Behavioral Health Interventions for CRPS

Patricia A. Richardson, PhD[1,2], Heather Poupore-King[3], PhD, Anya Griffin[3], PhD, Corinne Cooley[4], Rashmi P. Bhandari, PhD[3]

Departments of Pediatric Psychology and Pediatric Pain and Palliative Medicine, Helen DeVos Children's Hospital, Grand Rapids, MI[1]

Department of Pediatrics and Human Development, Michigan State University College of Human Medicine, East Lansing, MI[2]

Department of Anesthesiology, Perioperative, and Pain Medicine, Stanford University School of Medicine[3]

Pain Management Center, Orthopedic and Spots Rehabilitation, Stanford Health Care[4]

Patricia A Richardson, PhD (corresponding author):

- Patty.richardson1@gmail.com
- 810.488.1202

No funding sources to disclose. No conflicts of interest to disclose.

Abstract

Complex regional pain syndrome (CRPS) is a chronic pain condition characterized by regional pain (often extremity pain) that is disproportionate in intensity to the original injury/illness. Co-occurring symptoms are autonomic and inflammatory in nature and may include swelling, temperature change, skin color changes, motor changes, among others. Optimal treatment for CRPS utilizes a multidisciplinary approach, incorporating a team of specialty healthcare providers. Behavioral health interventions are a key domain of multidisciplinary care and have been shown to reduce functional impairments, pain, and comorbid psychological symptoms associated with CRPS. Behavioral health interventions are rooted in a biopsychosocial framework that accounts for biological, psychological, social, and environmental factors that influence pain and pain-related disability. The overarching aim of this chapter is to present an overview of evidence-based behavioral health treatments for chronic pain, as applied to CRPS, and consider promising directions for the field.

Key Words: CRPS, behavioral health interventions, biopsychosocial, chronic pain

Diagnostic Considerations and Theoretical Foundations

Complex Regional Pain Syndrome is a pain condition that presents as intense regional pain most often manifesting in patients' upper and/or lower extremities. Pain may develop after an injury or illness without confirmed nerve damage (CRPS Type I) or when nerve damage has been confirmed (CRPS Type II). Pain is considered to be out of proportion to the original injury (which can sometimes be minor) and extends beyond the area involved by the initial trauma, across both subtypes. Associated autonomic and inflammatory symptoms and signs include swelling of the affected limb and joints, sensitivity to touch, changes in temperature and skin texture, and motor impairments, among others.[1] Symptoms and signs can vary across time and person. Per the International Classification of Diseases (ICD-11), CRPS lasting > 3 months is considered to be a *primary chronic pain diagnosis,*[2,3] which means that for patients with CRPS, pain itself is the disease. Primary chronic pain conditions include chronic headache, functional abdominal pain, and fibromyalgia, among others. Primary chronic pain conditions can be contrasted with *secondary chronic pain conditions*, where chronic pain develops as a symptom of a different disease (e.g. cancer-related pain; post-concussive headache).[2]

Evidence-based behavioral health assessment and intervention for primary chronic pain conditions is rooted in biopsychosocial theory-driven frameworks. Biopsychosocial theory, as applied to chronic pain, is an integrative approach describing how the complex nature of pain and associated functional disability is related to interacting biological, cognitive, behavioral (e.g., health habits), and sociocultural influences,[4,5] see Figure 1. As guided by biopsychosocial theory, optimal interventional paradigms for CRPS and other primary chronic pain conditions hinge on the multidisciplinary integration of pain management, rehabilitation, and behavioral health treatments.[6] There is a nascent literature reporting on the clinical utility of behavioral health

treatments for CRPS and a much larger literature on effective and efficient treatments for primary chronic pain conditions. Given that CRPS is classified as a *primary chronic pain condition* by the ICD-11, this chapter will review behavioral health interventions for CRPS by incorporating the CRPS specific literature and broader extant evidence-base for primary chronic pain conditions.

Assessment

Comprehensive biopsychosocial assessment is essential to inform patient diagnostic presentation and develop targeted treatment plans.[5] Behavioral chronic pain assessments generally include the following key domains, including: 1) functional impact of pain on quality of life; 2) cognitive, behavioral, and emotional coping; 3) co-morbid psychiatric vulnerabilities; and 4) administering validated and normed self-reported symptom measures. Research has shown that each of these domains impact patient pain experience and response to treatment.[7]

Functional Impact

Consistent across chronic pain conditions, CRPS can negatively impact the patient's ability to engage in most functional domains, including: sleep, self-care, work, school, physical activity, social relationships, and mood. Behavioral health assessment inventories patient pain from a differing perspective than the medical evaluation, by focusing on how the experience of pain impacts physical functioning and cognitive and emotional adjustment. For example, assessment seeks to characterize pain persistence, intensity, and patterns, as well as the impact of pain on stress, emotional state, cognitive style and coping. Understanding how CRPS is impacting the biopsychosocial aspects of the patient's life becomes the underpinning of enacting efficient and effective rehabilitation treatment efforts.

Pain Coping

Strategies employed to manage pain encompass a range of behavioral and/or cognitive techniques that can be maladaptive, adaptive, or both, depending on the strategy employed and/or the context of deployment. Patients' approach to coping predicts their pain-related adaption, emotional distress, and functional disability.[8] Assessment of maladaptive coping often focuses on evaluating the presence of pain catastrophizing and avoidance. Pain catastrophizing refers to the maladaptive cognitive-affective experience of pain including rumination, feelings of helplessness, and magnification of pain. Among patients with chronic pain, pain catastrophizing is a robust predictor of deleterious outcomes, including higher pain intensity and greater functional disability.[9] Given the intensity and unusual nature of allodynic pain (i.e., pain from nonpainful stimuli) experienced by many patients with CRPS, catastrophic thinking may include incorrect beliefs about the meaning of CRPS pain (e.g., pain means tissue damage). Such beliefs may be a primary contributor to limb guarding, limb disuse, and activity avoidance. Activity avoidance frequently has the unintended side effect of maintaining chronic pain through processes such as physical deconditioning.

Adaptive approaches to coping may include setting positive expectations for recovery, relaxation exercises, distraction, positive self-statements, and acceptance (i.e., willingness to engage in personally meaningful activities even when in pain, without avoidance or attempting to control pain). Positive pain recovery expectations[10] and pain acceptance are negatively correlated with physical disability, depression, and pain related anxiety among other variables.[11] Finally, pain-related self-efficacy assess patients' perceived ability to manage pain symptoms and function in spite of pain, serves as a protective factor for patients with persistent pain and a resiliency factor for children, adolescents, and adults with chronic pain.[12]

Psychiatric Comorbidities

Depression. Depression is the most common mental health disorder to cooccur with chronic pain.[13] Depression can contribute to the development of chronic pain, decreased pain tolerance, and impede adherence to rehabilitation efforts which is cornerstone of the treatment of CRPS.[14] Conversely, factors such as the reduced engagement in pleasurable activities, decreased mood, and increased feelings of distress and helplessness that accompany chronic pain can further contribute to the development of depression.[3,13] While the bidirectional relationship between the two disorders can make diagnosis difficult at times and can complicate treatment, the best treatment outcomes have been demonstrated by treating both disorders concurrently utilizing a multidisciplinary approach.[3]

Anxiety. The prevalence rate for anxiety among chronic pain patients is almost double that of the anxiety found in community samples (35% v. 18%).[15] Pain-related anxiety leads to worse treatment outcomes and higher health costs.[16] Pain-related anxiety can lead to avoidance of activities which can exacerbate pain, in addition to creating problematic cognitive and affective experiences. Patients with CRPS often display extreme social avoidance and explain that they are trying to avoid being accidentally bumped in their region of pain (severe allodynia) by those around them. Although patients may admit that this is unlikely to occur, the social avoidance behavior persists. This pattern highlights that activity avoidance and limb disuse in CRPS can be operantly reinforced by the decreased fear that accompanies avoidance of expected pain exacerbations.[17] Accurate assessment of fear of pain and anxiety informs treatment, which usually includes graded exposures to avoided activities, and desensitization of the effected limb.

Validated Measures

It is challenging to globally assess the psychological underpinnings of CRPS during time-limited clinical interviews and physical exams. Assessment is enhanced by capturing patient

symptoms via validated and normed self-report measures. Frequently employed self-report measures seek to assess the above-described domains and are rooted in classical test theory (e.g. Pain Catastrophizing Scale, Functional Disability Inventory, Fear of Pain Questionnaire, Beck Depression Inventory etc.) and item response theory (IRT), such as the freely available National Institute of Health Patient-Reported Outcomes Measurement System (PROMIS).[18] The incorporation of validated tools in the assessment and treatment of chronic pain allows the clinician to have a more accurate picture of what are most often non-observable factors critical to the accurate assessment and treatment of chronic pain conditions and track response to treatment across key clinical outcomes. A list of commonly utilized, yet not exhaustive, measures are suggested in Table 1.

Behavioral Health Interventions

Cognitive Therapy

Behavioral health interventions primarily described as Cognitive Behavior Therapy (CBT) are well established in the treatment of chronic pain.[19,20] CBT harnesses cognitive and behavioral techniques to help patients recognize the relationships between thoughts, feelings, behaviors and pain. Cognitive therapy specifically teaches patients to notice maladaptive thoughts and their influence on pain and targets these thoughts for change. Thus, changing what people think to more adaptive thoughts. Typically, cognitive therapy for CRPS focus on the patient being actively involved in treatment with the goal to reduce fear of mobilizing the impacted extremity by modifying unhelpful beliefs about the consequences of moving the limb, catastrophic thinking[21] and to support the patient in working towards valued goals (e.g., work, school, social engagements, etc.). Common cognitive therapy strategies applied to the treatment of CRPS include psychoeducation, reframing, and cognitive restructuring.

Psychoeducation

Patients with chronic pain who believe that their condition is harmful, permanent, and or unexplained are less likely to use active pain coping strategies known to be important in treatment and regaining function.[22] Patients often possess inaccurate beliefs regarding the meaning of CRPS pain. Not surprisingly, given the intensity and unusual nature of allodynic pain, patients may assume that pain signals damage, and conclude ‘‘if it hurts, don’t do it.’’ Thus, offering education about what CRPS is and isn’t becomes an important first step. Educational treatment is known as pain neuroscience education (PNE), Explain Pain (EP), or pain biology.[23] The goal of the intervention is to emphasize the difference of nociception and pain experience with a biopsychosocial approach in order to decrease the threat value of pain. Systematic reviews have found that PNE/EP are effective for improving function, reducing fear of movement, pain catastrophizing and health care utilization.[24-27] PNE/EP can promote positive expectations for the efficacy of interdisciplinary treatment of CRPS[28] and thus, set the stage for progress.

