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Acceptance of Pain in Neurological Disorders: Associations With Functioning and Psychosocial Well-Being

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Abstract

Objective—Chronic pain acceptance has been shown to be related to positive adjustment to chronic pain in patients presenting with pain as a primary problem. However, the role of pain acceptance in adjustment to chronic pain secondary to a neurological disorder that is often associated with physical disability has not been determined. The purpose of this study was to examine whether two domains of chronic pain acceptance—activity engagement and pain willingness—predict adjustment to pain, controlling for pain intensity and key demographic and clinical variables in individuals with muscular dystrophy (MD), multiple sclerosis (MS), post-polio syndrome (PPS), or spinal cord injury (SCI).

Method—Participants were 508 community-dwelling adults with a diagnosis of MD, MS, PPS, or SCI who also endorsed a chronic pain problem. Participants completed self-report measures of pain acceptance, quality of life, pain interference, pain intensity, depression, and social role satisfaction.

Results—Hierarchical linear regressions indicated that activity engagement predicted lower pain interference and depression, and greater quality of life and social role satisfaction. Pain willingness predicted less pain interference and depression. Together, the two pain acceptance subscales accounted for more variance in outcomes than did self-reported pain intensity.

Conclusions—Findings correspond with the broader pain acceptance literature, although activity engagement appears to be a more robust predictor of adjustment than does pain willingness. This research supports the need for future studies to determine the extent to which treatments that increase acceptance result in positive outcomes in persons with chronic pain secondary to neurological disorders.

Keywords

chronic pain acceptance; multiple sclerosis; muscular dystrophy; post-polio syndrome; spinal cord injury

Introduction

Chronic pain acceptance has recently emerged as an important predictor of adjustment to chronic pain. The current body of evidence suggests that pain acceptance relates broadly to indicators of adjustment, including lower pain intensity, less emotional distress, and better physical and psychosocial functioning (Gauthier et al., 2009; Kratz, Davis, & Zautra, 2007; McCracken, 1998; McCracken & Eccleston, 2003, 2006; McCracken, Spertus, Janeck, Sinclair, & Wetzel, 1999; Viane, Crombez, Eccleston, Devulder, & De Corte, 2004; Vowles, McCracken, & Eccleston, 2008). In addition, acceptance-based interventions have been shown to increase pain acceptance and to improve emotional and physical well-being and functioning (McCracken, Vowles, & Eccleston, 2005; Vowles & McCracken, 2008).

Pain acceptance consists of two distinct facets that are captured by the Pain Willingness and Activity Engagement sub-scales of the Chronic Pain Acceptance Questionnaire (CPAQ) (Vowles, McCracken, McLeod, & Eccleston, 2008). Pain willingness reflects how much an individual feels it is acceptable to allow, rather than attempt to control, pain. Activity engagement reflects the degree to which an individual engages in usual life activities, even with pain. Studies that examine these subscales separately generally indicate differences between activity engagement and pain willingness. For example, pain willingness was associated (negatively) with negative affect, whereas activity engagement was associated (positively) with positive affect in a heterogeneous pain sample (Kranz, Bollinger, & Nilges, 2010). Pain willingness was found to predict only emotional outcomes, whereas activity engagement predicted both emotional and functional outcomes (McCracken, 2007), and activity engagement was found to be a stronger and more consistent predictor of physical and emotional outcomes than pain willingness (Fish, McGuire, Hogan, Morrison, & Stewart, 2010). Additionally, activity engagement, but not pain willingness, was found to predict adjustment when controlling for cognitive variables like pain catastrophizing (Nicholas & Asghari, 2006), suggesting that activity engagement is the more unique or robust subscale. Activity engagement may also be more readily modifiable, as suggested by greater increases compared with pain willingness pre- to post-acceptance-based treatment (McCracken et al., 2005; Morone, Greco, & Weiner, 2008).

Previous studies of pain acceptance have largely focused on individuals with back and/or mixed pain conditions reporting to primary care or pain management clinics. A few studies have examined pain acceptance in other clinical populations, such as cancer (Gauthier et al., 2009), arthritis and fibromyalgia (Kratz et al., 2007; Lachapelle, Lavoie, & Boudreau, 2008), and hemophilia (Elander, Robinson, Mitchell, & Morris, 2009). However, pain acceptance has not yet been investigated in individuals with pain secondary to neurological disorders commonly associated with both pain and physical disability, such as muscular dystrophy (MD), multiple sclerosis (MS), post-polio syndrome (PPS), or spinal cord injury (SCI).

