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Chronic Pain Acceptance Incrementally Predicts Disability in Polytrauma-Exposed Veterans at Baseline and 1-Year Follow-Up

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Abstract

War veterans are at increased risk for chronic pain and co-occurring neurobehavioral problems, including posttraumatic stress disorder (PTSD), depression, alcohol-related problems, and mild traumatic brain injury (mTBI). Each condition is associated with disability, particularly when co-occurring. Pain acceptance is a strong predictor of lower levels of disability in chronic pain. This study examined whether acceptance of pain predicted current and future disability beyond the effects of these co-occurring conditions in war veterans. Eighty trauma-exposed veterans with chronic pain completed a PTSD diagnostic interview, clinician-administered mTBI screening, and self-report measures of disability, pain acceptance, depression, and alcohol use. Hierarchical regression models showed pain acceptance to be incrementally associated with disability after accounting for symptoms of PTSD, depression, alcohol-related problems, and mTBI (total adjusted $R^2=.57$, $p<.001$, $R^2=.03$, $p=.02$). At 1-year follow-up, the total variance in disability accounted for by the model decreased (total adjusted $R^2=.29$, $p<.001$), whereas the unique contribution of pain acceptance increased ($R^2=.07$, $p=.008$). Pain acceptance remained significantly associated with 1-year disability when pain severity was included in the model. Future research should evaluate treatments that address chronic pain acceptance and co-occurring conditions to promote functional recovery in the context of polytrauma in war veterans.

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Keywords

chronic pain; acceptance; functioning; disability; posttraumatic stress disorder; veterans

Chronic pain and pain-related disability¹ are prevalent and significant problems among returning U.S. war veterans, occurring in up to 60% of those returning from recent conflicts (Adler et al., 2011; Butchart, Kerr, Heisler, Piette, & Krein, 2009; Dobie et al., 2004; Dobscha et al., 2009; Haskell et al., 2012; Kerns, Otis, Rosenberg, & Reid, 2003; Rodriguez, Holowka & Marx, 2012; Ruff, Ruff, & Wang, 2009). Chronic pain is strongly associated with functional disability in both the general population (Breivik, Collett, Ventafridda, Cohen & Gallacher, 2006; Smith et al., 2001) and in samples of war veterans (Barry, Guo, Kerns, Duong, & Reid, 2003; Dobscha et al., 2009; Helmer et al., 2009; Matthias, Miech, Meyers, Sargent & Bair, 2014). The long-term course of chronic pain is characterized by low recovery rates and relatively static pain severity, with as many as 80% of those with chronic pain continuing to report chronic pain after four to twelve years, and increased mortality (Andersson, 2004; Elliott, Smith, Hannaford, Smith & Chambers, 2002).

Chronic pain frequently co-occurs with a number of common mental health and neurobehavioral conditions, including posttraumatic stress disorder (PTSD), mild traumatic brain injury (mTBI), depression, and alcohol-related problems, each of which is associated with increased disability in Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans (Adler et al., 2011; Higgins et al., 2014; Holowka & Marx, 2011; Kehle et al., 2012; Matthias et al., 2014; Otis et al., 2010; Rodriguez et al., 2012). Thus, in this population, there are multiple potential contributors to impairment and disability. For example, higher levels of pain disability are associated with lower levels of pain severity among veterans with comorbid pain and clinical PTSD symptoms, in comparison to veterans with pain in the absence of PTSD symptoms (Alschuler & Otis, 2014).

The Veterans Health Administration (VHA) recognizes the importance of complex injuries resulting in such comorbidities. VHA defines polytrauma as “involving two or more injuries to physical regions or organ systems that result in various physical and/or psychosocial impairments and disability” (Veterans Health Administration, 2006). This common presentation of comorbid conditions and symptoms, labeled as post-deployment syndrome (PDS) (Lewis et al., 2012) or post-deployment multi-symptom disorder (PDMSD) (Walker, Clark, & Sanders, 2010), has gained increasing clinical and research attention. For example, in a sample of veterans treated in a VHA polytrauma program, the rate of co-occurrence among chronic pain, PTSD and persistent postconcussive symptoms was 42%, with an additional 36% being diagnosed with two of these three conditions (Lew et al., 2009). Ten to twenty-three percent of those deployed to Afghanistan and Iraq experience some form of TBI, the vast majority of which are mTBIs, and 22 to 95% of those with a TBI are estimated to develop a pain condition (Bosco, Murphy & Clark, 2013; Girona et al., 2009). Importantly, the co-occurrence of these conditions is associated with high healthcare costs (e.g., Outcalt, Yu, Hoen, Pennington, & Krebs, 2013). In a study by Taylor et al. (2012),

