Welcome to Introduction to Complex Regional Pain Syndrome. My name is Renee Glick-Hill and I am the vice president and Director of Research Studies for USPF, an organization created by people in pain for people in pain. I am a pain warrior like most of you tuning into today, for I struggle with Complex Regional Pain Syndrome, which is more commonly known as Reflex Sympathetic Dystrophy Syndrome. Currently, I am a therapist at Broward Health Medical Center and previously, I worked as a psychometrician at Miami Children’s Hospital. Thank you for being a member of U.S. Pain Foundation and for tuning in. If you would like to help us educate the nation about pain through mediums such as the Invisible project, raise funds for pain research and advocacy, please participate in our many events like the Power Over Pain Walk or donate by going to our website at www.uspainfoundation.org
Precautions

- U.S. Pain Foundation cannot provide a diagnosis or individual treatment advice via webinar. Please consult your physician about your specific health care needs.
- This information is intended for educational purposes only.
- Consult your doctor and health team if you are planning to increase your physical activity or start an exercise program.
- Consult your doctor if you are planning on discontinuing or starting a new treatment regimen.

Before we begin this important conversation, I have a few words of caution. U.S. PF cannot provide a diagnosis or individual treatment advice. Please consult your physician about your specific health care needs. This information is intended for educational purposes only. Consult your doctor and health team if you are planning to increase your physical activity or start an exercise program. Consult your doctor if you are planning on discontinuing or starting a new treatment regimen.
CRPS is a neurological disorder with an evasive presentation. There are five hallmark symptoms of CRPS, but the primary symptom is intense pain, which can surpass digit amputation. This pain is described as bone crushing, burning, and even bone freezing. Other symptoms include changes in skin such as dryness and shininess, changes in the nails such as groves, ridges, and brittleness, changes in the hair such as increased hair growth, changes in skin color such as mottled or red skin appearance, and bone loss. Allodynia speaks of pain that is caused by a stimulus that normally does not cause pain such as the wind, soft sheets, the shower water, and air conditioning. Hyperalgesia describes increases in pain sensitivity. It is important to note that often times, pain is treated with narcotic opiate analgesics that are shown to increase pain sensitivity and even upon discontinuation, hyperalgia can persists for weeks. Also, CRPS causes Immune system dysfunctions that can contribute to localized swelling and poor wound healing at the affected site. Overall immune system functioning is suppressed via prolonged activation of the sympathetic nervous system. Finally, as we will see in this video, Movement disorders such as dystonias and tremors frequently present with this disorder and can lead to limb contractures.
these are pictures of people diagnosed with CRPS. As you can see on the bottom left, this is a classic presentation of mottled skin color, and on the bottom right, you can see the atrophy and limb disfigurement that can occur in the later stages of this disease. In the upper right hand corner, the hand looks shiny and this woman evidences a red rash due to localized inflammation. The pain usually spreads proximally to include the entire arm or leg and can also spread bilaterally to the other limb typically in a mirror like fashion. The visual abnormalities of skin color, swelling, etc... need to be present for a period of time in order to meet the IASP CRPS diagnostic criteria, but many people with CRPS, including myself, do not have any visual symptoms of this syndrome.
How do you get CRPS? Crps type one is related to minor traumas like hairline fractures, immobilization of the limb, cryotherapy, venous bites, tic bites, electrical burns as well as surgical interventions.

Crps types two also know as causalgia, is due to an injury accompanied by nerve damage.

There are two types of crps, which are usually associated by the stage of disease progression. The warm or acute stage, typically occurs preliminarily and is accompanied by swelling, redness, inflammation, buring searing pain, and sweating. The cold stage occurs typically in people with refractory crps and have suffered with the pain for quite some time. The affected part is often cool to the touch, muscle, bone, and ligament damage are common, and pain is often described as bone crushing or freezing in nature.
1. The presence of an initiating noxious event or a cause of immobilization.

2. Continuing pain, alldynia, or hyperalgesia in which the pain is disproportionate to any known inciting event.

3. Evidence at some time of edema, changes in skin blood flow, or abnormal sudomotor activity in the region of pain.

4. This diagnosis is excluded by the existence of other conditions that would otherwise account for the degree of pain and dysfunction.