Reframing

Effective CRPS treatment and management necessitates an active rehabilitation approach[29] by reframing the role of the patient as an active participant in the treatment process. Clinical experience indicates that patients who adopt a passive role in treatment (overly depend on medications and interventional procedures e.g. nerve blocks to be curative) tend to be refractory to treatment.[30] Instead, reframing interventional procedures as a bridge to facilitate active participation in rehabilitation allows the patient to set appropriate expectations of their role in the treatment process. Although integrated medical, psychological, and physical therapy procedures are critical to resolution of CRPS, the patient should be encouraged to focus on making functional gains before anticipating pain relief.[31] As part of this active treatment focus, exacerbated pain

should be reframed as a cue to practice self-management interventions that may help the patient gain some control over their symptoms. Increased perceived control is known to be an important factor in determining positive outcomes in chronic pain treatment.[30]

Cognitive Restructuring

As in all chronic pain conditions, anxiety and catastrophic thinking are common in CRPS patients.[32] *Cognitive restructuring* refers to the process of identifying dysfunctional thinking patterns and replacing them with more adaptive cognitions. Given the importance of addressing limb disuse and reactivating the affected extremity in CRPS, thoughts such as ‘‘using my leg will worsen my pain’’ hinders behavioral activation. Using positive coping self-statements (e.g., ‘‘I won’t know until I try it,’’ ‘‘I can handle it’’) may facilitate increased confidence, management of fear of pain, and improved self-efficacy. Patients also benefit from reminding themselves that they now have pain management tools to manage pain exacerbation. *Thought challenging* is another cognitive restructuring strategy to counter avoidance and disuse, for example, ‘‘If I go to outside, someone will bump into me” which may be addressed through questioning the facts (i.e., ‘‘How many times has that actually happened?’’) and use of positive coping self-statements (‘‘I can practice my skills if it happens’’ “when pain increases, it generally goes back down”). Finally, restructuring can be utilized to counter hopelessness by adopting realistic self-affirmations (e.g. “everyone’s journey is different, I am making progress everyday”) and presenting data that demonstrates the success of multidisciplinary approaches in the treatment of CRPS

Behavioral Therapy

Behavioral therapy (BT) for chronic pain originated from classical learning theory, most notably operant conditioning. In brief, operant learning notes that behaviors that are reinforced are likely to increase in frequency. Conversely, when behaviors are not reinforced or are punished,

they decrease in frequency. Operant learning as applied to chronic pain conditions often focuses on the role of pain behaviors (i.e., actions, verbalizations, facial expressions that occur in response to pain). Protective pain behaviors (e.g., activity reduction, limb guarding) may be adaptive within the context of *acute* pain as they serve to reduce the extent of damage from the source of pain and garner helpful social support. However, for individuals with *chronic* pain, protective pain behaviors can become maladaptive over time, as they maintain pain intensity, decrease physical activity, and increase likelihood of functional disability.[33,34] Thus, BT for chronic pain seeks to improve pain and disability by shifting the contingencies of pain behaviors. BT for CRPS is accomplished using a number of techniques; this chapter reviews activity pacing and graded exposure.

Activity Pacing (AP)

Among patients with chronic pain, approach to activity engagement can have an impact on pain and disability. As noted in Fordyce's seminal work, it is problematic when patients base activity on pain levels as opposed to the goal of the activity itself (e.g., gardening until back pain becomes unbearable versus working on the garden).[35] When activity becomes pain-contingent, patients use their pain intensity to make decisions about when to initiate, continue, and stop activity (e.g. pain behaviors are reinforced).[36] Based on patterns of activity engagement, patients with chronic pain have been characterized as "persisters" or "rest/avoiders." A persister may continue to do a relatively high-impact activity, such as gardening, on a "good day" (i.e., low pain day) for an extended period. This overactivity may result in increased pain that could last for several days or weeks. Conversely, rest-avoiders have opted to limit activity, for example, no longer gardening to prevent previous pain experiences associated with gardening.[34] Underactivity results in physical deconditioning that serves to increase pain and disability.

To address these maladaptive activity patterns, activity pacing (AP) was developed to restructure activity to achieve one or more adaptive goals.[36] In *time-contingent* AP, the intervention seeks to shift activity engagement to being time-contingent as opposed pain-contingent. AP often proceeds as follows: 1) select a target behavior (e.g. gardening); 2) establish a baseline level of time the patient can do an activity without increased symptoms (e.g., 15 minutes); 3) create a schedule of activity pacing that allows the entire task (tending to the garden) to be completed within the pre-defined time contingent breaks, with activity-rest cycling; and 4) provide positive reinforcement when the time-contingent quota is reached, and then 5) increase the time-contingent goal after the patient is successful until patient has reached desired activity tolerance.[36] Of note, guidelines for the rate of time increase vary, though time goals should be tailored to the individual and mindful of injury prevention.

Operant AP strategies are commonly delivered with other treatment approaches within a multidisciplinary treatment program, intensive interdisciplinary pain treatment (IIPT) programs, which have shown to be effective for patients with chronic pain.[37,38] The clinician should emphasize the intention and goal of the intervention, as researchers note this may influence whether AP programs are adaptive and assist in improving the patient's function, activity tolerance and reducing disability, as opposed to using them as a pain-avoidant strategy.[39] Several variations of AP have been developed that focus on energy conservation and pain reduction, where the goal is to avoid energy depletion, rather than shifting from pain-contingent to goal/time contingent activities.[40] Currently, there is little data on whether energy-conservation activity pacing approach is efficacious for chronic pain.[36]

Graded Exposure

As outlined by the fear-avoidance model of chronic pain, which integrates behavioral and cognitive affective components of pain, negative appraisals of pain and consequences of pain may lead to pain-related fear of functional activities (e.g., school, work, social experiences, physical activity). Over time, functional activity is avoided which results in the overestimation of future pain from activity, physical deconditioning, and functional disability, see Figure 2.[41] Extinction of pain-related fear is achieved when the patient is exposed to previously avoided activities.

Inspired by the fear-avoidance model, graded exposure (GEXP) uses a graded hierarchy of fear-eliciting situations to expose patients to avoided functional activities. In GEXP, the clinician works collaboratively with the patient to identify situations and activities that are feared and avoided. The patient then rank-orders the above-described situations and activities into an exposure hierarchy, where least feared and avoided situations are on the bottom (and addressed first) and most feared and avoided situations are at the top. Associated negative appraisals and dysfunctional beliefs (e.g., fear of pain and injury) are also inventoried. Psychoeducation and cognitive techniques address patient misconceptions about fear of pain and injury and help patients learn that engaging in feared and avoided situations without protective behavior (e.g., limb guarding) does not lead to catastrophic results.[42] Patients then engage in gradual in vivo exposure based on their exposure hierarchy until they are able to confidently engage in all situations and activities on their hierarchy with minimal support.[18]

For example, a patient may be fearful to walk given CRPS of the left lower extremity. This fear may be particularly elevated in crowded environments, such as the mall, grocery store, and concerts. This information would be used to generate an exposure hierarchy. Exposing the patient to using the limb and walking would first occur in a very controlled environment and then move to more populated environments over time, as the patient successfully moves through steps on

their exposure hierarchy. Concurrent cognitive techniques would be implemented to shift the patient's beliefs of the relative importance of "protection" of the affected limb to "exposure" or "use" of the painful limb.

GEXP has been used with individuals with chronic musculoskeletal pain[43] and anxiety related disorders.[44,45] More recent clinical trials have supported the use of GEXP as a treatment for patients with CRPS, demonstrating that patients randomized to GEXP had improved function and reduced pain catastrophizing and perceived harmfulness of activities and pain as compared to patients randomized to a conventional therapy control.[21,46,47] One potential limitation of GEXP is that it has higher treatment dropout rates as compared to other psychological or behavioral treatments.[43] Thus, there may be a benefit to utilizing strategies to enhance motivation for engagement in GEXP (e.g., motivational interviewing).

During behavioral assessment, it is important to distinguish the type of coping mechanisms the patient uses in order to optimally select the BT approach (e.g., AP versus GEXP). For example, it is recommended that patients that are high "avoiders" of an activity commence treatment with GEXP with the goal of reducing the fear associated with pain activity. However, those who are continuing to "persist" in their activities but with difficulty managing their pain levels subsequent to overactivity would be more likely to benefit from an AP approach.[48]

Physiological self-regulation strategies

The pain of CRPS may cause muscle tension, restricted movements, shallow breathing, emotional distress, and anxious reactions. Anxiety may also increase as individuals with CRPS begin to engage in physical activity to improve their daily function.[49-51] In order to reduce the impact of aversive physiological arousal and anxiety secondary to pain, techniques to support self-regulation are indicated.[52] Rooted in biopsychosocial theory, physiological self-regulation

strategies teach patients how to regulate pain-related autonomic responses (e.g., respiration rate, heart rate, and muscle tension), emotional states (e.g., stress and anxiety), and to achieve a relaxation response. These strategies are considered to be a core component of pain management interventions and empower patients to be active participants in their own care. Physiological self-regulation interventions reviewed in this chapter include 1) relaxation training; 2) mindfulness-bases stress reduction; 3) self-hypnosis; and 4) biofeedback.

Relaxation training (RT)

Relaxation training (RT) seeks to increase mind-body awareness and has been found to optimize pain management and improve daily functioning.[52-54] The primary goal of RT is to elicit the relaxation response to counter the sympathetic nervous system "fight or flight" reactions, common in CRPS. In addition to supporting the relaxation response, RT also provides patients with active coping that they can utilize during physically uncomfortable components of multidisciplinary care, including physical therapy, and occupational therapy.[51] Utilization of these relaxation interventions during more physically challenging interventions may foster increased engagement and participation in treatments.[51,52]

RT incorporates a number of techniques including diaphragmatic breathing, guided imagery, progressive muscle relaxation, meditation techniques, and autogenic training. *Diaphragmatic breathing*, also referred to as belly breathing or abdominal breathing, is a type of breathing technique designed to strengthen the diaphragm and down regulate autonomic nervous system reactivity. Box breathing is a simple diaphragmatic breathing strategy that involves inhaling through the nose to a count of 4 seconds, holding breath for 4 seconds, exhaling through mouth for 4 seconds, and holding breath for 4 seconds. As one improves this pattern, the amount of time can be increased (i.e., 5-8 count for inhale, hold, and exhale). Another relaxation training

technique, *guided imagery*, incorporates deep relaxation with focused attention to envisioning a relaxing scene. In one application of guided imagery among children with functional abdominal pain, patients were asked to envision their pain and then were asked to develop an image that would get rid of the pain.[55] *Progressive muscle relaxation training*, seeks to gradually reduce muscle tension and increase mind-body awareness (i.e., how stress can manifest as muscle tightness). This technique involves gentle tensing and releasing of muscles, typically beginning from the feet and moving slowly up the body from one muscle group up to the next, until reaching the head. One consideration for individuals with CRPS is to allow passive progressive muscle relaxation (i.e., no tensing muscles), as tensing some muscles for patients with chronic pain may exacerbate pain symptoms.