¹The World Health Organization (WHO) defines disability as an umbrella term, encompassing impairment, activity limitations, and participation restrictions (<http://www.who.int/topics/disabilities/en/>).

veterans receiving VHA healthcare who were diagnosed with comorbid TBI, chronic pain, and PTSD had the highest median costs per patient.

In civilians, acceptance of chronic pain has been found to be a potent predictor of lower levels of disability (McCracken, Vowles, & Eccleston, 2004; McCracken & Vowles, 2008; Reneman, Kijkstra, Geertzen, & Dijkstra, 2010). Chronic pain acceptance is defined as “a behavior pattern of engagement in activity with pain present, but without restrictions by pain, or attempts to avoid or control pain” (McCracken & Vowles, 2008, p. 216). Attempts to manage chronic pain are often dominated by efforts to control the pain or associated experiences, behaviors, thoughts and/or feelings via medical, physical, behavioral or psychological strategies. Such efforts can be unsuccessful and can themselves contribute to distress and/or disability. Chronic pain acceptance emphasizes a willingness to experience pain or related distress without direct attempts to control them (see Thompson & McCracken, 2011 for a review). It predicts chronic pain adjustment and functioning beyond the influences of other common predictors such as pain severity, pain anxiety, attention to pain, and depression, over both the short and long term (McCracken, Vowles, & Eccleston, 2004; Thompson & McCracken, 2011). It is a stronger predictor of multiple dimensions of pain-related physical and psychosocial functioning than more control-based pain coping strategies (e.g., distraction, activity pacing, relaxation techniques, altered self-talk) (Thompson & McCracken, 2011). As a theoretical construct, acceptance of chronic pain is part of what is referred to as the contextual framework, as reflected in acceptance and commitment therapy (ACT) and other mindfulness- and acceptance-based treatment models (McCracken & Vowles, 2014; Thomson & McCracken, 2011). To our knowledge, no studies have examined the influence of chronic pain acceptance on disability among veterans while accounting for the influence of common co-occurring conditions.

The objective of the present study was to examine whether acceptance of chronic pain would predict current and future (i.e., one year) disability beyond the effects of PTSD, depression, alcohol-related problems, mTBI, and pain severity among trauma-exposed war veterans with chronic pain. We hypothesized that pain acceptance would be incrementally associated with current disability after accounting for the influence of PTSD, depression, alcohol-related problems, and mTBI, such that higher pain acceptance would predict lower current disability (Hypothesis 1), and that higher pain acceptance would similarly predict lower disability at 1-year follow-up (Hypothesis 2). Finally, in a subset of veterans who provided information on pain severity, we hypothesized that chronic pain acceptance would incrementally predict lower disability at 1-year follow-up after accounting for pain severity and the other predictors (Hypothesis 3).

Methods

Participants

A total of 117 participants were enrolled in a parent longitudinal study and also participated in a companion study examining predictors of mental health problems and functional impairment among OEF/OIF veterans enrolled at the Central Texas Veterans Health Care System (CTVHCS). Individuals were excluded if they: (a) met criteria for a diagnosis of schizophrenia or other psychotic disorder, or bipolar disorder; (b) reported current suicidal

or homicidal risk that warranted crisis intervention; (c) had recently begun (i.e., had not reached stabilization as indicated by less than three months of consistent treatment) psychiatric medications or psychotherapy; or (d) were unable to comprehend or complete the assessments. Recruitment involved over-sampling veterans with one or more lifetime mental health diagnoses other than the excluded diagnoses. All participants were enrolled in the parent study and then invited to participate in the second study if they met the additional inclusion criterion of being exposed to one or more potentially traumatic events that met *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; American Psychiatric Association, 2000) criterion A for PTSD during their military service. Most of the sample ($n = 80$; 68.4%) reported currently experiencing chronic pain and were included in the present analyses.

