trigger significant biological changes that ease symptoms.

The existence of placebo-induced effects does not negate treatment-induced results, patients feel better after a therapeutic encounter because of a complex physiological response to the treatment that includes but is not limited to placebo.

Learn more about the placebo response in this 5 min TED-Ed video.



Key Takeaways

Employing an Individualized Biopsychosocial Approach to Pain Management
Ascribing a patient's pain solely to a tissue-driven pain problem is often an oversimplification of a complex process. This insight provides us with an opportunity to re-frame our clinical models. Over time the supportive theories behind techniques evolve or change completely. It is becoming increasing evident that a biomechanical model as a basis for treatment is outdated based on the latest research into pain science. A shift to a biopsychosocial model of massage therapy helps put into context the interconnected and multidirectional interaction between physiology, thoughts, emotions, behaviors, culture, and beliefs.

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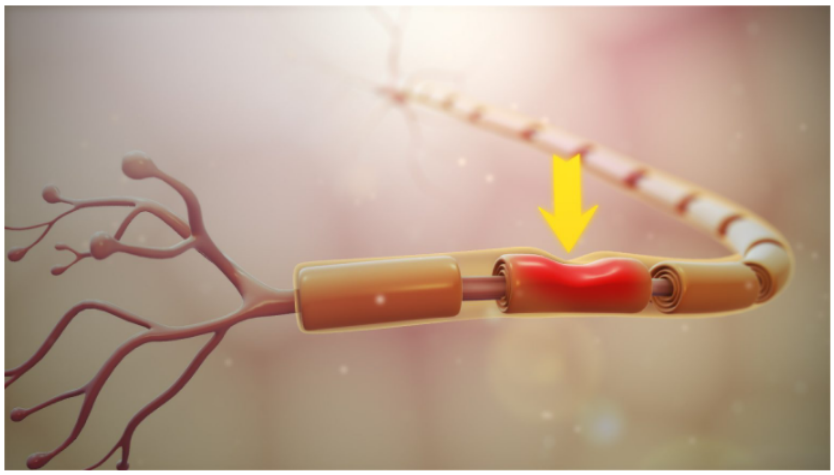
2.3: Neural Mobilization

Neural Mobilization: A Conceptual Framework

Neural mobilization is a multidimensional treatment approach that has gained popularity because it is effective, and easy to implement. These maneuvers can be performed in a passive manner where a therapist guides the client through a movement pattern, it can also be carried out as part of a self-care program that clients perform on their own. Clinicians may be familiar with terms such as nerve gliding, nerve flossing, sliders and tensioners. These names describe similar approaches, and all these techniques fall under the umbrella of neural mobilization – a gentle form of manual therapy that aims to assess and address irritated peripheral nerves.

Pathophysiology: Sensitivities of Axons Exposed to a Pathological Environment

As peripheral nerves pass through the body they may be exposed to mechanical or chemical irritation at different anatomical points. Prolonged compression or fixation of a nerve may result in a reduction of intraneural blood flow (Bove et al., 2019). This then triggers the release of pro-inflammatory substances (calcitonin gene-related peptide and substance P) from the nerve. This by product is referred to as neurogenic inflammation and it can disrupt the normal function of nerves even without overt nerve damage, it can also contribute to the initiation and propagation of chronic pain (Matsuda et al., 2019).

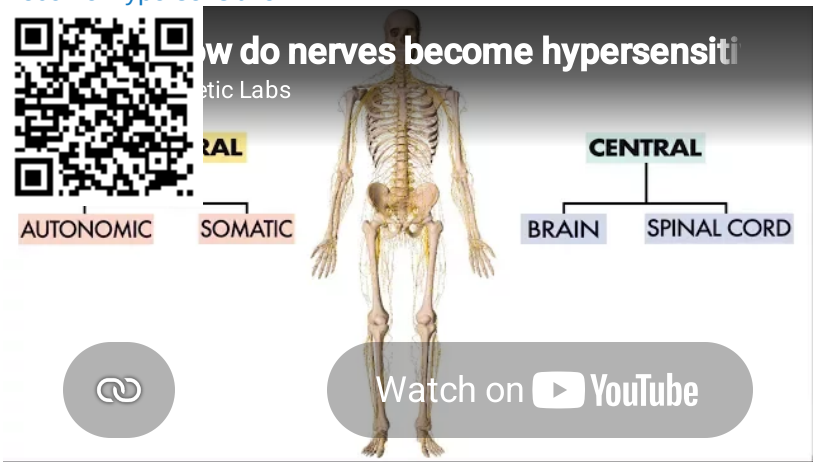


Prolonged compression or fixation of a nerve may result in a reduction of intraneural blood flow.

Examination: Clinical Sensory Testing Can Be Used to Assess for Increased Sensitivity of the Nervous System

If there is an irritated peripheral nerve, clinical sensory testing can be used to assess for areas of hypersensitivity. In addition to orthopedic testing this could involve palpation (neural and non-neural structures). If a hypersensitive peripheral nerve has been identified, a treatment plan is then implemented based on patient-specific assessment findings and patient tolerance.

FXNL: How Do Nerves Become Hypersensitive?



Treatment Considerations

Manual Therapy

The responses to neural mobilization are complex and multifactorial – physiological and psychological factors interplay in a complex manner. Systematic reviews have shown that neural mobilization combined with multimodal care can improve symptoms, decrease disability and improve function for patients who suffer from peripheral nerve entrapment (Basson et al., 2017).

The biopsychosocial model provides a practical framework for investigating the complex interplay between manual therapy and clinical outcomes. Based on this, the investigation into mechanisms of action should extend beyond local tissue changes and include peripheral and central endogenous pain modulation (Bialosky et al., 2018).

Central Response
Neural mobilization has a modulatory effect on peripheral and central processes via input from large sensory neurons that prevents the spinal cord from amplifying the nociceptive signal. This anti-nociceptive effect of massage therapy can help ease discomfort in patients who suffer from peripheral nerve entrapments.

Peripheral Response
Neural mobilization may also involve specific soft tissue treatment to optimize the ability of mechanical interfaces to glide relative to the neural structure. The application of appropriate shear force and pressure impart a mechanical stimulus that may attenuate tissue levels of fibrosis and TGF-β1 (Bove et al., 2016; Bove et al., 2019). Furthermore, passive stretching may help diminish intraneural edema and/or pressure by mobilizing the peripheral nerve as well as associated vascular structures (Boudier-Revéret et al., 2017; Gilbert et al., 2015).

Nerves, Knowledge and Theratube With David Butler



Prognosis

In terms of research evidence neural mobilization has been shown to be particularly helpful for common forms of back, neck, leg and foot pain (Basson et al., 2017). An observed favorable outcome may be explained by overlapping mechanisms in the periphery, spinal cord, and brain, including but not limited to affective touch, contextual factors, neurological factors, and mechanical factors.

Key Takeaways

Nerves can be exposed to mechanical or chemical irritants at different anatomical points. Gently stretching the muscles, neurovascular structures, and investing fascia activates endogenous pain modulating systems that help to mitigate the transition, amplification and development of peripheral neuropathies and chronic pain.

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2.4: Myofascial Release

A Look at Fascial Anatomy

Andreas Vesalius (1514-1564) is often considered to be the first anatomist and is best remembered for publishing the famous anatomy text, *De humani corporis fabrica* in 1543. If you look at these early illustrations, they present the fascia and muscles as one continuous soft tissue structure. Fast forward to the 20th century (texts we study) most omit fascial tissue in order to depict muscles in a cleaner fashion. Some recent anatomy textbooks have made an effort to include this 'forgotten tissue' in their depictions and descriptions.



Image from De humani corporis fabrica circa 1543

An example of this is the *Functional Atlas of the Human Fascial System* by Carla Stecco, an Orthopedic surgeon and a professor of human anatomy at the University of Padua in Italy, the same University that once employed Andreas Vesalius in the early 1500's. Another example is *Anatomy Trains* by Thomas Myers, in this book Myers presents conceptual 'myofascial meridians', recent systematic review confirmed a number of these continuous soft tissue structures (Wilke et al., 2016; Wilke et al., 2019).

To better understand myofascial release, there is a need to clarify the definition of fascia and how it interacts with various other structures: muscles, nerves, vessels.

Fascia has Been Used as an Ambiguous Term

Inconsistent definitions in the literature has led to confusion for researchers and therapists. A definition put forth by the Fascial Research Society hopes to provide some guidance. These researchers suggest making the distinction between A Fascia and The Fascial System (Schleip et al., 2019).

> **A Fascia** – "A fascia is a sheath, a sheet, or any other dissectible aggregations of connective tissue that forms beneath the skin to attach, enclose, and separate muscles and other internal organs."
>
> **The Fascial System** – "The fascial system consists of the three-dimensional continuum of soft, collagen-containing, loose and dense fibrous connective tissues that permeate the body. It incorporates elements such as adipose tissue, adventitiae and neurovascular sheaths, aponeuroses, deep and superficial fasciae, epineurium, joint capsules, ligaments, membranes, meninges, myofascial expansions, periostea, retinacula, septa, tendons, visceral fasciae, and all the intramuscular and intermuscular connective tissues including endo-/peri-/epimysium."

Myofascial Release in Various Forms Stimulates Mechanoreceptors

Ascribing a patient's pain solely to a tissue-driven pain problem is often an oversimplification of a complex process. This insight provides us with an opportunity to re-frame our clinical models. When it comes to myofascial release a biopsychosocial framework helps put into context the interconnected and multidirectional interaction between a number of proposed mechanisms of action, including but not limited to affective touch, contextual factors, neurological factors, and mechanical factors.

Neurologically myofascial release may be used to stimulate mechanoreceptors, which in turn, trigger tonus changes in skeletal muscle fibers. Furthermore, input from sensory neurons may prevent the spinal cord from amplifying nociceptive signaling.

Myofascial Release in Various Forms Influences Tissue and Cell Physiology

Researchers have investigated the effect of soft-tissue massage on cellular signaling and tissue remodeling; this is referred to as mechanotherapy. Geoffrey Bove, a researcher at the University of New England, has conducted research examining the effect of modelled manual therapy on repetitive motion disorders and the development of fibrosis. One study published in the *Journal of Neurological Sciences* showed soft-tissue massage prevented the deposition of collagen and transforming growth factor beta 1 (TGF beta 1) in the nerves and connective tissues of the forearm (Bove et al., 2016). This was recently followed up by a study published in the prestigious journal *Pain* showing that by attenuating the inflammatory response (with modelled massage) in the early stages of an injury, they were able to prevent the development of neural fibrosis (Bove et al., 2019). This is potentially impactful in postoperative rehabilitation because TGF-β1 plays a key role in tissue remodeling and fibrosis.

Furthermore, a recent joint research effort between Timothy Butterfield of the University of Kentucky and researchers at Colorado State University demonstrated that modelled massage enhanced satellite cell numbers (Miller et al., 2018; Hunt et al., 2019). This was in addition to earlier research from Butterfield and his collaborators at the University of Kentucky, which proposes the idea that mechanical stimulation prompts a phenotype change of pro-inflammatory M1 macrophages into anti-inflammatory M2 macrophages (Waters-Banker et al., 2014). Another group of researchers at The University of Arizona propose that mechanical stimulation can trigger fibroblasts to express anti-inflammatory cytokines (Zein-Hammoud & Standley, 2015; Zein-Hammoud & Standley, 2019). Taken together the increase in satellite cell numbers and reduction in inflammatory signaling may play a role in tissue remodeling and improve the body's ability to respond to subsequent rehabilitation.

Does Myofascial Release Break Adhesions?

As a result of aging, injury or trauma the neuromuscular system undergoes remodeling, which involves muscles, fascia, and the central and peripheral nervous system. If there has been significant adaptations this may impair the body's ability to respond to subsequent rehabilitation (Zullo et al., 2020). Traditionally when soft tissue structures have a reduced ability to glide adhesions are blamed. Currently there is a paucity of research to support the claim that manual therapy can break mature adhesions. However, in the developmental phase manual therapy may be able to attenuate the development of post-surgical adhesions (Bove et al., 2017). In the remodeling phase the mechanisms by which myofascial release interrupts the sequelae of pathological healing is most likely not in a single unified response.

Key Takeaways

Myofascial Release is a treatment approach that stimulates mechanoreceptors and influences tissue and cell physiology. Clinically this translates into improved proprioception, increased range of motion and pain management.

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2.5: Myofascial Trigger Points

Convergent Thinking and Myofascial Trigger points

The concept of sore spots that can be leveraged for therapeutic purposes have been independently discovered by several different cultures in Europe, Africa and Asia. One of the oldest examples on record is a 5,300 year old naturally preserved human body discovered in the Tyrolean Alps of Austria called Otzi "The Iceman". This frozen body has 61 tattoos that correspond to myofascial trigger points and traditional acupuncture points that are commonly utilized to treat musculoskeletal pain. This 5300 year old preserved body gives insight into ancient medical practices, as it is believed that these tattoos represent an early form of therapeutic treatment similar to acupuncture used to treat low back and knee pain (Kean et al., 2013; Zink et al., 2019).

It is well documented in Asian cultures that traditional healers would therapeutically treat sore spots with manual therapy or acupuncture needles, one example is ASHI (ah yes!) points, a central tenant in acupuncture for over two thousand years. Many years later in the 1930's Jonas Henrik Kellgren started the scientific investigation into these sore spots or what he called Referred Pain from Muscle (Kellgren, 1938). This was then followed up by years of research and documentation by Janet Travell and David Simons, the result of their cumulative work was the textbook – Travell, Simons and Simons' Myofascial Pain and Dysfunction (now in its 3rd edition).

Myofascial Trigger point Pathophysiology: Sore Spots Exist, But Their Etiology is Still Not Well Understood.

Early research into myofascial trigger points often focused on a physiological dysfunction involving local soft tissue, but recently clinicians have spoken out against these traditional narratives to say that the explanations used in the past of this observable phenomenon are flawed in reasoning. They posit that what we call a myofascial trigger point may represent a form of nociplastic pain where there are neuroplastic changes of the peripheral or central nervous system (Quintner et al., 2015).

Moving forward as a profession we ought to acknowledge that there is uncertainty about myofascial trigger points and update the way we communicate with patients and other healthcare providers. One issue is that ascribing a patient's pain solely to myofascial trigger points or other tissue-driven pain problem is often an oversimplification of a complex process. When it comes to myofascial trigger points there are several competing hypothesis, including, but not limited to:

- **Cinderella Hypothesis –** low-level, continuous muscle contractions overload tissues and makes "Cinderella" fibers susceptible to calcium dysregulation and subsequently sarcomere contracture (Bron et al., 2012).
- **Integrated Hypothesis –** the zone around a myofascial trigger points seems to be in an ischemic state resulting in a shortage of glucose and oxygen for metabolism and subsequent contracted sarcomeres in skeletal muscle (Gerwin et al., 2004; Gerwin et al., 2020).
- **Neurogenic Inflammation –** the release of inflammatory substances from the nerve axon, results in a lower threshold for depolarization and hyperalgesia in innervated tissue (Quintner et al., 2015).
- **Central Sensitization –** several studies support the hypothesis that persistent nociceptive input from myofascial trigger points contributes to the development of central sensitization and/or changes in the dorsal horn. In contrast, preliminary evidence suggests that central sensitization can also promote myofascial trigger points activity (Fernández-de-las-Peñas et al., 2014).

International Consensus on Diagnostic Criteria and Clinical Considerations of Myofascial Trigger Points

In an effort to establish standard terminology an international panel of 60 clinicians and researchers was recently consulted to establish a consensus for identification of a myofascial trigger point. The panel agreed on two palpatory and one symptom criteria: a taut band, a hypersensitive spot, and referred pain (Fernández-de-Las-Peñas & Dommerholt, 2018).

Myofascial Trigger Points: Examination and Treatment Considerations

It has been demonstrated in a number of studies that patients benefit from hands-on work aimed at myofascial trigger points, but this may not always be due to reasons we once were taught. Even if some of the traditional narratives around myofascial trigger points may be flawed, myofascial trigger points describe an observable phenomenon that may be help clinicians investigate common pain patterns, such as:

- Temporomandibular Disorders (Moayedi et al., 2020)

- Facial Pain (Gerwin, 2020)
- Neck Pain (Morikawa et al., 2017; Castaldo et al., 2019)
- Migraine Headaches (Landgraf et al., 2018)
- Tension-Type Headache (Fernández-De-Las-Peñas & Arendt-Nielsen, 2017; Palacios-Ceña et al., 2018)
- Carpal Tunnel Syndrome (Meder et al., 2017)
- Low Back Pain (Takamoto et al., 2015; Kodama et al., 2019)
- Chronic Pelvic Pain (Fuentes-Márquez et al., 2019)

Key Takeaways

Myofascial Trigger Points: What Are They, Really?

From a clinical perspective, myofascial trigger points describe an observable phenomenon that may help clinicians investigate common pain patterns. There is still no consensus on the etiology of these sore spots and what role they play in the generation and propagation of myofascial pain syndrome.

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2.6: Joint Mobilization

Joint mobilization is a type of passive movement of a skeletal joint with the aim of achieving a therapeutic effect such as decreasing pain or increasing range of motion.

Classification and Mechanisms of Joint Mobilization

Joint mobilization is classified by five 'grades' of motion (grade 1 through grade 5), each of which describes the range of motion of the target joint during the procedure. The different grades of mobilization are believed to produce selective activation of different mechanoreceptors in the joint, but in terms of outcomes studies have demonstrated that a general approach to joint mobilization is as effective as a specific one (de Oliveira et al., 2020; McCarthy et al., 2019).

Movements are classified as

- Anterior to Posterior (AP)
- Medial to Lateral
- Oscillations (which stimulate dynamic, rapidly adapting receptors, i.e., Meissner's and Pacinian corpuscles)
- Translation
- Distraction is the separation of joint surfaces without rupture of their binding ligaments and without displacement

The Goals of Joint Mobilization are

- Decrease pain in joint/periarticular structures
- Induce reflex muscle relaxation

Grade 1

- Small amplitude movement at the beginning range of joint play
- Used when pain and spasm limit movement early in range of motion

Grade 2

- Large amplitude movement at the mid-range of joint play
- Used for pain control, spasm reduction which inhibit movement

Grade 3

- Large amplitude movement at the end range of joint play
- Reduce pain, and increase periarticular extensibility

Grade 4

- Small-amplitude movement at the end of the range of joint play
- Reduce pain, and increase periarticular extensibility

Grade 5 (also referred to as a manipulation)

- Manipulation of high velocity and low amplitude to the anatomical end point of a joint
- Usually accompanied by a popping sound called a cavitation.

Precautions

- Joint ankylosis
- Joint hypermobility
- Rheumatoid arthritis
- Malignancy
- Fracture
- Osteoporosis
- Tuberculosis
- Paget's disease
- Joint effusion
- Severe scoliosis
- Spondylolisthesis

- Pregnancy

Key Takeaways

Joint mobilization is a type of passive movement of a skeletal joint with the aim of achieving a therapeutic effect. The different grades of mobilization are believed to produce selective activation of different mechanoreceptors in the joint, but in terms of outcomes studies have demonstrated that a general approach to joint mobilization is as effective as a specific one.

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2.7: Thermal Applications: Heat & Cold

Heat Therapy

Several clinical practice guidelines recommend the use of heat to manage acute and chronic low back pain (Bleakley & Costello, 2013; Clijsen et al., 2021; Chou et al., 2018; Chou et al., 2020; Qaseem et al., 2017). Heat therapy in the form of deep moist heat or a heating pad is a mild analgesic that has several effects on the human body including increase in local blood flow, mitochondrial biogenesis, improved range of motion, and pain relief (Bleakley & Costello, 2013; Hyldahl & Peake, 2020; McGorm et al. 2018).

Cold Therapy

Cold therapy in the form of cold compress, ice pack or ice massage can act as a mild analgesic. The physiological effects of cold therapy include reduced blood flow, reduced metabolic demand, and pain relief. This form of therapy may be useful for patients with chronic pain (Garcia et al., 2021). There is limited evidence from randomized clinical trials (RCTs) supporting the use of cold therapy following acute musculoskeletal injury and delayed-onset muscle soreness (DOMS), also a mounting body of research has shown that ice can delay healing, increase swelling, and possibly cause additional damage to injured tissues (Duchesne et al., 2017; Fuchs et al., 2020; Malta et al., 2021; Peake et al., 2017).

PEACE & LOVE: New acronym for the treatment of traumatic injuries

One of the primary changes surrounding the management of acute injuries is that most guidelines recommend against the use of ice to control inflammation. It is now recognized that ice can delay healing, increase swelling, and possibly cause additional damage to injured tissues. Traditionally treatment of an acute sprain or strain consists of RICE (Rest, Ice, Compression, Elevation), the most recent recommendation has been to provide soft tissue injuries with the PEACE & LOVE protocol to encourage optimal loading of the joint and tissue around the affected injury can affect the amount swelling leading to a faster recovery (Dubois & Esculier, 2020).

- **PEACE** makes up the first steps you would take after an injury. Immediately after the injury you would want to protect (P) the injured structure, followed by elevating (E) the limb higher than the heart, avoid anti-inflammatory (A) both over-the-counter or prescriptions and ice, as they slow down tissue healing. Compress (C) the injured area to decrease swelling. Ensure patient education (E) on the risks of overtreatment.
- **LOVE** makes up the progressive return to activities a few days after the injury. Gradual load (L) will facilitate healing, optimistic (O) influences the perception of pain and recovery speed. Loading and progressive return to activity will facilitate vascularization (V) of the injured tissues. The last step involves activity exercises (E) can help recover range of motion, strength and proprioception.

Ice baths (also known as cold-water immersion or whole-body cryotherapy)

Even though ice baths may delay healing, that does not mean that there is no use for the techniques. Controlled stress is a way to promote adaptation in the body, this may include, but it is not limited to training, fasting, cold immersions, breathing exercises. One prominent figure in the world of body experimentation is Wim Hof a Dutch adventurer, known by the name “The Iceman” who has popularized the Wim Hof Method and cold-water immersion. Research on this method of cold exposure suggest that people can learn to modulate their immune responses — a finding that has raised hopes for patients who have chronic inflammatory disorders such as rheumatoid arthritis and inflammatory bowel disease (Kox et al., 2014).

Table 2.7.1 Thermal Applications: Summary

Technique	Application	Application notes (e.g., anatomical location, conditions)
Application of Cold	Local application of cold/ice (e.g., compress, ice pack, ice massage) often for 15 minutes or less.	Used over areas of acute inflammation or pain. Generally, not used over areas of chronic inflammation.
Application of Heat	Local application of heat (e.g., compress, magic bag) often for 10 - 5 minutes.	Used for acute and chronic pain. Not recommended over areas of acute inflammation.

Contrast Application	Alternating application of cold (e.g., 3 minutes) with application of heat (e.g., 1 minute)	Used for subacute pain.

Key Takeaways

For those who suffer from musculoskeletal pain, thermal applications have been shown to be a safe non-pharmacological therapeutic intervention that is simple to carry out, economical, and has relatively minor side effects.

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2.8: Exercise and Physical Activity

Physical inactivity has an estimated cost of $67.5 billion worldwide through health-care expenditure and productivity loss (Ding et al., 2016). Increased levels of physical activity can play a significant role in decreasing this socioeconomic burden. Regular physical activity has been shown to significantly reduce symptoms of anxiety, reduce pain, and improve function (Bull et al., 2020; Pedersen & Saltin, 2015). Furthermore, exercise has been shown to be effective in the primary prevention of over 30 different chronic diseases (McGee & Hargreaves, 2020; Pedersen & Saltin, 2015; Thornton et al., 2016). Additionally, a meta-analysis published in *The Lancet* gathered information from over one million men and women. Researchers found that 60 to 75 minutes of moderate intensity exercise per day was sufficient to eliminate the increased risk of early death associated with sitting for over eight hours per day (Ekelund et al., 2016). Additionally, among adults age 40 and older, taking more steps per day is associated with lower all-cause mortality risk (Saint-Maurice et al., 2020).