It is important to study pain acceptance among patients with chronic pain secondary to neurological disorders. Though prevalence rates vary by diagnosis, current evidence suggests that more than half of people with pain and a neurological condition report chronic pain associated with their primary neurological diagnosis (for review, see Ehde et al., 2003). It is essential to determine whether theoretical concepts of pain coping that are based on clinical populations where pain is the primary condition (e.g., chronic low back pain, chronic headaches) are equally applicable to clinical populations where pain is secondary to neurological disorders often associated with physical disability. This may be especially true when behavioral activity is a key part of the coping response, such as with activity engagement. Such investigations will inform efforts to develop and evaluate treatments for

chronic pain in neurorehabilitation populations, where there may be additional challenges to activity engagement due to a neurological disorder.

The purpose of this study was to evaluate pain acceptance in a heterogeneous sample of adults with chronic pain and one of four neurological disorders: MD, MS, PPS, or SCI. Specifically, we examined the extent to which activity engagement and pain willingness predicted pain interference, depression, quality of life and social role satisfaction, above and beyond the effects of pain intensity and key demographic and clinical variables.

Method

Participants

This study included 508 adults with chronic pain and a self-reported diagnosis of MD ($n = 74$), MS ($n = 129$), PPS ($n = 141$), or SCI ($n = 164$). Participants were allowed to select multiple racial/ethnic categories on the questionnaire, and Caucasian was the most commonly endorsed category (94.9%), followed by African American (2.2%), Native American (2.2%), Asian (1.2%), Hispanic or Latino (.4%), and Pacific Islander (.2%). The median household income was \$41,000 to \$55,000. In terms of partnership status, 54.8% were married, 18.9% were divorced, 12.6% were never married, 6.5% were widowed, 5.9% were living with a partner, and 1.2% were separated from their spouse. Nearly three-quarters (73.2%) were not employed at the time of the study. Additional demographic and clinical data information is depicted in Table 1. Demographic variables that were used as covariates in regression models are shown in Table 1 and described in the Measures section.

Procedure

This study utilized data from the initial assessment period (Year 1) of an ongoing longitudinal study examining secondary conditions in a sample of individuals aging with a neurological disability. To be eligible, participants had to have a self-reported diagnosis of MS, MD, PPS, or SCI; be able to read and write English; be at least 18 years of age; and provide written consent. Participants were recruited via advertisements in organization newsletters and Web sites, the university's registry of individuals with disabilities, and other registries such as the SCI Model Systems. Participants who had participated in prior studies and agreed to be contacted for future studies were also invited to participate. In total, 2,202 individuals responded to study advertisements for a "quality of life" study, and 2,041 were determined eligible to participate and were mailed a self-report survey. A total of 1,862 eligible individuals (84.6%) provided written consent and completed and returned the survey. To assess a broad number of constructs while simultaneously reducing participant burden, two versions of the survey were randomly distributed. The survey containing the pain acceptance measure (i.e., the CPAQ) was administered to 928 of the participants. Of those, 508 endorsed persistent, bothersome pain and were included in these analyses. All study procedures were approved by the institutional review board at the University of Washington. After completion of the survey, a check for \$25 was sent to each participant.

Measures

Demographic information—Information on participant sex, race/ethnicity, age, education level, employment status, income, medical diagnoses, and marital status was collected at the beginning of the questionnaire.

Time since injury—The date of SCI or diagnosis of MS, MD, or PPS was subtracted from the date the questionnaire was completed to calculate the years since diagnosis for each participant.

Mobility—Participant mobility was assessed with the Gross Motor Function Classification System (GMFCS; Palisano et al., 1997), in which each person classified their ability to “get around” on a 0 (*I have no mobility limitations*) to 5 (*I have severely limited self-mobility even with the use of assistive technology [e.g., power mobility]*) rating scale.

Pain intensity—Participants rated their current, worst, and average pain intensity during the past week on an 11-point numeric rating scale ranging from 0 (*no pain at all*) to 10 (*pain as bad as it can be*). A composite score that we labeled “characteristic pain” was calculated by multiplying the mean of these three pain items by 10, for a possible range of 0 to 100. This approach to quantifying pain is meant to more fully capture a reliable hierarchy of pain intensity than using a single rating of average, current, or worst pain alone (Von Korff, Ormel, Keefe, & Dworkin, 1992). Cronbach’s alpha for this composite pain intensity score was .87 in this sample.

