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PSYCHOLOGICAL AND BEHAVIORAL ASPECTS OF HEADACHE AND PAIN (D BUSE, SECTION EDITOR)

The Interaction Between Chronic Pain and PTSD

Shelley Kind[1] · John D. Otis[2,3]

Abstract

Purpose of Review Post-traumatic stress disorder (PTSD) and chronic pain often co-occur. Understanding the shared mechanisms, signs to identify PTSD, and treatment options is integral in allowing providers to better serve their patients.

Recent Findings Individuals with comorbid PTSD and chronic pain report greater PTSD symptoms, pain, anxiety, depression, disability, and opioid use than those with only one of these conditions. There are several empirically supported therapies for chronic pain, and for PTSD, as well as pilot data for a treatment of comorbid pain and PTSD.

Summary The purpose of this paper is to review and synthesize current literature investigating the interaction between chronic pain and PTSD, and provide treatment recommendations for providers treating patients with chronic pain and PTSD.

Keywords Trauma · PTSD · Chronic pain · Headache

Introduction

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage [1]. Typically, pain is an adaptive experience to accompany an injury and with appropriate rest or care, the injury heals, pain subsides, and the individual returns to his former level of functioning. However, in some cases, pain persists beyond the point where it is considered an adaptive experience. The prolonged experience of pain in the individual can contribute to stress, anxiety, depression, and interference in normal everyday function. If the experience of pain persists 3 months or longer, it is classified as chronic pain [2].

Chronic pain can be caused by a variety of factors including natural degenerative changes that can occur in the body, disease conditions, or physical injury. Pain can also develop secondary to traumatic events, such as work-related injuries, motor-vehicle accidents, or injuries associated with engagement in military combat. Regardless of the cause, pain is more than just a sensory experience. Pain impacts every aspect of a person's life and there are dynamic and reciprocal relationships between biological, psychological, and social factors that interact and contribute to the experience of pain. Over the past decade, there has been growing interest in the connection between chronic pain and psychological conditions such as posttraumatic stress disorder (PTSD) as research and clinical practice have noted high rates of comorbidity and interaction between these conditions. Individuals with comorbid pain and PTSD report greater pain, PTSD symptoms, depression, anxiety, disability, and opioid use than those with only one of these conditions. Consequently, there has been a growing line of clinical research with the goal of developing a greater understanding of the factors that may be contributing to this comorbidity.

The primary aim of this paper is to review and synthesize current literature investigating the interaction between chronic pain and PTSD. The paper will begin with a review of the prevalence and costs associated with chronic pain, along with a review of the cognitive behavioral fear avoidance model of pain. Next, the comorbidity between pain and PTSD is presented and a model is highlighted that may serve to explain the mechanisms by which these two disorders are so closely linked. Finally, important treatment recommendations are

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✉ John D. Otis
johnotis@bu.edu

[1] Suffolk University, Boston, MA, USA

[2] United States of America Department of Veterans Affairs, VA Boston Healthcare System, Boston, MA, USA

[3] Center for Anxiety and Related Disorders, Department of Psychological and Brain Sciences, Boston University, Boston, MA 02115, USA

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described for providers who are treating patients with chronic pain and PTSD.

Chronic Pain

Approximately 100 million people in the USA are affected by chronic pain, with the national costs of pain ranging from $560 to $635 billion per year when considering annual health care costs and costs associated with lower productivity [3,4]. Chronic pain is also a significant problem among recent military returnees. In fact, a survey found that 9.1% of veterans reported severe pain compared to 6.4% of non-veterans [5].