Physical activity leads to changes in metabolic, cardiovascular, and immune function

Physical activity leads to changes in metabolic, cardiovascular, and immune function (Contrepois et al., 2020; Dunn & Olmedo, 2016). One of these changes is the release of myokines from skeletal muscles, which influence metabolism in virtually all organs in the body (Severinsen & Pedersen, 2020).

World Health Organization guidelines on physical activity and sedentary behavior

Exercise therapy has been shown to be safe and beneficial for physical and psychosocial health in people with multiple comorbidities (Bricca et al., 2020). The world health organization recommends adults should undertake 150-300 min of moderate-intensity, or 75-150 min of vigorous-intensity physical activity, or some equivalent combination of moderate-intensity and vigorous-intensity aerobic physical activity, per week. These guidelines highlight the importance of regularly undertaking physical activity (both aerobic and muscle strengthening activities) emphasizing the value of any activity, of any duration, and any intensity (Bull et al., 2020). Even one or two sessions of physical activity per week may be sufficient to reduce all-cause, cardiovascular disease, and cancer mortality risks (O'Donovan et al., 2017).

Key Takeaways

The recommended amount of physical activity is 150-300 minutes of moderate-intensity physical activity each week. This can improve cardio-respiratory fitness, muscle strength, physical well-being, quality of life, and reduce fatigue, anxiety, and depression. The difficulty with exercise is that it is not a one size fits all, what works for one person may not work for another, so it is important to try different approaches. The key to effectiveness of exercise is adherence, so keep in mind exercise should be designed to meet the needs of real people, this can be broken down into about five 30-minute brisk walks a week.

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2.9: Transcutaneous Electrical Nerve Stimulation (TENS)

Transcutaneous Electrical Nerve Stimulation (TENS) involves the delivery of electrical stimuli with the aim of relieving acute and chronic pain. Primary mechanism of action is likely through inhibition of nociceptive processing (bottom-up) and stimulation of endogenous pain inhibitory mechanisms (top-down) (de Oliveira et al., 2020; Peng et al., 2019).

Based on randomized controlled trials and systematic reviews TENS therapy does not have a large body of evidence, but there is still some research that supports the use of TENS as part of a multidimensional approach for patients suffering from fibromyalgia (Dailey et al., 2020).

The University of Vermont: How to Use a TENS Unit



Key Takeaways

Transcutaneous Electrical Nerve Stimulation (TENS) involves the delivery of electrical stimuli that stimulates afferent nerve (A-beta, A-delta and C fibers), which triggers neurological responses in the periphery, spinal cord, and brain that may help modulate the experience of pain.

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2.10: Instrument Assisted Soft Tissue Mobilization

What is Instrument Assisted Soft Tissue Mobilization?

Instrument Assisted Soft Tissue Mobilization (IASTM) is a soft tissue technique that uses handheld tools to stimulate local mechanoreceptors. IASTM devices may be made from different materials (e.g., wood, stone, jade, steel, ceramic, resin).

How can Massage Therapists Incorporate IASTM into Treatments?

IASTM has been shown to improve short term range of motion and improve function for athletes (Cheatham et al., 2016). IASTM is closely related to transverse friction massage which has long been used for tendon pain and sports injuries. The depth of application varies from simple massage based techniques aiming at stimulating mechanoreceptors and improving range of motion to a complex soft-tissue treatment system encompassing the latest research on mechanotherapy.

There are many nuances to using these techniques, with the possibility of bruising and petechiae if treatments are not done with care. Not fully understanding the different aspects and approaches to IASTM is leading to a great deal of confusion about what exactly IASTM is, when it's appropriate and how to use these techniques.

IASTM Protocols

IASTM techniques are often combined with other techniques, exercises, positions or different types of stretching. First, the treatment area is lubricated with massage lotion, then short sweeping movements are applied using multi-directional assessment and treatment strokes. IASTM techniques are often combined with active and passive stretching. Around 2-3 minutes of light scraping per area should be enough to stimulate local mechanoreceptors.

Post-Operative Care

Treatments depend on the underlying pathology, but IASTM may have a role in post-surgical care. A recent study published in *The Journal of Knee Surgery* looked at the effect that soft-tissue treatments with hand-held instruments have on post-surgical knee stiffness (Chunghtai et al., 2016). In the study soft-tissue treatments were shown to improve knee flexion deficits by 35° and knee flexion contractures by 12° in a small cohort of individuals who had failed to respond to traditional rehabilitation and manipulation under anesthesia. Hypothetically it may be used to impart a mechanical stimulus that contributes to the breakdown of immature scar tissue and developmental fibrosis. Fibrosis is a potential complication of surgery or trauma characterized by the production of excessive fibrous scar tissue, which may result in decreased movement. Understanding the cellular effectors and signaling pathways that drives the accumulation of fibrotic deposition, helps therapists optimize treatment protocols.

In the normal wound healing response, the cascade of biological responses is tightly regulated. Fibrotic development is characterized by a lack of apoptosis in the proinflammatory phase, resulting in an imbalance between synthesis and degradation. Persistent transforming growth factor-β (TGF-β) secretion and downstream responses are thought to contribute to a sustained inflammatory response (Cheuy et al., 2017). One study published in *The Journal of Neurological Sciences* showed soft-tissue massage prevented the deposition of collagen and transforming growth factor beta 1 (TGF beta 1) in the nerves and connective tissues of the forearm (Bove et al., 2016). This was recently followed up by a study published in the prestigious journal *Pain* showing that by attenuating the inflammatory response (with modelled massage) in the initial stages of an injury, they were able to prevent the development of neural fibrosis (Bove et al., 2019). This is potentially impactful in postoperative rehabilitation because TGF-β1 plays a key role in tissue remodeling and fibrosis.

Key Takeaways

The responses to IASTM are complex and multifactorial – biopsychosocial factors interplay in a complex manner. The use of prophylactic IASTM may help patients manage postoperative pain. It may also affect the development of fibrosis by mediating differential cytokine production. The next step for researchers is to look into what sort of dosage and duration would be needed to optimize the effects of this non-pharmacological approach.

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2.11: Stretching and Foam Rolling

Stretching

There are three general stretching categories described in the literature, they are static, dynamic, and pre-contraction stretches.

- **Static stretching** – A specific position is held with the muscle on tension to a point of a stretching sensation and repeated (this can be performed passively by a partner, or actively by the subject).
- **Dynamic stretching** – Active movements where joints and muscles go through a full range of motion.
- **Pre-contraction stretching** – This involves a contraction of the muscle being stretched or its antagonist before stretching. Examples of pre-contraction stretching include post-isometric relaxation (PIR) and proprioceptive neuromuscular facilitation (PNF).

The Science of Stretch

Changes in the passive elastic properties and range of motion induced by stretch training is due to both neurological increases in stretch tolerance and changes in passive properties of muscle (Freitas et al., 2018). Some positive adaptive mechanisms operate instantaneously (neurological adaptation), others take effect over months or years (musculoskeletal adaptation). In a rehab setting range of motion improvements in the first 4 weeks are often changes that occur in the nervous system. It is often much later down the road that muscle adaption helps to increase the individuals' range of motion.

Studies have shown that consistent stretching routines can extensibility or range of motion (ROM) of the stretched muscle or joint (Behm et al., 2021). In most of these studies, it is proposed that improved range of motion is due to both neurological increases in stretch tolerance and changes in passive properties of muscle. The basic supporting science behind stretching will help therapists design rehabilitation programs for a wide variety of conditions, here are a few examples in the research literature.

Stretching for the upper body

- Four weeks of soft tissue mobilization had an effect on tissue stiffness, shoulder internal rotation and horizontal adduction in baseball players with posterior shoulder tightness (Yamauchi et al. 2016)
- Instrumented manual therapy with self-stretching significantly reduces ROM risk factors in baseball players with motion deficits (Bailey et al. 2017)
- A 4-week treatment program of manual therapy or dry needling demonstrated a significant improvement in pain pressure threshold, muscle elasticity, and stiffness of neck and shoulder muscles (De Meulemeester et al. 2017).

Stretching for the lower body

- In one study 8 weeks of high intensity stretch training on biceps femoris induced architectural adaptation and improved range of motion (Freitas et al. 2015).
- Nordic hamstring extensions have been shown to be an effective rehabilitation exercise that stimulate architectural adaptation and assist return to play (Cuthbert et al., 2020).
- 4-week static stretch training program changes the flexibility of the gastrocnemius muscle tendon unit (Nakamura et al. 2012)
- 3 weeks of twice daily stretch training (4 × 30 s) lead to an increase in dorsiflexion range of motion (ROM) a 28% increase in passive joint moment (Blazevich et al. 2014).
- 6 weeks of stretch training of the plantar flexors resulted in hypertrophic like adaptations of the gastrocnemius. (Simpson et al. 2017).
- A 12 week stretching program was shown to have an effect on the mechanical properties of plantar flexor muscles and sciatic nerve (Andrade et al., 2020).

Rehabilitate the whole person, not just injured tissues

Research suggests that stretching may serve as a low intensity therapeutic intervention capable of improving several parameters of vascular function (Kruse & Scheuermann, 2017; Thomas et al., 2021). Additionally, through a process of gently stretching muscles, neurovascular structures and investing fascia nociceptive processing associated with tissue damage (actual or perceived) is modifiable in such a way that the pain subsides (Støve et al., 2019).

A video from Dr. Helene Langevin that highlights how connective tissue interacts with various other structures: muscles, nerves, vessels.



Self-Massage and Foam Rolling

The goal of performance support is ensuring that athletes have the physical and mental capacities necessary to compete at the top level. Which can be a challenge, due to the number of variables can affect athletic performance (e.g., fatigue, recovery, training status, health and well-being).

Increasingly athletes have taken soft tissue work into their own hands, using foam rollers to ease the pain of overexertion and support athletic performance.

Can Foam Rolling Ease the Pain of Overexertion?

There is conflicting evidence for the use of foam rolling for reducing pain perception after delayed onset muscle soreness (DOMS), but evidence seems to justify the use of foam rolling as a warm-up activity rather than a recovery tool (Wiewelhove et al., 2019). Other studies have demonstrated that the addition of self-massage significantly improved stretch tolerance and flexibility compared with isolated static stretching (Capobianco et al., 2018). As well decrease muscle excitability through central mechanisms, which may account for the post-treatment increase in range of motion and pain pressure threshold (Young et al., 2018, Wilke et al., 2020).



Key Takeaways

Stretching may decrease muscle excitability and improve stretch tolerance via neurological & musculoskeletal adaptations, which may account for increase in extensibility, range of motion, and pain pressure threshold. The addition of self-massage may decrease muscle excitability and improve stretch tolerance, which may also account for the post-treatment increase in range of motion and pain pressure threshold.

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2.12: Elastic Therapeutic Tape

Elastic therapeutic tape is an elastic cotton strip with an acrylic adhesive that is used with the intent of treating pain and disability from athletic injuries and a variety of other physical disorders. Unlike conventional athletic taping it is applied in a manner that allows the body to move freely without restriction. Research suggests that elastic taping may help relieve pain, but not more than other treatment approaches.

What is The Role of Taping?

The tape lifts the skin (decompression technique), increasing the space below it, and increasing blood flow and circulation of lymphatic fluids (swelling). This increase in the interstitial space is said to lead to less pressure on the body's nociceptors, which detect pain, and to stimulate mechanoreceptors, to improve overall joint proprioception. Performance Taping works by affecting the specialized nerve receptors of the skin and the underlying fascia through the gentle tugging action the tape offers during movement. The intention is to optimize motor recruitment in order to improve the quality of movement of a specific region, and to reduce pain.

Therapeutic Taping for Pain Management

There are many brands of elastic therapeutic tape, the most well known brand being Kinesio tape. This brand of therapeutic tape was developed by Kenzo Kase in 1970 as an adjunct treatment for athletic injuries and a variety of musculoskeletal disorders. Despite being around for nearly forty years, taping remained relatively unknown until a surge in popularity after the product was donated to Olympic athletes in the 2008 Beijing Summer Olympics and the 2012 London Summer Olympics. After being featured on this global stage it became common practice to add therapeutic taping to treatments in an effort to accelerate the return to activity, specifically for cases of low back pain. Evidence of efficacy is mostly anecdotal, but there are recent randomized controlled clinical trials showing clinically significant improvements in pain and disability.

The application of taping stays on the skin for 3-7 days, during this time the tape stimulates large diameter mechanosensitive nerve fibers. This novel sensory input helps to alleviate pain by preventing or reducing nociceptive traffic into the central nervous system. Essentially, this involves the gate control theory of pain, insofar as nociceptive signals are often modifiable in such a way that the pain experience greatly subsides or disappears altogether. Another proposed mechanism of action is that the application of tape facilitates tissue perfusion and lymphatic flow through a sympathetic vascular reflex and by mechanically increasing the interstitial space where the exchange of gases, nutrients, and metabolites between the blood and tissues occurs (Cimino et al., 2018).

In acute cases of low back pain, there are studies that show therapeutic taping provided clinically significant improvements in pain and disability (Kelle et al., 2016). In chronic cases of low back pain the literature on therapeutic taping is mixed. However there is a recent randomized controlled trial published in the journal Spine, that showed simple application of Kinesio tape over the erector muscle group reduces pain and disability in people who suffer from chronic non-specific low back pain (Al-Shareef et al., 2016).

Key Takeaways

For those who suffer from low back pain, taping has been shown to be a safe non-pharmacological therapeutic intervention that is simple to carry out, economical, and has very few and relatively minor side effects. Existing evidence suggests that therapeutic taping decreases the frequency, intensity and duration of non-specific low back pain, giving people confidence in their recovery and may lead to a reduced need for additional medication. However, it does not establish the superiority of taping to most sham interventions and other treatment approaches in terms of pain reduction. Additional rigorous study into the mechanisms behind and therapeutic values of taping would be of value.

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2.13: Therapeutic Ultrasound

Therapeutic ultrasound involves the use of a hand-held machine against the skin to deliver sound waves (vibrations) with the aim of relieving pain and to speed up recovery. Based on randomized controlled trials and systematic reviews therapeutic ultrasound does not have much research evidence supporting its use (Aiyer et al., 2020; Ebadi et al., 2020; Noori et al., 2020). Primary mechanism of action is likely through non-specific contextual effects.

Key Takeaways

Ultrasound involves the use of sound waves (vibrations) with the aim of relieving acute and chronic pain. Based on randomized controlled trials and systematic reviews therapeutic ultrasound does not have much evidence supporting its use.

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2.14: Cupping Therapy

The Use of Cupping Massage in Musculoskeletal Medicine

Cupping has been practiced in most cultures in one form or another throughout history, but the true origin of cupping therapy remains uncertain (Qureshi et al., 2017). The practice of cupping is a technique where a vacuum is created in a cup, drawing the skin up and decompressing the layers of the epidermis and subcutaneous superficial fascia.

Cupping massage is a modern version of a traditional therapy, often carried out using plastic cups and a manual hand-pump to create the vacuum. The vacuum draws the soft tissue perpendicular to the skin, providing a tensile force, which can be left in one site or moved along the tissue. The practitioner can control the intensity of the desired suction from 80 mmHg to 250 mmHg.

The most common sites of application are the back, chest, abdomen and hips. The cups are typically left in place for 5-15 minutes depending on the client's reaction and sensitivity. To cover a wider area, cupping massage can also be used with varying amounts of suction.

Why Does Cupping Work?

The responses to cupping are multifactorial – physiological and psychological factors interplay in a complex manner. The biopsychosocial provides a practical framework for investigating the complex interplay between cupping therapy and clinical outcomes. Based on the biopsychosocial model, investigation into mechanisms of action should extend beyond local tissue changes and include peripheral and central endogenous pain modulation. An observed favorable outcome may be explained by overlapping mechanism in the periphery, spinal cord, and brain including, but not limited to:

- Affective Touch – Interpersonal touch and therapeutic stimulation of somatosensory nerves (C-tactile afferent) mediates the release of oxytocin. Which can result in reduced reactivity to stressors and improved mood/affect.
- Contextual Factors – A positive therapeutic encounter is tied to clinical outcomes, the magnitude of a response may be influenced by mood, expectation, and conditioning.
- Mechanical Factors – Gentle stretching of neurovascular structures and muscles induces a molecular response that helps diminish edema and expedite clearance of noxious biochemical by-products of inflammation (cytokines, prostaglandins, and creatine kinase).
- Neurological Factors – The skin, subcutaneous tissue and fascia are all embedded with mechanosensitive nerve fibers, so the application of cupping invokes a number of neurophysiological responses. One being input from low-threshold Aβ fibers inhibits nociceptive processing and contributes to the activation of endogenous pain inhibitory mechanisms.

Is Cupping Safe?

Cupping is generally considered a safe therapy with minor side effects such as erythema, edema, and ecchymosis in a characteristic circular arrangement. The longer a cup is left on the skin and the higher tensile stress inside of the cup, the more of a circular mark is created this is due to capillary dilation. Cupping encourages blood flow to the cupped region (hyperemia), often the patient may feel warmer and/or hotter because of vasodilatation taking place, slight sweating may occur.

Key Takeaways

Cupping is a technique where a vacuum is created in a cup, drawing the skin and subcutaneous superficial fascia up into the cup. The use of cupping originated as early as 3000 B.C.E in a pre-scientific era and much of the reasoning once used to explain the effects do not make sense in the light of what we know today. Anecdotally cupping is used to alleviate pain, whether cupping works via contextual factors, neurophysiological responses or mechanical factors are all up for discussion.

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2.15: Medical Acupuncture

The earliest detailed report on Chinese and Japanese medicine to be written by a European was by Willem ten Rhyne, a Dutch physician who published Dissertatio de arthritide in 1683 (Bivins, 2001; Carrubba & Bowers, 1974). In this book Willem ten Rhyne documented the practice of acupuncture in detail, this was the first time that Europeans were introduced to the practice of acupuncture. Since then, there have been specific branches of acupuncture that have developed in Europe and North America independent of Traditional narratives. The practices are often referred to as medical acupuncture or western acupuncture. Regardless of its theoretical basis and based on the traditional definition, the term acupuncture refers to the actual insertion of a needle (usually a solid needle) into the body.



Figure 2.15.1 Sites for the application of acupuncture documented by Willem ten Rhyne.

> "The term 'acupuncture' is a translation of 针刺术 (zhen ci shu in Chinese pin yin) or in short 针 (zhen), and is literally equivalent to the term 'needling' or 'needling technique'. Based on the traditional and official definition, the term acupuncture refers to the actual insertion of a needle (usually a solid needle) into the body, which describes a family of procedures involving the stimulation of points on the body using a variety of techniques" — (Fan et al., 2016).

Following the European lineage, the concept of medical acupuncture was pioneered by Felix Mann who began to view acupuncture as a form of peripheral nerve stimulation. Fast forward to contemporary times and Medical Acupuncture is a precise peripheral nerve stimulation technique, in which acupuncture needles are inserted into anatomically defined sites and stimulated manually or with electricity. Needle insertion is based on an understanding of anatomy and neurophysiology and acknowledges the fact that, regardless of where the needle is inserted (skin, fascia, muscles, tendons, periosteum, joint capsules, etc.), there will be a number of physiological and psychological responses.

A Neurological Model: Evidence-based clinicians explain the mechanism of action in neurophysiological terms.

Acknowledging that traditional narratives are outdated, medical acupuncture is an approach that is based upon a theory that is inline current scientific understanding of how the body works (Robinson, 2016; White, 2009). Acupuncture originated in a pre-scientific era – Meridians and the concepts of Qi ought to be replaced by systems biology and an understanding of neurophysiology (endogenous opioids, endocannabinoid, and purinergic signaling).

The insertion of an acupuncture needle provides mechanical stimulation of specialized sensory receptors located in the cutaneous and subcutaneous structures. Preferential sites for acupuncture stimulation are associated with areas rich in specialized sensory receptors such as muscle spindles, Golgi tendon organs, ligament receptors, Paciniform and Ruffini's receptors (joint capsules), deep pressure endings (within muscle belly), and free nerve endings (muscle and fascia). Based on the neurological model, all these areas are highly innervated and as a result there are a number of physiological responses that help modulate the experience of pain. An observed favorable outcome may be explained by overlapping mechanisms in the periphery, spinal cord, and brain (Yin et al., 2017; Zhang et al., 2014).

Acupuncture Research Has Matured

The most comprehensive overview of acupuncture is published in *The Journal of Pain*, it is a meta-analysis using data from 39 trials and 20 827 patients showing that acupuncture helps with pain and effects exist beyond placebo. In this paper researchers

looked at all accumulated randomized controlled trials and examined how acupuncture fared in treating people with chronic pain, what it found was acupuncture often worked better than sham acupuncture and other control groups (Vickers et al., 2018).

As research into acupuncture continues to mature, more clinical practice guidelines, randomized controlled trials and systematic reviews now support the use of acupuncture as part of a multidimensional approach for patients suffering from common musculoskeletal symptoms including:

- Chronic pain (Vickers et al., 2018)
- Acute pain (Cohen et al., 2017; Jan et al., 2017; Murakami et al., 2017; Sakamoto et al., 2018)
- Low back pain (Chou et al., 2017; Foster et al., 2018; Qaseem et al., 2017)
- Non-acute pain after back surgery (Heo et al., 2021)
- Neck pain (Blanpied et al., 2017; Chou et al., 2018; Kjaer et al., 2017)
- Pelvic pain (Franco et al., 2018)
- Tension-type headaches (Busse et al., 2017; Linde et al., 2016)
- Migraines (Busse et al., 2017; Linde et al., 2016; Singh et al., 2020; Xu et al., 2020; Zhang et al., 2020)
- Osteoarthritis (Busse et al. 2017; Lin et al. 2016)
- Postoperative pain (Tedesco et al., 2017)
- Cancer pain (He et al., 2020; Hershman et al., 2018; Mao et al., 2021)
- Aromatase inhibitor-induced musculoskeletal symptoms (Gupta et al., 2020)
- Lateral elbow pain (Gadau et al., 2020)

Auricular Acupuncture for Pain

A specific branch of acupuncture is auricular acupuncture, which has been shown to be an easy to carry out non-pharmacological pain management method that may be of use for patients as a part of a larger multidisciplinary pain management pain strategy (Jan et al., 2017; Murakami et al., 2017; Ushinohama et al., 2016). Acknowledging that traditional narratives outdated auricular acupuncture is being reframed as a form of peripheral nerve stimulation technique in which acupuncture needles are inserted into anatomically defined sites and stimulated manually or with electricity. Auricular acupuncture is interesting because it can be used to stimulate the auricular branch of the vagus nerve (the inner conch of the ear) which may have therapeutic benefits (Butt et al., 2020; Usichenko et al., 2017).

Michigan Medicine: Deconstructing the Legitimization of Acupuncture: How Science Helped Move Acupuncture to Mainstream



The responses to acupuncture are multifactorial – physiological and psychological factors interplay in a complex manner.

The existence of placebo-induced effects does not negate treatment-induced results, the meaning response, therapeutic alliance, ritual, and context all play into the effects, the magnitude of a response may be influenced by mood, expectation, and conditioning (Kong et al., 2018).

The placebo response is real, and it is effective, which is why some may overlook other subtle physiological responses such as sensory gating. In addition to the placebo response the insertion of an acupuncture needle provides mechanical stimulation of

specialized sensory receptors located in the cutaneous and subcutaneous structures. This can have an analgesic & anti-inflammatory effect via the inflammatory reflex, endogenous opioids, endogenous cannabinoids and purinergic signaling (Yin et al., 2017; Zhang et al., 2014).

Adopting a neurophysiological explanation can lead to a wider acceptance in both research and clinical settings. Primary mechanism of action is through inhibition of nociceptive processing (bottom-up) and stimulation of endogenous pain inhibitory mechanisms (top-down) (Yu et al., 2020).

Key Takeaways

Acknowledging that traditional narratives outdated, medical acupuncture is an approach that is based upon a theory that is inline current scientific understanding of how the body works. For those who are unfamiliar with the literature, it may be easy to assume that acupuncture is just a placebo. The placebo response is a big part of why patients feel better, but it is also within the realm of reasons that patients have a complex biopsychosocial response to acupuncture that includes but is not limited to placebo.

