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Pain-Related Fear, Disability, and the Fear-Avoidance Model of Chronic Pain

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Abstract

Chronic pain is a significant public health concern that imposes substantial burdens on individuals and healthcare systems, and factors that contribute to the development and maintenance of pain-related disability are of increasing empirical and clinical interest. Consistent with the fear-avoidance model of chronic pain, greater pain-related fear has consistently been associated with more severe disability and may predict the progression of disability over time. Recent evidence indicates that treatments designed to reduce pain-related fear are efficacious for improving disability outcomes, and several clinical trials are currently underway to test tailored intervention content and methods of dissemination. Future research in this area is needed to identify factors (e.g., substance use, comorbid psychopathology) that may influence interrelations between pain-related fear, response to treatment, and disability.

Introduction

Chronic pain is a significant public health problem that imposes substantial burdens on both individuals and healthcare systems. Recent estimates indicate that chronic pain affects approximately 26–43% of all American adults, and is responsible for greater than \$600M in annual healthcare costs and lost productivity [1,2]. Given the substantial and wide-ranging impact of chronic pain, researchers have increasingly focused on the identification of factors that may contribute to the incidence and exacerbation of chronic pain and pain-related disability. The fear-avoidance model of chronic pain posits that pain-related fear plays a central role these processes [3], and the study of potentially bidirectional associations between pain-related fear and disability is an emerging area of clinical and empirical interest across the medical and behavioral sciences. The goals of the current review were to examine and synthesize recent advances in the study of pain-related fear (with a focus on work that has been published since 2012), and to identify factors that may inform future research and the development of novel interventions. We begin with a brief introduction to

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biopsychosocial perspectives on chronic pain and disability. We then describe the fear-avoidance model of chronic pain, review contemporary research on the topic of pain-related fear and disability, and conclude by identifying psychosocial factors (e.g., comorbid psychopathology) that may influence these associations.

Biopsychosocial Model of Chronic Pain and Pain-Related Disability

According to the biopsychosocial perspective, chronic pain is the result of a complex interplay between biological, psychological, and social factors [4]. The biopsychosocial model provides an optimal framework for conceptualizing pain-related disability because it integrates both medical and psychosocial models [5]. Whereas the medical model views disability as a direct result of disease processes that require treatment or intervention, the psychosocial model posits that environmental (e.g., social, political, physical environment) and individual (e.g., cognitive and affective processes) factors influence the experience of disability. Taken together, a biopsychosocial perspective on disability considers changes to body structure and function (e.g., injury, disease), personal factors (e.g., age, gender), activity limitations (e.g., difficulty executing physical tasks), and participation restrictions (e.g., problems maintaining participation in daily activities) [5].

Pain-related disability encompasses a variety of domains including physical, occupational, recreational, and social functioning. Self-report measures of pain-related disability typically assess pain-related interference with self-care behaviors and family/home responsibilities, physical activity and movement, sleep, sexual activity, recreation, occupation, and social activities [6]. Although not included in all measures, pain intensity and mood ratings may also be considered when assessing pain-related disability. For example, recent approaches to conceptualizing chronic pain severity have taken into account the magnitude and frequency of both pain intensity and pain-related interference [7]. Thus, application of the biopsychosocial model necessitates consideration of a wide range of factors that may contribute to the development and maintenance of chronic pain and disability.

Fear-Avoidance Model and Pain-Related Fear

The fear-avoidance model of chronic pain was originally developed to explain the transition from acute to chronic low back pain [3], and has become a “leading paradigm for understanding disability associated with musculoskeletal conditions” [8]. Research in the area of pain-related fear and disability has increased substantially since the introduction of the fear avoidance-model, with approximately half of the articles retrieved through PubMed ($N = 557/1038$) and PsycINFO ($N = 163/346$) published in the past 4 years (see Figure 1). Although there is some disagreement among researchers regarding both the sequential relationships between psychosocial risk factors in the fear avoidance model (e.g., whether changes in catastrophizing precede changes in pain-related fear) and future research directions (e.g., relevance of studying cyclical relationships between the model components) in this area [e.g., 8], we are of the opinion that the fear-avoidance model of chronic pain provides a useful framework for the study and treatment of pain-related disability. Below, we review the basic tenants of the fear-avoidance model and discuss recent updates to the model.