Chronic pain acceptance—The CPAQ (McCracken, Vowles, & Eccleston, 2004) is a 20-item measure that assesses two domains of pain-related acceptance. The CPAQ can be scored to produce a total scale and two subscales—Activity Engagement (11 items) and Pain Willingness (9 items). The Activity Engagement subscale measures behavioral participation in life activities that may take place in the context of pain, but in a way that is not determined or influenced by the experience of pain. Items on the Activity Engagement subscale include “I am getting on with the business of living no matter what my level of pain is” and “When my pain increases, I can still take care of my responsibilities.” The Pain Willingness subscale measures the absence of responses to pain that reflect controlling or avoiding pain. Items on the pain willingness subscale include “I need to concentrate on getting rid of pain” and “I would gladly sacrifice important things in my life to control this pain better.” Participants rated the extent to which each item applies to them on a scale from 0 (*never true*) to 6 (*always true*). Previous studies support the validity, factor structure, and reliability of the CPAQ (McCracken et al., 2004; Vowles, McCracken, McLeod, et al., 2008). Cronbach’s alphas were .91 for the Activity Engagement subscale and .86 for the Pain Willingness subscale. The total scale was not analyzed in this study. Only participants who answered “Yes” to the screening question “Do you have persistent, bothersome pain?” completed the CPAQ, so analyses for this study utilized data only from individuals who endorsed a problem with chronic pain.

Pain interference—Participants were asked to rate the degree to which pain interfered with (a) your enjoyment of life, (b) your ability to concentrate, (c) your day-to-day activities, (d) your enjoyment of recreational activities, (e) doing your tasks away from home, and (f) your socializing with others on 5-point scales from 1 (*not at all*) to 5 (*very much*). These six items are the Pain Interference Short Form 6b of the Patient Reported Outcomes Measurement Information System (PROMIS) pain interference measure (Ammann et al., 2010), and were summed to create a total pain interference score. Pain interference scores were converted to *t* scores in order to be consistent with the PROMIS metric, in which scores for the general U.S. population have a mean of 50 and a standard deviation of 10 (Liu et al., 2010). This allows for a meaningful comparison of a person or group’s mean level on any given domain with the general U.S. population. The Cronbach’s alpha for this measure was .92 in this sample.

Depressive symptoms were assessed with the Patient Health Questionnaire-9 (PHQ-9; Spitzer, Kroenke, & Williams, 1999), a 9-item self-report measure of depressive symptoms from the Primary Care Evaluation of Mental Disorders (Spitzer et al., 1994). Participants rated how often they have been bothered by any of nine depressive symptoms over the last 2 weeks on a 4-point scale ranging from 0 (*not at all*) to 3 (*nearly every day*). Item scores are

summed to produce a symptom-severity score with a theoretical range of 0 to 27, where higher values reflected greater endorsement of depressive symptomatology (Kroenke, Spitzer, & Williams, 2001). The scale demonstrated adequate internal reliability in the sample with a Cronbach's alpha of .84.

Quality of life was measured with a single item (Kemp, 2004). Participants were asked, "Taking everything in your life into account, please rate your overall quality of life on this 7-point scale." The following response options were provided: 1 = *Very distressing. It's hard to imagine how it could get much worse*; 4 = *So-So*; 7 = *Great! It's hard to imagine how it could get much better*. The modal response was 6 ($n = 100$) and the median response was 5 for this sample. The validity of this measure is supported by findings that scores correspond to other indicators of well-being or distress, including depression symptoms, morbidity (Kemp, 2004), and community participation. Furthermore, this measure demonstrated similar sensitivity to change (effect size) as the health-related quality of life subscales of the Short Form 36 Health Survey (SF-36) in an exercise-based intervention for shoulder pain in SCI (Mulroy et al., 2011; Ware & Sherbourne, 1992). Moderate correlations between the quality of life items and depressive symptoms, pain intensity, pain interference, and social role satisfaction (see Table 2) in expected directions in this sample are also supportive of the validity of this item.

Social role satisfaction—Participant contentment or satisfaction with social roles, such as work, home, family, and self-care responsibilities in the past 7 days was assessed with the 7-item PROMIS Adult Satisfaction with Participation in Social Roles, Version 1.0 Short Form. Participants rated their satisfaction with social roles on a 5-point scale from 1 (*not at all*) to 5 (*very much*). Social roles evaluated were ability to (a) do things for my family, (b) meet the needs of those who depend on me, (c) perform my daily routine, (d) run errands, (e) work (including work at home), (f) do household chores/tasks, and (g) with how much work I can do (including work at home). Items were summed for a total social role satisfaction score. *T* score transformed values were used in all analyses, as is consistent with the PROMIS metric. Cronbach's alpha for these 7 items was .93 in this sample.