Chronic pain can affect every aspect of a person's life and is associated with high rates of emotional disorders. This is not surprising given evidence suggesting that pain and emotional disorders share common neurobiological pathways [6]. Anxiety, fear, and avoidance may play an important role in the experience of pain [7]. In fact, one study found that for patients with low-back pain, anxiety accounted for 32% of the disability and 14% of the severity of the pain [8]. Depression prevalence rates range from 30 to 54% in patients with chronic pain [9] and depression is associated with pain complaints and physical impairment [10]. Pain can also have an impact on a patient's support system. Almost 60% of pain patients report relationship difficulties and 23% report low levels of satisfaction with family life [11]. Significant others may feel overburdened or frustrated which can contribute to the patient's psychological symptoms by increasing feelings of burdensomeness and dependence [12].

Vlaeyen and Linton [13] proposed a cognitive-behavioral fear–avoidance model of chronic pain that is helpful in explaining the role of fear and avoidance in the development and maintenance of chronic pain. According to the model, if an individual interprets pain as overly threatening, a process called "catastrophizing," it may contribute to a fear of pain and the avoidance of activities that are believed to have the potential to cause pain. This interpretation can cause "guarding" and "bracing" behaviors and a hypervigilance to bodily sensations. In this way, avoidance may also contribute to increased disability and depressive symptoms. As an individual becomes more depressed and inactive, their fear and avoidance of situations may increase causing pain to feel more intense. However, individuals who choose to find active ways to cope with pain (e.g., cognitive coping, maintaining activity level) are more likely to have quicker recoveries.

Chronic Pain and PTSD Comorbidity

A number of studies have noted high comorbidity rates between chronic pain and PTSD. PTSD is a psychological disorder that may occur after witnessing or experiencing a life-threatening event such as combat, a disaster, assault, or an automobile accident. Symptoms of PTSD include intrusive memories or nightmares of the event, avoidance of reminders of the trauma, hyperarousal, and feelings of isolation or difficulty feeling love or happiness [14]. Even if a person does not meet all of the diagnostic criteria for PTSD after experiencing a traumatic event, he/she can still experience PTSD-related symptoms that can be impairing and interfering. In the USA, it is estimated that 3.5 to 4.7% of people experience PTSD each year [15]; however, this rate is much higher in the chronic pain population. The rate of PTSD in patients presenting for the treatment of chronic pain is estimated to be between 9 and 10%, though rates of PTSD can vary depending on the type of pain reported or the pain setting [16•, 17••]. Veterans with pain are a particularly vulnerable population, with a rate of PTSD as high as 50.1% [16•]. Comorbidity between pain and symptoms of PTSD also has been found among children and adolescents, with 32% of youth with chronic pain also showing symptoms of PTSD compared with 8% of youth without chronic pain [18]. These high rates of comorbidity are significant because individuals with comorbid pain and PTSD report greater pain, PTSD symptoms, depression, anxiety, disability, and opioid use than those with only one of these conditions [19, 20, 21, 22]. Additionally, individuals with chronic pain and PTSD may be more likely to engage in suicidal behaviors than those with only chronic pain [23].

A Model of Pain and PTSD Comorbidity

One model that may be used to conceptualize the shared mechanisms contributing to the development of chronic pain and PTSD is called the Triple Vulnerability Model, which was initially developed by Barlow [24] to describe the etiology of anxiety and was later applied to help conceptualize the etiology of pain and PTSD [25]. The model suggests that there are three integrated vulnerabilities that need to be present in order for one to develop a disorder: biological vulnerabilities, generalized psychological vulnerabilities, and specific psychological vulnerabilities [24, 25]. The first vulnerability is a generalized biological vulnerability in the form of a genetically inherited tendency to respond anxiously when faced with a threat, such as a traumatic event or a painful injury. Evidence is accumulating that supports a genetic predisposition in the development of PTSD [26], and recent studies are examining the role of genetics in a number of chronic pain conditions [27, 28]. The second vulnerability is a general psychological vulnerability that is based on childhood learning experiences that instilled ideas such as "The world is not a safe place," "I cannot trust myself to make good decisions," or fostered a sense of uncontrollability over important events. These types of vulnerabilities can develop when parents are either over-restrictive or neglectful, and when children are not