The fear-avoidance model posits that pain-related fear activates escape mechanisms that lead to the avoidance of movement and activity. Although such behavior may be adaptive in the context of acute pain (e.g., by allowing an injury to heal), long-term avoidance of physical activity may impair functioning (e.g., reduced participation in occupational and recreational activities), increase negative mood (e.g., depression), and contribute to greater levels of disability (via disuse syndrome and physical deconditioning). Indeed, greater pain-related fear has been associated with lower levels of physical activity among persons with low-back pain [9], and recent longitudinal evidence indicates that persons with low-back pain who remain sedentary experience greater levels of disability over time [10]. The model further posits that pain-related fear can be negatively reinforced by avoidance behaviors, such that whereas avoidance of fearful stimuli may reduce fear in the short-term, it may also increase or strengthen the fear response over the long-term. In sum, the fear-avoidance model predicts that mutual reinforcement of pain-related fear and avoidance behaviors may contribute to the maintenance and progression of disability.

The related construct of pain-related fear has been conceptualized as representing fear of experiencing pain sensations, fear of activities that may elicit pain, fear of movement or (re)injury, and pain-related anxiety (i.e., anxious or fearful responses to pain). Similar to perceived disability, pain-related fear can be reliably assessed using self-report measures that query fear of experiencing pain, beliefs that pain may be indicative of serious injury or worsened by movement, and specific avoidance behaviors [6]. Pain-related fear and fear-avoidance beliefs have been observed among persons in the general population, and a recent experimental study demonstrated that healthy individuals with no history of chronic pain can evince both increased pain-related fear and delayed recovery (i.e., greater pain intensity and self-reported disability) in response to acute injury [11,12]. These data support the notion that pain-related fear may play an important role in the transition from acute injury to chronic pain and disability.

The fear-avoidance model of chronic pain is an evolving heuristic that has undergone multiple revisions since its introduction over a decade ago. An advantage to this approach is that the fear-avoidance model continues to be informed by ongoing research in this emerging domain. For example, although pain-intensity was not included as a component of the original fear-avoidance model, updated conceptualizations have incorporated evidence that greater pain may motivate avoidance behaviors, and that pain intensity may predict long-term disability outcomes [13]. Additional recent expansions address motivational factors (e.g., conflict between pain-related and non-pain goals), and the acquisition of fear-avoidance beliefs via classical conditioning [14,15]. Researchers have noted that important next steps for the fear avoidance model include consideration of a multidimensional, biopsychosocial definition of pain-related disability, use of a motivational perspective to understand how fear-avoidance behaviors occur in the context of competing demands, and consideration of additional mechanistic factors [8,15].

Associations between Pain-Related Fear and Disability

A growing body of evidence indicates a robust and positive association between pain-related fear and disability among individuals at various stages in the transition from acute to chronic

pain. First, a recent review of prospective relations between fear-avoidance and disability (number of studies [k] = 21) concluded that high fear-avoidance beliefs were predictive of work-related disability among patients with sub-acute low-back pain (i.e., pain > 2 weeks and < 3 months) [16]. A similar pattern of findings were observed in a review of randomized controlled trials (RCTs) of non-operative pain treatment (k = 17), such that, among persons with chronic pain for less than 6 months, greater fear-avoidance beliefs at baseline were associated with greater levels of self-reported disability and reduced likelihood of returning to work at 1-month, 6-month, and 1-year follow-ups [17]. Third, the authors of a review of RCTs of surgical intervention for lumbar disc herniation (k = 4) concluded that high fear-avoidance beliefs at baseline tended to be associated with poor surgical outcomes (i.e., pain, disability, return to work) [18]. Notably, of the two systematic reviews that examined associations between pain-related fear and disability as a function of pain duration [16,17], both observed greater consistency in prospective associations between pain-related fear and disability among persons with pain of shorter duration (i.e., < 3 months and < 6 months, respectively). Taken together, these findings suggest that pain-related fear may predict disability even when assessed during the early course of transition from sub-acute to chronic pain. However, given that previous research has tended to rely on categorical classifications of pain onset/duration [16,17], future research would benefit from employing more continuous measures so as to aid in the determination of when the assessment of pain-related fear may yield the greatest predictive utility.