   - Not required for diagnosis; 5–10% of patients will not have this.
   - Many symptoms are not visible to others, and often people with the syndrome don’t look sick.
   - However, research has proven that CRPS is a very real condition.
   - Do not confuse with Conversion Disorder, Pain Disorder, Factitious disorder, Munchausen’s disorder in the DSM-IV-TR and ICD-10.

This is the new proposed IASP diagnostic criteria for CRPS that has 90% sensitivity and 80% discrimination ability. IASP stands for international association for the study of pain, and these members got together in 2010 during a Belgium conference to develop an evidenced-based CRPS criteria set. Although, this has 90% sensitivity, which means that 9/10 people with CRPS will be identified utilizing this criteria set, it only has 80% discriminative ability which means that 2/10 people will be misdiagnosed with CRPS when they actually have diabetic neuropathy, arthritis, psychiatric disorders and other pain related disorders. To improve diagnostic reliability, doctors utilize EMGs, thermography, stellate ganglion blocks, and bone scan via x-rays and mris.

1. The presence of an initiating noxious event or a cause of immobilization. We will review how immobilization and even cryotherapy aka as ice therapy can cause changes in cognitive mapping and atrophy in normal subjects and can cause CRPS in people with genetic vulnerability.

2. Continuing pain, alldynia, or hyperalgesia in which the pain is disproportionate to any known inciting event. This criteria set is highly subjective and the doctor has the job of discerning how much pain should be experienced after certain injuries and also the duration of pain that should be experienced after an injury.

3. Evidence at some time of edema, changes in skin blood flow, or abnormal sudomotor activity in the region of pain. When people present with the symptoms like in those pictures, doctors find it easier to provide them with treatment and look for a medically related diagnosis, but these changes may only occur once during the course of this disease and is not necessary for diagnosis.

4. This diagnosis is excluded by the existence of other conditions that would otherwise account for the degree of pain and dysfunction, once again this quite a subjective criteria because for some people can loose their legs and run with prosthetics will little to no pain while others sprain their ankle and develop a pain disease.

Many symptoms associated with CRPS are not visible to others, and often people with the syndrome don’t look sick. Often times, patients who are resistant to conventional pain treatments and whose doctors label as difficult are sent for psychological evaluations. It is important for mental health professionals that are utilizing the diagnostic statistical manual or icd-10 to be aware of this criteria set and not confuse this disorder with somatoform disorders such as Conversion Disorder, Pain Disorder, Factitious disorder, Munchausen’s disorder. We are going to review somatoform disorders and the similairties in the diagnostic criterias.
The McGill pain scale was developed to rate various pain related traumas treated at emergency rooms. During registration, patients would rate their pain on a 50 point scale (0 being no pain, 50 being worst pain) and the related trauma such as back pain, limb amputation, etc... This information was later amalgamated and represented on this pain scale. The McGill pain scale describes CRPS pain as more intense than amputation of a digit, chronic back pain, cancer pain, phantom limb pain, post-herpetic neuralgia, fractures, and arthritis through subjective ratings.
Because there is a large autonomic component to CRPS pathology, I would like to take some time to review the components of the ANS. The autonomic nervous system automatically regulates essential life functions such as respiration, digestion, and heart rate and is composed of the Sympathetic nervous system Parasympathetic nervous system and Enteric nervous system. Today's focus will be on how deregulation of the sympathetic nervous system leads to many symptoms associated with CRPS. The ANS is divided into the Parasympathetic NS and the Sympathetic NS, which work as opposing forces to regulate bodily functions. The SNS is in charge of what we call the flight or fight response.

