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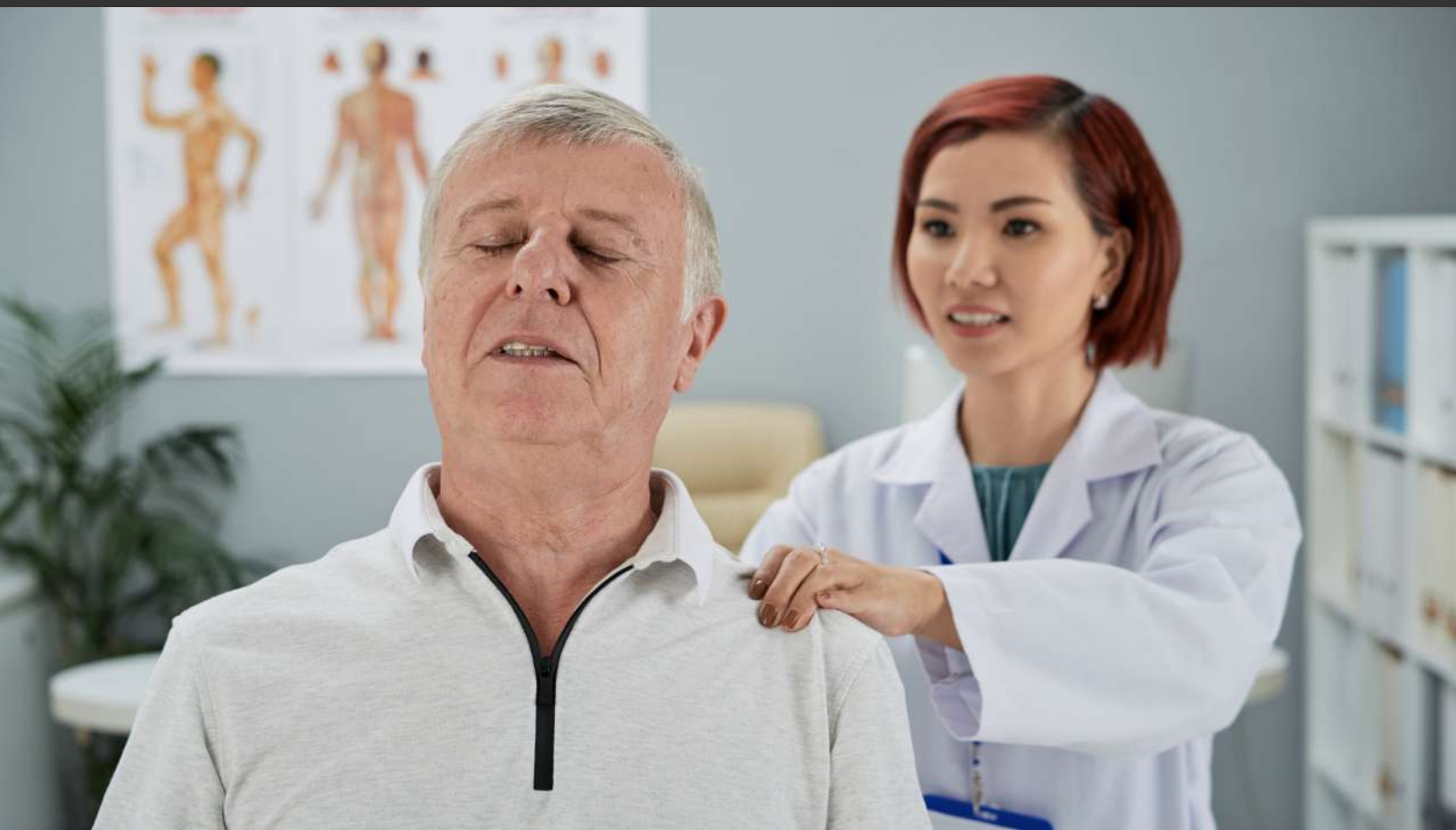
Pain Science



Introduction

Pain science is a complex topic and is rooted in individual perception and subjectivity. The experience of pain is based on various factors. Some of these include personal experience, the influence of family and culture, and how the nervous system develops.[1] Over time, different theories have been proposed on the n pain based on the best available evidence. While many of these theories provided valuable scaffolding to develop a foundation in the field of neuroscience, the experience of pain is not fully understood.[1]

In recent times, physical therapy has become one of the most effective interventions for pain, both in terms of cost and patient satisfaction.[2] This course will illustrate three of the predominant theories of pain science and outline the best physical therapy practices for the treatment of acute, subacute, and chronic pain. This will demonstrate the pivotal role of Physical Therapists and Physical Therapist Assistants in addressing pain in patients with various conditions.

