Published in final edited form as:

Clin J Pain. 2018 April ; 34(4): 357–365. doi:10.1097/AJP.0000000000000550.

Medicate or Meditate? Greater Pain Acceptance is Related to Lower Pain Medication Use in Persons With Chronic Pain and Spinal Cord Injury

Anna L. Kratz, PhD^a, John Murphy III, BS^a, Claire Z. Kalpakjian, PhD^a, and Philip Chen, MD^a

^aDepartment of Physical Medicine & Rehabilitation, University of Michigan, 325 E. Eisenhower Parkway, Ann Arbor, MI 48108, USA

Abstract

Objectives—There is little information about whether use of pain self-management skills that are common targets of psychosocial interventions for pain are associated with reduced reliance on pain medications. The aim of this study was to test whether higher chronic pain acceptance, which is a readily-modified pain self-management approach, is related to lower use of pain medications (all types), opioid medications, and gabapentinoids in a sample with chronic pain and spinal cord injury (SCI).

Methods—This is a cross-sectional survey study of pain medication use, pain severity and distribution (BPI), depressive symptoms (PHQ-9), and chronic pain acceptance (CPAQ) administered to a sample of 120 adults with chronic pain and SCI.

Results—Regression results indicated that, above and beyond the effects of pain intensity, pain distribution and depressive symptoms, higher pain acceptance was related to lower use of all types of pain medications, and lower odds of using opioid medications or gabapentinoids. Pain intensity was not related to pain medication use, but greater pain distribution was related to using more pain medications in general and to greater odds of using gabapentinoid medications.

Discussion—Findings from this study indicate that those with chronic pain and SCI who have a more accepting orientation to pain are less reliant on pain medications, and thereby experience lower risks associated with medication consumption. Longitudinal, daily process, and clinical trial studies are needed to better understand the association between pain acceptance and pain medication consumption.

Keywords

pain acceptance; spinal cord injury; opioids; gabapentinoids; pain medication; pain intensity; pain distribution

Corresponding Author: Anna L. Kratz, Department of Physical Medicine & Rehabilitation, University of Michigan, North Campus Research Complex, 2800 Plymouth Rd, Building NCRC B14, Room G218, Ann Arbor, MI, 48109-2800, Phone: (734) 647-5982, Fax: (734) 763-5927, alkratz@med.umich.edu.

Disclosures: The authors have no conflicts of interest to report.

Introduction

Chronic pain is very common after spinal cord injury (SCI), with a prevalence of approximately 65% [1-3]. Pain, which is often rated as “severe” or “excruciating” [1-3], is associated with adverse effects on well-being, function, and quality of life [1, 4-8] and is considered the most disabling secondary condition in SCI [9]. Similar to other chronic pain populations, various treatment modalities, including use of multiple pain medications (e.g., opioid and non-opioid analgesics, anti-convulsants) are typically used, but are often insufficient for resolving pain in persons with SCI [1, 10, 11]. Lack of efficacy as well as negative side effects are reasons that many with chronic pain and SCI try and discontinue numerous pain medications in search of pain relief [10, 12-14].

There is mounting concern about overuse of pain medications, particularly for chronic pain. Although most of this concern has focused on opioids, which are associated with significant morbidity and mortality as well as poor efficacy for chronic pain [15-17], other pain medications also present significant risks. For instance, nonsteroidal anti-inflammatory drugs (NSAIDs) present the risk for toxicity-related stomach upset, gastrointestinal bleeding and kidney failure [18, 19]. Anti-epileptics, which are commonly used to treat neuropathic pain in SCI, can be accompanied by a number of side effects, such as fatigue, dizziness, unsteadiness, somnolence, dry mouth, swelling, gastrointestinal problems, and cognitive dysfunction [13, 20]. In addition to these concerns about pain medications in the general population, there are reasons for specific concerns about pain medication use in those with SCI. Persons with SCI may be particularly sensitive to central nervous system-related side effects that are especially common to opioid and anti-epileptic drugs (e.g., gabapentin), possibly due to concomitant use of other centrally-acting agents to address other problems, such as neurogenic bladder and spasticity [21]. SCI can make it difficult for some individuals to detect stomach upset related to NSAIDs or other medications and opioid-induced constipation [22, 23] can present a particular challenge to those with compromised bowel functioning (i.e., neurogenic bowel dysfunction). Furthermore, the extant literature suggests a synergistic effect between the pathophysiology of SCI and the use of opioid medications that can increase the risk for worsening pain, locomotor deficits, infections, and mortality [24]. Despite these concerns, a survey of persons with SCI suggested an increase in the number of pain medications used over time, with no change in pain severity [14]. Taken together, these findings indicate a clear need for effective non-pharmacological alternatives in order to reduce reliance on all types of pain medications in those with chronic pain and SCI.