Let's pretend you are in the Savanna and a lion is hunting you down. Your SNS or your fight or flight response would kick in quickly in order to save your life. First, your pupils would dilate so you can be hypervigilant and find shelter, your heart would accelerate so you can get blood to your muscles, and your blood vessels would constrict in case you did get clawed by the lion you wouldn't bleed out. Your liver would convert glycogen into glucose so you had more energy to run and adrenaline would kick in so you can have superhuman speed. During this time, other bodily functions such as digestion and fighting infections via the immune response are less important so they shut down. This response is very important, but when the SNS is chronically activated, this can lead to hypertension, depression, anxiety, obesity, low immunity, digestion problems, and other health related issues. The name Reflex Sympathetic Dystrophy speaks to the fact that deregulation of the SNS is a large part of CRPS pathology. As aforementioned, the SNS when activated can cause vasoconstriction. For those who have "cold" CRPS, know oh too well about the discomfort of vasoconstriction, for they experience freezing bone crushing pain and their affect limb or part is often ice cold to the touch. However, the deregulation of the SNS works in both directions, as people with Warm or Hot CRPS experience burning pain accompanied by lots of inflammation and swelling, which is caused by an exaggerated vasodilation response.

The PNS works in opposition of the SNS, but much more slowly and is in charge of relaxation functions such as digestion and immunity. When the PNS is activated your heart rate is slowed, your saliva flows and your liver secrets bile for digestive purposes and you experience an overall sense of wellbeing. We will learn throughout this presentation about the importance for people with crps to deactivate the SNS and activate the relaxation response, as this will help manage symptoms such as swelling and burning pain or bone crushing freezing pain, as well as sweating, or overly dry skin, and nail, hair and skin changes.
Depending on the researcher, there are 3 to 5 stages associated with CRPS symptomatology. The first stage occurs within about 3 months of the onset of the injury and characteristics usually include warmth or coolness, burning pain, swelling, allodynia or sensitive to touch, hair, nail and skin changes, joint tenderness and stiffness, spasms, limited mobility, changes in bone density, and of course excruciating pain.

The first stage is often accompanied by decreased sympathetic activity, where the patient may feel as if their limb is on fire and is amazed when it actually feels cool to the touch. As mentioned, early interventions such as anticonvulsants, stelate ganglion blocks, and even IV Ketamine have shown promise to delay stage progression or even put people into early remission. Diagnostics during the early stage include thermography, X-ray, and EMGs.
The second stage can occur approximately up to a year and is associated with chronic pain described as throbbing, burning, aching, and bone crushing in nature, which is exacerbated by any stimuli such as the sensation of clothes against the affected part.

The limb may be swollen, discolored, mottled, or even cool to the touch. At this point, nails often soften and peel, muscle wasting begins due to disease pathology and guarding behaviors that cause disuse to the affected part, stiffness persists and worsens, and patients may experience memory problems as well as increased sensitive to noise or vibrations. Memory problems are likely worsened by the pharmacotherapies used to treat CRPS.
The final stage is synonymous with irreversible skin and bone damage. The pain is unyielding and may involve the entire limb or affected part and often spreads with new injuries. Muscle atrophy or loss causes weakness, which leads to limited mobility and may be accompanied by involuntary contractions of the muscles and tendons that flex the joints. There is an increased risk for cancer, mood, anxiety, and sleep disorders as well as suicide. Unfortunately, I have heard of way too many people in our CRPS community that have completed suicide. This is a matter close to my heart and most be addressed. Many whom are not with us, have shared feelings of marginalization due to misinformation about crps. Many also expressed feeling alone and hopeless, as uneducated medical and mental professionals were not able to improve their quality of life.
Epidemiology

- Female: Male = 4:1
- 50,000 new cases dx in the US yearly
- Prevalence (1990) = 20.57 per 100,000
- The mean age at diagnosis is 42 years; although children as young as 3 have been diagnosed (www.rsds.org)
- Upper limb affected 2x’s as commonly as lower limb.
- Fracture most commonly precipitates CRPS I
- CRPS I AKA: Reflex Sympathetic Dystrophy (RSD), Sudeck's atrophy, reflex neurovascular dystrophy (RND) or algoneurodystrophy
- CRPS II: Causalgia “burning pain”

It is important to recreate CRPS in the laboratory because our community need doctors to know that the intense chronic pain we endure is not in our head.