Section 1: Pain Science Background

One of the earliest defined theories on pain can be attributed to the ancient Greek philosopher Plato. He posited that pain was an “emotion” and was dependent on intensity and duration as stimuli for how one would experience pain. From there, many philosophers and scientists expanded upon and further changed this theory. Details involving religion and the soul were elements added to the pain theory. Though these elements provided valuable information, the theory surrounding pain was still incomplete. However, in the 1960s, pain theory was revolutionized by the introduction of the "gate control mechanism" of pain proposed by researchers, Wall and Melzcak.[1]

This section of the course will outline the background of pain science by examining the types of pain, the neuroscience behind pain, and three of the most influential theories on pain: the Gate Control Theory, The Neuromatrix Model, and the Biopsychosocial Model.

Types of Pain

Pain has a multidimensional etiology and presents in stages based on healing time and inflammatory processes. Pain typically begins in an acute phase and progresses to

chronic depending on the success of the intervention. Physical therapy can play an important role in each stage of pain management.

Acute Pain

Acute pain tends to be specific and isolated pain following an injury, such as a broken bone, which represents what many think of as pain. It is a protective mechanism to prevent further injury after experiencing an insult. It is often considered the typical course of the experience of sharp or sudden pain after a physical injury, trauma, or clear cause3. This includes anything from an accidental cut to back pain immediately experienced after lifting with poor form. From the injury, a patient will typically rest and schedule an appointment with a healthcare provider or seek treatment in an emergency. Depending on the intervention, symptoms will gradually dissipate and typically not last beyond six months.[4] Within this time frame, acute pain can develop into other types of pain described later in this section.

The acute phase of pain can be further broken down into three separate stages that all injuries must go through to heal. The healing timeline will vary for any musculoskeletal injury based on numerous factors including age, comorbidities, healing intervention, and gender.

Stage one of the acute phase is the Acute Inflammatory Phase, which can last up to three days post-injury. Stage two is the Repair Phase, which lasts typically three days to six weeks post-injury. Stage three is the Remodeling Phase, which will occur for six weeks and last up to a year or more.

This outline of acute pain applies to conditions such as joint replacements, strained muscles, or sprained ligaments, which physical therapists and physical therapist assistants treat daily. The three stages outlined above are typical for an injury with a known cause that is managed quickly and appropriately. However, if a healthcare provider fails to treat these patients with best practices, if the patient has comorbidities that extend the typical healing time, or if the patient is not responding to the treatment, the pain response may extend into the “subacute” phase.

Subacute Pain

Subacute pain represents the transition from acute to chronic pain. It begins around six weeks after an acute injury, presents with more diffuse and dull pain than the acute phase, and tends to last for about three months. Some components of the acute phase

and chronic phase of pain will be present. This includes pain, inflammation, poor ability to participate in daily activities or exercise, and potentially patient frustration about their quality of life. The subacute phase is a critical intervention period in the prevention of having the original injury become chronic.[4]

Chronic Pain

Chronic pain is widely regarded as the most difficult type of pain to treat. Chronic pain either is a result of acute and subacute pain that lingers on or can present with a gradual onset as a result of overuse. From the onset, this type of pain lasts longer than six months. Additionally, chronic pain is physiologically "non-protective" as opposed to acute pain, which is the body's protective response to an insult. Various definitions have been put forth for chronic pain over the years, but it essentially refers to pain that persists long after an injury would be expected to have healed or pain that is recurrent.[5]

Neuroscience of Pain

The neuroscience behind pain processing is extraordinarily complex, especially considering the evolving theories surrounding the topic. However, there is a consensus on what occurs in the pain pathway. This should be understood by clinicians treating patients with pain.