Acupuncture needles stimulate afferent nerves (A-beta, A-delta, and C fibers), which triggers mechanical, contextual, and neurological responses that help modulate the experience of pain.

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2.16: Mindfulness-Based Interventions

What are Mindfulness-Based Interventions?

Mindfulness-based interventions include slow controlled breathing, mindfulness meditation, cognitive–behavioral therapies, biofeedback, guided imagery and physical activities such as yoga, tai chi, and qigong. These activities may be used to increase self-awareness, relieve stress, and improve interoception. Interoception refers to the representation of the internal world, and includes the processes by which an organism senses, interprets, integrates, and regulates signals from within itself (Chen et al., 2021; Weng et al., 2021).

Mindfulness-Based Interventions and Pain Management

There are many ways that people can practice mindfulness-based interventions, some common ways are through yoga classes, meditation classes, exercise and even mindful coloring. The practice of mindfulness has been around for a long time, but the practice has not received much scientific attention. New research into mindfulness-based interventions show that it can be a helpful adjunct in managing pain and other stress related noncommunicable diseases by fostering resilience through self-care (Shires et al., 2020; Skelly et al., 2020). Preliminary findings also suggest that integrating these tools into the health care system may reduce health care utilization and may be cost-effective (Stahl et al., 2015).

Research describing various neurological and physiological changes associated with mindfulness-based interventions, including activation of specific brain regions, increased heart-rate variability, and suppression of stress-induced inflammatory pathways (Dossett et al., 2020; Wells et al., 2020). Mindfulness is not a panacea, but it is an evidence-based option for patients who are willing to explore non-pharmacological options for pain management (Cherkin et al., 2016; Shires et al., 2020; Skelly et al., 2020).

Key Takeaways

Increasingly people are looking for alternative pain management strategies. The difficulty with mindfulness-based interventions is that it is not a one size fits all, what works for one person may not work for another, so it is important to try different approaches. The next step for researchers is to investigate what sort of dosage and duration would be needed to optimize the effects of this non-pharmacological approach.

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CHAPTER OVERVIEW

3: Clinical Examination

A Person-Centered Approach to Clinical Examination

Increasingly, research has shown that attributing the experience pain solely to poor posture, minor leg length discrepancies, vertebral misalignment and other structural abnormalities is an oversimplification of a complex process (Green et al., 2018; Lewis et al., 2020; Swain et al., 2020). Even in the case of osteoarthritis wear and tear on the joints may not be the primary cause of pain (Culvenor et al., 2019; Girish et al., 2011; Sihvonen et al., 2018). This may sound counter-intuitive, but it is part of our ever-changing understanding of the experience of pain and disability.

Contemporary pain management is shifting away from a pathoanatomical model to a person-centered model of care that is responsive to the individual context of each patient. Clinical examination and decision-making ought to reflect this change by understanding that structural abnormalities alone do not explain or necessarily predict pain.

Postural Assessment: Poor Posture May Not Be the Primary Cause of Spinal Pain

The presumption that poor posture is a primary contributor to spinal pain is not supported by compelling evidence (Swain et al., 2020). When performing a postural analysis, static posture may vary based on a number of factors and has limited validity in predicting the cause of a person's pain. Long-term research trials have demonstrated that posture during sitting, standing, and lifting does not predict low back pain or its persistence (O'Sullivan et al., 2020).

Structural abnormalities alone do not explain or necessarily predict pain, this is why attributing the experience of chronic pain to poor posture, minor leg length discrepancies, vertebral misalignment is an oversimplification of a complex process (Lewis & O'Sullivan, 2018; Maher et al., 2019). Minor anatomical variation is considered normal and is not considered a pathological abnormality. People experience pain differently due to differences in genetics, emotional stress, and history of physical trauma and sensitization of the nervous system (Rethorn et al., 2019; Swain et al., 2020).

Orthopedic Special Testing Provides Limited Information about The Cause of Chronic Pain

Orthopedic special testing is based on a biomechanical process which can overlook important underlying processes such as sensitization of the nervous system or underlying psychosocial factors. People with chronic pain often may have multiple comorbidities which may lead to inconclusive testing (Wideman et al., 2019). The role of orthopedic testing is to define a treatable pathology, which is reasonable, in the management of acute injuries. In the chronic pain population, orthopedic special tests involve a degree of subjectivity and few are sensitive or specific enough to have clinical value on their own (Cook, 2010; Hegedus et al., 2017; Salamh & Lewis, 2020). Even when orthopedic special tests are clustered there are issues with testing validity. As demonstrated by a large body of research orthopedic special testing can not reliably confirm the presence or absence of a pathology when patients are experiencing chronic pain (Salamh & Lewis, 2020).

Clinical Tests: Sensitivity & Specificity

- Sensitivity refers to the percentage of people who test positive for a specific disease among a group of people who have the disease.
- Specificity refers to the percentage of people who test negative for a specific disease among a group of people who do not have the disease.

Musculoskeletal Imaging Does Not Reliably Identify The Source of Chronic Pain

The use of musculoskeletal imaging is focused on determining a pathoanatomical diagnosis. This is unreliable at determining the source of chronic pain (Cuff et al., 2020; Maher et al., 2019). In cases of osteoarthritis, the diminishing joint cartilage may not be the primary contributor to pain (Hunter & Bierma-Zeinstra, 2019). Imaging studies have demonstrated that when a non-symptomatic-population is scanned they will often have degenerative changes in the knee, hip, shoulder, and spine (Brinjikji et al., 2015; Culvenor et al., 2019; Girish et al., 2011; Horga et al., 2020; Kim et al., 2015). These are now considered to be common age-related changes that are part of normal aging and often unassociated with the experience of pain (Hunter & Bierma-Zeinstra, 2019; Lewis et al., 2020; Maher et al., 2019).

Incidental findings that would carry a diagnosis of degenerative disc disease are common in both symptomatic and asymptomatic persons, and cannot be directly correlated to the person's pain. So even after diagnostic imaging we may still have limited information as to how we should proceed and formulate a meaningful treatment plan. Most clinical practice guidelines recommend against widespread imaging, which is supported by the research that shows a sizable portion of people with no pain show abnormalities or degenerative tissue (e.g., degenerative disk disease, rotator cuff tear, degenerative torn meniscus, femoroacetabular impingement, etc.) (Foster et al., 2018; Kamper et al., 2020; Lin et al., 2020). In a pathoanatomical approach the inability to directly connect structural abnormalities and clinical presentation can create confusion for both patients and clinicians.

A Person-Centered Approach to Pain & Disability

This disconnect between structural abnormalities and clinical presentation can create confusion for both patients and clinicians. This does not mean we should give up performing a thorough health history and physical examination of our patients. What it does mean is that we ought to adopt a person-centered model of care and interpret these findings in the context of individual patient presentation. A person-centered model of care is a multidimensional approach that gives therapists a better understanding of an individual's symptoms.

A skilled clinical examination helps to orientate, and aid clinical decision-making based on patients' limitations, goals, and course of pain. By capturing the patient's narrative, it can also help to identify meaningful goals and direct the most appropriate intervention based on pain presentation, functional limitations, and psychosocial factors.

The added value of a person-centered assessment is that even when underlying mechanisms are unclear, by understanding the patient's functional limitations and how pain is affecting their activities of daily life we can still formulate a meaningful treatment plan. A skilled clinical examination and a comprehensive health history taking has even been shown to have a therapeutic effect related to pain, fear-avoidance, pain catastrophizing, and functional measures of mobility and sensitivity (Louw et al., 2020).

Table 3.0.1 Foundations of a Person-Centered Approach

Evidence-Based Healthcare	Evidence-based healthcare is a clinically-oriented approach based on the three principles of evidence-based practice (best available evidence, clinical expertise and patient values)
Biopsychosocial Framework of Health & Disease	Biopsychosocial framework of health and disease is a whole-person approach that incorporates biomedical, psychological, and social influences in the patient's experience.
Shared-Decision Making	Shared-decision making is an approach in which patients and clinicians work together to develop a shared appreciation of the patient's situation and decide how to best manage it.

The Multidimensional Clinical Examination

Massage therapists often are already taking a person-centered approach to the assessment of pain. An example of this would be the use of SOAP notes to combine quantitative measurements (questionnaires, scales and tests), with qualitative reporting (patient's narratives).

In practice a thorough health history is done to gather information about patients' limitations, course of pain, and prognostic factors (e.g., coping style) and answers to health-related questions. This information is then blended with the patient narrative and information gathered from a traditional physical examination including orthopedic special testing, neurological screening tests, mobility and/or muscle strength assessment. For assessing and monitoring patient progress validated outcome measurements (e.g., patient-specific functional scale, brief pain inventory, visual analog scale, McGill pain questionnaire, global impression of change, patient-centered outcomes questionnaire) can be used to capture quantitative measurements.

A person-centered clinical examination is one that seeks to better understand the complex web of interactions in the patient's history, physiology and lifestyle. This information is then used to formulate a clinical hypothesis that does not seek a single source of pain. If adopted widely a person-centered model of care helps to reframe pain leading to improved patient-clinician relationships, improved self-efficacy, and better health outcomes for patients with pain.

Summary

Contemporary best-practices for pain supports a multidimensional approach that addresses biopsychosocial influences and empowers people with shared decision-making. Adopting a person-centered model of care does not discount the use of a traditional orthopedic assessments, it helps to put into context the interconnected and multi-directional interaction between physiology, thoughts, emotions, behaviors, culture, and beliefs.

If adopted a person-centered model of care could help reduce suffering and costs associated with musculoskeletal pain in our society. By helping patients avoid unnecessary procedures, minimize unnecessary harms and decrease economic burden associated with low-value care.

Key Takeaways

Contemporary pain management is shifting away from a pathoanatomical model to a person-centered model of care that is responsive to the individual context of each patient. Clinical examination and decision-making ought to reflect this change by understanding that structural abnormalities alone do not explain or necessarily predict pain. This section of the textbook will explore treatment options and best-practice recommendations for evidence-based assessment strategies.

3.1: Interpersonal Communication Skills
3.2: Screening For Red and Yellow Flags
3.3: Orthopedic Physical Examination

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3.1: Interpersonal Communication Skills

A Person-Centered Approach to The Clinical Encounter

Adopting a person-centered model of care gives therapists a better understanding of an individual's symptoms by capturing the patient's narrative. It can also help identify meaningful goals and direct the most appropriate intervention based on pain presentation, functional limitations, and psychosocial factors. The added value of a person-centered model is that even when underlying mechanisms are unclear, by understanding the patient's functional limitations and how pain is affecting their activities of daily life we can still formulate a meaningful treatment plan.

5 Practices to Help Establish a Meaningful Connection with Patients in the Clinical Encounter

1. Prepare with intention (take a moment to prepare and focus before greeting a patient);
2. Listen intently and completely (sit down, lean forward, avoid interruptions);
3. Agree on what matters most (find out what the patient cares about and incorporate these priorities into the visit agenda);
4. Connect with the patient's story (consider life circumstances that influence the patient's health; acknowledge positive efforts; celebrate successes);
5. Explore emotional cues (notice, name, and validate the patient's emotions)

Practical Application: How I Interview New Massage Clients – From Massage Sloth



Key Takeaways

A person-centered clinical examination is one that seeks to better understand the complex web of interactions in the patient's history, physiology and lifestyle. If adopted widely a person-centered model of care helps to reconceptualize pain leading to improved patient-clinician relationships, improved self-efficacy, and better health outcomes for patients with pain.

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3.2: Screening For Red and Yellow Flags

Red flags are signs and symptoms that raise suspicion of serious underlying pathology, if a serious pathology is suspected a clinical decision should be made to refer the patient to an appropriate healthcare practitioner.

- **Red Flags for Back Pain** – For patients with low back pain there are several serious spinal pathologies to be aware of, these are cauda equina syndrome, spinal fracture, malignancy, and spinal infection (Finucane et al., 2020).

Yellow flags are psychosocial and occupational factors that may affect patient presentation and treatment approaches and outcomes.

PhysioTutors: Screening for Red Flags



PhysioTutors: What are Yellow Flags and Why are They Important?



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3.3: Orthopedic Physical Examination

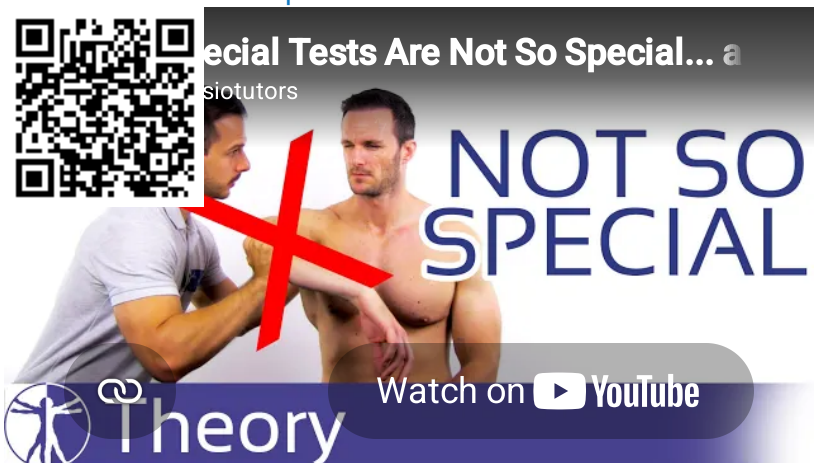
Most orthopedic special tests involve a degree of subjectivity and few are sensitive or specific enough to have clinical value on their own. Even when these tests are clustered there are issues with testing validity, this is because these tests are often good at reproducing pain but not great at telling us what structures the symptoms are coming from (Docking et al., 2016; Hegedus et al., 2017; Salamh & Lewis, 2020).

The current use of clinical tests is focused on a black and white pathoanatomical diagnosis, this often does not determine the source of pain. Increasingly, research shows that attributing the experience of pain solely to poor posture, minor leg length discrepancies, vertebral misalignment and other structural abnormalities is an oversimplification of a complex process (Green et al., 2018).

In some cases degenerative changes in the knee, shoulder, and spine are a normal part of normal aging and not associated with symptom presentation (Brinjikji et al., 2015; Culvenor et al., 2019; Farrell et al., 2019; Girish et al., 2011; Sihvonen et al., 2018). This disconnect between tissue damage seen on imaging and clinical presentation often creates confusion for both patients and clinicians. As a result, the medical community has moved on from a traditional biomechanical framework into a biopsychosocial framework (Lewis et al., 2020; Lin et al., 2020).

All this does not mean we should give up on performing a physical examination of our patients, what it means is that we ought to gather information about patients' limitations, course of pain, and prognostic factors (eg, coping style). This information is then blended with information gathered from a traditional clinical examination including special testing, neurological examination, mobility and/or muscle strength assessment.

PhysioTutors: Special Tests Are Not So Special… and when to use them



Key Takeaways

Increasingly, research shows that attributing the experience of pain solely to poor posture, minor leg length discrepancies, vertebral misalignment and other structural abnormalities is an oversimplification of a complex process. The human body is not a simple structure, but rather a complex and adaptable network of overlapping systems. We must move from the myth of a simple biomechanical framework, or pathoanatomical model of trying to fix the structure, to understanding the complexity of a biopsychosocial framework and how all of the systems within the body interact to experience all types of pain.

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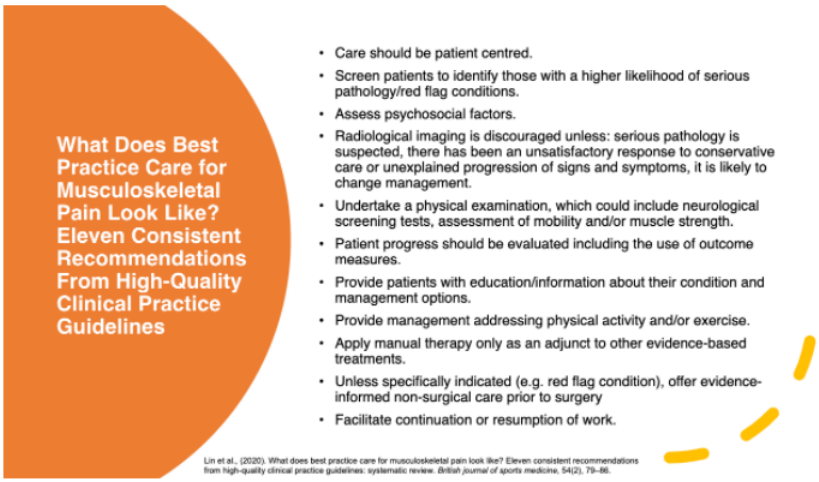
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CHAPTER OVERVIEW

4: Best Practice Recommendations for Musculoskeletal Pain

The medical community is acutely aware of the economic and social burden of musculoskeletal disorders and the overuse of radiological imaging and invasive interventions and opioids. Contemporary best-practices for musculoskeletal pain supports a multidisciplinary approach that addresses biopsychosocial influences and empowers patients to actively self-manage.

If a best practice approach for musculoskeletal pain was adopted, it would massively reduce suffering and costs associated with musculoskeletal pain in our society. A systematic review and narrative synthesis published in the *British Journal of Sports Medicine* identified eleven consistent best-practice recommendations for musculoskeletal pain (Lin et al., 2020):



Key Takeaways

If massage therapists adopt these best-practice recommendations, we could be part of the solution as we can reduce the suffering and costs of musculoskeletal pain in our society.

4.1: Acute Pain
4.2: Chronic Pain
4.3: Osteoarthritis
4.4: Neuropathic Pain
4.5: Tendinopathy
4.6: Rehabilitation for Strains and Sprains
4.7: Delayed Onset Muscle Soreness
4.8: Fibromyalgia
4.9: Cancer-Related Pain
4.10: Temporomandibular Disorders
4.11: Migraines and Tension-Type Headaches
4.12: Post-Concussion Syndrome
4.13: Neck Pain
4.14: Shoulder Pain
4.15: Elbow Pain
4.16: Thoracic Outlet Syndrome
4.17: Carpal Tunnel Syndrome
4.18: Dupuytren's Disease

4.19: Back Pain
4.20: Sciatica
4.21: Hip Pain
4.22: Knee Pain
4.23: Achilles Tendinopathy
4.24: Ankle Pain
4.25: Plantar Heel Pain

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4.1: Acute Pain

The International Association for the Study of Pain (IASP) states that “pain is an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage”. This definition represents a shift away from a pathoanatomical approach to contemporary view of pain recognizing that the experience of pain is multifactorial and is influenced to varying degrees by biological, psychological, and social factors (Raja et al., 2020). Six new key notes go with this new definition of pain, they are:

1. Pain is always a personal experience that is influenced to varying degrees by biological, psychological, and social factors.
2. Pain and nociception are different phenomena. Pain cannot be inferred solely from activity in sensory neurons.
3. Through their life experiences, individuals learn the concept of pain.
4. A person’s report of an experience as pain should be respected.
5. Although pain usually serves an adaptive role, it may have adverse effects on function and social and psychological well-being.
6. Verbal description is only one of several behaviors to express pain; inability to communicate does not negate the possibility that a human or a nonhuman animal experiences pain.

Pathophysiology

Acute pain can be a result of various conditions including post-operative pain, muscle strains, sprains, contusion, whiplash and nonsurgical fractures. Acute pain usually lasts less than 7 days, but can in some cases acute pain can last as long as 30 days (Kent et al., 2017).

Examination

A thorough health history intake can be done to gather information about patients’ limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Pain Self Efficacy Scale
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Numeric Pain Rating Scale (NPRS)
- Visual Analog Scale (VAS)
- The Revised Short McGill Pain Questionnaire Version-2 (SF-MPQ-2)

Treatment

Education

Provide patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

Ascribing patient’s pain solely a tissue-driven pain problem is often an oversimplification of a complex process. This insight provides us with an opportunity to re-frame our clinical models. Gently stretching the muscles, neurovascular structures, and investing fascia activates endogenous pain modulating systems that help to modulation neuro-immune responses.

Self-Management Strategies

To avoid harms associated with drugs, multi-modal nondrug therapies for pain are becoming more widely used, including ice, heat, acupressure, transcutaneous electrical nerve stimulation, exercise, and mindfulness-based interventions (Brasure et al., 2019; Chou et al., 2020; Hsu et al., 2019; Qaseem et al., 2020; Shires et al., 2020).

Prognosis

Massage therapy as a therapeutic intervention is being embraced by the medical community. This is in part because it is a non-pharmacological therapeutic intervention that is simple to carry out, economical, and has very few side effects. Existing evidence suggests that massage therapy (soft tissue massage, neural mobilization, joint mobilization) can be used to help relieve pain, improve function, and reduce anxiety when integrated with standard care (Brasure et al., 2019; Chou et al., 2020). An interdisciplinary approach including patient education, self-management strategies and massage therapy based on shared-decision making and patient safety is best practice for acute pain management.

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for acute pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.2: Chronic Pain

Chronic pain, defined as pain that occurs on ≥ 50% of days over a period of at least 6 months or as pain that persists for at least 3 months. Such pain often becomes the sole or predominant clinical problem in some patients (Treede et al., 2019).

- **Chronic primary pain** is characterized by disability or emotional distress and not better accounted for by another diagnosis of chronic pain. Here, you will find chronic widespread pain, chronic musculoskeletal pain previously termed “non-specific” as well as the primary headaches and conditions such as chronic pelvic pain and irritable bowel syndrome.
- **Chronic secondary pain** is organized into the following six categories:

1. 1. **Chronic cancer-related pain** is chronic pain that is due to cancer or its treatment, such as chemotherapy.
   2. **Chronic postsurgical or post-traumatic pain** is chronic pain that develops or increases in intensity after a tissue trauma (surgical or accidental) and persists beyond three months.
   3. **Chronic neuropathic pain** is chronic pain caused by a lesion or disease of the somatosensory nervous system. Peripheral and central neuropathic pain are classified here.
   4. **Chronic secondary headache or orofacial pain** contains the chronic forms of symptomatic headaches and follows closely the ICHD-3 classification.
   5. **Chronic secondary visceral pain** is chronic pain secondary to an underlying condition originating from internal organs of the head or neck region or of the thoracic, abdominal or pelvic regions. It can be caused by persistent inflammation, vascular mechanisms or mechanical factors.
   6. **Chronic secondary musculoskeletal pain** is chronic pain in bones, joints and tendons arising from an underlying disease classified elsewhere. It can be due to persistent inflammation, associated with structural changes or caused by altered biomechanical function due to diseases of the nervous system.

Pathophysiology

Chronic pain is a condition, affecting an estimated 20% of people worldwide. The current scientific consensus is that symptoms are caused by ongoing neuro-inflammation and hyper-vigilance of the central nervous system. More specifically sustained glial cell activation and elevated levels of certain inflammatory substances.

Examination

A thorough health history intake can be done to gather information about patients’ limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following chronic pain outcome measurements when assessing and monitoring patient progress:

- Patient Global Impression Change
- Pain Self Efficacy Scale
- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Numeric Pain Rating Scale (NPRS)
- Visual Analogue Scale (VAS)
- Michigan Body Map
- Perceived Stress Questionnaire (PSQ)
- McGill Pain Questionnaire (MPQ) or The Revised Short McGill Pain Questionnaire Version-2 (SF-MPQ-2)
- Multidimensional Pain Inventory
- Short Musculoskeletal Function Assessment (SMFA)

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

Ascribing a patient's pain solely to a tissue-driven pain problem is an oversimplification of a complex process. This insight provides us with an opportunity to re-frame our clinical models. Gently stretching the muscles, neurovascular structures, and investing fascia activates endogenous pain modulating systems that help to modulate neuro-immune responses.

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Exercise therapy is safe and beneficial for physical and psychosocial health in people with multiple comorbidities (Bricca et al., 2020). Regular physical activity have been shown to significantly reduce symptoms of anxiety, reduce pain, and improve function (Bull et al., 2020; Pedersen & Saltin, 2015). The world health organization recommends adults should undertake 150-300 min of moderate-intensity, or 75-150 min of vigorous-intensity physical activity, or some equivalent combination of moderate-intensity and vigorous-intensity aerobic physical activity, per week. These guidelines highlight the importance of regularly undertaking physical activity (both aerobic and muscle strengthening activities) emphasizing the value of any activity, of any duration, and any intensity (Bull et al., 2020).