Covariation between pain-related fear and disability has also consistently been observed among persons with chronic pain. A recent meta-analysis of cross-sectional studies (k = 46) demonstrated that associations between pain-related fear and disability were moderate-to-large in magnitude [6]. Moreover, moderation analyses suggested that the positive relation between pain-related fear and disability was stable across demographic (i.e., age and gender) and pain characteristics (i.e., pain intensity, duration, location, treatment-seeking). Although two systematic reviews observed variability in associations between pain-related fear and disability outcomes among persons with chronic pain of longer duration [16,17], meta-analytic estimates derived from cross-sectional studies indicate a robust association between pain-related fear and disability when measured concurrently [6].

Recent longitudinal evidence further indicates that both pre-and post-operative fear of movement may be associated with long-term disability outcomes among lumbar surgery patients [19,20], and that fear-avoidance beliefs among patients with sciatica may be associated with greater latency and reduced likelihood of returning to work [21]. Recent cross-sectional research has also demonstrated positive covariation between pain-related fear and disability among persons with knee osteoarthritis [22], shoulder pain [23], and chronic spinal pain [24]. In addition to self-reported disability, there is also new evidence that fear of movement may be associated with decreased range of motion among patients with chronic neck pain [25], which may, in turn, be associated with greater disability [26].

Pain-Related Fear as a Target for Pain Treatment

The fear-avoidance model of chronic pain predicts that reductions in pain-related fear will enhance disability outcomes. Accordingly, researchers have begun to adapt cognitive-

behavioral treatments (CBT) for fear and anxiety in the treatment of pain-related fear. Exposure-based procedures are considered the gold standard treatment for specific phobias (i.e., fear cued by the presence or anticipation of an object or situation), and typically include provision of adaptive coping strategies and exposure to feared situations or objects [27]. According to a recent review, graded exposure treatments that involved (1) development of an individualized hierarchy of feared and avoided activities, and (2) graded confrontation of activities across the hierarchy (beginning with least feared) were efficacious at decreasing levels of pain-related fear and improving functioning among persons with chronic low-back pain [28].

The results of several recent studies further indicate that pain-related fear may be reduced with exposure to movement through a variety of formats, including home-based, telephone guided, and physical therapy/rehabilitation programs. For example, an RCT of outpatients with severe disability due to neck injury revealed decreased fear-avoidance following exercise and strength training [29]. Similar results were observed in an RCT of home-based yoga for low-back pain [30]. There is also evidence that Progressive Goal Attainment (i.e., treatment that facilitates progressive resumption of activities) may reduce fear of movement and (re)injury, and facilitate return to work [31]. Finally, a recent RCT demonstrated that CBT (e.g., activity training and graded exposure in vivo) for persons with low-back pain, who had not yet utilized long-term work-related disability, was efficacious at reducing perceived disability and fear-avoidance beliefs, both immediately after treatment and at 9-month follow-up [32].

Several recent studies have also observed that changes in pain-related fear may mediate the effects of pain treatment on disability outcomes. For example, a systematic review of RCTs for low back pain concluded that decreased fear-avoidance beliefs during treatment were associated with improved disability outcomes, and that treatments that specifically addressed fear-avoidance beliefs were more effective than biomedical treatment alone [17]. Additional recent evidence derived from studies of treatment for anterior knee pain [33] and whiplash [34] suggests that reductions in pain-related fear during treatment may be predictive of reduced disability. Interestingly, one recent study, which utilized a daily diary method to examine changes in pain-related fear during graded exposure treatment, observed a 50% decrease in post-treatment fear of pain and movement, as well as reduced long-term self-reported disability [35]. Additional RCTs are currently underway to test the efficacy of varying durations of graded exposure [36], treatments designed to facilitate progressive goal achievement of goals [37], and post-operative CBT for reducing pain-related fear and disability [38].