Mindfulness based interventions (MBI)

Mindfulness-based interventions (MBIs) involve harnessing a range of techniques to facilitate patients' understanding and application of mindfulness: attention to the present moment "characterized by nonjudgmental awareness, openness, curiosity, and acceptance of internal and external present experiences."[56,57] MBIs may incorporate mindful breathing, meditation, mindful walking, and focusing on visual or auditory cues. For example, *mindful breathing* guides one's attention to focus on the act of inhaling and exhaling while allowing negative thoughts to simply just be observed mindfully, rather than attempting to avoid or resist negative thoughts. *Mindful listening* may incorporate noticing sounds surrounding the individual, then noticing the sound of breathing or even one's own heartbeat to help with increasing engagement with the present moment. Music or natural sounds may also be utilized for mindful listening.

Mindfulness based coping skills have become well known methods of chronic pain treatment for a variety of pain conditions across pediatric and adult patients, with findings similar

to CBT for chronic pain. [58-64] Mindfulness based strategies help to promote acceptance, which can foster resilience for individuals with CRPS.[65] However, as with other physiological self-regulation interventions, individual patient characteristics should be considered in treatment planning. Some MBI may be contraindicated for some patients with CRPS (e.g., mindful body scans that draw attention to the affected limb may increase pain).[61]

Self-Hypnosis

Self-hypnosis has long been utilized for its beneficial pain management effects and offers individuals suffering from chronic pain a tool for managing pain and the level of distress associated with pain. Many individuals with CRPS have received messages from providers and their community that "the pain is all in your head" or "there is nothing else we can do for your pain," thus reinforcing the belief that one does not possess the ability to change any aspects of their symptoms and this will be a lifelong experience without relief. These negative suggestions can be powerful. Self-hypnosis is a technique that may help individuals with CRPS to enhance their ability to capitalize on creative processes to alter perceptions of pain, catastrophic thoughts, negative feelings, avoidant behaviors, and physiological reactions to pain. Self-hypnosis typically includes three components: induction, suggestion, and post-hypnotic suggestion. Inductions are intended to develop a deep relaxation state (e.g., body scan, countdown breathing). Suggestions are made to shift how pain is understood and experienced (e.g., from sharp pain to a dull ache, increasing the sensation of comfort, increase movement from immobile states, changing from a cold sensation to warm, etc.).;[66] Post-hypnotic suggestions are made to generalize the benefits of self-hypnosis practice beyond the session.

Hypnosis has demonstrated empirical support in the treatment of chronic pain.[67-70] A meta-analysis of 85 experiential trial studies on the use of hypnosis for the treatment of pain identified

improvements in analgesic effects as well as optimizing pain relief.[66] In the Eccelston and colleagues Cochrane review, in addition to relaxation training, hypnosis was also found to be a helpful treatment modality for pain and that hypnosis interventions were effective in reducing chronic pain intensity.[67] Furthermore, hypnosis has been an effective method for individuals with CRPS to manage various symptoms (i.e., protective posture, reduced function, immobility, pain, etc.) and fosters increased self-regulation and self-efficacy.[71]

Self-hypnosis also combines well with other multidisciplinary interventions to provide a context for disrupting maladaptive patterns and creating more adaptive responses.[72,73] For example, in one study of adult patients with upper extremity CRPS Type I (n = 20), self-hypnosis was utilized in combination with physical therapy. The goal of self-hypnosis treatment for CRPS in this study was to "recreate the illusion of movement to disrupt the blockage and exclusion of the affected limb segment, thereby freeing the patient from pain and functional disability."[74] This treatment combination was found to be effective in improving function and return to work for the majority of participants.[74]

Biofeedback (BFB)

Biofeedback (BFB) is a skills-based treatment that targets improving patient health and wellbeing by teaching strategies to change physiological responses. BFB seeks to increase the patient's ability to control their response to pain by increasing the relaxation response and decreasing cognitive and emotional arousal. Simply put "bio" refers to bodily responses and "feedback" is the signal fed back to the patient in real time, usually though a visual or auditory system. With CRPS and other chronic pain conditions, the sympathetic nervous system "fight or flight" response becomes activated by pain. During times of pain and stress our body secretes stress hormones that lead to a cascade of physiological changes such as increased heart rate, blood

pressure, vasoconstriction and changes in breathing, sweating and muscle tension. Given the psychophysiological link between stress, dysregulation of the autonomic nervous system and chronic pain, learning self-regulation skills to interrupt the stress response is an important component of any pain management program.[75,76]

BFB involves using one or more physiological sensors to examine the body's physiology while in real-time feeding that signal back to the patient to increase awareness and allowing them to make changes. These sensors convert the body's information into a sound and/or an image on a computer or portable electronic device that allows for increased awareness and build/train increased active control of physiological factors that contribute to pain. Common sensors used with BFB to assess physiological factors include electromyography (EMG), heart rate variability (HRV), respiration, skin temperature and skin conductance (SC). While receiving feedback from sensors, patients learn in real time how to activate their parasympathetic nervous system using a range of techniques that may include diaphragmatic breathing, guided imagery, autogenics, body scan, progressive muscle relaxation, mindfulness, and meditation. EMG biofeedback may be a particularly beneficial sensor when conducting muscle-focused relaxation/retraining procedures.[77] Furthermore, for many patients, the extremity impacted by CRPS is often colder and therefore, thermal BFB is used to enhance the relaxation response and ultimately achieve bilateral balancing of temperature regulation.

The first stage of BFB treatment typically focuses on awareness (i.e., identifying problematic or dysregulated physical and psychological responses via self-report and sensors). Next, physiological self-management strategies are implemented to change the BFB signals from a stressed to relaxed range (e.g., postural training, CBT, Mindfulness and Acceptance based strategies, meditation, progressive muscle relaxation (PMR), body scan, guided imagery,

autogenic and self-hypnosis). BFB training necessitates consistent and regular practice. The final stages of training focus on reducing the reliance on the clinician and equipment by generalizing skills into day to day environment with daily independent practice. Often, patients can use recorded scripts from their clinician, their favorite meditations or self-guided approaches to ensure skills acquisition. Once the patient is demonstrating mastery of skills the therapist reduces reliance on BFB.[78]

Biofeedback is an empirically validated treatment for various chronic pain conditions[79] including headache disorders, TMD, and fibromyalgia.[80-86] There is limited research on BFB for CRPS therefore we look to the chronic pain literature for treatment options. A meta-analysis found that biofeedback treatments in the chronic pain population can lead to improvements on various pain-related outcomes in the short and long term, as a standalone and an adjunctive treatment intervention.[87] Furthermore, significant small-to-medium effect size have been reported for pain intensity reduction over an average follow-up of 8 months and a reduction in depression, disability, muscle tension and improved cognitive coping. [87]

BFB should only be delivered by trained healthcare professionals competent in using the modalities described above to ensure safety. Contraindications for patients who may not be a good fit for BFB include: severe debilitating depression, severe psychosis, and individuals with a pacemaker or other implantable electrical device. Overall when used with appropriately, it is considered to be a safe, fun, and engaging intervention. BFB provides a skill that patients can use anytime for any stressor they encounter, making this an important physiological self-management strategy. More information about biofeedback and training in BFB can be found by visiting the Biofeedback Certification Institute of American (BCIA) - http://www.bcia.org.

Acceptance and Commitment Therapy (ACT)

ACT is a 3rd wave therapy, also considered contextual CBT[88] and has been shown to be effective in treating chronic pain.[89] ACT is recognized by the American Psychological Association (APA) as an empirically validated treatment for chronic pain in both the adult and pediatric populations.[90] Pain acceptance has been found to contribute to positive physical and psychosocial adjustment,[91],[92,93] and demonstrate improvements in psychological inflexibility, pain-related functioning, mental health-related quality of life, self-efficacy, depression, and anxiety in the chronic pain population.[94] ACT works specifically through processes related to psychological flexibility.[95]

While traditional CBT focuses on identifying and changing the *content* of one's thoughts (cognitive restructuring), ACT promotes psychological flexibility, thus reducing the *influence* that unhelpful thoughts have on one's mood and behaviors highlighting engagement in deliberate *choice* regarding their actions despite what their mind (cognitions) tells them. ACT proposes that psychological inflexibility including: experiential avoidance, preoccupation with the past or future, lack of perspective taking and reduced engagement in values-based behaviors (committed action) are at the heart of all suffering. The opposite of this is psychological flexibility, or a conscious awareness (mindfulness) and emotional distancing (defusion) from painful "private experiences" (or difficult thoughts, feelings, memories, urges and sensations). The process of emotional distance from restrictive or unhelpful private experiences allows one to make deliberate choices to intentionally engage in values based activities (committed action).[95] Acceptance does not involve resignation, rather it is the willingness to accept the experience fully while engaging in behaviors that bring meaning and purpose to one's life.[96] Engagement in living a full life with chronic pain is about decreasing behaviors around controlling pain (when controlling pain means reducing engagement in meaningful life activities), and instead, focusing on accomplishing valued goals.

Acceptance is also known as willingness, the opposite of avoidance or efforts to control painful sensations, emotions or thoughts.[92] In ACT, the struggle that comes from trying to avoid or change painful thoughts, feelings, memories, sensations and urges is considered the actual problem, not the experience itself.