The pathway begins with a painful stimulus, like touching a hot stove. Nociceptors, or pain receptors, recognize this stimulus as pain and send the appropriate signal along peripheral nerves to their destination in the dorsal horn of the spinal cord. These signals then travel along the spinothalamic tract of the nervous system until they reach their next stop in the thalamus, specifically, thalamic cells in the ventral posterior lateral nuclei and the ventromedial nuclei. The thalamus then triages this sensory input and sends out signals to other, higher cortical areas of the brain. The areas of the brain that receive this information can vary from person to person based on a multitude of factors, but nearly always include the insula and the anterior singulate cortex. These areas contribute to the subjective experiences of pain. Additional areas that can be stimulated after reaching the thalamic areas include the amygdala, basal ganglia, and the hypothalamus. These structures collectively make up pain in the neuromatrix model.

Advancements in neuroscience and a further understanding of the pain pathway occur frequently due to continuous research and discoveries from imaging and functional studies.[1,6]

Theories of Pain

Gate Control Theory

This revolutionary theory was proposed in 1965 and was the first theory to view pain through the lens of both the mind and the body. Advancements in neuroscience were instrumental in developing and refining this theory over the years, which led to theories that provided an even more complete picture of pain.

To summarize the theory, a few crucial elements occur. First, pain occurs due to a stimulus such as burning oneself on a hot stove. This stimulus of pain prompts the nervous system to send a signal to the brain. Before this signal can reach the brain, it must pass through three “gates” in the spinal cord. These three gates are the cells housed in the substantia gelatinoso, nerve fibers located in the dorsal column, and transmitter cells located in the dorsal horn. If the pain signal, passing along on a small “C fiber” nerve, is strong enough to stimulate each of these three areas and thus pass through each of the “gates”, it is then transmitted to the brain. C fiber nerves convey sensory information to the central nervous system from the periphery by slow conduction on an unmyelinated nerve sheath. After the pain information reaches its destination, the brain interprets these signals, and the result is the individual experiencing pain. If the signal is not strong enough to pass through these “gates”, the brain does not receive the pain signal, and pain is not experienced by the individual. Alternatively, if larger “A-fibers” are stimulated, the gates will not open for the small “C fibers” due to the faster conduction velocity of A-fibers, and the patient will not experience pain. This is the theory behind transcutaneous electrical nerve stimulation (TENS), which is discussed later.

Additionally, this theory incorporated the emotional and psychological elements of pain, which were groundbreaking in the field of pain science. Melzack and Wall hypothesized that in addition to the aforementioned gates, there were additional control mechanisms in the cerebral cortex, involved with the emotional responses to pain.

Researchers who built upon the groundwork laid down by Melzcak and Wall found that emotional state could lead to differences in gate sensitivity, or how easily these gates would open and allow pain sensations to be transmitted to the brain. This had huge implications for the experience of pain for people who have clinical depression and neuro-atypical people.

Some current theories and research dismiss parts of the gate control theory, but the essential theories that comprise the Gate Control Mechanism were critical to our current understanding of pain.[1, 7]

The Neuromatrix Model

Expanding upon his Gate Control Theory from roughly thirty years prior, in the 1990s Melzack contributed even more significantly to pain science with the development of the Neuromatrix Model. The Neuromatrix Model is based on the theory that pain is created from signaling and responses in the central nervous system and does not occur from harm to tissue. The Neuromatrix Model posits that there are four conceptual elements within the central nervous system that lead to pain sensation. The first element is the Body-Self Neuromatrix. This is described directly by Melzack as "the neuromatrix is the origin of the neurosignature…". The neuromatrix is the complex system spread over many of the parts of the human brain, including cortical, limbic, and thalamic structures housing various neurons and cells responsible for pain processing. The neurosignature is the individual pattern that everyone's brain creates to develop a sense of "self" or "whole body awareness". This is critical because Melzack is implying that the neurosignature can be modified or "triggered" by inputs. However, the neurosignature develops independently of inputs and not as a result of inputs. The second element of the Neuromatrix Model is Cyclic Processing and the synthesis of signals. The signals that come through all parts of the brain generate unique neurosignatures. These neurosignatures are influenced by the signals that pass through portions of the brain. The third element is the Sentient Neural Hub, which is responsible for converting neurosignature processes into awareness. The fourth element is the Activation of the action Neuromatrix. Due to this awareness, the "action" neuromatrix creates the "pattern of movements" to accomplish the goal at hand.