Prognosis

Clinical practice guidelines recommend the use of massage therapy as part of a multi-modal approach for patients with chronic pain (Busse et al., 2017; Skelly et al., 2020). It is not suggested that massage therapy alone can control symptoms but can be utilized to help relieve pain & reduce anxiety when integrated with standard care.

The Mysterious Science of Pain - Joshua W. Pate



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for chronic pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.3: Osteoarthritis

Massage Therapy for People with Osteoarthritis

Osteoarthritis (OA) is the most common form of arthritis, affecting an estimated 302 million people worldwide, this is a condition characterized by cartilage degradation and bone remodeling which in some cases can lead to pain, stiffness, swelling, and loss of normal joint function (Kolasinski et al., 2020).

Pathophysiology

Osteoarthritis is a common finding in the general population, and most commonly will affect knees, hips, hands, and the spine. In addition to tissue degeneration this condition involves sensitization of the nervous system, which may result in patients with osteoarthritis perceiving relatively low-level stimuli as being overtly painful (Hunter & Bierma-Zeinstra, 2019).

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Outcome Measurements

Clinicians could incorporate one or more of the following validated outcome measurements when assessing and monitoring patient progress:

- Patient Global Impression Change
- Pain Self Efficacy Scale
- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Numeric Pain Rating Scale (NPRS)
- Visual Analogue Scale (VAS)
- McGill Pain Questionnaire (MPQ) or The Revised Short McGill Pain Questionnaire Version-2 (SF-MPQ-2)
- Multidimensional Pain Inventory
- Short Musculoskeletal Function Assessment (SMFA)
- Knee Injury and Osteoarthritis Outcome Score (KOOS)
- Hip Disability and Osteoarthritis Outcome Score (HOOS)
- Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)
- Six Minute Walk Test

Treatment

Skills-based capability framework for health professionals providing care for people with osteoarthritis

There are a number of rehabilitation strategies for osteoarthritis based on patient-specific assessment findings including, but not limited to self-management and education, exercise, and manual therapy. A skills-based capability framework helps to facilitate individualized treatment decisions regarding the management of osteoarthritis (Hinman et al., 2020), this includes but is not limited to:

1. communication
2. person-centered care;
3. history-taking;
4. physical assessment;
5. investigations and diagnosis;
6. interventions and care planning;
7. prevention and lifestyle interventions;
8. self-management and behavior change;

9. rehabilitative interventions;
10. pharmacotherapy;
11. surgical interventions;
12. referrals and collaborative working;
13. evidence-based practice and service development

Education

Provide reassurance and facilitate an evidence based understanding of treatment options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms. Reassess the patient's status at each visit for new or worsening symptoms, or satisfactory recovery.

Manual Therapy

Clinical practice guidelines and randomized controlled trials recommend the use of manual therapy as part of a multi-modal approach for patients with osteoarthritis related pain (Busse et al., 2017; Bowden et al., 2020; Kolasinski et al., 2020; Skelly et al., 2020). Two recent randomized clinical trials have highlighted the effect of conservative treatment options for patients suffering from osteoarthritis related knee pain. In one randomized clinical trial published in the *Journal of General Internal Medicine* massage therapy was shown to improve function in patients who suffer from osteoarthritis related knee pain (Perlman et al., 2019). In addition, a randomized trial published in *The New England journal of medicine* demonstrated the benefits of a conservative multimodal approach (manual therapy + exercise) for patients with symptomatic osteoarthritis of the knee (Deyle et al., 2020).

It is not suggested that massage therapy alone can control symptoms but can be utilized to help relieve pain & reduce anxiety when integrated with standard care. Ascribing a patient's pain solely to a tissue-driven pain problem is often an oversimplification of a complex process. This insight provides us with an opportunity to re-frame our clinical models. Massage therapy is a form of peripheral somatosensory stimulation that can modulate the activity of neuro-immune (peripheral, cortical, subcortical) processes correlated with the experience of pain (Bialosky et al., 2018). By activating ascending and descending inhibitory systems, massage therapy may be able to mitigate the transition, amplification and development of chronic pain.

Self-Management Strategies

Exercise programs for muscle strengthening, joint mobility, proprioception and aerobic exercises is a core treatment for people with osteoarthritis (Daste et al., 2021). People with osteoarthritis should be encouraged to engage in physical activity, irrespective of duration. There is good evidence that even modest volumes of exercise will benefit people with arthritis-related pain (Kraus et al., 2019).

Prognosis

Clinical practice guidelines for osteoarthritis are moving towards an interdisciplinary approach with an emphasis on self-management, physical and psychological therapies, and less emphasis on pharmacological and surgical treatments (Bannuru et al., 2019; Kolasinski et al., 2020). Pharmacological treatments options such as opioid analgesics and non-steroidal anti-inflammatory drugs (NSAIDs) have small effects on osteoarthritis related pain and are associated with adverse effects (Chou et al., 2020; Fuggle et al., 2019; Gregori et al., 2018; Machado et al., 2015; Osani et al., 2020; Osani et al., 2020; Zeng et al., 2019. Research also has demonstrated that corticosteroid injections can harm the joint resulting in cartilage loss, accelerated progression of osteoarthritis, and increase the risk of requiring arthroplasty (Kompel et al., 2019; Wijn et al., 2020).

Embracing an interprofessional strategy for pain treatment can include the use of conservative pain management strategies including but not limited to low-impact exercise, acupuncture, hydrotherapy, manual therapy, and psychological therapies as part of a multidimensional treatment approach for patients suffering from osteoarthritis related pain (Bannuru et al., 2019; Busse et al., 2017; Kolasinski et al., 2020; Lin et al., 2020; Skelly et al., 2020).

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for osteoarthritis based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)

- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.4: Neuropathic Pain

Neuropathic caused by a lesion or disease of the somatosensory nervous system. Peripheral and central neuropathic pain are classified here.

Pathophysiology: The Nervous System Becomes Sensitive When it is Exposed to a Pathological Environment

As peripheral nerves pass through the body they may be exposed to mechanical or chemical irritation at different anatomical points. Prolonged compression or fixation of a nerve may result in a reduction of intraneural blood flow. This then triggers the release of pro-inflammatory substances (calcitonin gene-related peptide and substance P) from the nerve. This by product is referred to as neurogenic inflammation and it can disrupt the normal function of nerves even without overt nerve damage, it can also contribute to the initiation and propagation of chronic pain (Barbe et al., 2020; Bove et al., 2019; Matsuda et al., 2019).

Clinical Examination: Clinical Sensory Testing Can Be Used to Assess for Increased Sensitivity of the Nervous System

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)

Physical Examination

Incorporate one or more of the following physical examination tools to determine the likelihood of neuropathic pain and interpret examination results in the context of all clinical exam findings. If there is an irritated peripheral nerve, clinical sensory testing can be used to assess for areas of hypersensitivity. In addition to orthopedic testing this could involve palpation (neural and non-neural structures). If a hypersensitive peripheral nerve has been identified, a treatment plan is then implemented based on patient-specific assessment findings and patient tolerance.

Table 4.4.1 Upper Limb Neurodynamic Tests

	1	2	3	4	5	6
ULNT - Median (1)	Shoulder Girdle Stabilization	Shoulder Abduction	Wrist/Finger Extension	Forearm	Supination	Shoulder External Rotation
ULNT - Median (2)	Shoulder Girdle Depression	Elbow Extension	Shoulder External Rotation	Forearm Supination	Wrist/Finger Extension	Shoulder Abduction
ULNT - Radial (3)	Shoulder Girdle Depression	Elbow Extension	Shoulder Internal Rotation	Forearm Pronation	Wrist/Finger Flexion	Shoulder Abduction
ULNT - Ulnar (4)	Wrist/Finger Extension	Forearm Pronation	Elbow Flexion	Shoulder External Rotation	SHoulder Girdle Depression	Shoulder Abduction

Table 4.4.2 Lower Limb Neurodynamic Tests

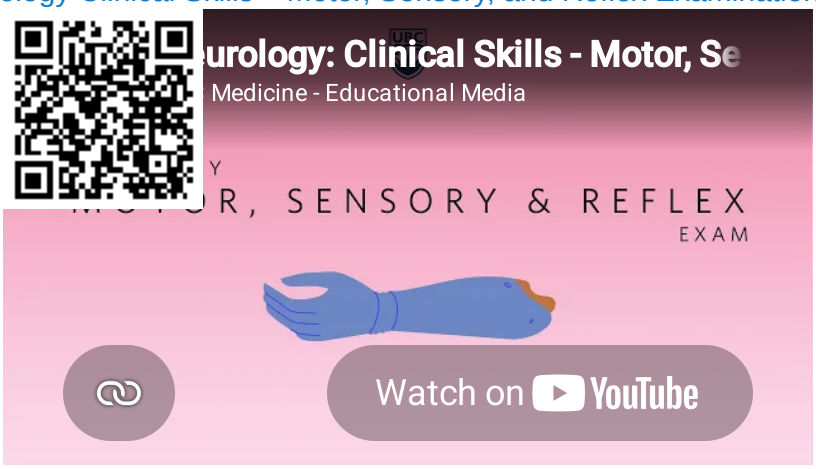
	1	2	3	4	5
Slump	Hands Behind Back	Thoracic Flexion	Extend One Knee	Dorsiflex Foot	Cervical Flexion
Straight Leg Raise	Supine Position	Raise the leg with the knee extended	If Pain radiates when the angle is between 30 and 70 degrees (positive)	Increased pain on dorsiflexion of the patient's foot increases sensitivity of the test	
Femoral Nerve Test	Prone or Side Lying	Knee Flexion	Extension at the Hip		
Dorsiflexion Eversion	Supine	Place foot into full dorsifelxion & eversion	Hold for 5-10 sec.		

Synopsis of Common Peripheral Nerve Complaints

Affected Nerve	Symptoms	Peripheral Nerve Palpation Point
Head, Neck & Upper Limb		
Occipital Nerve	Pain, numbness or tingling at the base of the occiput	Base of the occiput
Suprascapular Nerve	Shoulder pain, weakness in shoulder abduction and external rotation	Suprascapular notch
Dorsal scapular nerve	Upper and mid-thoracic pain, stiffness	Medial border of rhomboids
Long thoracic nerve	Pain, numbness or tingling over lateral flank. Winging of the scapula is possible	In-between scapula and chest wall
Median nerve	Pain, numbness or tingling in the thumb, index, middle, and ring fingers.	Upper arm, pronator teres and carpal tunnel
Ulnar nerve	Pain, numbness or tingling in ring and little finger	Upper arm, cubital tunnel
Radial nerve	Pain, numbness or tingling over common extensor tendon	Triangle interval, spiral grove, epimysial groove - extensor, snuff box
Back & Hip		
Spinal nerve (dorsal cutaneous ramus)	Dysesthesia on the upper back between the vertebra and scapula (T2-T6)	Deep to back muscles
Intercostal nerve	Sharp or shooting thoracic pain	Anterior cutaneous branches of the thoracoabdominal (T7-11) and subcostal (T12) nerves - lateral border of the rectus muscle
Cluneal nerve	Pain, numbness or tingling along iliac crest or into gluteus muscles	Superior rim of the iliac crest
Sciatic nerve	Pain, numbness or tingling felt in the buttock, back of the thigh down to the calf, into the toes	Popliteal fossa
Lateral femoral cutaneous nerve	Paresthesia of the lateral upper thigh	Distal to inguinal ligament
Lower Limb		

Saphenous nerve	Knee pain or paresthesia medial thigh	Adductor canal
Tibial nerve	Pain, numbness or tingling over medial ankle and arch of the foot	Tarsal tunnel, posterior to the medial malleolus
Medial & Lateral plantar nerve	Sharp or stabbing heel pain	Deep to plantar muscle - running under the calcaneus
Peroneal nerve	Pain, numbness or tingling over lateral ankle and dorsum of foot	Over peroneal muscle belly & dorsum of foot
Sural nerve	Pain, numbness or tingling over entrapment site and lateral calf	Mid-belly of the gastrocnemius, lateral ankle

UBC Medicine Neurology Clinical Skills – Motor, Sensory, and Reflex Examination



Treatment Considerations

Education

Provide patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

The responses to neural mobilization are complex and multifactorial – physiological and psychological factors interplay in a complex manner. Systematic reviews have shown that neural mobilization combined with multimodal care can improve symptoms, decrease disability and improve function for patients who suffer from peripheral nerve entrapment (Basson et al., 2017).

The biopsychosocial model provides a practical framework for investigating the complex interplay between manual therapy and clinical outcomes. Based on this, the investigation into mechanisms of action should extend beyond local tissue changes and include peripheral and central endogenous pain modulation (Bialosky et al., 2018).

Central Response
Neural mobilization has a modulatory effect on peripheral and central processes via input from large sensory neurons that prevents the spinal cord from amplifying the nociceptive signal. This anti-nociceptive effect of massage therapy can help ease discomfort in patients who suffer from peripheral nerve entrapments.

Peripheral Response
Neural mobilization may also involve specific soft tissue treatment to optimize the ability of mechanical interfaces to glide relative to the neural structure. The application of appropriate shear force and pressure impart a mechanical stimulus that may attenuate tissue levels of fibrosis and TGF-β1 (Bove et al., 2016; Bove et al., 2019). Furthermore, passive stretching may help diminish intraneural edema and/or pressure by mobilizing the peripheral nerve as well as associated vascular structures (Boudier-Revéret et al., 2017; Gilbert et al., 2015).

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Home-care recommendations such as hydrotherapy, stretching, splinting and home exercises have been shown to be useful for people with neuropathic pain.

Prognosis

In terms of research evidence neural mobilization has been shown to be particularly helpful for common forms of back, neck, leg and foot pain (Basson et al., 2017). An observed favorable outcome may be explained by overlapping mechanisms in the periphery, spinal cord, and brain, including but not limited to affective touch, contextual factors, neurological factors, and mechanical factors.

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for neuropathic pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.5: Tendinopathy

Rehabilitation for Tendon Pain

Tendinopathy is the preferred term for persistent tendon pain and loss of function related to mechanical loading (Scott et al., 2020).

- Patellar tendinopathy is the preferred term for persistent patellar tendon pain and loss of function related to mechanical loading.
- Achilles tendinopathy is the preferred term for persistent Achilles tendon pain and loss of function related to mechanical loading.
- Peroneal (fibularis) tendinopathy is the preferred term for persistent peroneal (fibularis) tendon pain and loss of function related to mechanical loading.
- Persistent tendon pain and loss of function related to mechanical loading of the medial or lateral elbow tendons should be referred to as medial or lateral elbow tendinopathy.

Pathophysiology

The presentation of pain in a tendon, does not always mean that the tendon is the primary contributor to pain. The multifactorial model of tendinopathy suggests that an impaired motor system, local tendon pathology, and changes in the pain/nociceptive system contributes to the complex clinical picture of tendon pain.

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

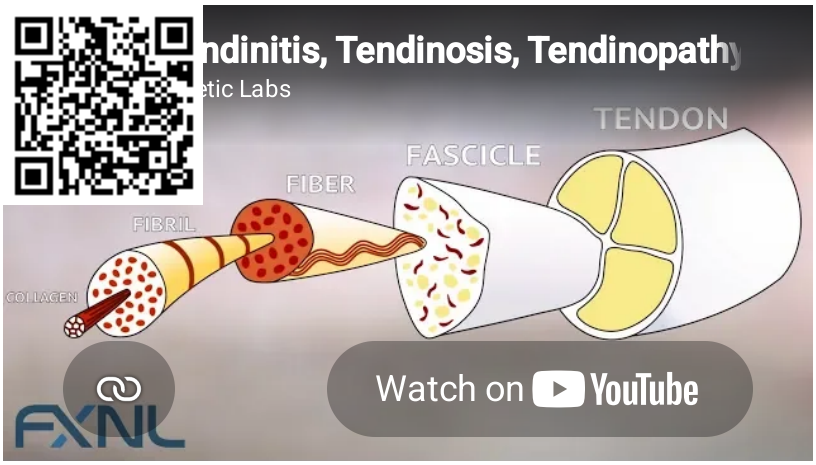
Manual Therapy

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. There may be times that focal irritability (i.e., nerve irritation, trigger points, nervous system sensitization) co-exists with tendon pain. Gently stretching the muscles, neurovascular structures, and investing fascia activates endogenous pain modulating systems that help to modulate neuro-immune responses.

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as hydrotherapy, relative rest, and strengthening exercises may be useful for people with tendon pain.

Tendinitis, Tendinosis, Tendinopathy? Exercise is the best medicine for tendon pain.



Prognosis

Multimodality options self-care techniques such as exercise therapy, relative rest, activity modifications should be considered as the first line treatment of tendon pain (Irby et al., 2020). Clinicians managing tendon pain should be thoughtful and skilled in managing the load on the tendons and supporting structures through a number of rehabilitation considerations including, but are not limited to manual therapy, education on psychosocial factors such as fear avoidance, and remedial loading programs.

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for tendon pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.6: Rehabilitation for Strains and Sprains

Pathophysiology

Many of the current clinical practice guidelines for acute care of sprains and strains run counter to some long-held beliefs. One of the primary changes surrounding the management of acute injuries is that most guidelines recommend against the use of ice to control inflammation. It is now recognized that ice can delay healing, increase swelling, and possibly cause additional damage to injured tissues (Duchesne et al., 2017).

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

Ascribing a patient's pain solely to a tissue-driven pain problem is often an oversimplification of a complex process. This insight provides us with an opportunity to re-frame our clinical models. Gently stretching the muscles, neurovascular structures, and investing fascia activates endogenous pain modulating systems that help to modulate neuro-immune responses. There is initial evidence indicating that conservative methods (exercise or manual therapy) may be able to mitigate the development of fibrosis and other similar pathologies by attenuating tissue levels of fibrosis and TGF-β1 (Bove et al., 2016; Bove et al., 2019).

Self-Management Strategies

By following the principles of load and exercise progression early movement and rehabilitation for acute muscle strains may accelerate return to sport. A recent article published in the New England Journal of Medicine highlights the role of early movement and rehabilitation for acute muscle strains (Bayer et al., 2017), this study used a combination of loads to accelerate return to sport including:

- Static stretching (Three times a day 30 seconds)
- Isometric exercises
- Dynamic resistance exercises
- Heavy slow resistance exercises

PEACE & LOVE: New acronym for the treatment of traumatic injuries

One of the primary changes surrounding the management of acute injuries is that most guidelines recommend against the use of ice to control inflammation. It is now recognized that ice can delay healing, increase swelling, and possibly cause additional damage to injured tissues. Traditionally treatment of an acute sprain or strain consists of RICE (Rest, Ice, Compression, Elevation), the most recent recommendation has been to provide soft tissue injuries with the PEACE & LOVE protocol to encourage optimal loading of the joint and tissue around the affected injury can affect the amount swelling leading to a faster recovery (Dubois & Esculier, 2020).

- **PEACE** makes up the first steps you would take after an injury. Immediately after the injury you would want to protect (P) the injured structure, followed by elevating (E) the limb higher than the heart, avoid anti-inflammatory (A) both over-the-counter or prescriptions and ice, as they slow down tissue healing. Compress (C) the injured area to decrease swelling. Ensure patient education (E) on the risks of overtreatment.
- **LOVE** makes up the progressive return to activities a few days after the injury. Gradual load (L) will facilitate healing, optimistic (O) influences the perception of pain and recovery speed. Loading and progressive return to activity will facilitate vascularization (V) of the injured tissues. The last step involves activity exercises (E) can help recover range of motion, strength and proprioception.



Prognosis

Massage therapy as a therapeutic intervention is being embraced by the medical community. This is in part because it is a non-pharmacological therapeutic intervention that is simple to carry out, economical, and has very few side effects. Existing evidence suggests that massage therapy (soft tissue massage, neural mobilization, joint mobilization) can be utilized to help relieve pain, improve function, and reduce anxiety when integrated with standard care (Brasure et al., 2019). However, massage therapists should not overlook the importance of educating patients and addressing psychosocial factors to enhance recovery, which is the backbone of rehabilitation of acute injuries.

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for sprains and strains based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.7: Delayed Onset Muscle Soreness

Delayed onset muscle soreness (DOMS) is the distinct feeling of discomfort after strenuous physical activity, symptoms typically peak at 24-72 hours.

Pathophysiology

There are different theories of what accounts for this delayed discomfort 24-48 hours post exercise. The inflammation theory proposes that delayed onset muscle soreness is due to the accumulation of histamines, cytokines, and prostaglandins (Vadasz et al., 2020). Another theory is that delayed onset muscle soreness is caused by an acute axonopathy, where increased fluid pressure mechanically irritates nerve endings in the muscle spindle (Sonkodi et al., 2020). Current evidence suggests that lactic acid does not play a role in this condition.

SciShow: Does Lactic Acid Really Cause Muscle Pain?



Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- Patient Global Impression of Change (PGIC)

Treatment

Massage therapists are professionally trained to treat active individuals from grassroots sports to professional athletes. They specialize in specific techniques for pre-event, post event and restorative/ training massage. There are important considerations to be made around dosage and timing of massage, but most treatment lengths vary between five and twenty minutes. Therapists use many different techniques, Swedish massage, sports massage, myofascial release and cupping massage, most often patients will feel a difference once they get off the table.

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

Researchers have investigated the effect of soft-tissue massage on cellular signaling and tissue remodeling; this is referred to as mechanotherapy. Research has demonstrated that massage therapy (effleurage in particular) has a modest effect on local circulation and perfusion both in the massaged limb and in the contralateral limb (Monteiro Rodrigues et al., 2020). Furthermore, a recent joint research effort between Timothy Butterfield of the University of Kentucky and researchers at Colorado State University demonstrated that modelled massage enhanced satellite cell numbers (Miller et al., 2018; Hunt et al., 2019). This was in addition to earlier research from Butterfield and his collaborators at the University of Kentucky, which proposes the idea that mechanical stimulation prompts a phenotype change of pro-inflammatory M^1 macrophages into anti-inflammatory M^2 macrophages (Waters-Banker et al., 2014). Taken together the increase in satellite cell numbers and reduction in inflammatory signaling may improve the body's ability to respond to subsequent rehabilitation.

Also, worth noting is that ascribing a patient's pain solely a tissue-driven pain problem is often an oversimplification of a complex process. This insight provides us with an opportunity to re-frame our clinical models. Gently stretching the skin, muscles, neurovascular structures, and investing fascia activates endogenous pain modulating systems that help to modulate neuro-immune responses. There is evidence indicating that conservative methods (exercise or manual therapy) can help to ease pain and muscle soreness (Davis et al., 2020; Dupuy et al., 2018; Guo et al., 2017).

Self-Management Strategies

When massage therapy is combined with a healthy diet, active recovery and sleep it can be part of an effective post-exercise recovery strategy (Van Hooren & Peake, 2018). The goal of post-exercise recovery is to ensure that athletes possess the physical & mental capacities to compete at their highest level. Which can be a challenge, due to the number of variables can affect athletic performance (e.g., fatigue, recovery, training status, health and well-being). However short-term gains in recovery may be balanced out by longer-term costs, ice baths and massage that may artificially accelerate recovery from exercise may carry a hidden cost, since post-exercise inflammation signals your body to adapt and get stronger.

Prognosis

The growing body of literature supports the use of massage therapy to help alleviate the musculoskeletal disorders associated with everyday stress, physical manifestation of mental distress, muscular overuse and many persistent pain syndromes (Skelley et al., 2020). Massage therapy may be an effective recovery tool considering it provides both physical and psychological benefits, examining the basic science behind massage therapy enables us to speculate how specific and nonspecific effects of massage can help to ease pain and muscle soreness (Best & Crawford, 2017). Existing evidence suggests that massage therapy (soft tissue massage, neural mobilization, joint mobilization) can be utilized to help relieve pain, improve function, and reduce anxiety when integrated with standard care (Davis et al., 2020; Dupuy et al., 2018; Guo et al., 2017).