Data Analyses

Preliminary data analyses included computing descriptive statistics and zero-order correlations for demographic, predictor, and criterion variables. Prior to completing the primary analyses, categorical variables—sex and diagnosis group—were dummy coded for use as predictors in linear regression (Cohen, Cohen, West, & Aiken, 2003). Specifically, sex was dummy coded such that male was the reference category, and a set of three dummy codes was created for diagnosis group, with SCI as the reference category (chosen because it the largest diagnosis group and the only diagnosis associated with onset due to traumatic injury). Four hierarchical linear regressions were used to test the prediction of the four criterion variables: pain interference, depressive symptoms, quality of life, and social role satisfaction. Demographic (age, education, sex) variables were entered in Step 1, diagnosis-related variables (diagnosis and years since diagnosis) were entered in Step 2, pain intensity and mobility limitations were entered in Step 3, and the acceptance variables (activity engagement and pain willingness) were entered in Step 4 of the hierarchical regression equation. Nonsignificant demographic and diagnosis-related variables—other than pain intensity (which was retained regardless of significance)—that were not independently significant predictors were dropped ($p < .05$ to retain) one at a time, starting with the weakest predictor, to arrive at a final equation. To address the main study aim of evaluating the role of activity engagement and pain willingness in predicting adjustment to pain, beta weights and significance for individual variables, as well as the proportion of variance accounted for in outcomes by each set of variables, were examined.

Results

Frequencies or means and standard deviations for predictors and criterion variables by diagnosis are reported in Table 1. Across the entire sample, most participants were male and had completed at least some college. There was a wide range of ages represented, from age 20 to 91 years, with a mean age of 56 years for the sample. Similarly, there was a 61-year range in years-since-diagnosis, though the average for the whole sample was slightly less than 16 years. The sample as a whole reported “moderate” pain intensity ($M = 55.77$) and “mild depression” ($M = 7.50$). On average, the sample rated their overall quality of life as slightly higher than “So-So” ($M = 4.59$) and their satisfaction with social roles as slightly lower than “somewhat satisfied” across social domains. In absolute terms, the mean for social role satisfaction ($M = 43.98$) was lower than the mean for the general population ($M = 50$), but was within one standard deviation ($SD = 10$). The mean score for pain interference ($M = 60.42$) was more than one standard deviation higher than the average for the general population ($M = 50$, $SD = 10$). On the GMFCS, a small percentage of participants reported no or low mobility limitations, with a modal response of “limited self-mobility with assistance or device and use power mobility outdoors and in the community.”

Zero-order correlation results are presented in the upper rows of Table 2. Most correlations between demographic variables and study variables were small (all r s $< .32$). Significant correlations include negative associations between mobility limitations and social role satisfaction ($r = -.31$, $p < .01$), and between education and pain intensity ($r = -.20$, $p < .01$). As expected, greater pain intensity was related to greater mobility limitations, pain interference and depression, and lower quality of life and social role satisfaction. Activity engagement and pain willingness showed significant moderate-sized correlations with all outcomes in expected directions; the correlation of pain intensity with both activity engagement and pain willingness was identical, $r = -.33$.

The results of the hierarchical linear regression analyses predicting pain interference, depression, quality of life, and social role satisfaction are presented in Table 3. None of the demographic variables tested (Step 1)—including age, sex, and education—were retained as significant predictors in any of the models.

In terms of diagnosis-related variables (Step 2), years-since-diagnosis was a significant predictor of depression, with greater years since diagnosis related to lower levels of depressive symptoms. Medical diagnosis was a significant predictor of pain interference, depression, and social role satisfaction. Specifically, compared with SCI (reference group), PPS was significantly different in the prediction of pain interference, MS was significantly different in the prediction of depression, and MD, MS, and PPS were significantly different in prediction of social role satisfaction. Post hoc analyses of variance with simple contrasts and including all relevant covariates that were in the regression model were conducted to examine significant differences by diagnosis. For pain interference, participants with SCI ($M = 16.25$, $SE = .29$) reported significantly lower mean levels compared with PPS ($M = 17.14$, $SE = .31$; contrast estimate = .92, $SE = .43$, $p = .03$, 95% CI [.08, 1.75]); the differences between SCI and MS ($M = 16.51$, $SE = .33$) and MD ($M = 17.18$, $SE = .43$) were not statistically significant. Comparing depressive symptoms between the four medical diagnoses groups revealed that participants with MS ($M = 8.83$, $SE = .39$) reported significantly higher mean levels of depressive symptoms compared with those with PPS ($M = 6.62$, $SE = .41$; contrast estimate = 2.21, $SE = .57$, $p < .001$, 95% CI [1.10, 3.33]) or SCI ($M = 7.27$, $SE = .35$; contrast estimate = 1.57, $SE = .53$, $p < .01$, 95% CI [.52, 2.62]); the difference in depressive symptoms between MS and MD ($M = 7.66$, $SE = .53$) groups was not statistically significant. The SCI group ($M = 21.92$, $SE = .44$) reported significantly higher levels of social role satisfaction compared with MD ($M = 20.21$, $SE = .63$; contrast

estimate = -1.71 , $SE = .78$, $p = .03$, 95% CI [-3.24 , $-.18$]), MS ($M = 18.64$, $SE = .49$; contrast estimate = -3.29 , $SE = .69$, $p < .001$, 95% CI = [-4.65 , -1.93]), and PPS ($M = 19.47$, $SE = .45$; contrast estimate = -2.45 , $SE = .62$, $p < .01$, 95% CI [-3.68 , -1.23]); the difference between mean social role satisfaction for MD and MS was also significant (contrast estimate = -1.57 , $SE = .79$, $p = .04$, 95% CI [-3.12 , $-.03$]).