ACT's core concepts are represented in the hexaflex and include: values, committed action, defusion, contact with the present moment (mindfulness), acceptance and self-as-context (Figure 3).[97] Here we describe each concept and it's conceptualization using a specific clinical example that a patient with CRPS may experience. Values are personal characteristics and behaviors that are vitally important to an individual; they serve as a guiding force, or a moral compass, that helps inform specific steps or behaviors, known as committed action, one can take in order to move toward restoring meaning and purpose in life. Values are critical to consciously define as they serve as a strong motivator when it comes to reducing avoidance. Mindfulness (focusing one's attention on the present moment) is bringing intentional awareness to internal experiences and observing these thoughts, feelings and sensations from a stance of curiosity without imparting judgement. Defusion is the act of separating or disentangling from challenging internal experiences and involves enacting exercises which cultivate acceptance, or the intention to willingly lean into inevitable internal discomfort, thus reducing emotional reactivity. These strategies work synergistically to help one realize the self-as-context, or the idea that we are not the content of our experiences (our thoughts, sensations, feelings, or things we see) but rather we are a being that can contain and observe these things and still behave in a way that we choose, rather than, or regardless of, what internal experiences may tell us. Broadly applied, if a patient with CRPS is fearful of walking due to pain, their instinctual response may be to avoid activities that involve walking more than a few minutes. They may engage in avoidance thus reducing engagement in social or

recreational life enhancing events. If time with loved ones is a valued activity, treatment targets would include helping them reduce avoidance and practice meaningful engagement in behaviors by using defusion and mindfulness to address internal conflicts, reducing the impact they have on their behaviors. Experiential exercises and metaphors are used to recognize the power of choice with regard to action rather than being controlled by internal thoughts and feelings. The goal is to build a repertoire of workable behaviors.

Case example of ACT for CRPS

Mary, is a 54-year-old woman loved organizing, advising, connecting and bringing families together. She was passionate about her job working as a wedding coordinator. She valued her physical, emotional and spiritual health, friendships, and spending time in nature. She regularly prioritized Sunday morning walks with friends. Unfortunately, she developed lower extremity CRPS after she fractured her ankle. Following the diagnosis of CRPS and subsequent pain, she became very fearful of walking, and started to avoid anything that involved walking more than 10 minutes as it increased her pain levels. As a result, she quit her job as it involved too much movement and told her friends she was no longer able to join them for their weekly walks. Consequently, she spent most of her time at home, rarely engaging with friends, and became depressed and disconnected from the things she once enjoyed. She stopped exercising and became physically deconditioned (disconnection from values, or "values illness"). As a result of these changes, she became more sensitized to pain, walking tolerance decreased to less than 5 minutes and the quality of her life diminished. Mary felt frustrated, guilty, worthless, hopeless, helpless, and irritable. Treatment utilizing ACT principals, would include: 1) recognition of avoidance behaviors (stopping valued activities) as a result of being fused with distressing internal experiences (fear, sadness, guilt, self-criticism, pain, unhelpful thoughts and rules and reasons

around her behaviors); 2) recognition that she is a person who contains these internal experiences (self as context); and 3) teach strategies (defusion) to recognize (via mindfulness) that her mind may come up with unhelpful thoughts (e.g., "CRPS has ruined my life, I'll never be able to work/exercise or see my friends until this goes away") yet she can choose to engage in valued activities (committed action) that are aligned with her values, even if the activities themselves may evoke some physical and emotional discomfort (acceptance). In Mary's case, modifying her work from on-site wedding coordinator to consultant advising those interested in becoming wedding coordinators nay allow her to remain in her area of expertise. Also, she could suggest alternative activities for social engagement e.g. Yoga or Tai Chi classes as a form of movement vs engaging in regular walks which may trigger increased pain. In this way, she is still able to remain engaged in her valued activities by practicing healthy behaviors, spend time with her friends, enjoy her skills of organization, creativity and bringing others together.

Motivational Interviewing (MI)

As outlined in this chapter, there are many evidence-based behavioral health interventions that are efficient and effective in treating CRPS and chronic pain conditions. However, effect sizes of interventions are often within the low to moderate ranges, which, in part, may be due to suboptimal rates of treatment adherence.[98] Only 50% of pediatric and adult patients with chronic pain referred to psychological interventions actually initiate these services[99-101] For individuals who do initiate treatment, increased engagement translates to better outcomes.[99,100] Treatment for CRPS hinges on patients learning self-management tools and achieving functional gains (e.g. increased physical activity, work/school attendance etc.).[102] For many patients, functional improvements result in short-term elevations in pain and discomfort. The nature of optimal CRPS interventions may undermine patient willingness to adhere to treatment. Thus, within this patient

population, there is a particular need to prioritize developing treatment motivation for self-management of symptoms, despite potential for discomfort.

In both the adult and pediatric literatures, readiness to change has emerged as a significant predictor of which patients benefit from multidisciplinary chronic pain interventions.[103-105] Readiness to change refers to one's readiness to adopt a self-management approach to chronic pain[106] and is based on Prochaska and DiClemente's Transtheoretical Model (TTM) of Behavioral Change.[107] The five TTM stages of change, contextualized for patients with chronic pain, include: 1) precontemplation*:* an individual does not wish to change their behavior; 2) contemplation: an individual is aware of personal responsibility for pain management but is not fully committed to making immediate behavior changes; 3) preparation*:* the individual is taking steps to prepare for behavior change; 4) action*:* the individual engages in the target behaviors and learns self-management of chronic pain; and 5) maintenance*:* the individual continues to engage in target behaviors and pain self-management.

Motivational Interviewing (MI) is a person-centered therapeutic approach that is rooted in TTM and seeks to resolve patients' ambivalence about behavior change by strengthening their intrinsic motivation and commitment to change.[108] MI has five overarching treatment principals, including: 1) express empathy through reflective listening; 2) develop discrepancy between patients' goals or values and their current behavior; 3) avoid argument and direct confrontation; 4) adjust to patient resistance rather than opposing it directly; and 5) support self-efficacy and optimism.[108] Core therapeutic skills utilized include the use of open-ended questions, affirmations (genuinely recognize patient strengths leading to behavior change), reflective listening, and summary statements. In a summary statement, the clinician summarizes the content of what the

patient has said, while highlighting the patient's use of "change talk" which refers to signs the patient is interested in committing to the target behavior.

MI was originally developed as treatment for substance dependence (e.g. alcohol use, smoking cessation) but since has expanded to successfully promote a range of health behaviors (e.g. obesity, type 1 diabetes, asthma).[109,110] Within the chronic pain literature, one available meta-analysis found that MI significantly increased adherence in adults to prescribed treatments in the short term, with small to moderate effects sizes.[111] However, the effect of MI on adherence was not maintained at a 6-month follow-up. The authors noted that there were only 7 published Randomized Control Trials (RCTs) at the time of their report. Though initial findings are promising, there is a need for research to continue to examine the effects of MI on treatment adherence, pain, and function over time, among pediatric and adult patients with CRPS.[111,112]

Group-delivered Interventions

Although behavioral health interventions for chronic have most often been developed to be administered within the context of individual therapy, group based interventions have also been developed and evaluated.[113,114] There are multiple advantages of group based-therapies that may enhance treatment of CRPS. Group delivered treatment allows clinicians to reach more patients at one time versus individual treatment approaches. This makes them a cost effective and far reaching treatment approach. Furthermore, people living with CRPS and other chronic pain conditions can often feel isolated, misunderstood, and invalidated by the people in their life and medical providers. The invisible nature of chronic pain adds to this dynamic. Group therapies provide a shared experience providing validation of the pain experience and the impact it has on one's life, a supportive environment to share and learn strategies to actively self-manage pain and a community of people who understand the impact that chronic pain has on one's identify,

relationships, and overall function. The comradery experienced via group therapy is powerful and integral part of the healing process. There are types of group interventions for CRPS and chronic pain conditions: reviewed here are CBT, mindfulness and acceptance-based, and Explain Pain group interventions.

CBT Groups

Group CBT includes psychoeducation, learning pain coping skills, and application of these skills to the chronic pain population. Identifying automatic negative thoughts, cognitive restructuring are often key components to this therapy, in addition to introduction to acute versus chronic pain, the biopsychosocial model, activity pacing, sleep hygiene, pleasant activity scheduling and constructive communication styles. CBT has been delivered in groups and shown to be effective for patients with depression, chronic pain including lower back pain, neck pain, migraines and headaches.[115] Research has demonstrated that the groups' success has been correlated to the skill/sense of community that is built by the group instructor, and that CBT for depression has lower dropout rates than individual treatment.[116] One RCT demonstrated that the addition of group based CBT to an exercise program was more effective for improving disability and quality of life for chronic neck pain compared to exercise alone.[117]

Mindfulness and Acceptance based group therapies

Unlike CBT's focus on controlling pain and changing unhelpful thoughts, mindfulness and acceptance-based group therapies focus on increased awareness while changing one's relationship with their painful thoughts, memories, sensations and urges to allow them to engage in meaningful life enhancing behaviors. A meta-analysis in 2016, comparing 25 RCT, exploring the efficacy MBIs found small effect sizes on depression, disability and quality of life and moderate effect sizes on anxiety and pain interference.[58] At follow-up small effect sizes were found on pain

intensity and disability and larger effects on pain interference. A recent RTC demonstrates that group-based MBSR has comparable results to CBT groups for patients with chronic low back pain and is considered an effective treatment option.[118] In addition, an RTC in 2011 found Acceptance and Commitment Therapy groups to be comparable to CBT groups in addressing chronic pain.[119]

Patient Education: Explain Pain Groups

Explain Pain differs from CBT in that it does not teach relaxation training, formal cognitive restructuring, or other physiological self-management skills.[120] Explain Pain focuses on education about the biological mechanisms of pain, often using metaphors to apply complex content to the patient's unique pain experience. Several key concepts are that pain is a normal biological process, pain can be overprotective, and pain is always real even when tissue damage is not present.[120] Explain Pain has been delivered via group therapy for various pain conditions including back pain, fibromyalgia, chronic fatigue syndrome, or with surgical procedures (lumbar radiculopathy).[121-123].