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for delayed onset muscle soreness based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.8: Fibromyalgia

Fibromyalgia is used to describe a ‘constellation of symptoms’ characterized by widespread pain in the muscles and joints, fatigue, sleep problems and cognitive difficulties (Arnold et al., 2019).

Pathophysiology

The current scientific consensus is that symptoms are caused by ongoing neuro-inflammation and hyper-vigilance of the central nervous system. More specifically sustained glial cell activation and elevated levels of certain inflammatory substances (Albrecht et al., 2019). Symptoms are then exacerbated as the body struggles to dampen neuro-immune responses associated with pain, fatigue and cognitive difficulties.

Examination

A thorough health history intake can be done to gather information about patients’ limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- Fatigue Severity Scale
- Fibromyalgia Impact Questionnaire (FIQ)
- Michigan Body Map
- Perceived Stress Questionnaire (PSQ)
- McGill Pain Questionnaire (MPQ)
- Pain Self Efficacy Scale
- Multidimensional Pain Inventory

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

Ascribing a patient’s pain solely to a tissue-driven pain problem is often an oversimplification of a complex process. This insight provides us with an opportunity to re-frame our clinical models. Gently stretching the muscles, neurovascular structures, and investing fascia activates endogenous pain modulating systems that help to modulate neuro-immune responses (Espejo et al., 2018).

Self-Management Strategies

People who experience symptoms of fibromyalgia may benefit from a moderate amount of exercise or physical activity. A 2020 umbrella review suggests 30-60 minutes of aerobic exercise or strength training 2-3 times a week is an appropriate dose for people with fibromyalgia (Andrade et al., 2020). However, it is important to note that people may experience exercise-related side effects as they start up a new program.

Prognosis

Several clinical practice guidelines recommend the use of massage therapy as part of a multi-modal approach for patients with Fibromyalgia (Busse et al., 2017; Skelly et al., 2020). It is not suggested that massage therapy alone can control symptoms but can be utilized to help relieve pain & reduce anxiety when integrated with standard care.

Massage Sloth: Massage for Fibromyalgia



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for fibromyalgia based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.9: Cancer-Related Pain

It is estimated that 40% of cancer survivors use integrative approaches to manage symptoms and improve their well-being after conventional cancer treatments, this includes: massage, acupuncture, and yoga (Sohl et al., 2015). Oncology massage is a specialty where massage techniques are modified to meet the needs of people with cancer and undergoing cancer treatments. In this field of research, there is a growing body of evidence that massage therapy can help improve their quality of life physically and emotionally for people with cancer.

Pathophysiology

Cancer-related pain is pain that is due to cancer or its treatment, such as chemotherapy.

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following chronic pain outcome measurements when assessing and monitoring patient progress:

- The Edmonton Symptom Assessment System (ESAS)
- The Fatigue Symptoms Inventory
- Brief Pain Inventory (BPI)
- Numeric Pain Rating Scale (NPRS)
- Visual Analogue Scale (VAS)

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Massage Can be a Source of Safety, Comfort and Relief

Oncology massage is a specialty where massage techniques are changed to meet the needs of people with cancer and undergoing cancer treatments. In this field of research, there is a growing body of evidence that massage therapy helps people with cancer physically and emotionally, and it can improve their quality of life (Hilfiker et al., 2018; Kinkead et al., 2018).

Acupuncture for Symptom Management

A multi-center randomized clinical trial published in *The Journal of the American Medical Association (JAMA)* has demonstrated that acupuncture may reduce joint-pain from prescription aromatase inhibitors (Bao et al., 2018; Hershman et al., 2018). In addition, a recent systematic review and meta-analysis published in *JAMA oncology* analyzed 14 randomized trials comparing acupuncture or acupressure with control therapies (placebo, sham acupuncture, analgesics, usual care) in over 900 cancer patients. What the researchers found was that compared with sham acupuncture, real acupuncture was associated with reduced cancer pain intensity (He et al., 2020).

Self-Management Strategies

As for exercise and yoga practices, there is research showing being physically active during and after cancer treatment has many health benefits (Hilfiker et al., 2018; Patel et al., 2019; Schmitz et al., 2019). Exercise therapy is safe and beneficial for physical and psychosocial health in people with multiple comorbidities (Bricca et al., 2020). Regular physical activity has been shown to significantly reduce symptoms of anxiety, reduce pain, and improve function (Bull et al., 2020). The world health organization recommends adults should undertake 150-300 min of moderate-intensity, or 75-150 min of vigorous-intensity physical activity, or some equivalent combination of moderate-intensity and vigorous-intensity aerobic physical activity, per week. These guidelines highlight the importance of regularly undertaking physical activity (both aerobic and muscle strengthening activities) emphasizing the value of any activity, of any duration, and any intensity (Bull et al., 2020).

Prognosis

There is a growing body of evidence that massage therapy can be a useful part of a multi-modal approach for patients with cancer-related pain (Boyd et al., 2016; Calcagni et al., 2019). It is not suggested that massage therapy alone can control symptoms but can be used to help relieve pain & reduce anxiety when integrated with standard care.

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for chronic pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.10: Temporomandibular Disorders

Temporomandibular disorders (TMDs) affect up to 15% of adults and 7% of adolescents, this umbrella term may include jaw pain, movement limitations, and clicking of the jaw (List et al., 2017).

Pathophysiology

Many factors may play a role in the progression of TMDs, this may include soft-tissue dysfunction, joint disorders and central sensitization. On its own TMDs can have a significant impact on quality of life and there are other comorbidities associated with TMDs, as it may be a contributing factor to cervicogenic headache (von Piekartz & Hall, 2013).

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient-specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- Numeric Pain Rating Scale (NRS)
- Jaw Functional Limitation (JFL-8)
- Mandibular Function Impairment Questionnaire (MFIQ)
- Tampa Scale for Kinesiophobia for Temporomandibular disorders (TSK/TMD)
- Neck Disability Index (NDI)

Physical Examination

Incorporate one or more of the following physical examination tools to determine the likelihood of temporomandibular disorders and interpret examination results in the context of all clinical exam findings.

- Physiological temporomandibular joint movements
- Trigger point palpation of the masticatory muscles
- Trigger point palpation away from the masticatory system
- Accessory movements
- Articular palpation
- Noise detection during movement
- Manual screening of the cervical spine
- The Neck Flexor Muscle Endurance Test

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Intra-oral and extra-oral massage can be performed in the clinic or as self-care. Structures to keep in mind while assessing and treating patients suffering from temporomandibular disorders may include neurovascular structures and investing fascia of:

- Medial Pterygoid
- Temporalis
- Masseter
- Sternocleidomastoid
- Suprahyoid Muscle Group (digastric, stylohyoid, geniohyoid, and mylohyoid)
- Infrahyoids Muscle Group (sternohyoid, sternothyroid, thyrohyoid, and omohyoid)
- Scalene Muscle Group (anterior scalene, middle scalene, and posterior scalene)
- Upper Cervical Spine (suboccipitals, upper trapezius, splenius cervicis, splenius capitis)

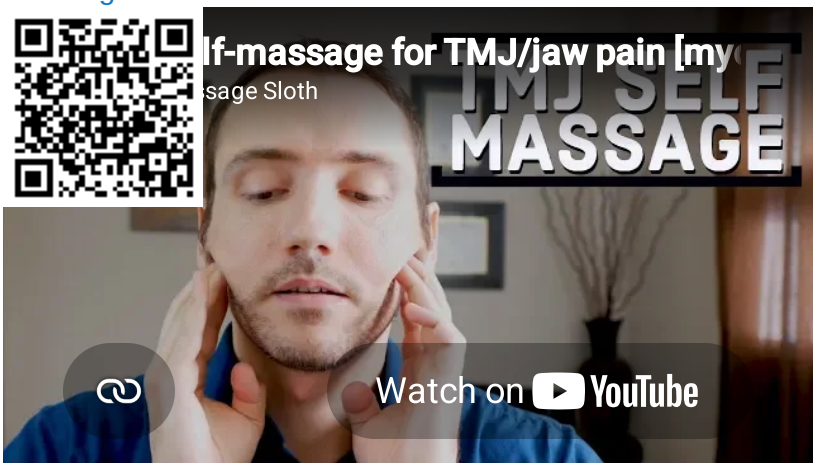


A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance.

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as self-massage, jaw strengthening, jaw stretching, and cranio-cervical and temporomandibular joint exercises have been shown to be useful for temporomandibular disorders (Bond et al., 2020).

Massage Sloth: Self-Massage for TMJ Pain



Prognosis

The therapeutic effects of intra-oral, extra-oral massage, and self-care management of temporomandibular dysfunction has been demonstrated in several randomized control trials and systematic reviews (La Touche et al., 2020; Martins et al., 2016; Randhawa et al., 2016).

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for temporomandibular disorder based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (intra-oral and extra-oral massage)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.11: Migraines and Tension-Type Headaches

With an estimated three billion individuals world-wide living with migraine or tension-type headache *The Global Burden of Diseases, Injuries, and Risk Factors* list migraine and tension-type headaches as one of the leading causes of disability worldwide (GBD 2016 Headache Collaborators).

Pathophysiology

Migraine has two major types.

1. Migraine without aura is a clinical syndrome characterized by headache with specific features and associated symptoms.
2. Migraine with aura is primarily characterized by the transient focal neurological symptoms that usually precede or sometimes accompany the headache. Some patients also experience a prodromal phase, occurring hours or days before the headache, and/or a postdromal phase following headache resolution. Prodromal and postdromal symptoms include hyperactivity, hypoactivity, depression, cravings for particular foods, repetitive yawning, fatigue and neck stiffness and/or pain.

Tension-type headache is very common, with a lifetime prevalence in the general population ranging in different studies between 30% and 78%. Tension-type headaches are divided into two categories: episodic and chronic.

TED-ED: What Causes Headaches



Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Red Flag Screen

- Thunderclap headache – a severe headache reaching at least 7 (out of 10) in intensity within 1 min of onset
- Fever and meningitis
- New headache with cognitive change in an elderly patient

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Headache Impact Test 6-item (HIT-6)
- Migraine-Specific Quality of Life Questionnaire (MSQ v2.1)
- Patient Perception of Migraine Questionnaire (PPMQ-R)
- The Migraine Disability Assessment (MIDAS)

- Headache Disability Index

Physical Examination

Incorporate one or more of the following physical examination tools to determine the likelihood of tension-type headache or migraine and interpret examination results in the context of all clinical exam findings.

- Cervical Flexion-Rotation Test
- Trigger point palpation of the cranio-cervical muscles
- Manual screening of the cervical spine

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. For patients with persisting headaches, it is important to work with the patient and their physician to develop strategies to manage symptoms. For people who suffer from migraine and tension-type headaches soft tissue irritation and nerve sensitization may be a major contributor to symptoms (Do et al., 2018). Gentle manual therapy of the upper cervical spine may help avoid ongoing nociceptive input into the trigeminocervical complex (Luedtke et al., 2017). Structures to keep in mind while assessing and treating patients suffering from headaches may include neurovascular structures and investing fascia of:

- Upper Cervical Spine (suboccipitals, upper trapezius, splenius cervicis, splenius capitis)
- Levator Scapula
- Longus Colli & Capitis
- Rhomboid Minor and Major
- Occipitofrontalis
- Corrugator Supercilii
- Sternocleidomastoid
- Scalene Muscle Group (anterior scalene, middle scalene, and posterior scalene)
- Temporomandibular Joint
    - Medial Pterygoid
    - Temporalis
    - Masseter
    - Suprahyoid Muscle Group (digastric, stylohyoid, geniohyoid, and mylohyoid)
    - Infrahyoid Muscle Group (sternohyoid, sternothyroid, thyrohyoid, and omohyoid)

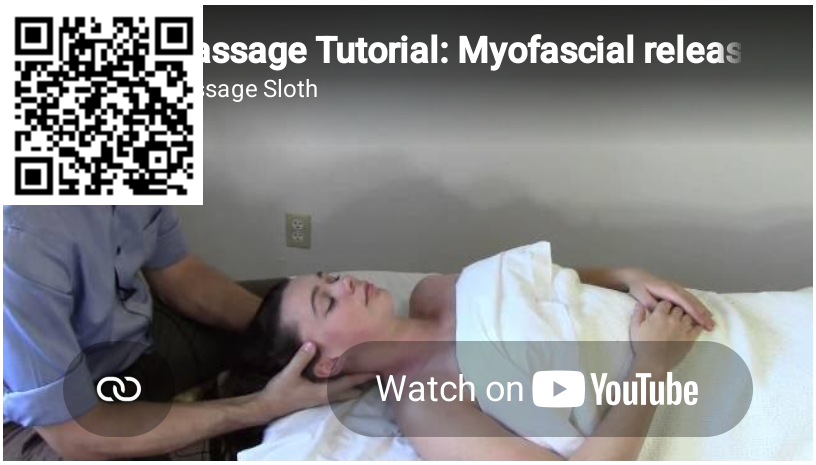
Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as self-massage, and mindfulness-based stress reduction has been shown to be safe and effective for reducing headaches, with little to no side effects (Seminowicz et al., 2020).

Prognosis

Globally physicians, now more than ever are recommending complementary treatment options (i.e., manual therapy, acupuncture, mindfulness-based stress reduction, pain neuroscience education, and exercise) as part of a multi-modal approach to decrease the individual's headache frequency, intensity, duration and acute medication requirements. Massage therapy specifically is included in several clinical practice guidelines for the treatment of headaches (Busse et al., 2017; Côté et al., 2019)

Massage Sloth: Myofascial Release for Headache



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for tension-type headaches and migraines based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, mindfulness-based interventions, and healthy sleep habits)

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4.12: Post-Concussion Syndrome

A concussion is a mild traumatic brain injury caused by a complex physical process affecting the brain, induced by biomechanical forces. The commonly reported symptoms are occipital headache, blurry vision, nausea, dizziness, balance problems, a “foggy feeling,” difficulty with concentration, difficulty with memory, fatigue, confusion, drowsiness, and irritability. Clinically these symptoms fall into four major categories:

1. Somatic: Headaches, nausea, vomiting, balance and or visual problems, and sensitivity to light and noise
2. Emotional: Sadness to the point of depression, nervousness, and irritability
3. Sleep disturbance: Sleeping more or less than usual and having trouble falling asleep
4. Cognitive: Difficulty concentrating, troubles with memory, feeling mentally slow or as if in a fog that will not lift

Pathophysiology

Persistent symptoms’ does not reflect a single pathophysiological entity, but describes a constellation of non-specific post-traumatic symptoms that may be linked to coexisting and/or confounding factors, which do not necessarily reflect ongoing physiological injury to the brain (McCrory et al., 2017).

Concussion is an injury that typically resolves relatively quickly in most people (symptoms generally disappear for 80-90% of patients within 7 to 10 days), however whiplash symptoms can linger for up to a year or more. Persistent symptoms after concussive injuries often include headaches and neck pain. Post-traumatic headache (PTH) is a highly disabling secondary headache disorder and one of the most common symptoms after a concussion (Ashina et al., 2019). In these demographics soft tissue irritation and subsequent nerve sensitization may be a major contributor to symptoms. With the high impact nature of most concussive injuries, the assessment and rehabilitation of cervical spine may decrease the likelihood that an individual will develop persistent headaches and neck pain (Kennedy et al., 2019).

Ted Ed: What Happens When You Have A Concussion?



Examination

A thorough health history intake can be done to gather information about patients’ limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Sport Concussion Assessment Tool 5th Edition (SCAT5)
- Headache Impact Test 6-item (HIT-6)
- The Migraine Disability Assessment (MIDAS)

- Post-Concussion Symptom Scale

Physical Examination

Incorporate one or more of the following physical examination tools to determine the likelihood of tension-type headache or migraine and interpret examination results in the context of all clinical exam findings.

- Cervical Flexion-Rotation Test
- Trigger point palpation of the cranio-cervical muscles
- Manual screening of the cervical spine

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms. After an initial short rest period lasting 24-48 hours, the early introduction of light cognitive and physical activity can be initiated if the activity does not worsen symptoms (sub-threshold activities).

Manual Therapy

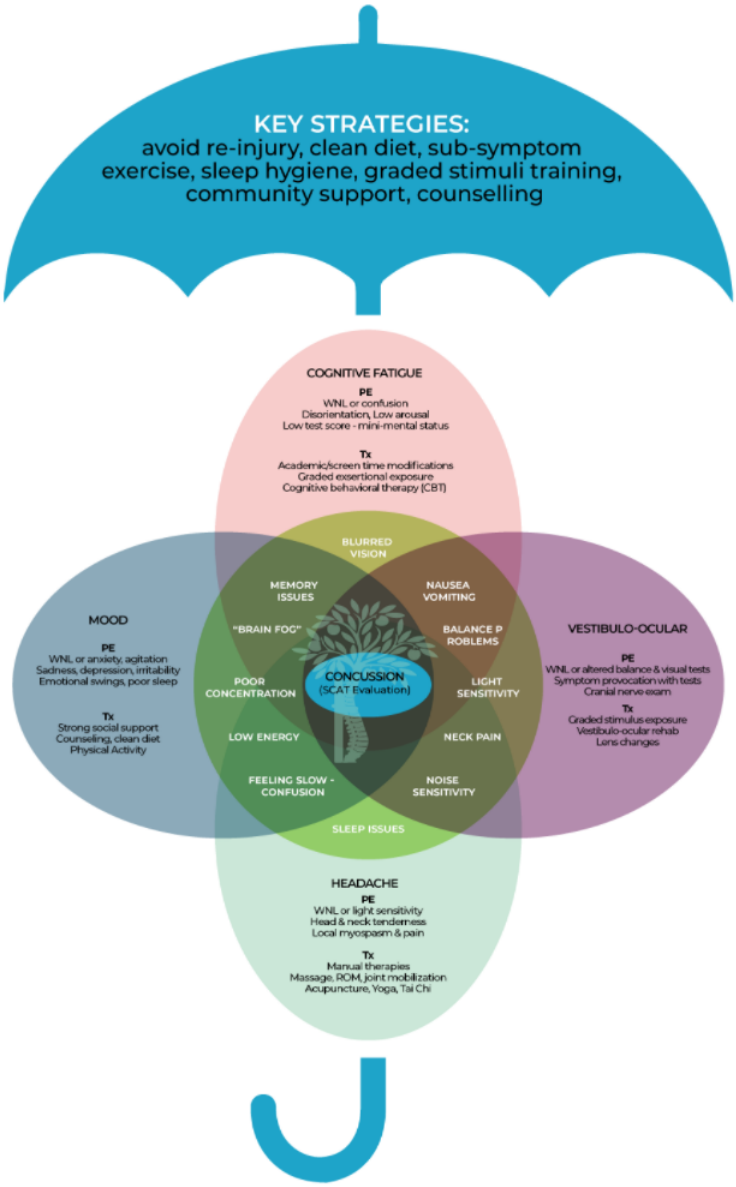
Post-concussion headaches are multifactorial with evidence for the contributions of muscles and other structures surrounding the cervical spine. A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from cervicogenic headaches may include neurovascular structures and investing fascia of:

- Upper Cervical Spine (suboccipitals, upper trapezius, splenius cervicis, splenius capitis)
- Levator Scapula
- Longus Colli & Capitis
- Rhomboid Minor and Major
- Occipitofrontalis
- Corrugator Supercilii
- Sternocleidomastoid
- Scalene Muscle Group (anterior scalene, middle scalene, and posterior scalene)
- Temporomandibular Joint
    - Medial Pterygoid
    - Temporalis
    - Masseter
    - Suprahyoid Muscle Group (digastric, stylohyoid, geniohyoid, and mylohyoid)
    - Infrahyoid Muscle Group (sternohyoid, sternothyroid, thyrohyoid, and omohyoid)

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as self-massage, and mindfulness-based stress reduction may help reduce symptoms.

Multidisciplinary Concussion Management



Multidisciplinary Concussion Management (Credit Dr. Nikita Vizniak)

Prognosis

Persistent symptoms often reflect a constellation of symptoms that may be linked to coexisting and/or confounding factors. Early intervention reduces the risk of cervicogenic headaches developing into chronic post-concussion headaches, but do not attempt to treat the concussion directly, instead treat the impairments that may be related to or irritating, based on patient-specific assessment findings and patient tolerance.

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for post-concussion syndrome based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)

- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.13: Neck Pain

Pathophysiology

Recent clinical guidelines published in the *Journal of Orthopaedic & Sports Physical Therapy (JOSPT)* suggest a pragmatic approach to the management of neck pain. These guidelines describe four subcategories of neck pain: neck pain with limited motion, neck pain associated with whiplash, headaches related to neck pain, neck and nerve-related pain into the arm (also known as radicular pain) (Blandpied et al., 2017).

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g.' low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Red Flags for Serious Spinal Pathology

Red flags are signs and symptoms that raise suspicion of serious underlying pathology, for patients with neck pain there are a number of serious spinal pathologies to be aware of, these are spinal fracture, malignancy, and spinal infection (Finucane et al., 2020).

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient-specific Functional Scale
- Neck Pain and Disability Scale
- Neck Disability Index

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Vertebral Artery Test
- Spurling's Test (Foraminal Compression Test)
- Cervical Distraction Test
- Cervical Compression Test
- Scalene Cramp Test
- Adson's Test
- Halstead Maneuver (Reverse Adson's Test or Wright's Test or Hyperabduction Test)
- Costoclavicular Test (Military Brace)
- Upper Limb Tension Tests (1, 2, 3, & 4)

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

Randomized controlled trials have demonstrated that compression at myofascial trigger points (MTrPs) significantly improved subjective pain scores compared with compression at Non-MTrPs and the control treatments for patients suffering from neck pain (Morikawa et al., 2017).

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating people suffering from neck pain may include neurovascular structures and

investing fascia of:

- Upper Cervical Spine (suboccipitals, upper trapezius, splenius cervicis, splenius capitis)
- Levator Scapula
- Longus Colli & Capitis
- Rhomboid Minor and Major
- Occipitofrontalis
- Corrugator Supercilii
- Sternocleidomastoid
- Scalene Muscle Group (anterior scalene, middle scalene, and posterior scalene)
- Temporomandibular Joint
  - Medial Pterygoid
  - Temporalis
  - Masseter
  - Suprahyoid Muscle Group (digastric, stylohyoid, geniohyoid, and mylohyoid)
  - Infrahyoid Muscle Group (sternohyoid, sternothyroid, thyrohyoid, and omohyoid)

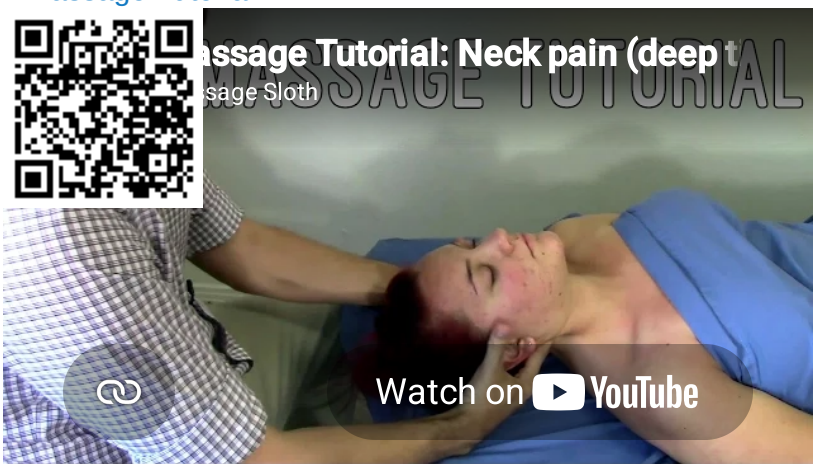
Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as routine healthy sleeping habits, motor control, yoga/Pilates/Tai Chi/Qigong and strengthening exercises may be useful for people with chronic neck pain (de Zoete et al., 2020).

Prognosis

Clinical practice guidelines for neck pain support the need for a multidimensional therapeutic approach with consistent recommendations including universal provision of information and advice to remain active, discouraging routine referral for imaging, and limited prescription of opioids (Chou et al., 2018). A multidimensional treatment approach can involve several management strategies that include but is not limited to education, reassurance, analgesic medicines and non-pharmacological interventions (Blandpied et al., 2017; Chou et al., 2018).