able to build the skills and confidence necessary to overcome obstacles or meet development milestones. Thus, this vulnerability may set the stage for the use of ineffective coping with stressful events later in life. The third vulnerability is a specific psychological vulnerability in which one learns to focus his or her anxious thoughts on specific situations. Exposure to a traumatic event or a painful injury is not sufficient to cause one to develop chronic pain or PTSD. One must perceive that these events, including one's own emotional reactions to them, are preceding in an unpredictable and uncontrollable manner. Thus, when negative affect and a sense of uncontrollability develop, chronic pain or PTSD may emerge.

One vulnerability that may be particularly influential in the development of chronic pain and PTSD is called catastrophizing. Catastrophizing is considered a key factor in the transition from acute to chronic pain [13] and has been implicated as a vulnerability in the development of PTSD [29]. Research has shown that veterans with PTSD and chronic pain report significantly less control over their pain, greater impact of emotions on their pain, and greater use of catastrophizing when compared to veterans with chronic pain without significant PTSD symptoms [30]. While the model implies that we may have psychological and biological vulnerabilities to develop disorders, it acknowledges that these can be moderated to some extent by variables such as the presence of adequate coping skills and social support. Thus, treatment interventions that help patients gain a sense of control over events and challenge catastrophic thinking may be well suited for chronic pain and PTSD.

Assessment of Pain and PTSD

Pain and PTSD assessment procedures will vary depending on the amount of time a provider has available to spend with a patient. The ideal psychological pain assessment is based on the biopsychosocial model [31] and would include questions assessing domains including pain onset and severity, functional impairment, emotional changes (e.g., depression), cognitive changes (e.g., memory), coping strategies used (e.g., catastrophizing), and substance use [32]. Pain self-report questionnaires can also be a helpful way to capture important information. The Brief Pain Inventory—Short Form (BPI) is a nine-item questionnaire that elicits information about an individual's pain severity, as well as pain's interference in various domains, such as mood, walking, work, relationships, sleep, and quality of life [33]. A three-item version of the BPI called the PEG includes the questions from the BPI addressing pain intensity, enjoyment of life, and general activity [34]. The Pain Catastrophizing Scale (PCS) asks patients to rate the extent to which, when they are having pain, that they experience each of 13 thoughts about pain [35]. The thoughts encompass three categories: magnification, helplessness, and rumination. These two questionnaires together typically take patients less than 10 min to complete and provide valuable information about the nature of pain severity, and pain-related cognitions and disability.

Given the high rates of comorbidity between chronic pain and PTSD, it is likely that many patients who seek treatment for chronic pain are experiencing psychological symptoms caused by trauma, and in some patients these symptoms can negatively impact treatment engagement and outcomes. Therefore, it is important that clinicians ask about trauma when working with a patient who has chronic pain, and be aware of behaviors that suggest the patient is coping with some type of trauma. Clinicians should take time to familiarize themselves with the criteria for PTSD and practice asking questions about trauma to all patients. The more comfortable a clinician becomes in asking questions about trauma, the more likely a patient will be willing to reveal past events and express how they are feeling. A number of brief PTSD screening questions have already been developed and can be easily incorporated into a clinical interview [36] (see Table 1). In addition, there are a number of self-report questionnaires that can be used to assess for PTSD symptoms. For example, the PTSD Checklist (PCL) is a 17-item self-report questionnaire in which patient are presented with a list of symptoms of PTSD and are asked to indicate the extent to which they have

Table 1 PTSD Screening Script for Providers (modified from Prins et al. 2015)

Sometimes things happen to people that are unusually or especially frightening, horrible, or traumatic. For example:
- a serious accident (car, boat, or plane crash) or fire
- an experience in which you thought you might die (e.g., traumatic childbirth)
- a physical or sexual assault or abuse
- an earthquake or flood
- seeing someone be killed or seriously injured
- having a loved one die through suicide or homicide

Have you ever experienced this kind of event?