While the concept of the neuromatrix model of pain seems complicated, the important thing to realize is that this model furthered the notion that pain is not strictly a sensory issue that arises due to painful stimuli. There are complex elements in the brain known as neuromatricies, which give rise to neurosignatures, which in turn allow individuals to interpret pain and have a general awareness of the body and mind. This model was missing one key piece of the puzzle, which is social influences on pain, an element of the biopsychosocial model.[1, 8]

The Biopsychosocial Model

While elements of this model were being theorized and tested early in the 1940s, it would take until the 1970s for the theory to gain any traction in the medical community. The biopsychosocial model builds upon the previous theories of pain science but accounts for one crucial element that researchers did not consider, the sociological influences on pain.

The Biopsychosocial model of pain has four elements: nociception, pain, pain suffering, and pain behaviors. Nociception is the physiologic process of a stimulus causing a cascade of events that allow a pain signal to reach the brain. Pain in the biopsychosocial model refers to the subjective response that occurs once the brain has processed the raw data through nociception. Pain suffering is the emotional portion of the brain's reaction to pain and may occur consciously or subconsciously. Pain behaviors are actual actions that a person performs following the experience of pain. These also may occur consciously or subconsciously and represent social behaviors related to pain.

Adding in the factor of sociological influences on pain took pain science in a new direction, especially about chronic pain and pain caused by trauma. Never before had a theory of pain considered the neural connections that take place when someone feels isolated from his/her peers or stigmatized by his/her social circle.

The biopsychosocial model emphasizes Pain Neuroscience Education (PNE). PNE is a critical component taught in medical and physical therapy school to ensure that providers understand that pain is more complex than strictly physical pathologies and direct tissue injury.[9,10]

Clinicians educated in this theory realize that certain pain presentations are far too complex to be addressed in isolation.[11] Rather, many different specialties such as physicians, psychologists, physical therapists, and professionals from all areas of the healthcare spectrum should be communicating and collaborating to treat patients who are experiencing pain. [1, 9,10, 11]

Section 1 Key Terms

Acute pain - pain that lasts less than six months that is protective

Subacute pain – a subset of acute pain that lasts more than three months, but less than six months

Chronic pain - pain that lasts longer than six months and is “non-protective” in nature

The Gate Control Theory of Pain - the first theory on the pain that incorporated biological and psychological aspects of pain

The Neuromatrix Model of Pain – a theory that expands on the Gate Control Theory, the Neuromatrix model defined corticothalamic and corticolimbic structures responsible for painful experiences

The Biopsychosocial Model of Pain - the most complete theory of pain to date, incorporating biological, psychological, and sociological factors as they relate to the experience of pain

Section 1 Summary

Pain neuroscience is an ever-evolving field and expands our understanding of how pain is processed. Acute, subacute, and chronic pain have distinct differences in terms of duration and rehab considerations. Modern pain theories incorporate the gate control theory, the neuromatrix model, and the biopsychosocial model of pain. The Biopsychosocial Model is crucial to the understanding of pain and rehabilitation as it considers the biological, psychological, and social aspects of pain.

Section 2: The Physical Therapist’s Role in Pain Management

Physical therapists are in a unique position when it comes to treating patients who are experiencing pain. Physical therapists and physical therapist assistants spend, on average, much more time with their patients in a one-on-one setting and tend to be well-liked by patients in general.[1,2] Since the early 2000’s PTs have been recognized as the providers who can most effectively treat pain as an alternative to opioids.[2] This section of the course will cover the physical therapist’s role in the management of acute, subacute, and chronic pain, how physical therapists can effectively treat pain by incorporating principles of the biopsychosocial model, and the most appropriate physical therapy treatments for patients with pain.

Duration of Pain (Acuity and Chronicity)

Physical therapists and physical therapist assistants are integral in pain management for patients at any stage of pain. For acute pain, modalities are more useful than for chronic pain to manage symptoms. Passive modalities include ultrasound, electrical stimulation, and some forms of manual therapy. For acute pain, PTs should be able to manage symptoms using appropriate modalities, make referrals as needed, and educate to avoid exacerbation of pain. For some cases of acute pain and nearly all cases of chronic pain, active treatments rather than passive modalities are effective. Active strategies include exercise, mobility, and movement retraining. Active treatments tend to have better patient outcomes than passive modalities.[13] When patients present with subacute, chronic, or pain presentations that become chronic throughout treatment, PTs have more considerations to make. This situation could warrant a referral to another provider, a modification of the plan of care, or both. Chronic pain sufferers will almost always have biological, psychological, and sociological considerations related to their pain.[5] Physical therapists should be able to recognize these elements of pain, refer appropriately, and treat within their scope of practice.