Massage Sloth: Neck Massage Tutorial



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for neck pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)

- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.14: Shoulder Pain

The rotator cuff is a group of tendons that holds the shoulder joint in place allowing people to lift their arm and reach overhead. Rotator cuff related shoulder pain is a term that encompasses a spectrum of conditions including subacromial pain syndrome, rotator cuff tendinopathy, and symptomatic partial and full thickness rotator cuff tears (Lewis, 2016).

Pathophysiology

Rotator Cuff Related Shoulder Pain

In some cases of rotator cuff disorders pathoanatomical explanations do not account for why pain persists, which is why it is important to take into account patient-specific assessment findings and psychosocial factors (Wylie et al., 2016; Wong et al., 2020). In other cases, pathological changes (e.g., fibrosis, interstitial collagen deposition, and inflammatory cells) may be associated with sensorimotor declines, and symptomatic rotator cuff disorders (Fouda et al., 2017).

Frozen Shoulder

Frozen shoulder also known as “Adhesive Capsulitis” is classified as idiopathic (primary) or following shoulder surgery or trauma (secondary). Traditionally it has been taught that regardless of therapeutic intervention the affected shoulder will eventually improve or “thaw out”. This long held idea of complete resolution without treatment for frozen shoulder is unfounded. In most cases an understanding of the pathophysiology of frozen shoulder will lead to improved treatment outcomes, reduced pain and suffering associated with the condition (Wong et al., 2017).

The progression of the frozen shoulder is a complicated process, involving a cascade of molecular and cellular events. Connective tissue fibrosis and storage of leukocytes and chronic inflammatory cells is thought to play a fundamental role. Ongoing inflammation feeds into a cycle and upregulation of pro-inflammatory cytokine production, namely transforming growth factor beta (TGF-β). This may be further perpetuated by sympathetic dominance of autonomic balance, and neuro-immune activation (Pietrzak, 2016).

Clinical Examination

A thorough health history intake can be done to gather information about patients’ limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient-specific Functional Scale
- DASH Outcome Measure
- Upper Extremity Functional Index
- Western Ontario Rotator Cuff (WORC) Index

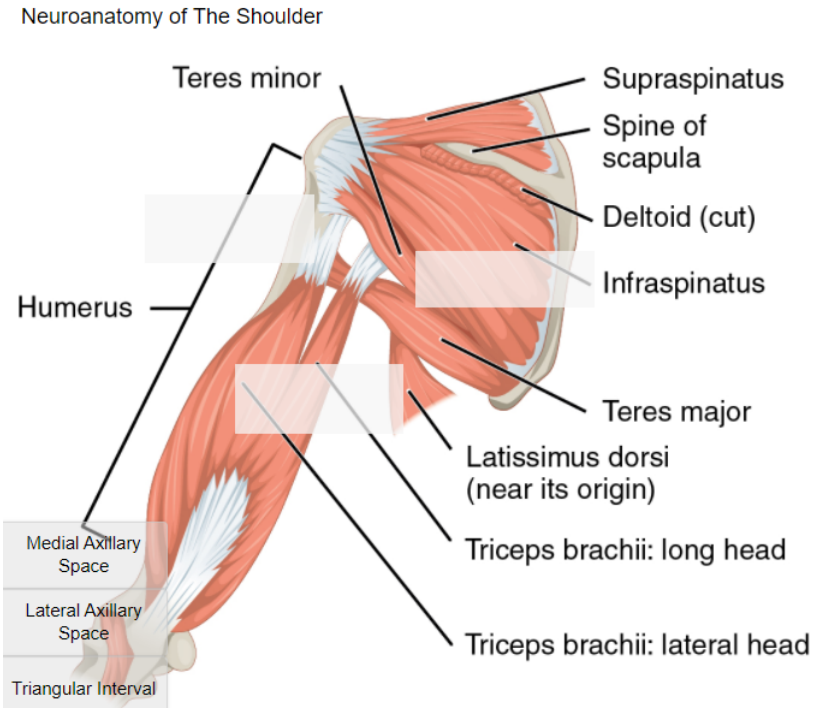
Neurovascular Assessment

Medial axillary space – The Axillary space is bounded by teres major muscle, teres minor muscle and humerus. The long head of triceps brachii splits this area into medial and lateral groups. Scapular circumflex artery and scapular circumflex vein pass through it.

Lateral axillary space – The axillary nerve and posterior circumflex humeral artery can be irritated by soft tissue structures. Symptoms include axillary nerve related weakness of the deltoid muscle, resulting in a reduction in shoulder abduction. The pain from axillary neuropathy is usually dull and aching rather than sharp and increases with increasing range of motion. Many people notice only mild pain but considerable weakness when they try to use the affected shoulder.

Triangular interval – The radial nerve and profunda brachii artery pass through the triangular interval, on route to the posterior compartment of the arm. The triceps brachii has potential to irritate the radial nerve in the triangular interval.

Drag and Drop: Anatomy Review

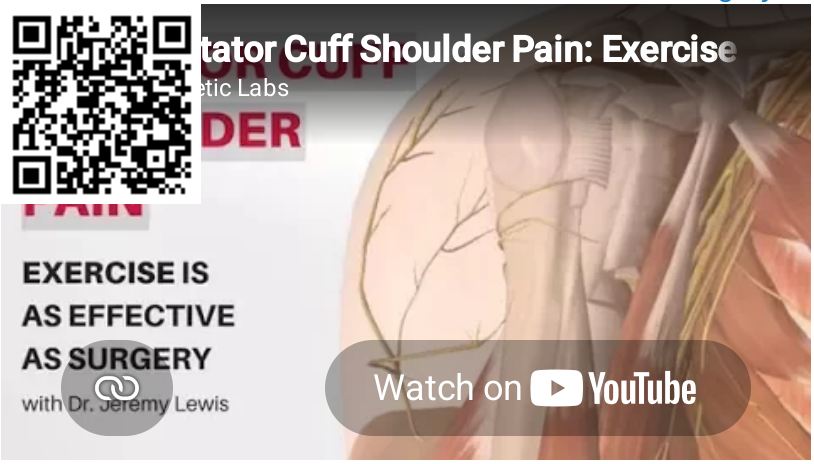


Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Apprehension Test (Crank Test)
- Hawkins Kennedy Impingement Test
- Acromioclavicular Shear Test
- Speed's Test
- Yergason's Test
- Supraspinatus Test (Empty Can Test)
- Drop Arm Test (Codman's Test)
- Apley's Scratch Test
- Sulcus Sign Test
- Neer's Test
- Roo's Test (EAST)
- Slap Lesion Cluster
- Load & Shift – Anterior
- Scapular Retraction
- AC Crossbody Adduction Test (Acromioclavicular Crossover)
- Posterior Capsule Tightness
- Serratus Anterior Strength Test (Punch Out)
- Jerk Test (Posteroinferior Labral Tear)
- Scapular Load Test
- O'Brien Test (Active Compression Test)
- Lift-off Sign
- Belly Press Test
- Painful Arc Test

Jeremy Lewis: Rotator Cuff Shoulder Pain – Exercise is as effective as surgery



Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from shoulder pain may include neurovascular structures and investing fascia of:

- Rotator Cuff (subscapularis, infraspinatus, teres minor, supraspinatus)
- Pectoral Region (pectoralis major, pectoralis minor, serratus anterior and subclavius)
- The Upper Arm (biceps brachii, brachialis, coracobrachialis, triceps brachii)
- Deltoid Muscle Group (anterior, middle, posterior)
- Erector Spinae (iliocostalis, longissimus, spinalis) & Multifidus
- External Obliques, Internal Obliques, and Transverse Abdominal
- Thoracolumbar Fascia, Latissimus Dorsi and Teres Major
- Quadratus Lumborum

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as stretching and strengthening exercises may be useful for people with shoulder pain.

Prognosis

Prognosis is favorable when therapists use a multidisciplinary approach to treatments. Exercise is the mainstay of treatment; a strong recommendation may be made regarding the effectiveness of manual therapy when combined with exercise for subacromial shoulder pain (Pieters et al., 2020). Several systematic reviews support the use of exercise and manual therapy for the treatment of shoulder pain (Hawk et al., 2017; Steuri et al., 2017).

Massage Therapeutics: How to treat frozen shoulder: Massage video with Maria Natera



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for acute and chronic shoulder pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.15: Elbow Pain

Lateral elbow tendinopathy (LET), also known as Tennis elbow is described as pain at the outside of the elbow and in the upper forearm where the muscle tendon attaches to the bone. Medial elbow tendinopathy (MET), also known as Golfer's elbow is described as pain at the inside of the elbow and in the upper forearm where the muscle tendon attaches to the bone.



Figure 4.15.1 *Tennis elbow is described as pain at the outside of the elbow and Golfer's elbow is described as pain at the inside of the elbow.*

Pathophysiology

The presentation of pain in a tendon, does not always mean that the tendon itself is the primary contributor to pain. There is research that suggests a majority of nerves are found in peritendinous tissue, which is likely contributes to the complex clinical picture of tendon pain. There may be times that focal irritability (i.e., nerve irritation, trigger points, nervous system sensitization) co-exists with lateral elbow tendinopathy.

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.



Elbow Joint From Gray's Anatomy (1918)

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient-specific Functional Scale
- Brief Pain Inventory (BPI)

- Visual Analog Scale (VAS)
- Patient-Rated Elbow Evaluation (PREE)
- Patient-Rated Tennis Elbow Evaluation (PRTEE)
- DASH Outcome Measure
- Upper Extremity Functional Index

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Elbow Valgus and Varus Stress Tests
- Moving Valgus Stress Test of the Elbow
- Cozen's Test
- Mill's Test
- Medial Epicondylitis Test (Golfers Elbow)
- Tinel's Sign's at the Elbow (Cubital Tunnel Syndrome)
- Pronator Teres Syndrome Test
- Upper Limb Tension Tests (1, 2, 3, & 4)

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

A massage therapy treatment plan for elbow pain should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from elbow pain may include neurovascular structures and investing fascia of:

- Scalene Muscle Group (anterior scalene, middle scalene, and posterior scalene)
- Pectoral Region (pectoralis major, pectoralis minor, serratus anterior and subclavius)
- Rotator Cuff (subscapularis, infraspinatus, teres minor, supraspinatus)
- The Upper Arm (biceps brachii, brachialis, coracobrachialis, triceps brachii)
- Anterior Interosseous Membrane
- Common Extensor Tendon (extensor carpi radialis brevis, extensor digitorum, extensor digiti minimi, extensor carpi ulnaris)
- Common Flexor Tendon (pronator teres, flexor carpi radialis, palmaris longus, flexor digitorum superficialis, flexor carpi ulnaris)
- Carpal Bones (trapezium, trapezoid, capitate, hamate, scaphoid, lunate, triquetrum, pisiform)

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as strengthening exercises for the forearm may be useful for people with elbow pain (Karanasios et al., 2020).

Prognosis

Prognosis is good for the conservative management of elbow pain (Piper et al., 2016). Massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for patients with elbow pain including soft tissue massage, simple home-care recommendations and remedial exercise.

Massage Sloth: Massage for Elbow Pain



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for elbow pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.16: Thoracic Outlet Syndrome

Thoracic outlet syndrome is a neurovascular condition characterized by tingling, numbness and pain in the shoulder and upper extremity, hand and fingers.

Pathophysiology

Symptoms are often the result of irritation or compression at the thoracic outlet (three structures are at risk: the brachial plexus, the subclavian vein, and the subclavian artery). Compression of these structures is classified as neurogenic (NTOS), venous (VTOS), and arterial (ATOS) thoracic outlet syndromes. Although each of these three are separate entities, multiple sites of compression can coexist and have overlapping symptoms.

Osmosis: Klumpke's palsy and thoracic outlet syndrome



Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient-specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- DASH Outcome Measure
- Upper Extremity Functional Index

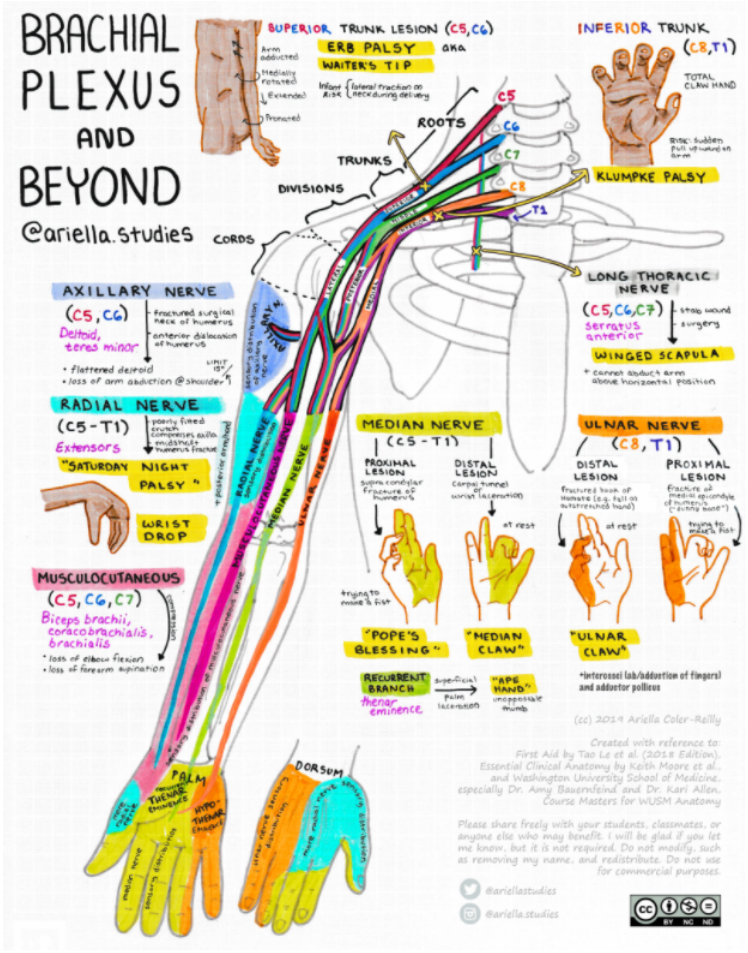
Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Spurling's Test (Foraminal Compression Test)
- Cervical Distraction Test
- Cervical Compression Test
- Scalene Cramp Test
- Adson's Test
- Halstead Maneuver (Reverse Adson's Test or Wright's Test or Hyperabduction Test)
- Costoclavicular Test (Military Brace)
- Upper Limb Tension Tests (1, 2, 3, & 4)

- Tinel’s Sign

Ariella.Studies – Injuries Associated with The Brachial Plexus



Injuries associated with brachial plexus.

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

The responses to massage therapy are complex and multifactorial – physiological and psychological factors interplay in a complex manner. Massage therapy combined with multimodal care may improve symptoms, decrease disability and improve function for patients who suffer from mild forms of thoracic outlet syndrome. Massage has a modulating effect on peripheral and central processes via input from large sensory neurons that prevents the spinal cord from amplifying the nociceptive signal. This anti-nociceptive effect of massage therapy can help ease discomfort in patients who suffer from peripheral nerve entrapment.

Structures to be Aware of When Treating Thoracic Outlet Syndrome

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from thoracic outlet syndrome may include neurovascular structures and investing fascia of:

- Interscalene Triangle (anterior scalene muscle, middle scalene muscle, and first rib)
- Costoclavicular Space (subclavius muscle, clavicle, the first rib, and anterior scalene muscle)

- Subcoracoid Space (pectoralis minor muscle, and the ribs)
- The Upper Arm (biceps brachii, brachialis, coracobrachialis, triceps brachii)
- Common Extensor Tendon (extensor carpi radialis brevis, extensor digitorum, extensor digiti minimi, extensor carpi ulnaris)
- Common Flexor Tendon (pronator teres, flexor carpi radialis, palmaris longus, flexor digitorum superficialis, flexor carpi ulnaris)
- Carpal Bones (trapezium, trapezoid, capitate, hamate, scaphoid, lunate, triquetrum, pisiform)

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as stretching, splinting and home exercises may be useful for people with thoracic outlet syndrome.

Prognosis

Prognosis for the conservative management of thoracic outlet syndrome is mixed. Massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for patients with thoracic outlet syndrome including soft tissue massage, simple home-care recommendations and remedial exercise. It is not suggested that massage therapy alone can control symptoms but be can used to help relieve pain & reduce anxiety when integrated with standard care.

Massage Tutorial: Thoracic outlet syndrome, tingling fingers, myofascial release



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for thoracic outlet syndrome based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.17: Carpal Tunnel Syndrome

Carpal tunnel syndrome is a condition characterized by tingling, numbness and pain in the hand and fingers (particularly the thumb, index, middle and ring fingers). These symptoms are often the result of median nerve irritation in the wrist or forearm.



Carpal tunnel syndrome is a condition characterized by tingling, numbness, and pain in the hand and fingers (particularly the thumb, index, middle, and ring fingers).

Pathophysiology

The median nerve passes through several anatomical structures and it may be exposed to mechanical irritation at many different points. Prolonged irritation of a peripheral nerve triggers the release of inflammatory mediators, known as “neurogenic inflammation”; this noxious substance can disrupt the normal function of nerves. Ongoing tissue hypoxia or inflammatory responses lead to molecular signaling that promote the development of fibrosis, this may contribute to further peripheral nerve dysfunction (Barbe et al., 2020; Bove et al., 2019).

Clinical Examination

A thorough health history intake can be done to gather information about patients’ limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- DASH Outcome Measure
- CTS-6 Evaluation Tool
- Kamath and Stothard Questionnaire
- Katz and Stirrat hand symptom diagram
- Upper Extremity Functional Index
- Brigham and Women’s Carpal Tunnel Questionnaire
- Boston Carpal Tunnel Questionnaire (BCTQ)
- Patient-Rated Wrist Evaluation (PRWE)
- Patient-Rated Wrist/Hand Evaluation (PRWHE)

Physical Examination

Incorporate one or more of the following physical examination tools to determine the likelihood of carpal tunnel syndrome and interpret examination results in the context of all clinical exam findings.

- Spurling's Test (Foraminal Compression Test)
- Cervical Distraction Test
- Cervical Compression Test
- Scalene Cramp Test
- Adson's Test
- Halstead Maneuver (Reverse Adson's Test or Wright's Test or Hyperabduction Test)
- Costoclavicular Test (Military Brace)
- Upper Limb Tension Tests (1, 2, 3, & 4)
- Phalen Test
- Tinel Sign
- Carpal Compression Test

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

The responses to massage therapy are complex and multifactorial – physiological and psychological factors interplay in a complex manner. Systematic reviews have also shown that manual therapy combined with multimodal care can improve symptoms, decrease disability, and improve function for patients who suffer from carpal tunnel syndrome (Huisstede et al., 2018). Research has looked at both peripheral and central responses elicited by massage therapy treatments, by working within the patients' pain tolerance, massage therapy may help modulate nociceptive barrage into the central nervous system (peripheral drive) and activate endogenous pain networks (central drive).

Central **Drive**

Massage has a modulatory effect on peripheral and central processes via input from large sensory neurons that prevents the spinal cord from amplifying the nociceptive signal. This anti-nociceptive effect of massage therapy can help ease discomfort in patients who suffer from carpal tunnel syndrome.

Peripheral **Drive**

Carpal tunnel specific work may also involve specific soft tissue treatment to optimize the ability of mechanical interfaces to glide relative to the median nerve. The application of appropriate shear force and pressure impart a mechanical stimulus that may attenuate tissue levels of fibrosis and TGF-β1 (Bove et al., 2016; Bove et al., 2019). Furthermore, passive stretching may help diminish intraneural edema and/or pressure by mobilizing the median nerve as well as associated vascular structures (Boudier-Revéret et al., 2017).

Myofascial trigger point: Infraspinatus

The etiology of myofascial trigger points is still not well understood, but that does not deny the existence of the clinical phenomenon. From a clinical perspective, myofascial trigger points describe an observable phenomenon that may help clinicians investigate common pain patterns. An international panel of 60 clinicians and researchers was recently consulted to establish a consensus for identification of a myofascial trigger point. The panel agreed on two palpatory and one symptom criteria: a taut band, a hypersensitive spot, and referred pain (Fernández-de-Las-Peñas & Dommerholt, 2018). For patients with carpal tunnel syndrome studies have demonstrated that assessing and treating the infraspinatus muscle may be an effective treatment option for a sub-group of patients (Meder et al., 2017).

Structures to be Aware of When Treating Carpal Tunnel Syndrome

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from carpal tunnel syndrome may include neurovascular

structures and investing fascia of:

- Costo-Clavicle Space
- Scalene Muscle Group (anterior scalene, middle scalene, and posterior scalene)
- Pectoral Region (pectoralis major, pectoralis minor, serratus anterior and subclavius)
- Rotator Cuff (subscapularis, infraspinatus, teres minor, supraspinatus)
- The Upper Arm (biceps brachii, brachialis, coracobrachialis, triceps brachii)
- Superficial Anterior Compartment of the Forearm (pronator teres, flexor carpi radialis, palmaris longus, flexor digitorum superficialis, flexor carpi ulnaris)
- Deep Anterior Compartment of the Forearm (flexor digitorum profundus, flexor pollicis longus, and pronator quadratus)
- Anterior Interosseous Membrane
- Carpal Bones (trapezium, trapezoid, capitate, hamate, scaphoid, lunate, triquetrum, pisiform)
- Palmar Aponeurosis & Transverse Carpal Ligament
- Lumbricals

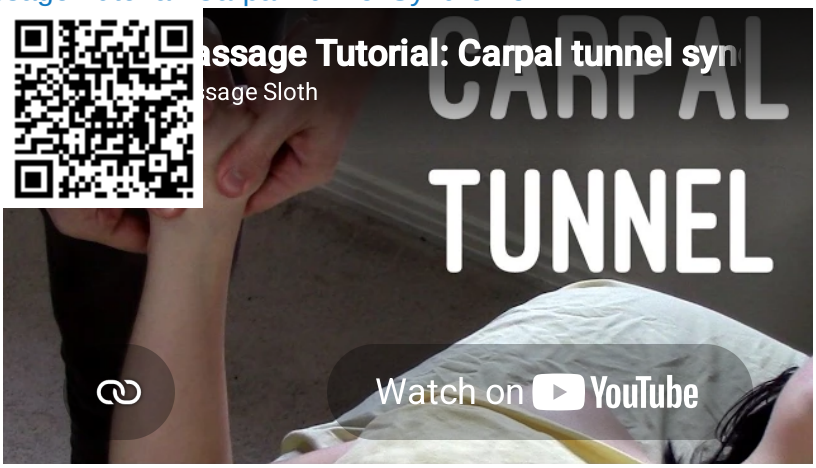
Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as stretching, splinting and home exercises have been shown to be useful for carpal tunnel syndrome (Lewis et al., 2020; Shem et al., 2020).

Prognosis

Massage therapy as a therapeutic intervention is being embraced by the medical community, it is simple to carry out, economical, and has very few side effects. Randomized clinical trials have demonstrated that for some patients who suffer from carpal tunnel syndrome there is no significant differences in pain and functional outcomes at a six month, twelve month, and four year follow up when surgical and conservative care are tested (Fernández-de-Las Peñas et al., 2017; Fernández-de-Las-Peñas et al., 2019; Fernández-de-Las-Peñas et al., 2020).

Massage Sloth: Massage Tutorial: Carpal Tunnel Syndrome



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate several rehabilitation strategies for carpal tunnel syndrome based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.18: Dupuytren's Disease

Dupuytren's disease (also known as Dupuytren's contracture) is a progressive fibroproliferative disorder of the hand that eventually can cause contractures of the affected fingers. Typical presentation is a gradual onset in males over 50 years of age. At first people may not notice the development of changes in their palms, the condition may even go dormant, but if the palmar fascia begins to thicken and contractions develop, the condition is recognizable – this is the ideal time to seek help from massage therapy.

Pathophysiology

The progression of the disease is a complicated process, involving a cascade of molecular and cellular events, in which the cytokines transforming growth factor beta (TGF-β) and tumor necrosis factor (TNF) play a fundamental role during the course of Dupuytren's disease. Elevated levels of TGF-β & TNF contribute to the contractile activity of myofibroblasts, which drives disease development, in patients with Dupuytren's contractures (Hinz & Lagares, 2020). This leads to a thickening of the tendons of the forearm and the palmar fascia.