Innovative Digital Directions for the Field

Optimal treatment of CRPS includes behavioral health support, though widespread access to these specialized services is limited by treatment-related costs to patients, shortage of programs outside of university centers, and a dearth of pain behavioral health specialists.[124] Unequal access to specialized behavioral health treatment further exacerbates healthcare disparities and underscores the critical need to develop treatment delivery-systems that are effective and address current limitations of treatment access. Over the past few decades, advancements in technology have supported the proliferation of virtually-delivered care. Electronic health (eHealth) is a broad term that refers to healthcare delivered virtually (e.g. virtual sessions with a clinician,[125] Internet treatment). Virtual sessions with clinicians are under the umbrella of eHealth and are commonly

referred to as telehealth. Early efficacy findings comparing the benefit of in-person versus telehealth behavioral health, suggests equivalency of care on clinical outcomes.[126] eHealth also incorporates the digitization of behavioral health interventions. There are multiple interventions for chronic pain that are now delivered remotely.[127-130] For example, the Web-based Management of Adolescent Pain (WebMAP) is an Internet-delivered CBT program that provides 8 weeks of online training modules completed by children and caregivers. A multicenter RCT revealed that adolescents randomized to the WebMAP group reported greater reductions in pain catastrophizing, functional impairment, and depressive symptoms as compared to youth completing an informational control.[127]

In additional to eHealth, mobile health interventions (mHealth) describes the use of mobile devices and wireless technology to deliver healthcare (e.g. smartphone applications, wearable devices, text messaging).[131] Access to smartphones has become largely universal for individuals across developmental groups and socioeconomic backgrounds, which may support mHealth modalities as being uniquely suited for the rapid dissemination of behavioral health interventions across differing healthcare settings.[132] Increasingly sophisticated technology has led to the development of interactive and engaging, game-like programs that are able to adapt to an individual's responses and generate tailored content. Digitally-delivered care is rapidly expanding across healthcare and is a promising interventional modality with early evidence suggesting it is primed to enhance behavioral health delivery and patient outcomes. There are numerous smartphone apps that may help to promote physiological self-regulation (i.e., Calm, Headspace, Relax Melodies, Breathe2Relax, etc.). These and many others may be utilized to assist individuals with CRPS to learn to incorporate relaxation training into daily practice. See Table 2 for examples of digital resources.

One very relevant application of digital solutions for the treatment of CRPS is virtual reality (VR). Therapeutic VR is an immersive, three-dimensional (3D) experience that grants patients the ability to engage in activities that may seem impossible in real life. VR could be particularly relevant for supporting patients' use of CRPS affected extremities in a highly engaging and distracting environment. There is emerging evidence that VR can be harnessed to increase movement among patients with chronic pain, yet additional study is needed to better understand the utility of VR with patients who have CRPS.[133,134]

Conclusions

Optimal treatment for CRPS espouses a multidisciplinary approach where pain medicine, physical and occupational therapies, and behavioral health specialists collaborate to facilitate patients' recovery. Behavioral health providers are key members of the treatment team and there are a breadth of efficacious behavioral health interventions that successfully address cognitive distortions and pain worry thoughts, improve patient physiological self-regulation, and encourage motivation to engage in treatment, among other treatment targets. Behavioral health interventions are related to patient improvement across pain, functional disability, and comorbid psychological conditions. Although behavioral health services were designed for individual and in-person delivery, there are emerging and promising trends in the field that seek to harness the power of group interventions and digital solutions to expand the reach of efficacious interventions. Up to this point, most research advancements have not been specific to CRPS, but have been generated within the broader chronic pain literature. To ensure the optimal treatment of CRPS, additional research is needed to better understand patients' unique behavioral health needs. Furthermore, the majority of extant literature reviewing efficacious behavioral health interventions has been conducted with adult patients. Pediatric patients have unique treatment needs not covered in this

chapter (e.g., role of caregivers) that could be further explored in the literature. As reviewed in this chapter, there are a number of evidence-based behavioral health interventions that improve pain, pain-related distress, and function associated with chronic pain, yet there is also significant room for the field to grow as we aspire to provide optimal treatment for patients with CRPS.

References

1. Harden RN, Bruehl S, Stanton-Hicks M, Wilson PR. Proposed new diagnostic criteria for complex regional pain syndrome. *Pain medicine.* 2007;8(4):326-331.
2. Treede R-D, Rief W, Barke A, et al. Chronic pain as a symptom or a disease: the IASP Classification of Chronic Pain for the: International Classification of Diseases:(: ICD-11:). *Pain.* 2019;160(1):19-27.
3. Surah A, Baranidharan G, Morley S. Chronic pain and depression. *Continuing Education in Anaesthesia, Critical Care & Pain.* 2014;14(2):85-89.
4. Melzack R, Wall PD. Pain mechanisms: a new theory. *Science.* 1965;150(3699):971-979.
5. Gatchel RJ, Peng YB, Peters ML, Fuchs PN, Turk DC. The biopsychosocial approach to chronic pain: scientific advances and future directions. *Psychological bulletin.* 2007;133(4):581.
6. Stanton-Hicks M. Complex regional pain syndrome. In: *Fundamentals of Pain Medicine.* Springer; 2018:211-220.
7. Walk D, Poliak-Tunis M. Chronic Pain Management: An Overview of Taxonomy, Conditions Commonly Encountered, and Assessment. *The Medical clinics of North America.* 2016;100(1):1-16.
8. Turk DC, Fillingim RB, Ohrbach R, Patel KV. Assessment of psychosocial and functional impact of chronic pain. *The Journal of Pain.* 2016;17(9):T21-T49.
9. Arnow BA, Blasey CM, Constantino MJ, et al. Catastrophizing, depression and pain-related disability. *General hospital psychiatry.* 2011;33(2):150-156.
10. Benedetti F, Amanzio M. Mechanisms of the placebo response. *Pulmonary pharmacology & therapeutics.* 2013;26(5):520-523.

11. Baranoff J, Hanrahan S, Kapur D, Connor J. Acceptance as a process variable in relation to catastrophizing in multidisciplinary pain treatment. *European journal of pain.* 2013;17(1):101-110.

12. Stewart DE, Yuen T. A systematic review of resilience in the physically ill. *Psychosomatics.* 2011;52(3):199-209.

13. Holmes A, Christelis N, Arnold C. Depression and chronic pain. *The Medical Journal of Australia.* 2013;199(6):S17-S20.

14. Perez RS, Zollinger PE, Dijkstra PU, et al. Evidence based guidelines for complex regional pain syndrome type 1. *BMC neurology.* 2010;10(1):1-14.

15. Turk DC, Okifuji A. Psychological factors in chronic pain: Evolution and revolution. *Journal of consulting and clinical psychology.* 2002;70(3):678.

16. Jordan KD, Okifuji A. Anxiety disorders: differential diagnosis and their relationship to chronic pain. *Journal of pain & palliative care pharmacotherapy.* 2011;25(3):231-245.

17. Asmundson GJ, Norton PJ, Norton GR. Beyond pain: the role of fear and avoidance in chronicity. *Clinical psychology review.* 1999;19(1):97-119.

18. Alonso J, Bartlett SJ, Rose M, et al. The case for an international patient-reported outcomes measurement information system (PROMIS®) initiative. *Health and quality of life outcomes.* 2013;11(1):210.

19. de C Williams AC, Eccleston C, Morley S. Psychological therapies for the management of chronic pain (excluding headache) in adults. *Cochrane database of systematic reviews.* 2012(11).

20. Palermo TM. *Cognitive-behavioral therapy for chronic pain in children and adolescents.* Oxford University Press; 2012.

21. Harden RN, Oaklander AL, Burton AW, et al. Complex regional pain syndrome: practical diagnostic and treatment guidelines. *Pain medicine.* 2013;14(2):180-229.

22. Stanton-Hicks M, Baron R, Boas R, et al. Complex regional pain syndromes: guidelines for therapy. *The Clinical journal of pain.* 1998;14(2):155-166.

23. Butler DS, Moseley GL. *Explain Pain 2nd Edn.* Noigroup publications; 2013.

24. Clarke CL, Ryan CG, Martin DJ. Pain neurophysiology education for the management of individuals with chronic low back pain: A systematic review and meta-analysis. *Manual therapy.* 2011;16(6):544-549.

25. Louw A, Diener I, Butler DS, Puentedura EJ. The effect of neuroscience education on pain, disability, anxiety, and stress in chronic musculoskeletal pain. *Archives of physical medicine and rehabilitation.* 2011;92(12):2041-2056.

26. Louw A, Zimney K, Puentedura EJ, Diener I. The efficacy of pain neuroscience education on musculoskeletal pain: a systematic review of the literature. *Physiotherapy theory and practice.* 2016;32(5):332-355.

27. Watson JA, Ryan CG, Cooper L, et al. Pain neuroscience education for adults with chronic musculoskeletal pain: a mixed-methods systematic review and meta-analysis. *The Journal of Pain.* 2019.

28. McCormick ZL, Gagnon CM, Caldwell M, et al. Short-term functional, emotional, and pain outcomes of patients with complex regional pain syndrome treated in a comprehensive interdisciplinary pain management program. *Pain Medicine.* 2015;16(12):2357-2367.

29. Stanton-Hicks MD, Burton AW, Bruehl SP, et al. An updated interdisciplinary clinical pathway for CRPS: report of an expert panel. *Pain practice.* 2002;2(1):1-16.

30. Williams DA, Keefe FJ. Pain beliefs and the use of cognitive-behavioral coping strategies. *Pain.* 1991;46(2):185-190.

31. Singh G, Willen SN, Boswell MV, Janata JW, Chelimsky TC. The value of interdisciplinary pain management in complex regional pain syndrome type I: a prospective outcome study. *Pain Physician.* 2004;7(2):203-210.

32. Bruehl S, Husfeldt B, Lubenow TR, Nath H, Ivankovich AD. Psychological differences between reflex sympathetic dystrophy and non-RSD chronic pain patients. *Pain.* 1996;67(1):107-114.

33. Prkachin KM, Schultz IZ, Hughes E. Pain behavior and the development of pain-related disability: the importance of guarding. *The Clinical journal of pain.* 2007;23(3):270-277.

34. Karsdorp PA, Vlaeyen JW. Active avoidance but not activity pacing is associated with disability in fibromyalgia. *Pain®.* 2009;147(1-3):29-35.

35. Fordyce W. Behavioral methods for chronic pain and illness. In: LWW; 1977.

36. Nielson WR, Jensen MP, Karsdorp PA, Vlaeyen JW. Activity pacing in chronic pain: concepts, evidence, and future directions. *The Clinical journal of pain.* 2013;29(5):461-468.

37. Johansson C, Dahl J, Jannert M, Melin L, Andersson G. Effects of a cognitive-behavioral pain-management program. *Behaviour research and therapy.* 1998;36(10):915-930.

38. Marhold C, Linton SJ, Melin L. A cognitive–behavioral return-to-work program: effects on pain patients with a history of long-term versus short-term sick leave. *Pain.* 2001;91(1-2):155-163.

39. McCracken LM, Samuel VM. The role of avoidance, pacing, and other activity patterns in chronic pain. *Pain.* 2007;130(1-2):119-125.

40. Furst GP, Gerber LH, Smith CC, Fisher S, Shulman B. A program for improving energy conservation behaviors in adults with rheumatoid arthritis. *American Journal of Occupational Therapy.* 1987;41(2):102-111.

41. Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain.* 2000;85(3):317-332.

42. de Jong JR, Vlaeyen JW, van Eijsden M, Loo C, Onghena P. Reduction of pain-related fear and increased function and participation in work-related upper extremity pain (WRUEP): effects of exposure in vivo. *PAIN®.* 2012;153(10):2109-2118.

43. Bailey KM, Carleton RN, Vlaeyen JW, Asmundson GJ. Treatments addressing pain-related fear and anxiety in patients with chronic musculoskeletal pain: a preliminary review. *Cognitive behaviour therapy.* 2010;39(1):46-63.

44. Gould RA, Otto MW, Pollack MH, Yap L. Cognitive behavioral and pharmacological treatment of generalized anxiety disorder: A preliminary meta-analysis. *Behavior therapy.* 1997;28(2):285-305.

45. Rodebaugh TL, Holaway RM, Heimberg RG. The treatment of social anxiety disorder. *Clinical Psychology Review.* 2004;24(7):883-908.

46. Shim H, Rose J, Halle S, Shekane P. Complex regional pain syndrome: a narrative review for the practicing clinician. *British journal of anaesthesia.* 2019.

47. den Hollander M, Goossens M, de Jong J, et al. Expose or protect? A randomized controlled trial of exposure in vivo vs pain-contingent treatment as usual in patients with complex regional pain syndrome type 1. *Pain.* 2016;157(10):2318-2329.

48. Huijnen IP, Verbunt JA, Roelofs J, Goossens M, Peters M. The disabling role of fluctuations in physical activity in patients with chronic low back pain. *European Journal of Pain.* 2009;13(10):1076-1079.

49. Logan DE, Williams SE, Carullo VP, Claar RL, Bruehl S, Berde CB. Children and adolescents with complex regional pain syndrome: more psychologically distressed than other children in pain? *Pain Research and Management.* 2013;18(2):87-93.

50. Dilek B, Yemez B, Kizil R, et al. Anxious personality is a risk factor for developing complex regional pain syndrome type I. *Rheumatology international.* 2012;32(4):915-920.

51. Tileston KR, Griffin A, Wagner JF, O'Day MN, Krane EJ. Team Approach: Complex Regional Pain Syndrome in Children and Adolescents. *JBJS reviews.* 2020;8(4):e0174.

52. Katholi BR, Daghstani SS, Banez GA, Brady KK. Noninvasive treatments for pediatric complex regional pain syndrome: a focused review. *PM&R.* 2014;6(10):926-933.

53. Ehde DM, Dillworth TM, Turner JA. Cognitive-behavioral therapy for individuals with chronic pain: efficacy, innovations, and directions for research. *American Psychologist.* 2014;69(2):153.

54. McKenna K, Gallagher KA, Forbes PW, Ibeziako P. Ready, set, relax: biofeedback-assisted relaxation training (BART) in a pediatric psychiatry consultation service. *Psychosomatics.* 2015;56(4):381-389.

55. Weydert JA, Shapiro DE, Acra SA, Monheim CJ, Chambers AS, Ball TM. Evaluation of guided imagery as treatment for recurrent abdominal pain in children: a randomized controlled trial. *BMC pediatrics.* 2006;6(1):29.

56. Chiesa A, Serretti A. Mindfulness-based interventions for chronic pain: a systematic review of the evidence. *The journal of alternative and complementary medicine.* 2011;17(1):83-93.

57. Kabat-Zinn J. Full catastrophe living: The program of the stress reduction clinic at the University of Massachusetts Medical Center. In: New York: Delta; 1990.

58. Veehof MM, Trompetter H, Bohlmeijer ET, Schreurs KMG. Acceptance-and mindfulness-based interventions for the treatment of chronic pain: a meta-analytic review. *Cognitive behaviour therapy.* 2016;45(1):5-31.

59. Ladwig RJ, Weisman SJ. A randomized, controlled pilot study of mindfulness-based stress reduction for pediatric chronic pain. *Alternative therapies in health and medicine.* 2013;19(6):8.

60. Ruskin D, Kohut SA, Stinson J. The development of a mindfulness-based stress reduction group for adolescents with chronic pain. *Journal of Pain Management.* 2014;7(4):301.

61. Waelde LC, Feinstein AB, Bhandari R, Griffin A, Yoon IA, Golianu B. A pilot study of mindfulness meditation for pediatric chronic pain. *Children.* 2017;4(5):32.

62. Britton WB, Lepp NE, Niles HF, Rocha T, Fisher NE, Gold JS. A randomized controlled pilot trial of classroom-based mindfulness meditation compared to an active control condition in sixth-grade children. *Journal of School Psychology.* 2014;52(3):263-278.

63. Veehof MM, Oskam M-J, Schreurs KM, Bohlmeijer ET. Acceptance-based interventions for the treatment of chronic pain: a systematic review and meta-analysis. *PAIN®.* 2011;152(3):533-542.

64. Lakhan SE, Schofield KL. Mindfulness-based therapies in the treatment of somatization disorders: a systematic review and meta-analysis. *PloS one.* 2013;8(8).

65. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L. Using self-report assessment methods to explore facets of mindfulness. *Assessment.* 2006;13(1):27-45.

66. Thompson T, Terhune DB, Oram C, et al. The effectiveness of hypnosis for pain relief: A systematic review and meta-analysis of 85 controlled experimental trials. *Neuroscience & Biobehavioral Reviews.* 2019.

67. Eccleston C, Palermo TM, de C Williams AC, et al. Psychological therapies for the management of chronic and recurrent pain in children and adolescents. *Cochrane Database of Systematic Reviews.* 2014(5).

68. Vlieger AM, Menko–Frankenhuis C, Wolfkamp SC, Tromp E, Benninga MA. Hypnotherapy for children with functional abdominal pain or irritable bowel syndrome: a randomized controlled trial. *Gastroenterology.* 2007;133(5):1430-1436.

69. Tomé-Pires C, Miró J. Hypnosis for the management of chronic and cancer procedure-related pain in children. *International Journal of Clinical and Experimental Hypnosis.* 2012;60(4):432-457.

70. Kohen DP. Long-term follow-up of self-hypnosis training for recurrent headaches: what the children say. *Intl Journal of Clinical and Experimental Hypnosis.* 2010;58(4):417-432.

71. Jensen M, Patterson DR. Hypnotic treatment of chronic pain. *Journal of behavioral medicine.* 2006;29(1):95-124.

72. Yapko MD. *Trancework: An introduction to the practice of clinical hypnosis.* Psychology Press; 2003.

73. Thomas J, Griffin A. Psychological Treatment of Chronic Pain in Pediatric Populations. In: *Handbook of Psychosocial Interventions for Chronic Pain.* Routledge; 2019:506-536.

74. Lebon J, Rongières M, Aprédoaei C, Delclaux S, Mansat P. Physical therapy under hypnosis for the treatment of patients with type 1 complex regional pain syndrome of the hand and wrist: retrospective study of 20 cases. *Hand Surgery and Rehabilitation.* 2017;36(3):215-221.

75. Woda A, Picard P, Dutheil F. Dysfunctional stress responses in chronic pain. *Psychoneuroendocrinology.* 2016;71:127-135.

76. Morley S, Eccleston C, Williams A. Systematic review and meta-analysis of randomized controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache. *Pain.* 1999;80(1-2):1-13.

77. Bruehl S, Chung OY. Psychological and behavioral aspects of complex regional pain syndrome management. *The Clinical journal of pain.* 2006;22(5):430-437.

78. Glick RM, Greco CM. Biofeedback and primary care. *Primary Care: Clinics in Office Practice.* 2010;37(1):91-103.

79. Willmarth EK, Willmarth KJ. Biofeedback and hypnosis in pain management. *Biofeedback.* 2005;33(1):20.

80. Nestoriuc Y, Martin A. Efficacy of biofeedback for migraine: a meta-analysis. *Pain.* 2007;128(1-2):111-127.

81. Nestoriuc Y, Martin A, Rief W, Andrasik F. Biofeedback treatment for headache disorders: a comprehensive efficacy review. *Applied psychophysiology and biofeedback.* 2008;33(3):125-140.

82. Nestoriuc Y, Rief W, Martin A. Meta-analysis of biofeedback for tension-type headache: Efficacy, specificity, and treatment moderators. *Journal of consulting and clinical psychology.* 2008;76(3):379.

83. Glombiewski JA, Bernardy K, Häuser W. Efficacy of EMG-and EEG-biofeedback in fibromyalgia syndrome: a meta-analysis and a systematic review of randomized controlled trials. *Evidence-Based Complementary and Alternative Medicine.* 2013;2013.

84. Hassett AL, Radvanski DC, Vaschillo EG, et al. A pilot study of the efficacy of heart rate variability (HRV) biofeedback in patients with fibromyalgia. *Applied psychophysiology and biofeedback.* 2007;32(1):1-10.

85. Flor H, Birbaumer N. Comparison of the efficacy of electromyographic biofeedback, cognitive-behavioral therapy, and conservative medical interventions in the treatment of chronic musculoskeletal pain. *Journal of Consulting and Clinical Psychology.* 1993;61(4):653.

86. Crider A, Glaros AG, Gevirtz RN. Efficacy of biofeedback-based treatments for temporomandibular disorders. *Applied psychophysiology and biofeedback.* 2005;30(4):333-345.

87. Sielski R, Rief W, Glombiewski JA. Efficacy of biofeedback in chronic back pain: a meta-analysis. *International journal of behavioral medicine.* 2017;24(1):25-41.

88. Hayes S, Strosahl K, Wilson K. Review of Acceptance and Commitment Therapy: An Experiential Approach to Behavior Change. 2002.

89. Dimidjian S, Arch JJ, Schneider RL, Desormeau P, Felder JN, Segal ZV. Considering meta-analysis, meaning, and metaphor: A systematic review and critical examination of "third wave" cognitive and behavioral therapies. *Behavior therapy.* 2016;47(6):886-905.

90. Practice APTFoE-B. Evidence-based practice in psychology. *The American Psychologist.* 2006;61(4):271.

91. Reneman MF, Dijkstra A, Geertzen JH, Dijkstra PU. Psychometric properties of chronic pain acceptance questionnaires: a systematic review. *European Journal of Pain.* 2010;14(5):457-465.

92. McCracken LM, Vowles KE, Eccleston C. Acceptance of chronic pain: component analysis and a revised assessment method. *Pain.* 2004;107(1-2):159-166.