Biological/Physical Pain Symptoms with Chronic Pain

The physical therapy plan of care for a patient with chronic pain needs to factor in biological factors related to pain. This means taking a comprehensive subjective history where a patient reveals how long the pain has been present, what activities are limited because of symptoms, and what remedies the patient has already sought out. A clinician should conduct a thorough examination of the symptomatic area along with joints and muscles surrounding the area. A clinician's goal is to find any factors such as deficits in joint range of motion, muscle length discrepancies, compensatory movement patterns, or strength deficits that are related to chronic pain. A patient with chronic pain will likely have deficits surrounding the area and needs to be educated on how to move the affected area effectively again.

Psychological/Emotional Pain Symptoms with Chronic Pain

The psychological component of chronic pain needs to be addressed. Many of these factors can be identified during the interview portion of the evaluation. While referral to a mental health specialist should be considered, there are steps that physical therapists can and should consider with patients in chronic pain. The subjective history is crucial in

identifying risk factors for patients with chronic pain. The history should cover patient preferences, fears, and experience with rehab/medical professionals. The provider should get a sense of motivational factors behind the patient's recovery, a strategy known as motivational interviewing. Providers should ask open-ended questions so the patient can fully explain the story behind their pain and feel like the provider is listening and cares to help their situation. Many patients in chronic pain have sought treatment multiple times from various providers. They may have difficulty believing that physical therapy can help and will require a strong therapist-patient rapport for therapy to be effective. Some intervention strategies for pain management include mindfulness and/or deep breathing exercises, education on pain neuroscience, and creating a shared decision-making model to allow the patient an active role in their recovery.[9,14,15]

Sociological Pain Symptoms with Chronic Pain

Perhaps the least understood and most foreign component of pain to PTs/PTAs is that of the sociological aspects of pain. The impact of the social components of a patient's recovery should not be ignored. Patients who have suffered trauma, or any patients who are experiencing chronic pain, may feel isolated, shunned, disbelieved, ostracized or a whole host of other feelings as a result of their symptoms.[9] Physical therapists should incorporate interview questions and recommendations that help to uncover this aspect of pain to help the patient recover fully. Physical therapists should understand what social environment a patient normally operates in and the dynamic of family and relationships as appropriate. If it is appropriate and effective to do so, providers should encourage their patients to attend support group meetings and provide recommendations on resources. Although it is not considered traditional practice, inquiring about these topics can help develop rapport and trust with patients and potentially help patients improve their quality of life.

Section 2 Key Terms

Patient interview - the portion of the evaluation in which the therapist creates a dialogue and opens up two-way communication with the patient

SDM (Shared Decision Making) model - a system of communication and evaluation in which both therapist and patient are actively involved in the patient's evaluation and treatment.

Section 2 Summary

Physical Therapists need to consider pain from both a perspective of the duration of pain and the dimensions of pain according to the biopsychosocial model. Physical therapists should always conduct a thorough examination and subjective history to ensure comprehensive care of patients in chronic pain. Many of the psychosocial factors can be obtained through the patient interview, which is also an opportunity for the therapist to develop trust and rapport with the patient. Therapists should always see treating patients in chronic pain as an opportunity to improve their quality of life as they may feel hopeless that their situation will not improve.

Section 3: Specific PT Approaches to Managing Pain

With so many tools available to PTs and PTAs it can be hard to navigate the literature and determine which approach may best serve their patients in pain. Certain methodologies, especially those designed to treat children with chronic pain, show some promising results. In the following section, we will investigate some of the current practices that physical therapists are implementing for individuals with acute/subacute and chronic pain and how these treatments relate to the current understanding of the neuroscience behind the pain.

Acute Pain/Subacute Pain

Management of acute pain is generally more straightforward than chronic pain. The subjective experience of pain can usually be improved if the PT performs a thorough evaluation and selects appropriate treatment methods based on evidence and clinical experience. Physical therapists and physical therapist assistants should keep a few things in mind when managing patients with acute pain. The first is to consider the biopsychosocial model and never minimize the patient's pain. The therapist should explain to the patient the difference between acute/subacute (protective) pain and chronic (non-protective) pain and incorporate patient preferences into the treatment plan. They should follow evidence-based guidelines and incorporate clinical expertise based on specific injuries and body regions. For example, for patients who are post-surgery, the PT should follow the surgeon's protocol and maintain contact with the physician when treating the patient experiencing pain. When considering a treatment plan for patients with acute pain, it is imperative to know when to refer to another

provider, such as when there are red flag signs. Some red flag signs of cancer include sudden, unexplained weight loss, night pain, and pain without movement. Patients with acute pain should receive education on pain neuroscience.[16] Acute pain that is inappropriately managed may result in a longer plan of care and worse patient outcomes.