In terms of symptoms and functioning (Step 3), greater mobility limitations were related to significantly lower social role satisfaction, but mobility was not a significant predictor of any other outcomes. Pain intensity was a significant independent predictor of greater pain interference and depression and lesser quality of life, but did not significantly predict social role satisfaction.

As a set, pain willingness and activity engagement (Step 4) were significant predictors of all outcomes and accounted for more variance in outcomes than any other set of predictors. Specifically, variance accounted for by pain acceptance ranged from 21% to 31% across outcomes. Pain intensity and mobility, on the other hand, accounted for between 5% and 17% of the variance in outcomes, with the exception of pain interference, where pain intensity naturally accounted for a relatively large proportion of the variance (30%). Even in the case of pain interference, however, pain acceptance accounted for more variance than pain intensity. Independently, activity engagement was a significant predictor of better pain interference, depression, quality of life, and social role satisfaction, and beta weights for activity engagement were more substantial than the beta for any other individual variable. Pain willingness, on the other hand, was only related to better pain interference and depression, and had relatively small beta weights in the final equations.

Discussion

The research linking chronic pain acceptance to positive adjustment to pain has grown steadily in the past decade. This work has led to increased scientific understanding of the psychosocial experience of individuals with chronic pain, and has informed current and developing clinical practice with these patients. To date, research on chronic pain acceptance has focused on individuals for whom pain is the primary condition; consequently, little is known about the role of acceptance in individuals with chronic pain that is secondary to a neurological disorder that may be associated with significant physical disability. To our knowledge, the current study is the first to address the question of how pain acceptance is related to outcomes in persons with pain and the neurological conditions of MD, MS, PPS, and SCI.

Pain acceptance variables—activity engagement and pain willingness—as a set were significant predictors of each outcome variable and in all equations accounted for more variance in the criterion variables than any other predictor. Activity engagement in particular appears to be an important predictor of adjustment to chronic pain, as it demonstrated relatively robust and significant prediction of lower pain interference and depression and greater quality of life and social role satisfaction. Interestingly, pain willingness predicted only what could be considered “negative” indicators of adjustment, namely, less pain interference and depression, but did not predict “positive” indicators, that is, quality of life or social role satisfaction. Also, pain willingness showed less robust prediction of these outcomes, as indicated by smaller beta weights compared with activity engagement.

The results indicating that activity engagement is related to both positive and negative indicators of adjustment and that pain willingness is related to only negative indicators of adjustment were not predicted but are generally consistent with previous findings (Fish et al., 2010; Kranz et al., 2010; McCracken, 2007; Nicholas & Asghari, 2006). These results

somewhat parallel the finding that pain willingness is related to lower negative affect, whereas activity engagement is related to higher positive affect (Kranz et al., 2010). Additionally, previous research has found that activity engagement is a more robust and consistent predictor of emotional and physical/functioning outcomes (Fish et al., 2010; McCracken, 2007; Nicholas & Asghari, 2006).

Interestingly, in this sample, neither pain intensity nor diagnosis were consistent predictors of all outcomes. Whereas pain intensity was related to significantly greater pain interference and depression and lower quality of life, it was not a significant predictor of social role satisfaction. Similarly, differences by diagnosis were detected for pain interference, depression, and social role satisfaction, but not for quality of life. It is notable that, even in cases where pain intensity and diagnosis were significant predictors, pain acceptance accounted for relatively large proportions of variance in the outcome beyond the contribution of these important factors.

Also consistent with previous research in heterogeneous pain samples, this study found that higher pain acceptance corresponded with lower levels of pain intensity ($r = -.33$; Kratz et al., 2007; McCracken, 1998; McCracken & Eccleston, 2003, 2006; McCracken & Vowles, 2008). This relatively modest correlation suggests that pain acceptance is not simply a function of having low pain. This finding is in line with the conceptual underpinnings of pain acceptance, which emphasize the immutable nature of chronic pain and the fact that efforts to eliminate pain are often futile. Instead, from an acceptance-based approach, pain is a part of life that does not have to be a major source of suffering or a barrier to living life. This is reflected in acceptance-based treatments for pain that do not emphasize reduction of pain. Rather, treatments such as operant pain treatment, mindfulness-based stress reduction (MBSR), and acceptance and commitment therapy (ACT) share common goals of weakening the link between pain sensations and emotional, physical, and social distress and dysfunction (Fordyce, 1976; Kabat-Zinn, Lipworth, & Burney, 1985; Vowles & McCracken, 2008).