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient-Specific Functional Scale (PSFS)
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- DASH Outcome Measure
- Upper Extremity Functional Index
- Patient-Rated Wrist Evaluation (PRWE)
- Patient-Rated Wrist/Hand Evaluation (PRWHE)

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Allen Test
- Tinel's Sign
- Froment's Sign (Pinch Grip Test)

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

Studies have demonstrated that non-operative treatments such as massage therapy combined with active and passive stretching may affect progression (Christie et al., 2012). As a therapeutic intervention massage therapy has the potential to attenuate TGF-β1 induced fibroblast to myofibroblast transformation. Recent studies have looked at the effect of modeled massage therapy and mechanical stretching on tissue levels of TGF-β1. In these studies, it was demonstrated that manual therapy has the potential to attenuate tissue levels of TGF-β1 and the development of fibrosis (Bove et al., 2016; Bove et al., 2019). This is potentially impactful in the treatment of Dupuytren's disease because TGF-β1 plays a key role in tissue remodeling and fibrosis.

Treatment focus is on the intrinsic hand muscles and carpal bones of the wrist, while also addressing areas of compensation, such as the flexors and extensors of the forearm. Massage therapy may delay the progression of contractures and decrease recurrence in post-operative patients. Massage therapy treatment for Dupuytren's disease should not be vigorous and stretching should be a gentle exploration of range of motion. A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from Dupuytren's may include neurovascular structures and investing fascia of:

- Biceps Brachii (bicipital aponeurosis)
- Triceps Brachii
- Common Extensor Tendon (extensor carpi radialis brevis, extensor digitorum, extensor digiti minimi, extensor carpi ulnaris)
- Common Flexor Tendon (pronator teres, flexor carpi radialis, palmaris longus, flexor digitorum superficialis, flexor carpi ulnaris)
- Anterior Interosseous Membrane
- Palmar Aponeurosis
- Carpal Bones (trapezium, trapezoid, capitate, hamate, scaphoid, lunate, triquetrum, pisiform)
- Lumbricals

Self-Management Strategies

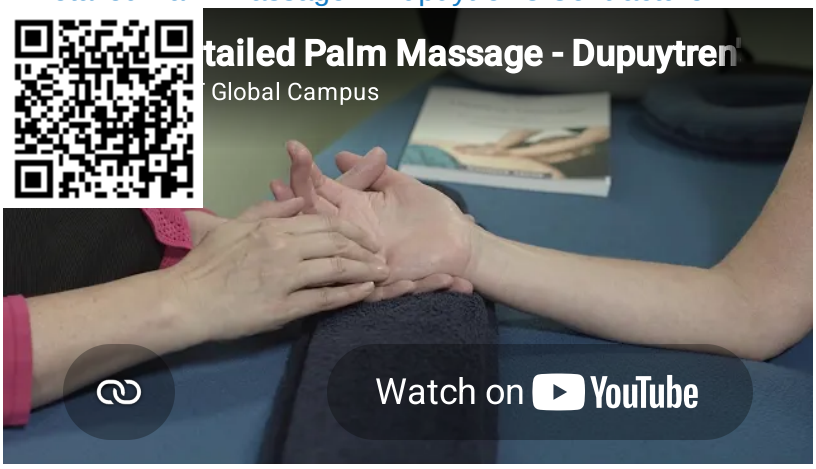
Tension and compression orthotic devices and splinting is often used after surgery in the short term. This has been shown to reduce the chances of recurrence in some people. Long term use of orthotic devices and splinting has mixed evidence. There have been modeled experiments to demonstrate the impact of stretching on inflammation-regulation mechanisms within connective tissue. Patients should be educated on the benefits of gentle stretching routines. Stretching should not be vigorous, it should be a gentle exploration of range of motion.

Prognosis

There is a high rate of recurrence in the post-operative population. In the early stages a trial of conservative care is the preferred treatment approach, this often includes physical therapy, night splinting, and home hand exercises. Persistent inflammation has the potential to interfere with the tissue remodeling, early conservative interventions may serve to interrupt the sequelae of pathological healing.

The ideal treatment for patients with progressive Dupuytren's disease would be at the early stage to prevent or delay the development of flexion deformities and loss of manual dexterity. Prophylactic massage therapy treatments may inhibit inflammatory processes and affect the development of fibrosis by mediating differential cytokine production. Consequently, this may stabilize the progression of contractures and in some cases ameliorate the degree of deformity.

Niel Asher Education: Detailed Palm Massage – Dupuytren's Contracture



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for Dupuytren's disease based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.19: Back Pain

Back pain affects roughly 568 million people worldwide and symptoms may vary from a dull ache to a sudden sharp shooting pain (Cieza et al., 2020). After a detailed history and clinical examination back pain is often classified three into broad categories:

- Specific spinal pathology (< 1% of cases)
  - Vertebral fracture
  - Malignancy
  - Spinal infection
  - Axial Spondyloarthritis
  - Cauda equina syndrome
- Radicular syndrome (~ 5-10% of cases)
  - Radicular pain
  - Radiculopathy
  - Spinal stenosis
- Non-specific LBP (90-95% of cases)
  - Presumed lumbar musculoskeletal low back pain. Difficult to reliably specify pathoanatomical source of low back pain

DocMikeEvans: Low Back Pain



Pathophysiology

Increasingly, research shows that attributing the experience of back pain solely to poor posture, minor leg length discrepancies, vertebral misalignment and other structural abnormalities is an oversimplification of a complex process (Green et al., 2018; Swain et al., 2020). So-called abnormalities are often normal variations or adaptations, in some cases they may even be advantageous. Even in the case of degenerative changes in the spine, landmark studies have shown that tissue tears revealed on imaging are a part of normal aging (Brinjikji et al., 2015). What's more is that in the case of herniated discs 60-80% have been shown to spontaneously resorb (Zhong et al., 2017). This disconnect between tissue damage seen on imaging and clinical presentation often creates confusion for both patients and clinicians.

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Red Flags for Serious Spinal Pathology

Red flags are signs and symptoms that raise suspicion of serious underlying pathology, for patients with low back pain there are a number of serious spinal pathologies to be aware of, these are cauda equina syndrome (0.08% of low back pain patients presenting to primary care), spinal fracture, malignancy, and spinal infection (Finucane et al., 2020; Hoeritzauer et al., 2020).

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient-specific Functional Scale
- Oswestry Disability Index
- Roland-Morris Disability Questionnaire
- STarT Back Screening Tool (SBST)

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Craig's Test
- Gaenslen's Test
- Gillet's Test
- Kemp's Test (Lower Quadrant Test)
- Kernig/Brudzinski Test
- Rebound Tenderness (McBurney's Point)
- Piriformis Test (FAIR Test)
- Cluster of Laslett (Sacroiliac Joint Pain Provocation)
- Sacroiliac Compression Test (Squish Test)
- Sacroiliac Distraction Test (Gap Test)
- Slump Test
- Valsalva Maneuver
- Well Leg Raise
- Straight Leg Raise (Lasègue's sign) or Braggard's Test
- Bowstring Maneuver
- Prone Gap Test (Hibb's Test)
- Prone Knee Bend Test/Femoral Nerve Stretch Test (Reversed Lasègue)



Figure 4.19.1 Once red flags and serious pathology are excluded low back pain guidelines recommend self-management, physical and psychological therapies and place less emphasis on pharmacological and surgical treatments; routine use of imaging and investigations is not recommneded

Treatment

Most clinical practice guidelines for low back pain are moving towards an interdisciplinary approach with an emphasis on self-management, physical and psychological therapies and less emphasis on pharmacological and surgical treatments (Foster et al., 2018). Pharmacological treatments options such as opioid analgesics and non-steroidal anti-inflammatory drugs (NSAIDs) have small effects on low back pain (Chou et al., 2020; Kamper et al., 2020; Tucker et al., 2020; van der Gaag et al., 2020). Embracing an interprofessional strategy for pain management can include the use of education, exercise, acupuncture, massage therapy and spinal manipulation as part of a multi-dimensional approach for the management of back pain.

Table 4.19.2

Recommendations	Acute low back pain (less than six weeks duration)	Chronic low back pain (more than 12 weeks duration)
First Line Treatments	Advice to stay active; patient education	Advice to stay active; patient education; exercise therapy; cognitive behavioral therapy
Second Line Treatments	Spinal manipulation; massage; acupuncture	Spinal manipulation; massage; acupuncture; yoga; mindfulness-based stress reduction; interdisciplinary rehabilitation
If the above treatments fail	Non-steroidal anti-inflammatory drugs	Non-steroidal anti-inflammatory drugs; selective norepinephrine reuptake inhibitors; surgery

*Reference – Foster et al., (2018). Prevention and treatment of low back pain: evidence, challenges, and promising directions. Lancet.

Education

When consulting with someone living with low back pain provide reassurance and educational resources on condition and management options and encourage the use of active approaches (e.g., lifestyle, physical activity) to help manage symptoms. As an example of an educational resource a recent review published in the *British Journal of Sports Medicine* provided a list of ten sensible evidence-based recommendations for the management of low back pain (O'Sullivan et al., 2020).

Back to basics: 10 facts every person should know about back pain

Once red flags and serious pathology are excluded, evidence supports that:

1. Low back pain (LBP) is not a serious life-threatening medical condition.
2. Most episodes of low back pain improve and LBP does not get worse as we age.
3. A negative mindset, fear-avoidance behavior, negative recovery expectations, and poor pain coping behaviors are more strongly associated with persistent pain than is tissue damage.
4. Scans do not determine prognosis of the current episode of LBP, the likelihood of future LBP disability, and do not improve LBP clinical outcomes.
5. Graduated exercise and movement in all directions is safe and healthy for the spine.
6. Spine posture during sitting, standing and lifting does not predict LBP or its persistence.
7. A weak core does not cause LBP, and some people with LBP tend to tense their 'core' muscles. While it is good to keep the trunk muscles strong, it is also helpful to relax them when they aren't needed.
8. Spine movement and loading is safe and builds structural resilience when it is graded.
9. Pain flare-ups are more related to changes in activity, stress and mood rather than structural damage.
10. Effective care for LBP is relatively cheap and safe. This includes education that is patient-centered and fosters a positive mindset, and coaching people to optimize their physical and mental health (such as engaging in physical activity and exercise, social activities, healthy sleep habits and body weight, and remaining in employment).



Manual Therapy

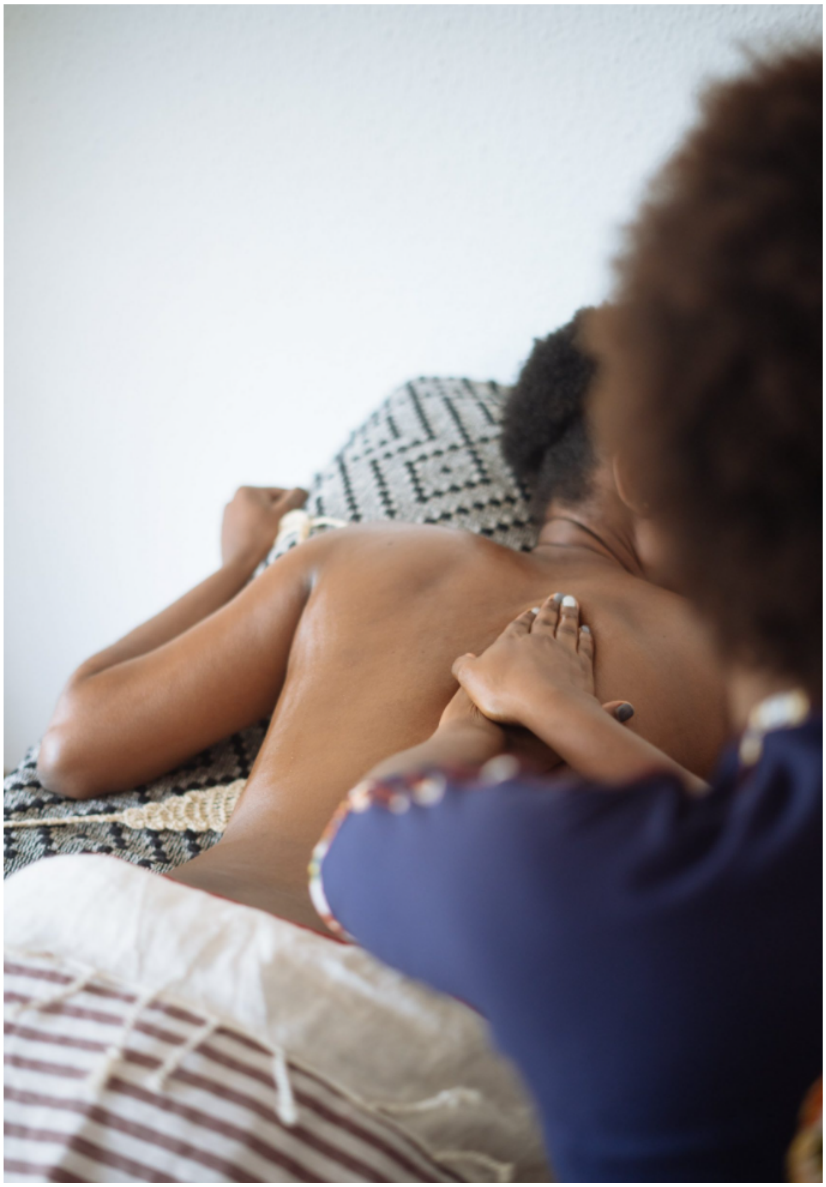
There have been several studies looking at the use of massage therapy for patients with low back. One study published in the *Annals of Internal Medicine* randomized 401 people with nonspecific chronic low back pain. The control group in the study received usual care and the other two groups received two different types of massage, what this study found was that massage therapy was beneficial for this patient population and there did not appear to be a meaningful difference between the two types of massage that patients received (Cherkin et al., 2011).

Two additional randomized controlled trials demonstrated that a treatment approach focused on the compression at myofascial trigger points (MTrPs) significantly improved subjective pain scores compared with compression at non-MTrPs for patients suffering for back pain (Takamoto et al., 2015; Kodama et al., 2019).

Structures to be Aware of When Treating Back Pain

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance, back pain may be caused by disc herniation, spondylolisthesis or soft tissue irritation. Structures to keep in mind while assessing and treating patients suffering from sciatica may include neurovascular structures and investing fascia of:

- Erector Spinae (iliocostalis, longissimus, spinalis)
- Quadratus Lumborum
- Multifidus
- Thoracolumbar Fascia and Latissimus Dorsi
- External Obliques, Internal Obliques, and Transverse Abdominis
- Iliopsoas (iliacus and psoas major)
- External Rotators of The Hip (piriformis, gemellus superior, externus and internus obturators, gemellus inferior, and quadratus femoris)
- Gluteal Muscles (gluteus maximus, gluteus medius, gluteus minimus, and tensor fasciae latae)
- Quadricep Muscles (rectus femoris, vastus lateralis, vastus medialis, vastus intermedius)
- Hamstring Muscles (semimembranosus, semitendinosus and biceps femoris)



A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance.

Self-Management Strategies

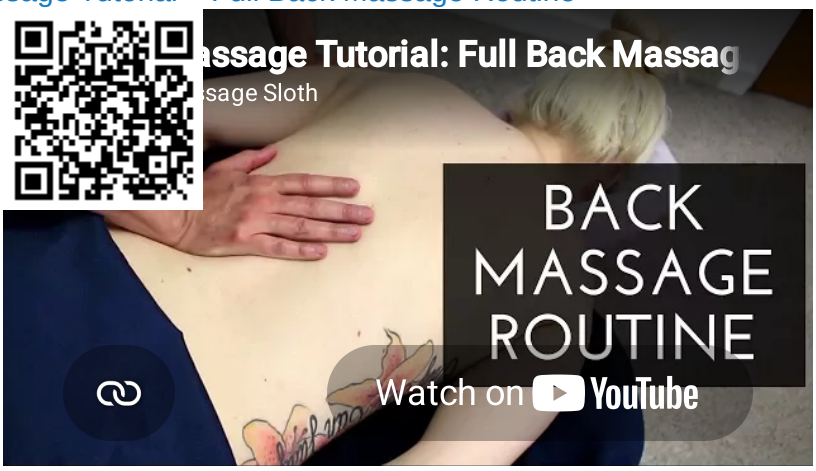
Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as routine healthy sleeping habits, Pilates, resistance training and aerobic exercise may be useful for people with back pain (Hutting et al., 2019; Owen et al., 2020).

Prognosis

International clinical practice guidelines for low back pain contain consistent recommendations including the need for a multi-modal therapeutic approach, advice to remain active, discouraging routine referral for imaging, and limited prescription of opioids (Kamper et al., 2020). A multi-modal approach can involve a number of management strategies that include but is not limited to education, reassurance, analgesic medicines and non-pharmacological therapies (Chou et al., 2018).

Recommendations from *The American College of Physicians* and *The Canadian Medical Association* represent a monumental shift in pain management. Physicians now more than ever are recommending conservative treatment options including massage, spinal manipulation, acupuncture and exercise as part of a multi-modal approach for patients suffering from low back pain (Chou et al., 2017; Qaseem et al., 2017; Traeger et al., 2017)

Massage Sloth: Massage Tutorial – Full Back Massage Routine



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for back pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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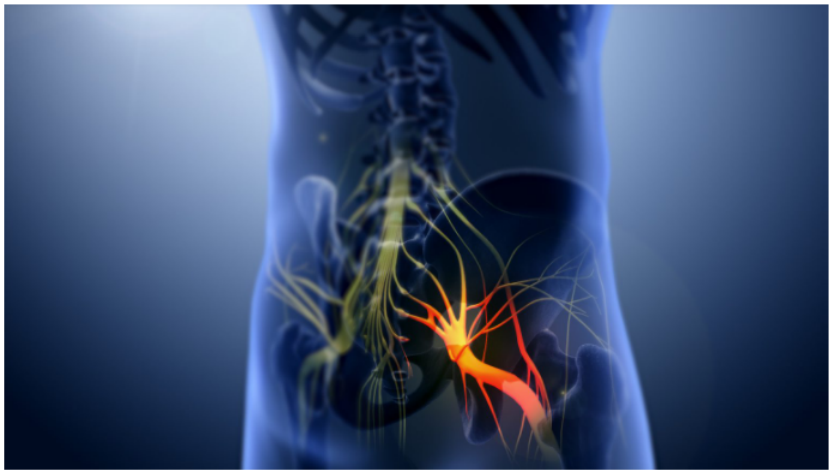
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4.20: Sciatica

Sciatica is a condition characterized by symptoms of radiating pain in one leg with or without associated neurological deficits on examination. Lumbar disk herniations are a frequent cause of sciatica, for most of the population (70 to 90% of people) symptoms are generally self-limited and often resolve within 3 months (Schoenfeld & Weiner, 2010).



Sciatica is a condition characterized by symptoms of radiating pain in one leg.

Pathophysiology

Symptoms of sciatica radiates along the path of the sciatic nerve, which branches from your lower back through your hips and buttocks and down the leg. Neurovascular bundles may be exposed to mechanical irritation or a noxious biochemical environment at many different points. Prolonged irritation may result in a reduction of intraneural blood flow. In turn, local hypoxia of a peripheral nerve leads to a drop in tissue pH that triggers the release of inflammatory mediators, known as “inflammatory soup”. This noxious substance may contribute to ongoing nociception without overt nerve damage. The application of specific soft tissue treatments and neural mobilization may help to decrease sciatic nerve stiffness and diminish intraneural edema and/or pressure by mobilizing neural tubes (Gilbert et al., 2015; Neto et al., 2020).

Examination

A thorough health history intake can be done to gather information about patients’ limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Red Flags for Serious Spinal Pathology

Red flags are signs and symptoms that raise suspicion of serious underlying pathology, for patients with low back pain there are a number of serious spinal pathologies to be aware of, these are cauda equina syndrome (0.08% of low back pain patients presenting to primary care), spinal fracture, malignancy, and spinal infection (Finucane et al., 2020; Hoeritzauer et al., 2020).

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Oswestry Disability Index
- Roland-Morris Disability Questionnaire
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- Lower Extremity Functional Scale (LEFS)

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Kemp's Test (Lower Quadrant Test)
- Kernig/Brudzinski Test
- Rebound Tenderness (McBurney's Point)
- Piriformis Test (FAIR Test)
- Slump Test
- Valsalva Maneuver
- Well Leg Raise
- Straight Leg Raise (Lasègue's sign) or Braggard's Test
- Bowstring Maneuver
- Prone Knee Bend Test/Femoral Nerve Stretch Test (Reversed Lasègue)

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

A treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from sciatica may include neurovascular structures and investing fascia of:

- Gluteal Muscles (gluteus maximus, gluteus medius, gluteus minimus, and tensor fasciae latae)
- Hamstring Muscle Group (biceps femoris, semitendinosus, and semimembranosus)
- External Rotators of The Hip (piriformis, gemellus superior, externus and internus obturators, gemellus inferior, and quadratus femoris)
- Erector Spinae (iliocostalis, longissimus, spinalis) & Multifidus
- Quadratus Lumborum
- Thoracolumbar Fascia & Latissimus Dorsi

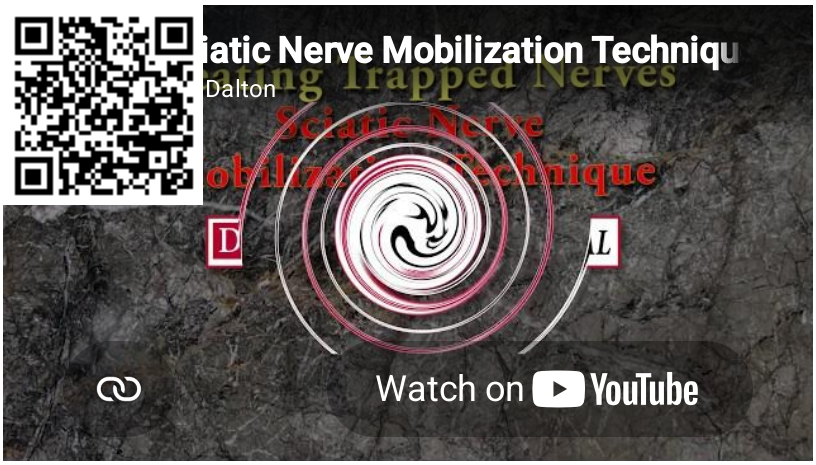
Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as hydrotherapy and stretching may be useful for people with sciatica.

Prognosis

Most patients improve over time with conservative treatment including exercise, manual therapy, and pain management (Stochkendahl et al., 2018; Jensen et al., 2019).

Sciatic Nerve Mobilization Technique with Erik Dalton



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for sciatica based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.21: Hip Pain

Hip-related pain is common in young to middle aged active adults (usually aged 18–50 years) and has a significant impact on physical activity and quality of life (Kemp et al., 2020).

Pathophysiology

The presentation of hip pain does not always mean that the joint is the primary contributor to pain. Another peripheral generator that is often overlooked is peripheral nerve irritation, namely, sciatic, pudendal, obturator, femoral, and lateral femoral cutaneous (Martin et al., 2017). There are also twenty-one muscles that cross the hip providing both movement and stability between the femur and acetabulum, all of this contributes to the complex clinical picture of hip pain.

Classification of hip-related pain

Osteoarthritis Related Hip Pain

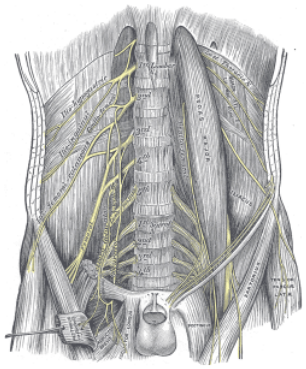
Osteoarthritis of the hip is a common finding in the general population, and in a majority of cases these degenerative changes are asymptomatic. However, in some cases this condition involves sensitization of nociceptive pathways, which may result in patients with osteoarthritis perceiving relatively low level stimuli as being overtly painful (Hunter & Bierma-Zeinstra, 2019).