Chronic Pain

When pain becomes chronic, there are many treatment options available through physical therapy. Many traditional treatments within the scope of physical therapy, including things like therapeutic exercise, retraining movement patterns, patient education will likely help patients dealing with chronic pain. However, some cases of chronic pain do not respond to traditional physical therapy or other interventions by the medical community. Physical therapists and physical therapist assistants should always collaborate and refer to medical specialists in the pain field and mental health professionals as appropriate.

There is a misconception that chronic pain occurs more often in people with poor pain tolerances and that it can only stem from extremely severe injuries. However, this is far from the truth. Chronic pain can result from minor injuries and can occur in anyone at any time.[17]

Physical therapy is a safe, effective alternative to opioids and other pain relief medication and should be strongly considered in patients with most types of chronic pain. While opioids bind to receptors in the central nervous system, creating a feeling of pain relief, they also cause side effects and can be extremely addictive. Physical therapy aims to address the root cause of pain, creating long-lasting improvement in the condition.[2,17]

Pain Management Strategies

Beyond the traditional physical therapy intervention, this section will discuss alternative programs and strategies to help the patient with chronic pain.

Intensive Pain Rehabilitation Therapy

Outpatient interdisciplinary programs have gained traction for teenage patients diagnosed with fibromyalgia. These programs incorporate both cognitive-behavioral

therapy (CBT) and Neuromuscular Exercise Training. From small studies, there is evidence that this type of program has a significant effect on patient pain and disability when compared to programs that solely utilized CBT.

Programs known as IIPT (intensive interdisciplinary pain treatment) are just as the name suggests: treatment plans that incorporate professionals from across multiple disciplines of the rehabilitation field to address pain through all dimensions of the biopsychosocial model. These programs tend to be inpatient, as psychologists, physical therapists, and other pain specialists work together on an intensive program that lasts up to 8 hours a day. The purpose of this is to reprogram the brain of the chronic pain patient to process pain more effectively. While these programs have typically been geared toward children, there are implications for treatment of the adult with chronic pain as well.[18]

Research on the effectiveness of IIPTs has demonstrated significant improvements in the domain of disability and up to moderate improvements in pain intensity and depression. Due to the limitations of the study, more research is needed for IIPT programs to be applied to a general population.

Mindfulness-Based Stress Reduction (MBSR)

While many PTs may be reluctant to venture into the area of addressing the psychological components of a patient's pain, there are practices within the physical therapy scope that are effective for chronic pain sufferers.

One such treatment is of mindfulness-based stress reduction. MBSR is used in an attempt to redirect a patient's attention to the present moment, which allows the therapist to guide the patient in using productive strategies to deal with pain and disability.[14]

MBSR is a promising tool that should not be discounted by clinicians. However, more research is necessary to determine how MBSR should be prioritized by physical therapists.

Massage and Manual Therapy

There is little research to show that massage or manual therapy, in general, is effective for chronic pain sufferers. However, depending on patient preference and other aspects of the biopsychosocial model, manual treatments may bear consideration. The nature of the condition, how the patient responds to physical touch, and many other factors will

play into a physical therapist's decision on whether or not to incorporate manual therapy techniques into the treatment plan.[16,19]

Aquatic Therapy

Aquatic therapy has long been proposed as a treatment option for chronic pain sufferers, especially those with fibromyalgia. The theory behind the use of aquatic therapy in the chronic pain population is that it will enable less pain with movement and the benefits of aerobic exercise. A systematic review of aquatic exercise programs for individuals with fibromyalgia specifically found up to moderate evidence of the effectiveness of using aquatic therapy in this patient population.[20,21] Recent research has demonstrated great benefit in combining traditional exercise with pool-based exercise therapy to achieve maximum benefit and improved function in the chronic disease population. [21]

Transcutaneous Electrical Nerve Stimulation (TENS)

TENS is a widely used treatment for both acute and chronic pain. Although the use of TENS and passive modalities, in general, has been a topic of division among physical therapists for years, the modality provides an example of the Gate Control Theory in action.[1,7]