Psychosocial Factors Relevant to Pain-Related Fear and Disability

Previous reviews have focused on the role of anxiety sensitivity [39] and self-efficacy [40] as psychosocial constructs that may influence associations between pain-related fear and disability. However, recent research also indicates that co-occurring substance use (e.g., tobacco, cannabis, alcohol) and comorbid psychopathology (e.g., depressive and anxiety disorders) may play a prominent role in complex associations between pain, pain-related fear and disability.

With regard to substance use, pain-related anxiety has been associated with expectancies for negative affect reduction via tobacco smoking among persons in pain [41], and chronic pain patients with greater levels of pain-related anxiety have been shown to be more likely to endorse smoking tobacco to cope with pain [42]. There is also some evidence of covariation between pain-related anxiety and severity of tobacco dependence among persons with and without chronic pain [43,44], there is converging evidence that tobacco smoking may serve an escape/avoidance function in response to pain [45], and smokers have been shown to report greater levels of pain-related disability than nonsmokers [42,46]. Taken together, these data suggest that pain-related anxiety may motivate smoking, and that ongoing tobacco use may be associated with poorer disability outcomes. Similar associations have been observed between pain-related fear and motives for cannabis use [47], researchers have noted that persons with chronic pain may use alcohol for pain-coping [48,49], and the authors of a recent integrative review identified fear-avoidance pathways as a potential mechanism in bidirectional associations between pain and alcohol consumption [48]. We did not, however, identify any studies that explicitly tested interrelations between pain-related fear, disability, and co-occurring substance use. Thus, additional research is needed to examine how substance use may influence the trajectory of pain-related disability within the context of the fear-avoidance model. Future studies should also test whether co-occurring substance use may impair the efficacy of treatments designed to reduce pain-related fear and avoidance behaviors.

With regard to comorbid psychopathology, symptoms of anxiety and depression are both highly prevalent among persons with chronic pain [50,51], and comorbid psychiatric disorders tend to be associated with greater pain-related disability [52]. The fear-avoidance model acknowledges that escape/avoidance behaviors (e.g., withdrawal from daily activities) may contribute to the manifestation of depression. However, it is also possible that symptoms of depression may stimulate fear-avoidance pathways. For example, recent data indicate that pain and depression may interact to promote a negative bias toward health information [53], and that negative affect may enhance catastrophic thinking and fear-avoidance beliefs [24,54]. There is also some evidence that anxiety disorders tend to precede the onset of chronic pain [55], and that persons with remitted anxiety or depression continue to demonstrate greater pain intensity and disability than persons with no history of anxiety or depression [56]. Taken together, these findings suggest that both current and historical psychiatric comorbidity should be considered when assessing pain-related fear and disability. Additional research is needed to identify how comorbid psychopathology may influence both the development and maintenance of pain-related disability, as well as response to novel interventions.

Conclusions

Interrelations between pain-related fear and disability are of increasing empirical and clinical interest. Numerous cross-sectional studies have consistently demonstrated positive associations between pain-related fear and disability, and recent meta-analytic estimates indicate that these relations tend to be robust and stable across sociodemographic and pain characteristics. The results of several recent systematic reviews further suggest that pain-related fear may predict the onset of disability, especially when assessed during the

transition from acute injury to chronic pain. Consistent with the fear-avoidance model of chronic pain, changes in pain-related fear have been shown to mediate treatment effects on disability, and numerous RCTs are underway to develop efficacious treatments for pain-related fear and disability. The fear-avoidance model of chronic pain represents and evolving conceptualization of pain-related disability, and has undergone several revisions since its introduction more than a decade ago. The current review identified additional biopsychosocial factors (i.e., comorbid substance use or psychopathology) that may influence interrelations between pain-related fear and disability. Future research in this area should examine how these factors may influence the trajectory of pain-related disability or response to interventions that target pain-related fear.

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- Pain-related fear has consistently been associated with more severe disability
- Treatments designed to reduce pain-related fear may improve disability outcomes
- The fear-avoidance model has undergone revisions to incorporate new findings
- Comorbid substance use and psychopathology are important factors for future study

Figure 1. Number of citations returned with the search terms (*fear of pain OR pain-related fear OR fear-avoidance OR pain-related anxiety*) AND disability in PubMed and PsycINFO databases from the introduction of the fear-avoidance model in 2000 to present.