Demographic and descriptive characteristics of the sample are shown in Table 1. The ratio of males (86.3%) to females was representative of the 2013 gender distribution of veterans ages 20 to 64 nationally (i.e., 13.5% females, U.S. Department of Veterans Affairs, 2014). The majority of the sample (86.0%) served in the Army. Based on structured clinical interviews, the majority met criteria for military-related PTSD (i.e., related to any type of traumatic stressor(s) occurring during their service in support of OEF/OIF; 55% current; 75% lifetime).

Additional data regarding chronicity, frequency, and severity of chronic pain were obtained at baseline for a subset of participants ($n = 55$, 68.8%), due to these questions being added after the study was underway. The majority of participants ($n = 71$; 88.8%) completed a functional assessment at one-year follow-up. All participants who provided the additional pain data ($n = 55$) completed the 1-year follow-up assessment.

Procedures

All study procedures were reviewed and approved by the CTVHCS Institutional Review Board prior to data collection. Participants were recruited through direct mailings, advertisements at enrollment sites, and presentations to clinical staff. Following informed consent, participants completed structured interviews and self-report measures in private offices within the VA medical center. Interviews were conducted by licensed or license-eligible psychologists or master's level assessment technicians who completed intensive assessment training. Diagnostic consensus was reached in every case via diagnostic review groups supervised by doctoral-level clinical psychologists with significant assessment experience. A follow-up assessment was completed in person one year following the baseline assessment.

Measures

Descriptive details for key measures are located in Table 1.

The Clinician Administered PTSD Scale (CAPS; Blake et al., 1995) for DSM-IV (American Psychiatric Association, 2000) is the state-of-the-art diagnostic interview for PTSD. The CAPS assesses DSM-IV criteria with excellent reliability and validity (Weathers, Keane, & Davidson, 2001), providing a continuous scale of PTSD symptom severity in addition to assessing full diagnostic criteria for PTSD. CAPS interviews were conducted on the DSM-

IV Criterion A event identified by the participant as the worst that occurred during their military service. Lifetime diagnoses are based on the worst month related to the event, as identified by the participant. Current PTSD diagnoses were based on meeting full criteria within the past 30 days. Internal consistency for the CAPS items within the last 30 days was $\alpha=.90$.

The Beck Depression Inventory-Second Edition (BDI-II; Beck, Steer, Ball, & Ranieri, 1996) is a well-known 21-item self-report measure administered to assess the intensity of depressive symptoms in the past two weeks. Items are aligned with DSM-IV diagnostic criteria.

The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989, 2000) is a 23-item self-report measure of negative alcohol-related consequences in the past 6 months. Items overlap substantially with DSM-IV criteria for alcohol abuse and dependence. The RAPI has good reliability and good predictive and construct validity (White & Labouvie, 2000). Internal consistency in the current study was $\alpha = .96$. As RAPI scores were positively skewed, a log transformation was applied prior to the main analyses, resulting in an improved distribution.

Sixty-two of the veterans were screened by interviewers for deployment-related mTBI with the 3-question Brief Traumatic Brain Injury Screen (BTBIS; Schwab et al., 2006) utilized by the Defense and Veterans Brain Injury Center, whereas the remaining 18 participants were assessed for mTBI with a lengthier TBI interview (Vasterling, 2008), which was added after the study was underway. Veterans screened positive for mTBI based on endorsement of a head injury during deployment that led to an alteration of consciousness (e.g., being disoriented, “dazed”, or confused, seeing “stars”), loss of consciousness, or post-traumatic amnesia.