93. McCracken LM, Vowles KE, Gauntlett-Gilbert J. A prospective investigation of acceptance and control-oriented coping with chronic pain. *Journal of behavioral medicine.* 2007;30(4):339-349.

94. Wicksell R, Kemani M, Jensen K, et al. Acceptance and commitment therapy for fibromyalgia: a randomized controlled trial. *European journal of pain.* 2013;17(4):599-611.

95. Wicksell RK, Olsson GL, Hayes SC. Psychological flexibility as a mediator of improvement in Acceptance and Commitment Therapy for patients with chronic pain following whiplash. *European Journal of Pain.* 2010;14(10):1059. e1051-1059. e1011.

96. Dahl J, Wilson KG, Nilsson A. Acceptance and commitment therapy and the treatment of persons at risk for long-term disability resulting from stress and pain symptoms: A preliminary randomized trial. *Behavior therapy.* 2004;35(4):785-801.

97. Hayes SC, Strosahl KD, Wilson KG. *Acceptance and commitment therapy: The process and practice of mindful change.* Guilford Press; 2011.

98. Butow P, Sharpe L. The impact of communication on adherence in pain management. *PAIN®.* 2013;154:S101-S107.

99. Nicholas MK, Asghari A, Corbett M, et al. Is adherence to pain self-management strategies associated with improved pain, depression and disability in those with disabling chronic pain? *European Journal of Pain.* 2012;16(1):93-104.

100. Nicholas MK, Asghari A, Sharpe L, et al. Cognitive exposure versus avoidance in patients with chronic pain: adherence matters. *European Journal of Pain.* 2014;18(3):424-437.

101. Simons LE, Logan DE, Chastain L, Cerullo M. Engagement in multidisciplinary interventions for pediatric chronic pain: parental expectations, barriers, and child outcomes. *The Clinical journal of pain.* 2010;26(4):291-299.

102. Parker DM, Harrison LE, Simons LE. Chronic pain. In: *Adherence and Self-Management in Pediatric Populations.* Elsevier; 2020:133-158.

103. Simons LE, Sieberg CB, Conroy C, et al. Children with chronic pain: response trajectories after intensive pain rehabilitation treatment. *The Journal of Pain.* 2018;19(2):207-218.

104. Logan DE, Conroy C, Sieberg CB, Simons LE. Changes in willingness to self-manage pain among children and adolescents and their parents enrolled in an intensive interdisciplinary pediatric pain treatment program. *PAIN®.* 2012;153(9):1863-1870.

105. Kerns RD, Rosenberg R. Predicting responses to self-management treatments for chronic pain: application of the pain stages of change model. *Pain.* 2000;84(1):49-55.

106. Guite JW, Logan DE, Simons LE, Blood EA, Kerns RD. Readiness to change in pediatric chronic pain: initial validation of adolescent and parent versions of the Pain Stages of Change Questionnaire. *PAIN®.* 2011;152(10):2301-2311.

107. Prochaska JO, DiClemente CC. Toward a comprehensive model of change. In: *Treating addictive behaviors.* Springer; 1986:3-27.

108. Rollnick S, Miller WR, Butler C. *Motivational interviewing in health care: helping patients change behavior.* Guilford Press; 2008.

109. DiClemente CC, Corno CM, Graydon MM, Wiprovnick AE, Knoblach DJ. Motivational interviewing, enhancement, and brief interventions over the last decade: A review of reviews of efficacy and effectiveness. *Psychology of Addictive Behaviors.* 2017;31(8):862.

110. Burke BL, Arkowitz H, Menchola M. The efficacy of motivational interviewing: a meta-analysis of controlled clinical trials. *Journal of consulting and clinical psychology.* 2003;71(5):843.

111. Alperstein D, Sharpe L. The efficacy of motivational interviewing in adults with chronic pain: a meta-analysis and systematic review. *The Journal of Pain.* 2016;17(4):393-403.

112. Wakefield EO, Kutner EC. Improving Adherence in Pediatric Chronic Pain: An Introduction to Motivational Interviewing. *Topics in Pain Management.* 2018;33(10):1-8.

113. Yalom ID. *The theory and practice of group psychotherapy.* Basic books (AZ); 1995.

114. Turk DC, Gatchel RJ. *Psychological approaches to pain management: a practitioner's handbook.* Guilford publications; 2018.

115. Christiansen S, Jürgens TP, Klinger R. Outpatient combined group and individual cognitive–behavioral treatment for patients with migraine and tension-type headache in a routine clinical setting. *Headache: The Journal of Head and Face Pain.* 2015;55(8):1072-1091.

116. Thimm JC, Antonsen L. Effectiveness of cognitive behavioral group therapy for depression in routine practice. *BMC psychiatry.* 2014;14(1):292.

117. Monticone M, Ambrosini E, Rocca B, et al. Group-based multimodal exercises integrated with cognitive-behavioural therapy improve disability, pain and quality of life of subjects with chronic neck pain: a randomized controlled trial with one-year follow-up. *Clinical rehabilitation.* 2017;31(6):742-752.

118. Cherkin DC, Sherman KJ, Balderson BH, et al. Effect of mindfulness-based stress reduction vs cognitive behavioral therapy or usual care on back pain and functional limitations in adults with chronic low back pain: a randomized clinical trial. *Jama.* 2016;315(12):1240-1249.

119. Wetherell JL, Afari N, Rutledge T, et al. A randomized, controlled trial of acceptance and commitment therapy and cognitive-behavioral therapy for chronic pain. *Pain.* 2011;152(9):2098-2107.

120. Moseley GL, Butler DS. Fifteen years of explaining pain: the past, present, and future. *The Journal of Pain.* 2015;16(9):807-813.

121. Moseley GL, Nicholas MK, Hodges PW. A randomized controlled trial of intensive neurophysiology education in chronic low back pain. *The Clinical journal of pain.* 2004;20(5):324-330.

122. Van Oosterwijck J, Meeus M, Paul L, et al. Pain physiology education improves health status and endogenous pain inhibition in fibromyalgia: a double-blind randomized controlled trial. *The Clinical journal of pain.* 2013;29(10):873-882.

123. Barrenengoa-Cuadra M, Angón-Puras L, Moscosio-Cuevas J, González-Lama J, Fernández-Luco M, Gracia-Ballarín R. Effectiveness of pain neuroscience education in

patients with fibromyalgia: Structured group intervention in Primary Care. *Atencion Primaria.* 2020.

124. Palermo T. Remote management of pediatric pain. *Encyclopedia of Pain 2nd Edition New York: Springer.* 2013:3389-3393.

125. Borrelli B, Ritterband LM. Special issue on eHealth and mHealth: Challenges and future directions for assessment, treatment, and dissemination. *Health Psychology.* 2015;34(S):1205.

126. McGeary DD, McGeary CA, Gatchel RJ. A comprehensive review of telehealth for pain management: where we are and the way ahead. *Pain Practice.* 2012;12(7):570-577.

127. Palermo TM, Law EF, Fales J, Bromberg MH, Jessen-Fiddick T, Tai G. Internet-delivered cognitive-behavioral treatment for adolescents with chronic pain and their parents: a randomized controlled multicenter trial. *Pain.* 2016;157(1):174.

128. Slater H, Jordan JE, Chua J, Schütze R, Wark JD, Briggs AM. Young people's experiences of persistent musculoskeletal pain, needs, gaps and perceptions about the role of digital technologies to support their co-care: a qualitative study. *BMJ open.* 2016;6(12):e014007.

129. Du S, Liu W, Cai S, Hu Y, Dong J. The efficacy of e-health in the self-management of chronic low back pain: A meta analysis. *International Journal of Nursing Studies.* 2019:103507.

130. Slattery BW, Haugh S, O'Connor L, et al. An Evaluation of the Effectiveness of the Modalities Used to Deliver Electronic Health Interventions for Chronic Pain: Systematic Review With Network Meta-Analysis. *Journal of medical Internet research.* 2019;21(7):e11086.

131. MHealth W. New horizons for health through mobile technologies. *Geneva: WHO.* 2011.

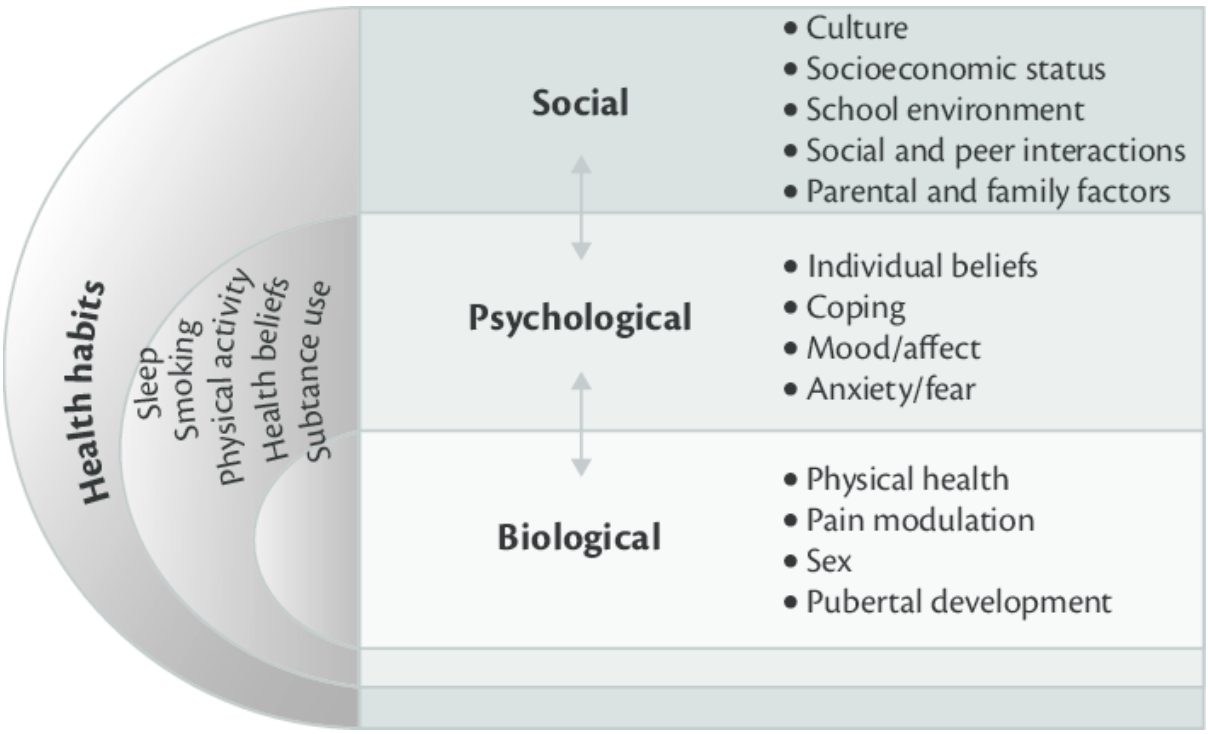
132. Chassiakos YLR, Radesky J, Christakis D, Moreno MA, Cross C. Children and adolescents and digital media. *Pediatrics.* 2016;138(5):e20162593.