Ground breaking research have revealed the processes related to how crps develops after an injury.
Researchers tied a tourniquet to the hind paw of a rat for 3 hours to prevent blood flow. After releasing the tourniquet, the paw exhibited swelling, which was followed by pain sensitivity, pain sensitivity to non painful stimuli, and cold-intolerance that last for a month. Slices of the tissue in the hind paw revealed a microvascular injury which was ensued when blood returned to the affected site after occluding blood flow, as oxygen and nutrients were unavailable to the tissue. This injury initially caused problems regulating normal blood flow to the affected site and this was shown to cause inflammation and activation nociceptors that cause pain.

Occluded blood flow can also occur during casting and immobilization techniques, injury, icing and elevating limb for long periods of time.

Hyperemia = vasodilation and increased blood to the area causing edema, redness, and swelling
Ischemia- reduced or restricted blood supply
Hyperalgeisa- increased pain sensitivity
Allodynia- things that don’t usually cause pain cause pain

Reperfusion injury refers to tissue damage caused when blood supply returns to the tissue after a period of ischemia. The absence of oxygen and nutrients from blood creates a condition in which the restoration of circulation results in inflammation and oxidative damage through the induction of oxidative stress rather than restoration of normal function.
Are psychological factors such as depression or anxiety related to the development of CRPS? A meta-analysis was conducted on research articles looking at this topic and they found that there was no relationship between crps and depression, anxiety, anger, and having neurotic personality traits. However, they did find a correlation between increased stress and crps, suggesting that increased activation of the sympathetic nervous system may play a role in crps pathology. In some studies, crps was related to insomnia once again alluding to increased SNS activation. When depression did predate the onset of CRPS, the person's depressive etiology did not appear to predict severity of disease progression. Note, that depression accompanies many other chronic illnesses such as DM, lupus, heart disease, and COPD and this correlation does not discount the legitimacy of these aforesaid health conditions.
Researchers found that people with CRPS did not somatize their stress levels more than people without CRPS. Not surprisingly, they found that a high pain day was predictive of increased anger, but increased anger was not predictive of increased pain. Therefore, negative emotional states typically follow pain flare ups and not the other way around. Moreover, CRPS patients were found to have decreased levels of hostility compared to chronic pain patients and less OCD behavior compared to headache patients. Having a high pain day did significantly increase anxiety, but as someone with CRPS, this finding is logical considering that bone crushing pain rang the bodies’ alarm systems. The take home message is that psychological factors do not cause CRPS, but CRPS can cause depression, anxiety, anger, and sleep disturbances.
Through my advocacy work with the pain community, clinical experience, research, and my own personal knowledge of CRPS related chronic pain, I know first hand that CRPS can cause psychological distress. As aforementioned, symptoms can be confused with malingering for pain medication or attention, mental illness, and secondary gain; especially when the injury is tied to workman’s compensation or a litigation.

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**Psychological Implications of CRPS**

- Symptoms can be confused with malingering, somatization disorder, pain disorder, conversion disorder, factitious disorder, and Munchausen’s disorder DSM-IV-TR
- Chronic pain can exacerbate psychiatric symptoms such as depression, anxiety, and somnolence; assess for AXIS I diagnosis. ¹
- Implications for the use of SNRI’s or anti-seizure medications for comorbid disorders
- Pts with CRPS are accused of malingering and Munchausen’s disorder b/c of the obscure clinical presentation (e.g., bruises, discoloration, and limb contortions). ¹
- Doctors use the label “psychogenic pain” when pts don’t respond to medical or surgical treatment, or pts display behaviors that doctors find difficult to cope with. ⁷
- CRPS/RSD is becoming more prevalent possibly due to increases in orthopedic surgeries, cryotherapy, lidocaine injections, and immobilization techniques. ²
The Socio-Emotional Impact of CRPS