The Chronic Pain Acceptance Questionnaire (CPAQ; McCracken, Vowles, & Eccleston, 2004) is the most commonly used measure of chronic pain acceptance (Thompson & McCracken, 2011; Vowles, McCracken, McLeod, & Eccleston, 2008), intended to measure psychological flexibility associated with an individuals’ experience of chronic pain. A 20-item, 2-factor (labeled activity engagement and pain willingness) version of the CPAQ with good psychometric and theoretical support (Vowles et al., 2008) was used in this study. Additional research supports the psychometric properties of the CPAQ (Wicksell, Olsson, & Melin, 2009; Fish, McGuire, Hogan, Morrison, & Stewart, 2010). Internal consistency in the current study was $\alpha = .89$.

The World Health Organization Disability Assessment Schedule 2.0 self-report version (WHODAS 2.0; Üstün, 2010) is a 36-item measure used to assess disability related to health conditions in the past 30 days. The WHODAS 2.0 is based on the International Classification of Functioning, Disability, and Health (ICF) framework (WHO, 2001) and provides a global disability score that combines the following domains: cognition, mobility, self-care, getting along with others, life activities (which includes both household activities and work/school), and participation in society. The WHODAS 2.0 is recommended in the *Diagnostic and Statistical Manual of Mental Disorders, 5th edition* for use in assessing

disability related to mental disorders (*DSM-5*; APA, 2013; Konecky, Meyer, Marx, Kimbrel, & Morissette, 2014). Response options range from 1 (“none”) to 5 (“extreme”). The WHODAS 2.0 has demonstrated excellent reliability and validity in several multi-site field studies (Üstün 2010; Üstün et al., 2010) and in a multi-site study of veterans with PTSD (Goldberg et al., 2013). We used the global disability score (mean item score) in the current study, for which internal consistency was excellent ($\alpha = .96$).

Pain severity at the time of assessment was assessed with a single item numeric rating scale asking participants to rate their typical pain on a 0 to 10 scale (0 = “no pain”, and 10 = “the most intense pain you could possibly imagine”). This method of assessing pain severity is well established and widely utilized in clinical and research settings (Campbell & Vowles, 2008; Jensen & Karoly, 1992).

Data analyses

Preliminary analyses examined zero-order correlations between the WHODAS 2.0 disability score and demographic variables (i.e., age, sex, education level, race and ethnicity). No significant relationships were found between demographic variables and disability (see Table 2). Therefore demographic variables were excluded from further analyses.

The study hypotheses were tested via hierarchical linear regressions. For hypothesis 1 (model 1), CAPS PTSD symptom severity, BDI-II depression symptom severity, RAPI alcohol problems, and TBI screen were entered as a block in step 1, followed by the CPAQ total pain acceptance score in step 2 to assess the incremental predictive value of pain acceptance on WHODAS 2.0 rated disability after accounting for predicted functional impairment from the four comorbid conditions. For hypothesis 2 (model 2), the same independent variables at baseline were examined as predictors of WHODAS 2.0 rated disability at 1-year follow-up, using the same hierarchical steps. For hypothesis 3 (model 3), pain severity was entered first, prior to the comorbid conditions scores or chronic pain acceptance, to evaluate whether the contribution of chronic pain acceptance to prediction of disability at 1-year follow-up was distinct from the predictive value of pain severity.

Results

Correlational analyses

Pearson product-moment correlations for the demographic, pain and predictor variables, and WHODAS 2.0 disability score, are presented in Table 2. Disability was associated with each of the pain and predictor variables, with the strongest relations being positive associations with PTSD and depression, $r = 0.65$ and 0.69 , respectively, p -values $< .001$, and a negative association with chronic pain acceptance ($r = -0.54$, $p < .001$). Chronic pain acceptance was also negatively associated with PTSD severity and depression, $r = -0.48$ and -0.50 , respectively, p -values $< .001$.

Regression analyses

The results of the regression analysis examining predictors of baseline disability are presented in Table 3. The combination of PTSD severity, depression, alcohol-related

problems and mTBI screen accounted for 54% of the variance in disability at baseline ($p < .001$). PTSD severity, depression, and TBI screen, but not alcohol-related problems, were associated with disability in this first step of the hierarchical model. Chronic pain acceptance accounted for an additional 3% of variance in disability in step two ($p = .02$; $f^2 = .08$; small effect). In this final step, PTSD severity, depression, TBI screen, and chronic pain acceptance were each associated with disability, accounting for 57% of variance ($p < .001$). Thus, chronic pain acceptance was incrementally associated with disability, supplemental to the associations with PTSD severity, depression, alcohol-related problems, and TBI screen.