The use of conventional TENS activates larger "touch" nerve fibers and when these are activated, they close the "gate" for the smaller, pain nerve fibers. This effectively prevents the pain signals from reaching the central nervous system so they are not perceived. While there are parts of this theory that continue to hold up against scrutiny, recent neuroscience studies have challenged the mechanisms proposed in the original Gate Control Theory.[7]

Mirror Box Therapy/Mirror Therapy

Mirror therapy, involving the use of a mirror for a patient to visualize a body part through the use of a mirror, has been proven successful in patients suffering from chronic pain. This treatment has been effectively implemented in patients suffering from complex regional pain syndrome (CPRS), phantom limb pain, recovery after a cerebrovascular accident, and other conditions in which hesitance to use a body part and pain are significant hindrances in recovery.[22]

Exercise for Pain Management

A primary role of physical therapists and physical therapist assistants is to empower their patients through exercise and to normalize mobility and movement. There are many ways to do this for patients in pain which are discussed in this section.

Comprehensive Exercise Programs

For low back pain and many other conditions, a general exercise program that emphasizes core strengthening, flexibility, and cardiovascular exercise tends to be beneficial. Exercise programs should be appropriately programmed and progressed according to what the individual patient can tolerate.[23] When patients are empowered by movement, their pain may dissipate as their trust in the process of recovery and quality of life improves.

Progression should be based on several factors including baseline measures, goals of the patient, therapist goals, comorbidities, and other important considerations gleaned from the evaluation. For example, if a young child has a goal to return to playing sports at the end of her plan of care, sport-specific movements should be incorporated to address patient goals and work within the biopsychosocial model.

Strengthening Exercise

Depending on the results of the PTs examination, strengthening exercises should address weak and poorly performing muscles and joints in the patient.[23] For example, in people with low back pain, there is often a physical impairment of core weakness. With exercises to target weakness and poorly performing core, gluteal, and multifidi muscles, people with low back pain almost always improve. For most conditions with musculoskeletal pain, physical therapy should include strengthening exercise, progressing to incorporate large movements that target multiple body regions and are functional such as squats and step-ups. Incorporating these elements into the plan of care can reprogram pathways in the brain and central nervous system that show the nervous system that movements do not always create pain.

Flexibility Exercise

Muscles that are excessively tight on evaluation should be addressed with a comprehensive flexibility program to improve the range and efficiency of motion in the affected joints. For low back pain specifically, yoga-based movements such as an upward

and downward dog can provide a stretch to anterior and posterior chain structures respectively.[23] Similarly to strength exercise, when a patient has limited movement in a joint due to fear of pain, guiding that patient through flexibility and range of motion exercises, such as yoga movements, can serve to create new connections in the brain. These connections demonstrate that movements do not have to be painful and eliminate non-protective pain connections that were strengthened and maintained throughout the patient's symptoms.

Cardiovascular Exercise

Cardiovascular exercises such as walking, biking, and swimming should be a part of everyone's routine, including patients with pain. These movements provide benefits to the cardiovascular, respiratory, skeletal, muscular systems, and have been linked to improved mental health. Aerobic exercise improves the psychological aspect of pain by releasing endorphins in the brain which improve mood.[23]

Cardiovascular exercise can serve to "retrain" the brain to tolerate movements that have been avoided due to the non-protective nature of chronic pain.

For pain sufferers, there is a wide range of recommendations in terms of frequency, duration, and intensity of exercise. However, any increase in cardiovascular activity above baseline has a beneficial effect on symptomatology.

The consensus for the minimum amount of moderate-intensity cardiovascular exercise that the average person should perform for optimal health is 150 minutes per week. Physical therapy should incorporate education on this amount of exercise for patients in pain as well, and modify the type based on the potential exacerbation of pain.