Gluteal Tendinopathy

Tendinopathy of the gluteus medius and gluteus minimus tendons is now recognized as a primary local source of lateral hip pain. Many cases of hip “bursitis” should be more correctly classified as a non-inflammatory insertional tendinopathy of the gluteus medius or gluteus minimus tendons, that attach just deep to the greater trochanteric bursa. This condition interferes with sleep (side lying) and common weight-bearing tasks. The cardinal sign for this diagnosis is pain on palpation of the soft tissues over the greater trochanter.

Greater Trochanteric Pain Syndrome

An umbrella term used to encompass trochanteric bursitis, snapping hip syndrome, and abductor tendinopathy.



Femoroacetabular Impingement (FAI) Syndrome

The diagnosis of FAI syndrome currently includes bony morphological changes in the hip which may cause aberrant joint forces during hip movements and possible damage to the intra-articular structures of the joint.

Ischiofemoral Impingement

Refers to the painful entrapment of the quadratus femoris muscle between the lesser trochanter and the ischial tuberosity. The quadratus femoris acts synergistically with the other short external rotators but also serves as a secondary adductor of the hip.

Snapping Hip Syndrome

(iliopsoas tendinitis, or dancer’s hip) is characterized by a snapping sensation felt when the hip is flexed and extended. This may be accompanied by an audible snapping or popping noise and pain or discomfort. Pain often decreases with rest and diminished activity. Snapping hip syndrome is classified by location of the snapping, either extra-articular or intra-articular.

- **Intra-articular**
  Because the iliopsoas or hip flexor crosses directly over the anterior superior labrum of the hip, an intra-articular hip derangement (i.e., labral tears, hip impingement, loose bodies) can lead to an effusion that subsequently produces internal snapping hip symptoms.
- **Extra-articular**
  - **Lateral extra-articular (More common)** Occurs when the iliotibial band, tensor fasciae latae, or gluteus medius tendon slides back and forth across the greater trochanter. This normal action becomes a snapping hip syndrome when one of these connective tissue bands thickens and catches with motion. The underlying bursa may also become inflamed, causing a painful external snapping hip syndrome.
  - **Medial extra-articular (Less common)** The iliopsoas tendon catches on the anterior inferior iliac spine, the lesser trochanter, or the iliopectineal ridge during hip extension, as the tendon moves from an anterolateral to a posterior medial position. With overuse, the resultant friction may eventually cause painful symptoms, resulting in muscle trauma, bursitis, or inflammation in the area.

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- The Western Ontario and McMaster Universities Arthritis Index (WOMAC)
- Lower Extremity Functional Scale (LEFS)

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- FABER (Flexion-Abduction-External Rotation) Test (Patrick's Test)
- FADDIR (Flexion-Adduction-Internal Rotation) Test
- Resisted External Derotation Test
- Trendelenburg Sign
- Thomas Test
- Ely's Test
- Ober's Test
- 90-90 Straight Leg Test
- Piriformis Strength Test (Pace Maneuver)

Clinical Signs of Osteoarthritis

According to a recent systematic review the most useful clinical finding to identify patients most likely to have osteoarthritis of the hip are (Metcalfe et al., 2019):

- Posterior Pain with squatting
- Groin pain with passive abduction or adduction
- Hip abductor weakness
- Decreased passive hip adduction or internal rotation as measured by a goniometer or compared with the contralateral leg.

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

The use of massage therapy has been shown to improve outcomes in post-operative hip patients. One recent randomized controlled trial published in the journal *PM&R*, looked at the use of manual therapy following total hip arthroplasty (Busato et al., 2016). In this study two treatment sessions were able to significantly improve functional outcomes in patients when used in addition to usual treatment.

Structures to be Aware of When Treating Hip Pain

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from hip pain may include neurovascular structures and investing fascia of:

- Iliopsoas (iliacus and psoas major)
- Hip Adductors (adductor brevis, adductor longus, adductor magnus, pectineus, gracilis)
- External Rotators of The Hip (piriformis, gemellus superior, externus and internus obturators, gemellus inferior, and quadratus femoris)
- Quadricep Muscles (rectus femoris, vastus lateralis, vastus mediali, vastus intermedius)
- Hamstring Muscles (semimembranosus, semitendinosus and biceps femoris)
- Gluteal Muscles (gluteus maximus, gluteus medius, gluteus minimus, and tensor fasciae latae)
- Erector Spinae (iliocostalis, longissimus, spinalis) & Multifidus
- Quadratus Lumborum
- Thoracolumbar Fascia & Latissimus Dorsi

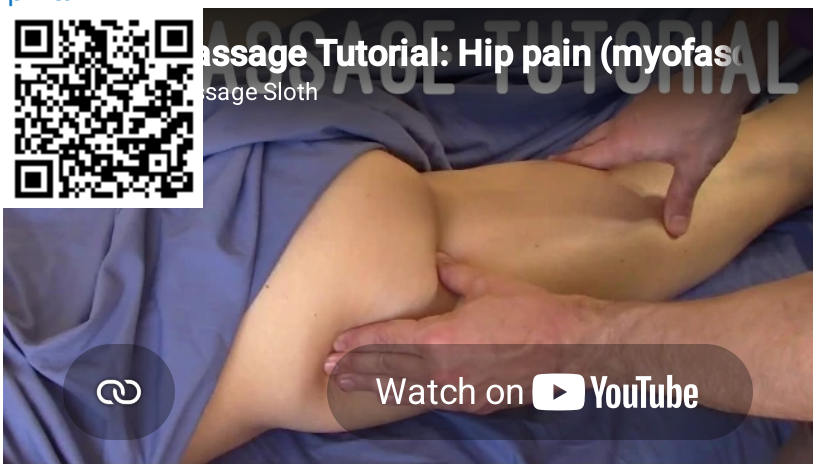
Rehabilitation Program

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as patient education to remove or reduce loads that exacerbate symptoms, this may be sitting or standing with crossed legs, standing out onto one hip, and side lying (without pillows between the knees) may be useful for people with hip pain.

Prognosis

Prognosis is good, manual therapy is supported by clinical practice guidelines for the management of hip pain and mobility deficits (Ceballos-Laita et al. 2019; Cibulka et al., 2017).

Massage Tutorial: Hip Pain



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for acute and chronic hip pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.22: Knee Pain

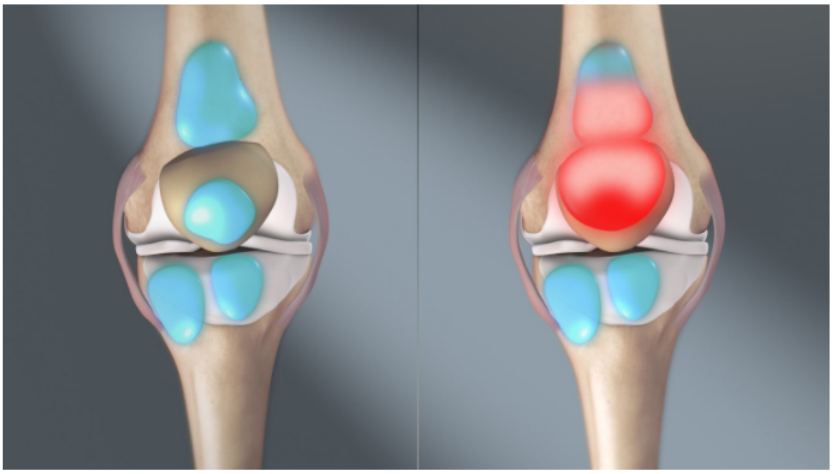
Physicians now more than ever are recommending conservative treatment including but not limited to low-impact exercise, acupuncture, and manual therapy as part of a multi-modal approach for patients suffering from knee pain.

Pathophysiology

Patellofemoral Pain Syndrome is an umbrella term used to describe pain around or behind the patella, it is common in individuals between 10 and 50 years of age. Patients often present with pain during daily activities such as stair walking, squatting or running (Winters et al., 2020).

Degenerative meniscus and osteoarthritis of the knee is a common finding in the general population, and in a majority of cases these degenerative knee changes are asymptomatic (Hortga et al., 2020). However in some cases this condition involves sensitization of nociceptive pathways, which may result in patients with osteoarthritis perceiving relatively low level stimuli as being overtly painful (Hunter & Bierma-Zeinstra, 2019).

Patellar tendinopathy is the preferred term for persistent patellar tendon pain and loss of function related to mechanical loading.



Physicians, now more than ever are recommending conservative treatment options for patients suffering from knee pain.

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- The Western Ontario and McMaster Universities Arthritis Index (WOMAC)
- Lower Extremity Functional Scale (LEFS)

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Bounce Home
- Apley's Test (Compression/Distraction)

- McMurry's Test
- Valgus Stress Test (Medial Collateral Ligament)
- Varus Stress Test (Lateral Collateral Ligament)
- Noble's Compression
- Lachman's Test
- Anterior Drawer Test
- Posterior Drawer Test
- Posterior Sag Sign
- Coronary Ligament Stress Test
- Patellar Grind Test (Clarke's Sign)
- Thessaly Test
- Bragard's Sign
- Mediopatellar Plica Test (Hughston Plica Test)
- Plica "Stutter" Test
- Ballotable Patella (Major Effusion or Patellar Tap Test)
- Brush Test (Minor Effusion, Stroke, OR Wipe Test)
- Fluctuation Test
- Waldron's Test
- McConnell Patellofemoral Knee Test
- Q-Angle
- Patellar Apprehension Test

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from hip pain may include neurovascular structures and investing fascia of:

- Erector Spinae (iliocostalis, longissimus, spinalis) & Multifidus
- Quadratus Lumborum
- Thoracolumbar Fascia & Latissimus Dorsi
- Hip Adductors (adductor brevis, adductor longus, adductor magnus, pectineus, gracilis)
- Quadricep Muscles (rectus femoris, vastus lateralis, vastus medialis, vastus intermedius)
- Gluteal Muscles (gluteus maximus, gluteus medius, gluteus minimus, and tensor fasciae latae)
- Hamstring Muscles (semimembranosus, semitendinosus and biceps femoris)
- Anterior Compartment of the Leg (tibialis anterior, extensor hallucis longus, extensor digitorum longus, peroneus tertius)
- Superficial Posterior Compartment of the Leg (gastrocnemius, soleus, plantaris)
- Deep Posterior Compartment of the Leg (flexor hallucis longus, flexor digitorum longus, tibialis posterior, popliteus)
- Proximal Tibiofibular Joint
- Ankle Joint (talocrural joint, subtalar joint and inferior tibiofibular joint)

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as hydrotherapy, stretching, and strengthening exercises have been shown to be useful for patients with knee pain (Kolasinski et al., 2020; Willy et al., 2019).

Massage Sloth: Massage Tutorial – Knee Pain



Prognosis

Physicians now more than ever are recommending conservative treatment options for patients suffering from knee pain. Two recent randomized clinical trials have highlighted the effect of conservative treatment options for patients suffering from osteoarthritis related knee pain. In one randomized clinical trial published in the *Journal of General Internal Medicine* massage therapy was shown to improve function in patients who suffer from osteoarthritis related knee pain (Perlman et al., 2019). In addition, a randomized trial published in *The New England journal of medicine* demonstrated the benefits of a conservative multimodal approach (manual therapy + exercise) for patients with symptomatic osteoarthritis of the knee (Deyle et al., 2020).

Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for knee pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.23: Achilles Tendinopathy

Tendinopathy is the preferred term for persistent tendon pain and loss of function related to mechanical loading. Achilles tendinopathy is the preferred term for persistent Achilles tendon pain and loss of function related to mechanical loading, this injury is commonly categorized into two types:

- Insertional (affects 20–25%)
- Non-insertional (affects 75–80%)

Pathophysiology

The presentation of pain in a tendon, does not always mean that the tendon is the primary contributor to pain. The multifactorial model of tendinopathy suggests that an impaired motor system, local tendon pathology, and changes in the pain/nociceptive system contributes to the complex clinical picture of tendon pain (Eckenrode et al., 2019).

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- Lower Extremity Functional Scale (LEFS)
- Foot and Ankle Ability Measure
- Foot and Ankle Disability Index

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Thompson's Test
- Tinel's Sign
- Royal London Hospital Test
- Arc Test

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. There may be times that focal irritability (i.e., nerve irritation, trigger points, nervous system sensitization) co-exists with Achilles tendinopathy. Structures to keep in mind while assessing and treating patients suffering from Achilles tendon pain may include neurovascular structures and investing fascia of:

- Plantar Fascia
- Lumbricals
- Adductor Hallucis
- Flexor Hallucis Brevis

- Metatarsals & Interossei
- Peroneals (peroneus longus, peroneus brevis)
- Hamstring Muscles (semimembranosus, semitendinosus and biceps femoris)
- Anterior Compartment of the Leg (tibialis anterior, extensor hallucis longus, extensor digitorum longus, peroneus tertius)
- Superficial Posterior Compartment of the Leg (gastrocnemius, soleus, plantaris)
- Deep Posterior Compartment of the Leg (flexor hallucis longus, flexor digitorum longus, tibialis posterior, popliteus)
- Ankle Joint (the talocrural joint, subtalar joint and the inferior tibiofibular joint)

Self-Management Strategies

Massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for patients with Achilles pain including manual therapy, simple home-care recommendations and remedial exercise, such as slow eccentric heel-drops. Remedial loading programs such as eccentric heel drops do-as-tolerated repetition and specific Alfredson Achilles tendinopathy rehabilitation protocol have both been shown to be useful for Achilles tendon pain (Head et al., 2019).

Prognosis

Multimodality options self-care techniques such as exercise therapy, relative rest, activity modifications should be considered as the first line treatment of tendon pain (van der Vlist et al., 2020). Clinicians should be thoughtful and skilled in managing the load on the tendons and supporting structures through several rehabilitation considerations including, but are not limited to manual therapy, education on psychosocial factors such as fear avoidance, and remedial loading programs.

Manual joint mobilization and soft tissue techniques for the calf muscles may modify a contributing factor in the experience of pain. In cases that involve nerve entrapment, a massage therapist may use a specialized technique called neural mobilization. The goal of neural mobilization is to free the entrapped nerve by mobilization of the nerve itself or muscles that surround the nerve. There research to support the use of neural mobilization. A 2017 meta-analysis published in the *Journal of Orthopaedic & Sports Physical Therapy* showed that nerve mobilizations are an effective treatment approach for patients with back, neck and foot pain (Basson et al., 2017).

PhysioTutors: Alfredson Achilles Tendinopathy Rehab Protocol



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for Achilles tendon pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)
- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.24: Ankle Pain

There are a number of different things to take into consideration when assessing a patient with ankle pain.

- One cause of ankle pain can be peroneal tendinopathy, which is described as persistent peroneal tendon pain and loss of function related to mechanical loading (Scott et al., 2020).
- Another causes of ankle pain is a sprained ankle, there are three different types of ankle sprain all with varying severity:
  - Inversion (lateral) ankle sprain – The most common type of ankle sprain involving tearing of the ligaments on the outside of the ankle (anterior talofibular ligament).
  - Eversion (medial) ankle sprain – Involving a tear of the deltoid ligaments, on the inside of the ankle.
  - High (syndesmotic) ankle sprain – Injury to the tibiofibular ligament above the ankle.

Pathophysiology

The structure of the foot consists of 26 bones, 33 joints (20 of which are actively articulated), 4 layers of arch muscles, and 100+ muscles, tendons, and ligaments. Following an initial ankle injury there is a risk of re-injury dependent on a combination of factors including, but not limited to: sensorimotor deficits and changes in ankle biomechanics.

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Outcomes Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- Lower Extremity Functional Scale (LEFS)
- Foot and Ankle Ability Measure
- Foot and Ankle Disability Index

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Talar Tilt Test
- Anterior Drawer of the Ankle
- Calcaneocuboid Stress Test
- Calcaneofibular Stress Test
- Talofibular Ligament Stress Test (Anterior & Posterior)
- Deltoid Ligament Stress Test
- Dorsiflexion External Rotation Stress Test (Kleiger's Test)
- THE SYNDESMOSIS SQUEEZE TEST
- Tinel's Sign

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

Massage therapists are uniquely suited to incorporate a number sensory-targeted rehabilitation strategies for patients with chronic ankle instability (Mckeon et al., 2016). This may include superficial peroneal nerve mobilization – the superficial peroneal nerve passes between peroneal muscles and the extensor digitorum longus. It then pierces the deep fascia and is divided in cutaneous nerves that enter the foot to innervate the dorsal surface (Plaza-Manzano et al., 2016). The specific movement to mobilize the superficial peroneal nerve involves plantar flexion with inversion combined with straight leg raise. Branches of the saphenous nerve also innervate the talocrural capsule.

Structures to be Aware of When Treating Ankle Sprains

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from ankle pain may include neurovascular structures and investing fascia of:

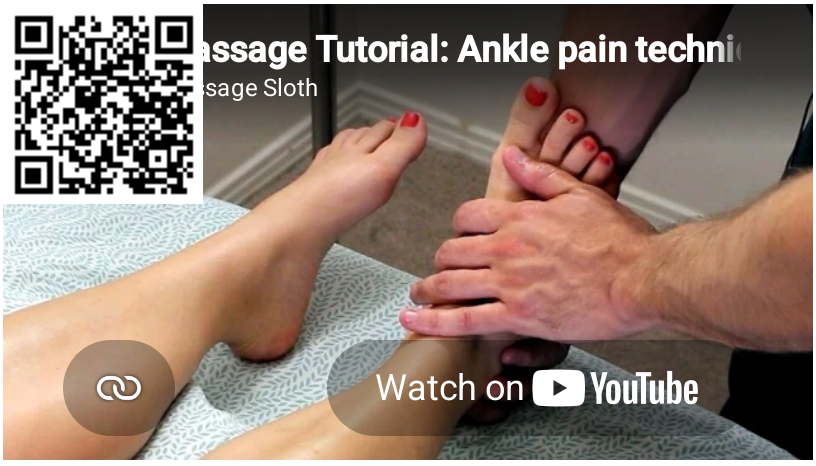
- Plantar Fascia
- Lumbricals
- Adductor Hallucis
- Flexor Hallucis Brevis
- Metatarsals & Interossei
- Peroneals (peroneus longus, peroneus brevis)
- Anterior Compartment of the Leg (tibialis anterior, extensor hallucis longus, extensor digitorum longus, peroneus tertius)
- Superficial Posterior Compartment of the Leg (gastrocnemius, soleus, plantaris)
- Deep Posterior Compartment of the Leg (flexor hallucis longus, flexor digitorum longus, tibialis posterior, popliteus)
- Ankle Joint (talocrural joint, subtalar joint and the inferior tibiofibular joint)

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Simple home-care recommendations such as stretching, strengthening and proprioceptive exercises may be useful for people with ankle pain.

Prognosis

Prognosis is favorable, a multi-modal rehabilitation approach utilizing exercise (proprioceptive and strengthening) and manual therapy (plantar massage, joint mobilizations and nerve mobilization) can be used to enhance motor control in patients (Doherty et al., 2017; Plaza-Manzano et al., 2016).



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for ankle pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)

- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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4.25: Plantar Heel Pain

Plantar heel pain, also known as plantar fasciitis, is generally described as sharp or stabbing, and worse in the morning. The pain can decrease with activity but can return after long periods of standing or after getting up from a seated position.

Pathophysiology

Just because this condition is referred to as plantar fasciitis, does not mean that the plantar fascia is the primary contributor to symptoms. Entrapment of the tibial nerve and its branches in the tarsal tunnel (along the inner leg behind the ankle) may mimic symptoms of plantar fasciitis. Inside the tunnel, the nerve splits into three different segments – one nerve continues to the heel, the other two continue to the bottom of the foot. Entrapment of any of these nerves may contribute to the complex clinical picture of plantar fasciitis (Plaza-Manzano et al., 2019).

Examination

A thorough health history intake can be done to gather information about patients' limitations, course of pain, and prognostic factors for delayed recovery (e.g., low self-efficacy, fear of movement, ineffective coping strategies, fear-avoidance, pain catastrophizing) and answers to health-related questions. Screen patients to identify those with a higher likelihood of serious pathology/red flag conditions. Then undertake a physical examination: neurological screening test, assess mobility and/or muscle strength.

Outcome Measurements

Incorporate one or more of the following outcome measurements when assessing and monitoring patient progress:

- Self-Rated Recovery Question
- Patient Specific Functional Scale
- Brief Pain Inventory (BPI)
- Visual Analog Scale (VAS)
- Lower Extremity Functional Scale (LEFS)
- Foot and Ankle Ability Measure
- Foot and Ankle Disability Index

Physical Examination

Incorporate one or more of the following physical examination tools and interpret examination results in the context of all clinical exam findings.

- Windlass Test
- Plantar Fascia Test
- Tinel's Sign

Treatment

Education

Provide reassurance and patient education on condition and management options and encourage the use of active approaches (lifestyle, physical activity) to help manage symptoms.

Manual Therapy

A massage therapy treatment plan should be implemented based on patient-specific assessment findings and patient tolerance. Structures to keep in mind while assessing and treating patients suffering from plantar heel pain may include neurovascular structures and investing fascia of:

- Plantar Fascia
- Lumbricals
- Adductor Hallucis
- Flexor Hallucis Brevis
- Metatarsals & Interossei

- Peroneals (peroneus longus, peroneus brevis)
- Hamstring Muscles (semimembranosus, semitendinosus and biceps femoris)
- Anterior Compartment of the Leg (tibialis anterior, extensor hallucis longus, extensor digitorum longus, peroneus tertius)
- Superficial Posterior Compartment of the Leg (gastrocnemius, soleus, plantaris)
- Deep Posterior Compartment of the Leg (flexor hallucis longus, flexor digitorum longus, tibialis posterior, popliteus)
- Ankle Joint (the talocrural joint, subtalar joint and the inferior tibiofibular joint)

Self-Management Strategies

Massage therapists not only provide hands-on treatment they can also develop self-management programs to help patients manage symptoms. Stretching, foot taping and educational interventions are part of the core approach for people with plantar heel pain. Also intrinsic foot muscles play a crucial role in supporting the medial longitudinal arch, providing the foot stability and flexibility for shock absorption. Foot core exercises can help recondition foot muscles (McKeon et al., 2015).

- Toe Adduction & Abduction
- Doming & Arching
- Toe Splaying
- Big Toe Press
- Reverse Tandem Gait
- Vele's Forward Lean

Prognosis

Current best practice recommendations are that plantar fascia stretching, foot taping and educational interventions should be the primary treatment for people with plantar heel pain (Morrissey et al., 2021). In addition evidence also suggests that massage therapy (joint mobilization and soft tissue massage) is helpful in improving function and reducing plantar heel pain (Fraser et al., 2018).

In cases that involve nerve entrapment, a massage therapist may use a specialized technique called neural mobilization. The goal of neural mobilization is to free the entrapped nerve by mobilization of the nerve itself or muscles that surround the nerve. There is research to support the use of neural mobilization. A 2017 meta-analysis published in the *Journal of Orthopaedic & Sports Physical Therapy* showed that nerve mobilizations are an effective treatment approach for patients with back, neck and foot pain (Basson et al., 2017).

Massage Sloth: Massage Tutorial – Myofascial Release for Plantar Fasciitis and Heel Pain



Key Takeaways

Contemporary multimodal massage therapists are uniquely suited to incorporate a number of rehabilitation strategies for plantar heel pain based on patient-specific assessment findings including, but not limited to:

- Manual Therapy (soft tissue massage, neural mobilization, joint mobilization)

- Education that is Person-Centered (e.g., biopsychosocial model of health and disease, self-efficacy beliefs, active coping strategies)
- Stretching & Loading Programs (e.g., concentric, eccentric, isometric exercises)
- Hydrotherapy (hot & cold)
- Self-Management Strategies (e.g., engaging in physical activity and exercise, social activities, and healthy sleep habits)

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Supplementary Resources

Setting The Groundwork For Evidence-Based Massage Therapy: A selection of books and research articles that might be of interest if readers want to explore the topics introduced here in more depth.

General Reference Books

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