Results examining predictors of disability at 1-year follow-up are presented in Table 4 (see model 2). The combination of PTSD symptom severity, depression, alcohol problems and mTBI screen scores at baseline predicted 22% of variance in disability at 1-year ($p = .001$). Only PTSD severity ($\beta = .37$, $p = .02$) was a significant predictor. In step 2, the addition of chronic pain acceptance at baseline accounted for an additional 7% of variance ($p = .008$; $f^2 = .13$; small-to-medium effect) in 1-year disability. Only chronic pain acceptance was a significant predictor ($\beta = -.34$, $p = .008$) in the final model, which accounted for 29% of overall variance ($p < .001$). Thus, the incremental value of chronic pain acceptance for predicting disability in veterans was maintained when predicting impairment one year after initial assessment. At follow-up, the strength of the relationship between chronic pain acceptance and disability increased relative to the baseline assessment model and all other predictors.

Results of the analysis for the final hypothesis, which controlled for chronic pain severity, are presented in Table 4 (see model 3). In step 1, pain severity accounted for 9% of variance in disability at 1-year follow-up, and was a significant predictor ($\beta = .34$, $p = .018$). The addition of PTSD severity, depression, alcohol-related problems, and TBI screen in step 2 accounted for an additional 16% of variance in disability ($p = .015$). Only pain severity was a significant predictor ($\beta = .26$, $p = .046$) in this model. The addition of chronic pain acceptance in step 3 accounted for an additional 6% of variance in disability ($p = .03$; $f^2 = .11$; small effect). In the final step, only chronic pain acceptance was a significant predictor ($\beta = -.30$, $p = .047$). The final model accounted for 31% of variance in functional impairment at one year ($p < .001$).

Discussion

The present study examined chronic pain acceptance as an incremental predictor of current and future (i.e., one year) disability among trauma-exposed war veterans with chronic pain. As hypothesized, higher chronic pain acceptance predicted lower disability (at both baseline and 1-year follow-up) after controlling for symptoms of PTSD, depression, alcohol-related problems, and mTBI. The incremental predictive validity of chronic pain acceptance was maintained at follow-up after accounting for pain severity. The relationship of chronic pain acceptance was stronger with disability at 1-year follow-up in comparison to baseline, despite all other baseline predictors accounting for less variance in disability at follow-up. Thus chronic pain acceptance adds incremental value to models of current and future disability among returning war veterans experiencing chronic pain.

The current findings build on prior research in several ways. First, this was the first study to examine the influence of chronic pain acceptance on disability within a broader predictive model that included mental health problems and head injury, which are strongly related to disability. Second, this was the first study to examine the role of chronic pain acceptance in relation to disability in veterans. This is an important population in which to study the functional impact of chronic pain, given the high proportion of war veterans who experience chronic pain. Chronic pain is the most common health problem among veterans returning from recent conflicts; more than half of all veterans enrolled in the Veterans Health Administration are affected (Clancy, 2014). Relatedly, this sample included high rates of co-occurring mental health conditions and head injury, as would be expected in trauma exposed war veterans enrolled for VA healthcare. Therefore, the current study allowed for a rigorous test of whether chronic pain acceptance influences disability over and above other conditions known to be strongly associated with disability.

The construct of chronic pain acceptance contributes significantly to our understanding of the functional impact of chronic pain. Lack of or low acceptance of chronic pain may be part of a broader pattern of maladaptive avoidant responding to unwanted internal experiences that can lead to intensification of emotional distress and disability (Meyer, Morissette, Kimbrel, Kruse, & Gulliver, 2013). Efforts to control or avoid chronic pain risk both lack of success and potential harm through adding to disability and/or distress (Thompson & McCracken, 2011). To better understand the role of acceptance in chronic pain we can turn to the contextual framework or model (McCracken & Vowles, 2014; Thomson & McCracken, 2011). This model combines acceptance with several other important processes (McCracken, 2005; Thompson & McCracken, 2011; Vowles, Witkiewitz, Sowden, & Ashworth, 2014) including mindfulness or present moment awareness (experiencing the world more directly, in a non-judgmental manner), cognitive defusion (changing the way one relates to thoughts to diminish their unhelpful functions), self-as-context (being more aware of one's internal experiences without attachment to them), values (chosen life directions in various domains such as family or spirituality), and committed action (patterns of behavior linked to chosen values) (Hayes, n.d.). Together, these core processes constitute what is referred to as psychological flexibility. "Psychological flexibility refers to an ability to be fully present in the current moment, and from that position, to be able to either maintain or to change one's behavior to more successfully pursue that which is most personally important, according to what the situation directly affords" (Thompson & McCracken, 2011, pp. 146–147).