If patients answer "yes", ask:

1. In the past month, have you had nightmares about the event(s), thought about the event(s) when you did not want to, or felt like you were back in the event?
2. In the past month, have you tried hard not to think about the event(s) or went out of your way to avoid situations that reminded you of the event(s)?
3. In the past month, have you felt guilty or unable to stop blaming yourself or others for the event(s) or any problems the event(s) may have caused?
4. In the past month, have you been constantly on guard, watchful, or easily startled?
5. In the past month, have you felt numb or detached from people, activities, or your surroundings?

Note: Preliminary results from validation studies suggest that a cut-point of three on the PC-PTSD-5 (e.g., respondent answers "yes" to any three of five questions about how the traumatic event(s) have affected them over the past month) is optimally sensitive to probable PTSD

been bothered by each during the past month [37]. Versions of the PCL have been developed for military personnel (PCL-M), civilians (PCL-C), and for specific identified stressors (PCL-S) [37]. Patients will sometimes feel more comfortable revealing information on a questionnaire than answering a question in person; however, if it is the provider's responsibility to read over the patient's responses and follow-up with answers that suggest that a patient is in distress.

Treatment Options for Pain and PTSD

Cognitive behavioral therapy (CBT) is an "evidence-based" psychological treatment approach that has been found to be highly effective for the treatment of chronic pain and PTSD. CBT for chronic pain is a skill-based approach that focuses on teaching patients ways to identify and change negative thoughts, feelings, and behaviors and to replace them with more adaptive strategies. In the beginning of treatment, clinicians provide psychoeducation about the nature and theories of pain, as well as mindfulness and relaxation skills. Patient learn how to modify negative ways of thinking, pace their activity levels, regulate stress and anger, and improve sleep with the ultimate goal being to improve quality of life, reduce pain-related interference, and decrease psychological distress. CBT for pain has been shown through numerous trials to be efficacious at reducing pain-related symptoms, distress, and disability for both adults and children with a variety of chronic pain conditions [38, 39]. Another type of psychotherapy for chronic pain is called Acceptance and Commitment Therapy (ACT). ACT teaches patients nonjudgmental present-focused awareness of both positive and negative experiences, encourages identification of values and the initiation of actions in line with those values [40]. A systematic review of ACT for pain demonstrated that compared to control groups, ACT patients improved psychological flexibility, pain acceptance, anxiety, depression, and functioning [41]. Two of the "gold standard" evidence-based treatment approaches for PTSD are Prolonged Exposure (PE) and Cognitive Processing Therapy (CPT). Both of these approaches have been shown to be equally effective in treating PTSD [42•]. PE is a treatment approach where people are taught to gradually approach trauma-related memories, feelings, and situations. By confronting rather than avoiding situations people are able to understand their reactions rather than fearing them [43]. CPT is a more cognitively based therapy that teaches people how to challenge and modify unhelpful ways of thinking related to the trauma [44].

Given the high comorbidity between pain and PTSD, and models suggesting that they may share underlying mechanisms, researchers are now investigating the efficacy of an integrated treatment approach for both conditions [45]. Otis et al. [46••] developed and pilot tested the Pain and Trauma Intensive Outpatient Treatment (PATRIOT) Program, a brief, intensive (3 weeks, six sessions) integrated chronic pain and PTSD treatment. The goal of this program was to develop an integrated treatment for pain and PTSD that was effective, transportable, and practical to use outside the confines of a research study. The rationale for this intensive approach was based on studies supporting the efficacy of intensive treatment of psychological disorders [47, 29], and existing intensive psychological treatments that have gained much empirical support [48, 49]. The program included the development of treatment modules that allowed the delivery of content based on the individual needs of each patient. This feature allowed the treatment to more closely and flexibly approximate clinical practice. A total of eight US veterans with pain and PTSD participated in the study and there were no treatment dropouts. At post-treatment, there were significant reductions in PTSD. Depressive symptoms, pain, and catastrophic thinking also decreased from pre- to post-treatment. The authors concluded that with continued support and controlled evaluations, the PATRIOT Program may prove to offer a brief, cost-effective, and more easily accessible treatment option for individuals who could benefit from learning skills to manage pain and PTSD more effectively.