Pain acceptance is highly consistent with other long-standing models of chronic pain and pain coping. Fordyce (1976) wrote about behavioral approaches for adjusting to pain, including non-pain contingent activity and task persistence, which correspond highly with pain willingness and activity engagement, respectively. From a goals-attainment framework (Wrosch, Scheier, Miller, Schulz, & Carver, 2003), pain acceptance can be conceptualized as a flexible type of coping, where pain willingness reflects a relative willingness to disengage from pain reduction goals and activity engagement reflects a general orientation to reengagement in broader life activities despite pain. McCracken (2010) has argued that pain acceptance is achieved only when these two facets function together, as pain willingness reflects the quality (“how”) of the activities that are engaged in (not resigning and struggling but rather intentional and willingly). It has also been speculated that pain willingness is a precursor, or a necessary precondition, to activity engagement; this notion has been supported by findings that activity engagement mediates the association between pain willingness and positive affect, for example (Kranz et al., 2010). A study that identified three patient clusters based on CPAQ scores found that the largest subgroup of individuals scored low on pain willingness and high on activity engagement, and reported fewer difficulties than those who were low on both pain willingness and activity engagement, but more difficulties than those who were high on both subscales (Vowles, McCracken, McLeod, et al., 2008). These findings suggest that willingness is not a necessary condition for engaging in activities, but that those who are both willing *and* actively engaging in life’s activities and responsibilities demonstrate optimal functioning.

This examination of pain acceptance was undertaken in neurorehabilitation populations where “acceptance of disability” is a popular concept. Study of acceptance of disability, which predates the pain acceptance research by almost three decades, is broadly conceptualized as an adjustment of a person’s value system following the loss of a former level of physical ability (Keany & Glueckauf, 1993). Like pain acceptance, acceptance of disability has been found to relate to indicators of positive adjustment (Li & Moore, 1998) and is defined, in part, as the orientation to engage in a broad range of life activities despite the challenges associated with physical disability. It is possible that once an individual has learned to accept and cope flexibly with one challenge, such as physical disability, it is relatively easier to accept subsequent challenges, such as chronic pain. Alternatively, some individuals may find it increasingly difficult to accept a series of physical challenges. Another hypothesis is that individuals use different coping strategies to deal with different challenges like pain and physical disability. The findings about the relative importance of activity engagement compared with pain willingness are particularly interesting within this context. The exploration of how acceptance of various challenges or symptoms such as pain, fatigue, and physical limitation, along with how often competing values, such as pain elimination and engagement in activity, overlap and interact could offer additional insight into how individuals cope with complex medical situations. Because only acceptance of chronic pain was measured in this study, these questions could not be addressed within these data.

Clinical and Research Implications

Existing manualized treatments, such as MBSR and ACT, aim to improve adjustment by way of increasing acceptance of pain. An examination of the effectiveness of a multidisciplinary group intervention consistent with ACT resulted in significant and moderate to large improvements in pain acceptance and pain intensity, depression, and anxiety in a sample of chronic pain patients (Vowles & McCracken, 2008). Although MBSR and ACT interventions have not been empirically tested in neurorehabilitation populations, the present study’s findings suggest that they are potentially relevant to the treatment of pain in neurological disorders. The findings from this study indicate that further investigation of pain acceptance in the context of a neurological disorder may prove useful for improving the treatment of chronic pain associated with these groups.

Moreover, findings suggest that other forms of psychological intervention that are not typically considered “acceptance-based” approaches but that encourage activation and life engagement despite pain may also be beneficial. These include traditional cognitive-behavioral treatment (Keefe, Dunsmore, & Burnett, 1992) and operant approaches (Fordyce, 1976) to pain. Research examining the extent to which improvements with these treatments are mediated by changes in pain acceptance versus, or in addition to, other psychological and behavioral factors thought to mediate outcome (e.g., environmental responses to pain behavior, pain catastrophizing, perceived control over pain, belief that pain is a sign of physical damage, guarding, and pain-contingent resting; Jensen, Moore, Bockow, Ehde, & Engel, 2011) would also help to shed light on the relative importance of acceptance to pain treatment outcomes.