- Trauma associated with endless painful medical procedures (PTSD)
- Frustration about misdiagnosis and mismanaged symptoms
- Stigma about utilizing narcotic pain medication
- Messages that create cognitive dissonance “You don’t look like you are in that much pain!”
- Messages that create helpless attitudes “don’t do that, I will get that for you”
- Insidious unpredictable disability: crutches, wheel chair, loss of function, difficulty with basic self-care
- Relationship difficulties and family care issues
- Family confusion, disbelief, and anger
- Lack of CRPS/RSD awareness in the Healthcare system and public creates isolation – nobody understands what I am going through, not even doctors!
- GRIEF
- Financial difficulties: difficulties acquiring disability ins, workers comp, medicare/medicaid, and obtaining work
What can be done to allay the psychological distress related to CRPS. People with CRPS can work with a mental health profession to develop effective problem solving skills to manage the new obstacles related to having a chronic illness. Relaxation training techniques such as guided imagery, progressive muscle relaxation, and hypnotherapy can help deactivate the Sympathetic Nervous System and consequently reduce pain, agitation, and anxiety. Acceptance therapy can target grief and anger related to developing a chronic painful illness. Cognitive Behavioral therapy can target maladaptive cognitions which activate the SNS. Maladaptive cognitions include catastrophizing statements such as I am going to be wheelchair bound in five years. CBT works to replace maladaptive cognitions with self-coping statements such as the pain will pass and I am a fighter. Assertion training can help people with crps communicate their needs to loved ones, friends, and medical professionals.
### DSM-IV-TR Somatization Disorder

- **A.** A history of many physical complaints beginning before age 30 years that occur over a period of several years and result in treatment being sought or significant impairment in social, occupational, or other important areas of functioning.
- **B.** Each of the following criteria must have been met, with individual symptoms occurring at any time during the course of the disturbance:
  - (1) Four pain symptoms: a history of pain related to at least four different sites or functions (e.g., head, abdomen, back, joints, extremities, chest, rectum, during menstruation, during sexual intercourse, or during urination).
  - (2) Two gastrointestinal symptoms: a history of at least two gastrointestinal symptoms other than pain (e.g., nausea, bloating, vomiting other than during pregnancy, diarrhea, or intolerance of several different foods).
  - (3) One sexual symptom: a history of at least one sexual or reproductive symptom other than pain (e.g., sexual indifference, erectile or ejaculatory dysfunction, irregular menses, excessive menstrual bleeding, vomiting throughout pregnancy).
  - (4) One pseudoneurological symptom: a history of at least one symptom or deficit suggesting a neurological condition not limited to pain (conversion) symptoms such as impaired coordination or balance, paralysis or localized weakness, difficulty swallowing or lump in throat, aphasia, urinary retention, hallucinations, loss of touch or pain sensation, double vision, blindness, deafness, seizures; dissociative symptoms such as amnesia; or loss of consciousness other than fainting.
- **C.** Either (1) or (2):
  - (1) After appropriate investigation, each of the symptoms in Criterion B cannot be fully explained by a known general medical condition or the direct effects of a substance (e.g., a drug of abuse, a medication).
  - (2) When there is a related general medical condition, the physical complaints or resulting social or occupational impairment are in excess of what would be expected from the history, physical examination, or laboratory findings.
- **D.** The symptoms are not intentionally feigned or produced (as in Factitious Disorder or Malingering).

As mentioned, CRPS is often mistaken for mental illness; in particular somatoform disorders. A Somatoform disorder (also known as Briquet’s syndrome) is a mental disorder characterized by physical symptoms that mimic physical disease or an injury for which there is no identifiable physical cause. Or, when there is an identifiable cause such as a sprain or a fracture for the symptoms like pain or neurological deficits, the symptoms cannot be fully explained by the nature of the injury and are thought to be psychologically maintained. Therefore, the symptoms that result from a somatoform disorder are said to be due to repressive or emotional trauma, poor coping skills, and an excess of life stress.