Acceptance and Commitment Therapy (ACT) for chronic pain is based on the contextual model and combines training in pain acceptance and psychological flexibility with mindfulness, behavior change, and behavior activation (McCracken & Vowles, 2014). This treatment approach has strong empirical support for efficacy in studies with civilians (McCracken & Vowles, 2014). It led to significant improvements in emotional and physical functioning, pain medication use, and pain-related healthcare visits (Vowles & McCracken, 2008). Mechanistic analyses from several treatment outcome studies provide further support for the contextual model of chronic pain. Changes in pain acceptance during treatment were related to changes in emotional state, physical and psychosocial disability, and physical task persistence, with changes in pain acceptance accounting for unique variance in these

outcomes beyond that accounted for by changes in pain intensity and catastrophic thinking (Vowles & McCracken, 2008). Overall increases in psychological flexibility mediated decreases in disability, depression, pain-related anxiety, number of medical visits, and the number of classes of prescribed analgesics resulting from interdisciplinary ACT treatment for chronic pain (Vowles et al., 2014). Further, recent analyses suggest that increases in pain acceptance, accompanied by increased engagement in values-driven behaviors (i.e., another core process of the contextual model) are related with statistically reliable reductions in disability (Vowles, Fink, Cohen, 2014). These findings point to potentially promising directions for focused study in veterans experiencing chronic pain and common co-occurring conditions.

In addition to chronic pain, the veterans in this study were dealing with complex co-occurring neurobehavioral conditions (i.e., PTSD, depression, alcohol use, mTBI). Our findings suggest that interventions that concurrently address chronic pain acceptance and these co-occurring conditions could be beneficial for reducing disability and improving quality of life. Combined interventions for PTSD and chronic pain have been developed, with preliminary empirical support (Bosco, Gallinati, & Clark, 2013; Otis, Keane, Kerns, Monson, & Scioli, 2009; Plagge, Lu, Lovejoy, Karl, & Dobscha, 2013). These treatments are primarily rooted in cognitive therapies (i.e., cognitive behavioral therapy, cognitive processing therapy), behavioral activation, and interdisciplinary treatment. Recommendations have also been developed for treating chronic pain and PTSD when comorbid with mTBI (Otis, McGlinchey, Vasterling, & Kerns, 2011).

The previously described ACT treatment model, based on acceptance of unwanted internal experiences including chronic pain, is transdiagnostic, and therefore holds promise as an integrated treatment approach to these co-occurring conditions. ACT has empirical support for the treatment of multiple mental health and biopsychosocial disorders including chronic pain (McCracken & Vowles, 2014; Vowles et al., 2014), depression (Walser, Karlin, Trockel, Mazina, & Taylor, 2013), and substance use problems (Bricker, Wyszynski, Comstock, & Heffner, 2013; Gifford et al., 2004; Hayes et al., 2004). There is some evidence for ACT-based treatment of PTSD and co-occurring substance use problems via case studies and open trials (e.g., Batten & Hayes, 2005; Hermann, Meyer, Schnurr, Batten, & Walser, under review). Further development and evaluation of ACT-based interventions for chronic pain in the context of co-occurring conditions could produce treatment options with significant potential impact for returning veterans suffering with these challenging and disabling problems.