Strengths and Limitations

The consideration of diverse outcomes is an important strength in this study. The four outcomes examined broadly encompass both negative (depression, pain interference) and positive (social role satisfaction, quality of life) indicators of adjustment to chronic pain secondary to physical disability, as well as adjustment across social, emotional, and physical domains. Another strength of this study is our large, relatively heterogeneous sample, which represents a range of ages, mobility levels, pain and disease severity, and neurological

diagnoses. On the other hand, the relatively well-educated sample of mostly Caucasian race limits our ability to generalize findings to a broader population. Future research should look at pain acceptance in other neurological populations where chronic pain is common, including traumatic brain injury (Nampiarampil, 2008), Parkinson's disease (Beiske, Loge, Ronningen, & Svensson, 2009), and stroke (Kong, Woon, & Yang, 2004).

Because they were not assessed in this study, cognitive factors, such as catastrophizing, as well as other pain coping responses that are known to predict pain adjustment and to account for some or all (in rare cases) of the predictive ability of pain acceptance (Nicholas & Asghari, 2006; Richardson et al., 2009), could not be evaluated. Methodological limitations include relying on self-report of medical diagnosis and use of a single item to measure quality of life, which would have most likely been better and more reliably captured with a survey that asked about multiple aspects of quality of life. Requiring physician confirmation of diagnosis and using validated outcomes measures is preferable. The recruitment strategies used have a number of pros and cons. Due to the fact that the sample was community based (not clinic based) and was advertised as a quality of life study (not a pain study), our sample may be different from previously published studies on pain acceptance that utilized clinic patients or specifically recruited individuals with pain. Although this could be viewed as a strength, in that we replicated prior findings in a unique sample, it also limits our ability to directly compare the findings across these studies. Future studies should include not only pain acceptance constructs but also other psychosocial domains important to pain adjustment, including both pain-related beliefs and coping. Finally, because of the cross-sectional nature of this study, we are unable to draw conclusions about the direction of the association between acceptance and indicators of adjustment to chronic pain.

Conclusions

Despite the study's limitations, the findings shed additional light on the potential importance of pain acceptance to adjustment to chronic pain in persons with neurological disorders, and suggest that acceptance concepts might help to better understand response to pain as well as inform the treatment of pain in these populations. Important next steps include determining the relative importance, compared with other psychological factors of known importance, of acceptance constructs as well as examining the benefits of pain treatments that target pain acceptance in persons with neurological disorders.

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Impact and Implications

- Although acceptance of pain has been extensively examined in populations where pain is the primary medical symptom, this is the first study to examine the association of pain acceptance to adjustment in a sample of individuals with neurological disorders and chronic pain.
- Consistent with previous research, these findings indicate that pain acceptance is related to indicators of positive adjustment, and further extend those findings to suggest that one facet of acceptance, activity engagement, is a particularly robust predictor of increased well-being and reduced distress.
- Psychological interventions that bolster acceptance of pain may result in improved functioning and well-being for those who have chronic pain in addition to a neurological disorder.

Table 1

Descriptive Statistics for Demographic, Clinical, and Key Study Variables by Diagnosis

Variable	MD <i>n</i> = 74	MS <i>n</i> = 129	PPS <i>n</i> = 141	SCI <i>n</i> = 164
Age (possible range = NA)	53.53 (1.27) ^a	53.88 (.96) ^a	66.09 (.92) ^b	50.41 (.85) ^c
Pain intensity (possible range = 0–100)	51.53 (2.15) ^b	52.95 (1.63) ^b	56.69 (1.56)	59.11 (1.45) ^a
Pain Interference (possible range = 0–100)	16.46 (.67)	16.49 (.52) ^a	17.62 (.49) ^b	16.40 (.46) ^b
Years since diagnosis (possible range = NA)	15.65 (1.21)	14.95 (.90)	15.48 (.92)	17.01 (.80)
Activity engagement (possible range = 0–66)	43.34 (1.45)	44.24 (1.10)	42.16 (1.05)	43.35 (1.00)
Pain willingness (possible range = 0–54)	30.16 (1.27)	27.12 (.96)	26.58 (.92)	29.01 (.85)
Depressive symptoms (possible range = 0–27)	7.23 (.60)	8.67 (.46) ^a	6.93 (.44) ^b	7.17 (.41) ^b
Quality of life (possible range = 1–7)	4.47 (.16)	4.56 (.12)	4.69 (.12)	4.57 (.11)
Social role satisfaction (possible range = 0–100)	20.99 (.81) ^b	20.16 (.61)	18.84 (.58) ^a	20.95 (.54) ^b
Frequencies <i>N</i> (%)				
Gender <i>n</i> (%) female	39 (52.7)	112 (86.8)	111 (78.7)	51 (31.1)
Education				
<12th grade	2 (2.7)	1 (0.8)	1 (0.7)	8 (4.8)
High school or GED	9 (12.2)	13 (10.1)	15 (10.6)	19 (11.6)
Vocational/Tech school	3 (4.1)	10 (7.8)	3 (2.1)	13 (7.9)
Some college	19 (25.7)	47 (36.4)	34 (24.1)	50 (30.5)
College graduate	20 (27.0)	36 (27.9)	40 (28.4)	53 (32.3)
Graduate or professional school	21 (28.4)	22 (17.1)	48 (34.0)	21 (12.8)
Mobility limitations (GMFCS)				
0. Walk without restrictions	2 (2.7)	22 (17.1)	5 (3.5)	5 (3.1)
1. Walk w/o restrictions, but have limitations in more advanced gross motor skills	13 (17.6)	22 (17.1)	9 (6.4)	8 (5.0)
2. Walk w/o an assistive device and have limits walking outdoors & in the community	21 (28.4)	33 (25.6)	26 (18.4)	13 (8.1)
3. Walk with assistive mobility device & have limits walking outdoors & in the community	21 (28.4)	27 (20.9)	40 (28.4)	16 (9.9)
4. Limited self-mobility with assistance or device & use power mobility outdoors & in community	13 (17.6)	18 (14.0)	42 (29.8)	91 (56.5)
5. Severely limited self-mobility even with use of assistive technology	4 (5.4)	7 (5.4)	19 (13.5)	28 (17.4)