Clinical Implications

Our experience working with patients who have pain and PTSD has shown us that although it might be anticipated that the onset of the painful condition and PTSD would be associated with the same traumatic event, this is not necessarily the case. Data from a recent randomized controlled trial assessing chronic pain and PTSD in a VA Medical Center indicated that approximately 50% of patients reported that their first traumatic experience preceded their military service. There were often multiple traumatic experiences that occurred throughout life, with childhood traumatic experiences being rated as the most interfering in life. For pain and PTSD to interact with one another, the traumatic event does not need to be linked with the event that caused physical pain, so when discussing trauma, it is important that providers ask about events that might have occurred over the course of a patient's life.

Patients with chronic pain and PTSD may present in different ways depending on the clinical setting. Psychotherapists may notice that patients with PTSD symptoms are hesitant to engage in therapeutic activities that are typically part of CBT. For example, a patient may be less likely to engage in activities that involve increased socialization and the development of social support if they experienced some type of trauma where their trust in others was violated. Violations of trust by a person in power (e.g., supervisor, commanding officer) may also impact a patient's willingness to trust health providers. Similarly, when conducting cognitive

exercises that involve developing alternate ways of thinking, a patient with PTSD may be more likely to adopt a "worst case scenario" approach to coping with life's challenges as if he or she always had to be prepared for things to go poorly. A patient may also be highly resistant and express anger towards a provider when presented with evidence that his/her way of thinking is non-adaptive or inaccurate.

Providers may notice a number of ways in which the presence of trauma can interact with patient engagement in physical activities. Physical or occupational therapists may notice patients with PTSD becoming overwhelmed and tearful when performing exercises or movements that cause the patient to feel vulnerable, defenseless, and not fully in control. In contrast, we have also observed that some patients with PTSD may intentionally over-exert themselves to take their mind away from trauma symptoms. Although over-engaging in physically strenuous activities increases their pain, it also serves as a source of distraction from unwanted thoughts. Still, other patients have reported exposing themselves to reminders of traumatic events in order to trigger strong negative emotions and take their mind off the pain. Exploring these relationships with the patient may be an effective way of educating patients about the interactions between pain and PTSD.

While providers may be concerned about prescribing pain medications, these concerns are elevated when working with patients with pain and PTSD as research indicates that patients with PTSD have higher rates of misuse of opiates when compared to patients without PTSD [50]. Veterans with PTSD are particularly vulnerable. In 2010, 60% of the drug overdose deaths in the US were related to prescription medications with veterans being twice as likely to die from a drug overdose compared to non-veterans [51]. However, providers will also encounter patients with pain and PTSD who have prior experience with addiction and are wary of taking any type of pain medication that might lead them down a path toward substance abuse. These individuals are highly motivated to find non-pharmacological methods to manage their symptoms and are excellent candidates for CBT. Clinicians should keep an open mind, assess the patient's motivation to engage in these approaches prior to developing and assigning goals, and explain to patients the rationale behind these approaches.

Conclusions

Taken together, the research presented in this paper indicates that chronic pain and PTSD frequently co-occur and that similar mechanisms, such as fear, avoidance, and catastrophizing, may maintain both conditions. Given the manner in which pain and PTSD can interact with one another, clinicians should assess for PTSD in all patients who have chronic pain. Evidence-based treatment for pain and PTSD have been developed and integrated treatment approaches are currently in development. Ultimately, this research should translate into improving treatments for patients suffering from pain and PTSD so that more people gain the skills necessary to return to healthy everyday functioning.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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