As you can see Somatization Disorder has several overlapping symptoms with CRPS, for example for this disorder to be dx, you need several pain symptoms, GI problems, sexual problems, and neurological issues such as burning or numbness. Although CRPS usually affects one limb, it can spread to other limbs and even systemically. Several body systems are affected in the course of this illness like GI problems such as constipation or diarrhea, urinary problems like interstitial bladder cystitis and neurological deficits or excesses such as numbness or burning pain. Many people also experience gynecological problems, arousal difficulties, and even pain during sex depending on the stage, progression, and treatment of this syndrome. Thus, it is imperative for medical and mental health professionals to be well versed on the symptom presentation of CRPS prior to diagnosing someone with a somatoform disorder.
Conversion disorder is another somatoform disorder often mistaken for CRPS. This disorder entails having 1 or more symptoms or deficits that affect motor or sensory function that cannot fully be accounted for by the medical condition. Psychological factors are said to be associated with the exacerbation of the symptom or deficit. The symptom or deficit causes clinically significant distress or impairment in social, occupational, or other important areas of functioning or warrants medical evaluation. The symptom or deficit is not limited to pain or sexual dysfunction, does not occur exclusively during the course of somatization disorder, and is not better accounted for by another mental disorder.

Conversion disorder is another somatoform disorder often mistaken for CRPS. This disorder entails having 1 or more symptoms or deficits that affect motor or sensory function that cannot fully be accounted for by the medical condition. Psychological factors are said to be associated with the exacerbation of the symptom or deficit. Neurological deficits include: tremors, dystonias, and other movement disorders, paralysis, sensory loss or pain, balance disturbances, vision and hearing disturbances and so forth. The symptom causes distress and functional impairment and is not intentionally feigned as seen with malingering. Now imagine that a person who in reality is suffering with CRPS type I with no known nerve injury and has concurrent neurological deficits is referred to see a mental health professional that is not educated about crps. There is a high likelihood that the client will be diagnosed with a conversion disorder and receive treatment that will not slow the disease progression and will not receive appropriate palliative care. The mental health professional is not to blame given the fact that he or she received a referral from the doctor explaining that all diagnostic tests were exhausted and the patients pain exceeds what would be expected by the injury.

I know of a young woman 7 years old who sprained her foot, and developed CRPS I. After going from doctor to doctor to cure the pain, one of her doctors sent her to a psychiatrist who later diagnosed her with a conversion disorder due to the tremors and dystonias the patient had. She was treated with a serotenergic antidepressant and did not receive any more physical therapy or palliative care until she got progressively worse. So much so that her limb became disfigured and had irreversible bone loss. After which, she received appropriate care by a neurologist familiar with CRPS. The most unfortunate part of this story is that she could have received anticonvulsants, stelate ganglion blocks which have been shown to prevent stage progression and bring people into remission in the early stages of crps.
Once again, a somatoform disorder is characterized by physical symptoms that mimic physical disease and typically there is no identifiable physical cause. However, when there is a cause for the symptoms, symptoms cannot be fully explained by the nature of the injury and are thought to be maintained by stress and other psychological factors (e.g., evading work responsibilities and eliciting attention from loved ones).

Pain disorder is a type of a somatoform disorder classified in the DSM and the main criteria include: pain that is present in more than one anatomical sites and warrants clinical attention, causes distress, or functional impairment. Most importantly for a diagnosis, the onset, severity and exacerbation of pain is believed to be maintained by psychological factors other than malingering. This criteria is highly subjective and thus this can lead to misdiagnosis.

According to Fröhlich C, Jacobi F, Wittchen HU, the 12-month prevalence of pain disorder in the general population is about 8% with more than half meeting criteria for concurrent anxiety and mood disorders. Subjects in that study with pain disorder revealed significantly poorer quality of life, greater disability, and higher health-care utilization rates compared to normals. The majority had more than one type of pain, with excessive headache being the most frequent type.

DSM-IV pain disorder in the general population. An exploration of the structure and threshold of medically unexplained pain symptoms.
Depression

- Depression 2x’s as likely in women then men
- Prevalence of Major Depression is ~ 17% in general pop
- Individuals with depression report more physical symptoms, poorer self-appraisal health, and seek medical attention at increased rates
- Individuals with depression with chronic diseases have poorer medical outcomes
- Depression can cause increased fatigue, difficulty with motivation, hopelessness, sleep disturbances, poor self-management for health problems, and is related to overeating and obesity.