133. Yilmaz Yelvar GD, Cirak Y, Dalkilinc M, Parlak Demir Y, Guner Z, Boydak A. Is physiotherapy integrated virtual walking effective on pain, function, and kinesiophobia in patients with non-specific low-back pain? Randomised controlled trial. *Eur Spine J.* 2017;26(2):538-545.

134. Thomas JS, France CR, Applegate ME, Leitkam ST, Walkowski S. Feasibility and Safety of a Virtual Reality Dodgeball Intervention for Chronic Low Back Pain: A Randomized Clinical Trial. *J Pain.* 2016;17(12):1302-1317.

Figure 1.

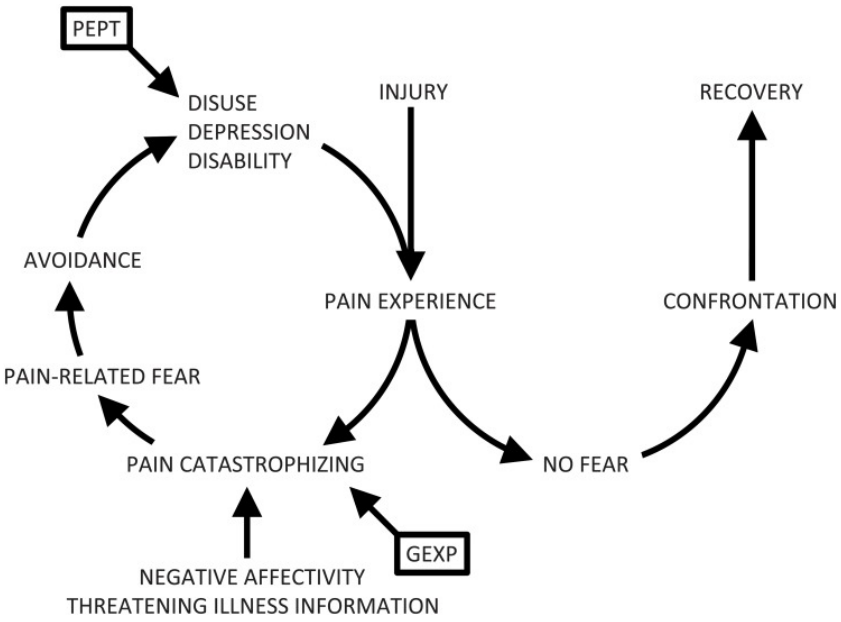
Guiding Conceptual Model for Understanding Pediatric Chronic Pain and Disability[20]



Note: permission granted by Oxford University Press

Figure 2.

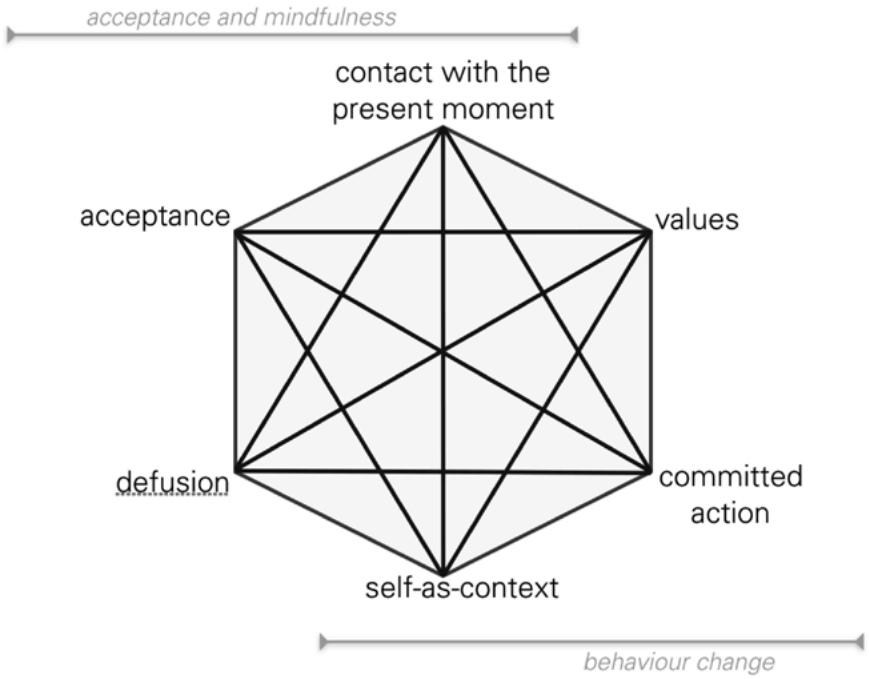
Fear-avoidance Model of Chronic Pain



Note. The fear-avoidance model showing the targets of graded exposure treatment.[41] PEPT = Pain Exposure Physical Therapy. GEXP = Graded Exposure treatment. Permission to reprint granted from Vlaeyen, J. W., & Linton, S. J. (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*, *85*(3), 317-332.

Figure 3.

The ACT Hexaflex diagram, illustrating six mid-level constructs often found useful in conceptualizing patient concerns



Note. Permission to reprint granted from Hulbert-Williams, L., Hochard, K. D., Hulbert-Williams, N., Archer, R., Nicholls, W., & Wilson, K. (2016). Contextual behavioural coaching: An evidence-based model for supporting behaviour change. BPS.

Table 1

Sample Assessment Measures

	Adult	Child
PROMIS (Pain)	http://www.healthmeasures.net/search-view-measures	http://www.healthmeasures.net/search-view-measures
Pain Catastrophizing	Pain Catastrophizing Scale (PSC) Sullivan MJL, Bishop SR, Pivik J. The Pain Catastrophizing Scale: Development and validation. Psychol Assess. 1995;7:524–32. PubMed PMID: 1996007788.	PCS-Child Crombez G, Bijttbier P, Eccleston C, Mascagni T, Mertens G, Goubert L, Verstraeten K. The child version of the pain catastrophizing scale (PCS-C): A preliminary validation. Pain. 2003;104(3): 639-46 PCS-Parent Eccleston C, Vervoort T, Jordan A, Crombez G. Parental catastrophizing about their child's pain. The parent version of the Pain Catastrophizing Scale (PCS-P): A preliminary validation. Pain. 2006;123: 254-263
Fear of Pain	Fear of Pain Questionnaire (FOPQ) McNeil DW, Rainwater AJ. Development of the fear of pain questionnaire—III. J Behav Med. 1998; 21(4):389-410	FOPQ Simons LE, Sieberg CB, Carpino E, Logan D, Berde C. The fear of pain questionnaire (FOPQ): Assessment of pain-related fear among adolescents with chronic pain. J Pain. 2011;12(6):677-86
Functional Disability	Short Form Health Survey (SF-36) Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30:473-483	Functional Disability Index (FDI) Walker LS, Greene JW. The functional disability inventory: Measuring a neglected dimension of child health status. 1991;16(1): 39-58
Anxiety	State Trait Anxiety Inventory (STAI): Spielberger CD. Manual for the State-Trait Anxiety Inventory STAI (Form Y)("Self-Evaluation Questionnaire") Mountain View (CA): Consulting Psychologists Press; 1983.	The Screen for Child Anxiety Related Emotional Disorders (SCARED): Birmaher B, Khetarpal S, Brent D, Cully M, Balach L, Kaufman J, Neer SM J Am Acad Child Adolesc Psychiatry. 1997 Apr; 36(4):545-53.
Depression	Beck Depression Inventory	Children's Depression Inventory

	Beck AT, Steer RA, & Brown GK (1996). BDI-II Manual San Antonio, Texas: The Psychological Corporation.	Kovacs, M. (2003). *Children's Depression Inventory (CDI): Technical manual update*. North Tonawanda, NY: Multi-Health Systems.

Table 2

Digital Behavioral Health Resources

How Does Your Brain Respond to Pain?: https://www.youtube.com/watch?v=I7wfDenj6CQ
Pain Retreat: http://www.painretreat.net/mainbottom.htm
Understanding Pain: What To Do About It In Less Than 5 Minutes: https://www.youtube.com/watch?v=vdM4dHefA4w
Pain Education: http://www.tamethebeast.org/#tame-the-beast

Apps for Behavioral Health Treatment
Deep "Belly" Breathing:

- Breathe2Relax – Free on the App Store – All ages
- iBreathe-Relax and Breathe – Free on the App Store – All ages
- BellyBio Interactive Breathing – Free on the App Store – All ages

General Relaxation:

- Relax & Rest Guided Meditations – $1.99 on the App Store – Best for adolescents
- Simply Being-Guided Meditation for Relaxation & Presence – $1.99 on the App Store – Best for adolescents
- Autogenic Training & Progressive Muscle Relaxation – $2.99 on the App Store – Best for adolescents
- Calm (simple breath work with great visual imagery) – Free in the App Store
- Headspace: Meditation & Sleep (helpful for anxiety, sadness, pain management, self-esteem, and creativity) – Free in the App Store
- Stop, Breathe, & Think (helpful for stress, anxiety, sleep, focus, resilience, happiness, yoga, and mindfulness) – Free in the App Store
- Insight Timer-Meditation App (timer to help calm the mind, reduce anxiety, manage stress, sleep deeply, and improve happiness) – Free in the App Store

General Cognitive-Behavioral Therapy:

- Stress & Anxiety Companion – Free on the App Store – All ages
- Moodpath: Depression & Anxiety – Free on the App Store – Best for ages 14+
- At Ease: Anxiety & Worry Relief – $2.99 on the App Store – Best for adolescents

Sleep:

- CBT-I Coach – Free on the App Store – All Ages
- Breathe: Meditation & Sleep – Free on the App Store – All ages
- iSleep Easy-Meditations for Restful Sleep – $3.99 on the App Store – Best for all ages
- Relax Melodies: Sleep Sounds – Free on the App Store – All ages
- Sleep Cycle: Smart Alarm Clock – Free in the App Store – All ages