Development of needed concurrent treatments can also be guided by empirical study of central neural sensitization. These neuroplastic central nervous system processes, which have been hypothesized to result from changes in the insular cortex involved in working memory, sensory integration, and somatic awareness (Alschuler & Otis, 2014; Lewis et al., 2012; Yunus, 2008), could provide an important key for understanding and treating polytrauma comorbidities in veterans. To date, this line of research has not identified clear treatment implications, but cognitive-behavioral therapies (CBT) and several classes of medications have shown promise in treating conditions involving central neural sensitization

(Lewis et al., 2012). Research to identify components of CBT and other psychological interventions that produce therapeutic changes in central sensitization is needed.

Strengths of the current study include the use of a state-of-the-art diagnostic interview to assess PTSD, well-validated self-report measures, and the inclusion of 1-year follow-up data. Though the sample was adequate for testing the hypothesized models, results would be strengthened by replication with a larger sample. Replication in a larger sample would allow for testing of the examined relationships within specific sub-domains of functioning, such as those assessed by the WHODAS 2.0, as well as examination of the component factors of the CPAQ. Additionally, it is unknown whether these findings would generalize beyond veterans with high rates of mental health diagnoses. Other variables that could contribute to disability in the context of chronic pain, such as pain control, coping, anxiety, and attention, were also not examined in this study. Future research is needed to determine whether augmenting traditional pain management practices with brief chronic pain acceptance interventions would benefit long-term functional recovery in veterans.

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Table 1**Sample Characteristics and Descriptive Information on Primary Study Variables**

Variable	M (SD)
Age	37.4 (9.6)
Education (years)	13.7 (2.1)
Number of OEF/OIF deployments	1.6 (0.7)
PTSD symptom severity (CAPS)	52.6 (27.1)
Chronic pain acceptance (CPAQ)	58.3 (19.4)
Alcohol-related problems (RAPI)	5.9 (11.5)
Depression symptoms (BDI-II)	22.3 (13.5)
Functional disability (WHODAS 2.0)	
- Mean item score	2.4 (0.7)
Pain severity (NRS)	6.8 (1.9)
Duration of pain (months)	90.5 (78.7)
Frequency of pain (days per week)	5.6 (1.9)
	% (n)
Sex: % Male	86.3 (69)
Race: % White	64.6 (51)
Ethnicity: % Hispanic	29.1 (23)
PTSD diagnosis – current % (CAPS)	55.0 (44)
PTSD diagnosis – lifetime % (CAPS)	75.0 (60)
Traumatic brain injury screen (BTBIS)	
-% positive (n)	55.7 (44)

Note. $n = 80$ unless otherwise noted. OEF/OIF = Operation Enduring Freedom/Operation Iraqi Freedom; Combat exposure = Full Combat Exposure Scale ($n=79$); CAPS = Clinician-Administered PTSD Scale; CPAQ = Chronic Pain Acceptance Questionnaire; BDI-II = Beck Depression Inventory II ($n=76$); RAPI = Rutgers Alcohol Problem Index (log transformed; $n=78$); BTBIS = Brief Traumatic Brain Injury Screen ($n=79$); WHODAS 2.0 = World Health Organization Disability Assessment Schedule 2.0; NRS = Numeric Rating Scale (0 to 10; $n=54$); Duration of pain ($n=54$); Frequency of pain ($n=55$).

Table 2
Correlations among Demographic Variables, Predictors and Disability at Baseline Assessment

	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender	–											
2. Age	–.10	–										
3. Years of education	–.45***	.34**	–									
4. Race – White/Caucasian	.01	–.07	.29*	–								
5. Ethnicity–Hispanic/Latino	.10	.00	–.05	.01	–							
6. Pain severity (NRS)	–.04	–.27	–.26	–.34*	–.01	–						
7. Duration of chronic pain	.02	.35*	.42**	.19	–.02	–.11	–					
8. PTSD severity (CAPS)	.05	–.11	–.23*	.07	.04	.17	.41**	–				
9. Depression (BDI-II)	–.05	–.12	–.15	.00	.00	.14	–.29*	.70***	–			
10. Alcohol-related problems (RAPI)	.16	–.22*	–.04	–.06	–.20	.08	–.20	.30**	.27*	–		
11. Traumatic brain injury screen (BTBIS)	.38**	–.08	–.28*	.13	.08	.08	–.19	.23*	.23*	.14	–	
12. Chronic pain acceptance (CPAQ)	–.07	.12	.18	–.02	.01	–.23	.25	–.48***	–.50***	–.19	–.14	–
13. Disability (WHODAS 2.0)	.04	–.01	–.11	.09	.04	.31*	–.34*	.65***	.69***	.24*	.37**	–.54***