Note. GED = General Education Development (high school equivalency test); GMFCS = Gross Motor Functioning Scale (Palisano, et al., 1997); MD = muscular dystrophy; MS = multiple sclerosis; PPS = post-polio syndrome; SCI = spinal cord injury.

^{a,b,c} Means with different superscripts are significantly different in general linear models with simple group contrasts.

Table 2
Zero-Order Correlations of Participant Demographic and Key Study Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Age	—									
2. Mobility limitations	.13**	—								
3. Education	.13**	.01	—							
4. Years since diagnosis	.28**	.25**	.02	—						
5. Activity engagement	-.03	-.14**	.11*	.01	—					
6. Pain willingness	-.13**	-.07	.09	-.03	.57**	—				
7. Pain intensity	-.06	.23**	-.20**	.11*	-.33**	-.33**	—			
8. Pain interference	.10*	.14**	-.08	.03	-.65**	-.59**	.53**	—		
9. Depressive symptoms	-.08	-.01	-.11*	-.09	-.50**	-.40**	.25**	.50**	—	
10. Quality of life	-.01	-.15**	.08	-.01	.54**	.35**	-.31**	-.46**	-.52**	—
11. Social role satisfaction	-.11*	-.31**	.10*	-.02	.58**	.37**	-.28**	-.53**	-.50**	.58**

* $p < .05$.

** $p < .01$.

Table 3
 Hierarchical Linear Regression Results Predicting Four Indicators of Adjustment From Diagnosis-Related Variables, Pain Intensity, Mobility, Activity Engagement, and Pain Willingness

Criterion	Step	Predictor	Adjusted R^2	$R^2\Delta$	Final β	p value
Pain interference	1	MD vs. SCI	.002	.002	.06	.07
		MS vs. SCI			.04	.18
		PPS vs. SCI			.07	.03
Pain intensity	2		.30	.30**	.32	<.001
		Pain willingness	.61	.31**	-.28	<.001
Depression	1	Activity engagement			-.39	<.001
		Years since diagnosis	.01	.01*	-.09	.02
		MD vs. SCI			.03	.53
Quality of life	1	MS vs. SCI			.13	<.01
		PPS vs. SCI			-.05	.23
		Pain intensity	.09	.08**	.10	.02
Social role Satisfaction	2	Pain willingness	.29	.21**	-.15	<.01
		Activity engagement			-.39	<.001
		Pain intensity	.09	.09**	-.14	<.001
Mobility	2	Pain Willingness	.31	.22**	.02	.60
		Activity engagement			.48	<.001
		MD vs. SCI	.01	.01*	-.09	.03
Activity engagement	1	MS vs. SCI			-.21	<.001
		PPS vs. SCI			-.16	<.001
		Pain intensity	.18	.17**	-.06	.13
Pain willingness	3	Mobility			-.29	<.001
		Pain willingness	.42	.25**	.02	.64
		Activity engagement			.52	<.001

Note. MD = muscular dystrophy; MS = multiple sclerosis; PPS = post-polio syndrome; SCI = spinal cord injury; Sex: 0 = male, 1 = female; β = standardized coefficient; Adjusted R^2 = a modification of R^2 that adjusts for the number of explanatory terms in the model. Values are slightly smaller than unadjusted R^2 values and are thought to better reflect population values.

* $p < .05$.

**
 $p < .01$.

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