Education and Patient Communication

Pain Neuroscience Education (PNE)

PNE as a standalone treatment does not appear to have a significant impact on pain levels in patients. However, when combined with other treatments such as manual therapy and exercise, there appears to be a benefit for patients with pain from all different dimensions. The goal of PNE with chronic pain is to emphasize that pain does not equal tissue damage. There are many phrases to use to reduce a patient's emphasis on their pain but never to diminish their experience. Some examples of these phrases

are “Your nerves act to protect you. At this point, they are incredibly sensitive and tell you that your body is being damaged, when that is not true. Pain does not always equal harm and we need to work on your brain-body connection to reduce your perception of pain.” With acute pain such as post-surgical, physical therapists should emphasize that pain is normal and will go away as the body heals. It is important to normalize the pain and healing response early on with acute injuries to lessen the chance that pain becomes chronic.[10,16,19]

Biopsychosocial Model in PT Treatment Plans

It cannot be overstated that every patient must be considered individually when constructing a physical therapy treatment plan aimed at pain reduction. The evidence should be considered heavily and used in decision-making, but patient preferences, emotional status, and societal considerations need to be tied into every plan of care. As mentioned earlier, implementing a shared decision model that incorporates a patient’s thoughts as an active contributor to the plan of care helps establish excellent rapport which helps improve outcomes.[15]

Section 3 Key Terms

Mindfulness-Based Stress Reduction (MBSR) - a form of relaxation/mindfulness treatment that does not require licensed psychology professional to administer and that PTs should consider for treating the psychological domain of pain

Intensive Interdisciplinary Pain Treatment (IIPT) - a form of collaborative treatment for chronic pain sufferers involving physicians, physical therapists, psychologists, and other pain professionals as needed.

Red Flags - Conditions that warrant referral to another provider or that signal contraindications for certain treatments

Cognitive Behavioral Therapy (CBT) - a talk therapy technique used by mental health professionals to help clients create a more productive and effective link between their thoughts and behaviors

Section 3 Summary

Physical therapists and physical therapist assistants have a wide variety of options to choose from when treating patients across the pain spectrum and the biopsychosocial model should be considered in all treatment decisions for patients who are in pain. Collaboration with other professionals in the pain field is essential in assisting patients on their road to recovery from both chronic and acute pain.

Section 4: Case Study

Case Description

A 50-year-old female is seen by a physical therapist for an evaluation for chronic low back pain. She reports having had ongoing pain for the past three years after “slipping and falling when walking out of work one day.” Her condition has worsened over the years, and she is beginning to feel isolated because her family believes she is seeking attention. As a result, she has now withdrawn from activities she used to enjoy, has gained 30 pounds, and feels hopeless. She reports feeling sad all the time and whenever she notices the pain in her back, she feels sadness mixed with the pain. For the past month, she reports that her pain is the worst at night and it keeps her awake occasionally. She states that her pain is best sitting reclined in a chair, which is a 0/10, and worst with standing and doing dishes. She had tried physical therapy in the past, but it did not improve her symptoms.

Reflection Questions

1. What additional information should be known from the subjective history?
2. What is an area of concern from the case description and how should a physical therapist manage this?
3. What model should a physical therapist or physical therapist assistant incorporate when treating this patient?
4. What are some intervention strategies that may be effective for this patient?

Responses

1. The physical therapist should screen for mental health concerns on intake forms, offer resources and refer to a mental health professional as appropriate. The physical therapist should incorporate motivational interviewing strategies and open-ended questions to determine what motivates the patient to improve and to ensure that the patient feels comfortable expressing their concerns. The patient should state what their daily routine looks like and when their symptoms are heightened and at a low point.

2. The fact that this patient has night pain is concerning as this is a red flag for cancer. This piece of information should be placed in the context of the patient having no recent weight loss and the fact that her pain can be nonexistent at rest in the right position. The provider should still refer for a physical and imaging if she has not brought up these concerns to her primary care physician.

3. This is a case where the biopsychosocial model would work well. The biological factors are back pain which is worse with movement. The psychological factors are feeling down about the pain, which is tied with emotion. The sociological factors include social withdrawal and feeling isolated.

4. This patient may respond well to a traditional physical therapy course including addressing joint mobility at the low back (after ruling out red flags), therapeutic exercise including core and low back strengthening, closed chain progressive resistive exercise, cardiovascular and flexibility training. Additionally, mindfulness-based meditation, breathing training, and pain neuroscience education may prove helpful.

Conclusion

Pain and pain neuroscience is incredibly complex and constantly evolving in terms of clinical practice. The biopsychosocial model should be practiced so patients feel they are heard and being treated for the biological, psychological, and social components of their pain. Physical therapists and physical therapist assistants are at the forefront of pain treatment and are in a unique position to provide many of the treatments that can positively influence patients who are experiencing pain. Rehabilitation professionals should always refer patients to either primary care or mental health professionals as

clinically appropriate to ensure comprehensive management of patients with chronic pain.

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