Anxiety

- Prevalence of Anxiety Disorders in the major population is ~ 8.5%
- The prevalence of Panic disorder, PTSD, and GAD is increased with chronic medical conditions; especially if pain is a primary symptom
- Greater disability and utilization of health care
- Anxiety causes elevated arousal of the sympathetic nervous system and can interact with the pathophysiology of CRPS via increasing heart rate and BP, vasoconstrictor, and neuroendocrine changes that increase blood glucose

137 pts with CRPS were administered tests that assessed: executive control, naming/lexical retrieval, & declarative memory.

2-step cluster analysis classified pts into 3 gps; no control.

gp1 (n = 48) average range all scores.

gp2 (n = 58; dysexecutive gp) mild impairment or low avg test performance on working memory/verbal fluency test.

gp3 (n = 31), global gp low average/borderline range on all tests with reduced scores on naming/declarative memory tests.

(89/137) impaired working memory/verbal fluency.

MANCOVA assessed scaled scores; no effect size.
Body Perception Disturbance & CRPS

- Clinical observations: pts pay less attention to or fail to care for their affected limb as if it were not part of their body
- Neurological neglect-like syndrome
- 27 pts classified by IASP CRPS were interviewed qualitatively to explore feelings and perceptions about their affected body parts
- Semi structured interviews were analyzed utilizing grounded theory
Results

- Pts revealed bizarre perceptions about their aff’d limb
- Pts expressed desire to amputate limb; despite probability of further pain and functional loss
- A mismatch was experienced between the sensation of the limb and how it looked
- Anatomical parts of the CRPS limb were erased in mental representations of the affected area
- Pain raised awareness of limb; but less awareness of limb position
- Interaction between pain, disturbances in body perception, and central mapping
A full explanation of the results is difficult to ascertain. However research indicates that parts of the brain that are in charge of moving muscles and sensing the environment become atrophied with periods disuse. With brain atrophy of the motor and sensory cortex, perceptions of the environment become distorted and the ability to perform motor functions may be lost. Range of motion may become restricted, weakness and sensitivity to environmental stimuli may ensue. Casting and immobilization for long periods of time can cause dysfunctions of the motor and sensory cortex in addition to causing changes in blood flow. Guarding behaviors and avoidance behaviors such as preventing stimuli from touching the affected part like a sheet or a hug can also cause sensory and cortical atrophy that can exacerbate pain symptoms and weakness.
Problems Balancing in Feel & Function

PAIN / INJURY
Pains can cause a person to withdraw from activities that are necessary for physical rehabilitation.

PERSISTENT PAIN, ATROPHY, WEAKNESS, AND PERCEPTUAL DISTURBANCES
People are more vulnerable to re-injury, "flare-ups," and significant loss of function once deconditioning and atrophy become established.

MUSCLE ATROPHY, SWELLING, AND STIFFNESS CAN LEAD TO INCREASED PAIN WITH ACTIVITY

LONG-TERM INACTIVITY
Rest is important for healing, but can become an obstacle when people fail to engage in activities necessary for recovery of function.

GUARDING AND AVOIDANCE BEHAVIORS
Altered movement patterns and "guarding" against pain can affect cognitive mapping and lead to both motor and sensory dysfunction.
Implications & Interventions

- Body perception disturbance may be more appropriate than neurological neglect-like syndrome\textsuperscript{10}
- Protective guarding and pain/avoidance posturing can lead to muscle imbalances, decreased function, and atrophy \textsuperscript{11}
- Protective guarding and other avoidance behaviors can amplify to agoraphobic proportions; which causes further disability
- Desensitization techniques help to normalize sensations of the affected area by utilizing progressive stimulation \textsuperscript{11}
- Progressive Muscle Relaxation (PMR) and other relaxation techniques may be required prior to implementing Desensitization techniques
Mirror Therapy

- Treatments that target cortical areas may reduce body perception disturbance and pain\(^\text{10}\).
- Mirror Therapy: pt receives visual feedback in order to train the brain to configure a new body map\(^\text{10}\).
Thank you for attending Introduction to CRPS

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