Note. n = 80 unless otherwise noted. NRS = Numeric Rating Scale (0 to 10 scale; n=54); Duration of chronic pain = months (n=54); CAPS = Clinician-Administered PTSD Scale; BDI-II = Beck Depression Inventory II (n=76); RAPI = Rutgers Alcohol Problem Index (log transformed; n=78); BTBIS = Brief Traumatic Brain Injury Screen (n=79); CPAQ = Chronic Pain Acceptance Questionnaire; WHODAS 2.0 = World Health Organization Disability Assessment Schedule 2.0.

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 3

Hierarchical Regression of Global Disability on Co-Occurring Neurobehavioral Conditions and Chronic Pain Acceptance at Baseline

Predictor	<i>R</i> ² (<i>Adjusted</i>)	<i>B</i>
MODEL 1		
Step 1	.54 ***	
CAPS – PTSD severity		.29 *
BDI-II – Mean depression		.44 ***
RAPI – Mean alcohol problems		.02
BTBIS – TBI screen		.20 *
Step 2	.03 *	
CAPS – PTSD severity		.23 *
BDI-II – Mean depression		.37 **
RAPI – Mean alcohol problems		.01
BTBIS – TBI screen		.20 *
CPAQ – Total pain acceptance		-.21 *
Total Adjusted <i>R</i>²	.57 ***	

Note. n=80. Regression beta coefficients are standardized. CAPS = Clinician-Administered PTSD Scale; CPAQ = Chronic Pain Acceptance Questionnaire; BDI-II = Beck Depression Inventory- II; RAPI = Rutgers Alcohol Problem Index (log transformed); BTBIS = Brief Traumatic Brain Injury Screen. Total disability assessed by the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0).

*
 $p < .05$;

**
 $p < .01$;

 $p < .001$

Table 4

Hierarchical Regression Analyses of Global Disability at 1-Year Follow-Up on Co-Occurring Neurobehavioral Conditions, Chronic Pain Acceptance and Pain Severity

Predictor	<i>R</i> ² (Adjusted)	<i>B</i>
MODEL 2^a		
Step 1	.22 **	
CAPS – PTSD severity		.37 *
BDI-II – Mean depression		.15
RAPI – Mean alcohol problems		–.08
BTBIS – TBI screen		.14
Step 2	.07 **	
CAPS – PTSD severity		.29
BDI-II – Mean depression		.04
RAPI – Mean alcohol problems		–.09
BTBIS – TBI screen		.14
CPAQ – Total pain acceptance		–.34 **
Total Adjusted R²	.29 ***	
MODEL 3^b		
Step 1	.09 *	
NRS Pain severity		.34 *
Step 2	.16 *	
NRS Pain severity		.26 *
CAPS – PTSD severity		.34
BDI-II – Mean depression		.14
RAPI – Mean alcohol problems		–.10
BTBIS – TBI screen		.13
Step 3	.06 *	
NRS Pain severity		.22
CAPS – PTSD severity		.27
BDI-II – Mean depression		.05
RAPI – Mean alcohol problems		–.11
BTBIS – TBI screen		.13
CPAQ – Total pain acceptance		–.30 *
Total Adjusted R²	.31 ***	

Note. Regression beta coefficients are standardized. NRS = Numeric Rating Scale (0 – 10); CAPS = Clinician-Administered PTSD Scale; CPAQ = Chronic Pain Acceptance Questionnaire; BDI-II = Beck Depression Inventory- II; RAPI = Rutgers Alcohol Problem Index (log transformed); BTBIS = Brief Traumatic Brain Injury Screen. Total disability assessed by the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0).

^a_n=71.

$b_{n=54}$ $*p < .05;$ $**p < .01;$ $***p < .001$

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