Psychological interventions for chronic pain, including so-called “third wave” behavioral therapies such as Acceptance and Commitment Therapy (ACT) and Mindfulness-Based Stress Reduction (MBSR), are associated with reduced pain intensity and improved physical and emotional function [12, 25-36]. When used to treat chronic pain, interventions such as ACT and MBSR typically include a treatment component that focuses on increasing pain acceptance, commonly defined as the willingness to experience pain (“pain willingness”) coupled with engagement in valued life activities (“activities engagement”) [37-39]. Interestingly, multidisciplinary pain treatment programs that are not acceptance-focused, *per se*, as well as the aforementioned acceptance-based interventions have been shown to

increase pain acceptance [28-35, 40]. In addition, there is a robust body of observational research showing that greater acceptance of pain is associated with lower emotional distress and better physical and psychosocial functioning in multiple chronic pain conditions [41-49], and with lower pain interference, depression, and higher functioning and quality of life in persons with SCI [50-52].

These data are encouraging as to the positive effects of psychological pain interventions generally and of the benefits of pain acceptance specifically. In the context of a growing interest in reducing pain medication use, it is also important to determine whether one of the outcomes of psychological approaches to pain management is a reduced reliance on pain medication. Although this is one of the assumed benefits, studies on the association between pain coping or self-management interventions and reliance on pain medication are lacking. Data on the effects of behavioral intervention on pain medication use are sparse and equivocal [53-55], and there are no known studies that examine this in the context of SCI. The question of whether pain acceptance is specifically related to lower reliance on pain medications in any clinical population has also not been investigated. Because willingness to experience pain coupled with a de-emphasis on reduction/control of pain are foundational aspects of pain acceptance [56], it is plausible that acceptance of pain may be an especially important construct to investigate as it relates to pain medication use. Such knowledge can inform treatment planning and patient-specific tailoring of psychological pain interventions.

The purpose of this study was to examine the association between levels of pain acceptance and medication use in a sample of persons with chronic pain and SCI. Our hypothesis was that those with higher pain acceptance would use fewer pain medications, controlling for pain intensity, pain distribution (number of pain sites on the body), and level of depressive symptoms. In examining this association, we considered whether pain acceptance related to the use of a number of different types of medications that are commonly used for chronic pain management, opioid medications alone, and gabapentinoids (i.e. gabapentin or pregabalin) alone; these drugs were singled out due to their high rate of use in SCI and their especially high risk for serious side effects. We also examined whether one of the components of pain acceptance, pain willingness or activities engagement, was the main driver of these associations, with the expectation that pain willingness would be more strongly associated with pain medication use than activities engagement.

Materials & Methods

Participants

Participants with SCI and chronic pain participated in this study. Potential volunteers were told that this was a study of chronic pain in SCI and asked whether they had “chronic pain” (not further operationalized) and were interested in participating. Inclusion criteria were: 1)

18 years of age; 2) 4/10 average pain *in the past month* on a 0 “no pain” to 10 “worst imaginable pain” scale, which is typically recommended as the minimum score to screen for “clinically significant”, at least “moderate” pain that interferes with daily functioning [57-62]; 3) SCI diagnosis (confirmed by medical record review); 4) 1 year since SCI; 5) able to use the study device (i.e., use a touchscreen or computer mouse and push a button on a wristwatch with finger of opposing hand); 6) able to converse fluently in English; and 7)

able to read at the 6th grade level. Subjects were excluded from participating if they had atypical wake/sleep patterns (e.g., shift work) or were currently receiving inpatient rehabilitation or hospitalization.

Study Procedures

This is a secondary analysis of cross-sectional data from a study that examined the role of pain acceptance in the day-to-day experiences of people with chronic pain and SCI. The study included a 7-day home monitoring period where participants continuously wore an accelerometer, provided real-time self-report of pain and pain interference 5 times a day, and completed end-of-day online surveys each of the 7 nights. Data from the baseline survey measures were analyzed for this study. Details on the full study methodology can be found in earlier papers [51, 63].

Three sites collaborated to collect these data: University of Michigan (UM) in Ann Arbor, MI, Wayne State University/Rehabilitation Institute of Michigan (WSU/RIM) in Detroit, MI, and University of Washington (UW) in Seattle, WA. Institutional Review Board (IRB) approval was granted prior to initiation of study activities at each site. Data were collected between June 2014 and January 2016.

Study participants were recruited through placement of flyers in medical centers and community locations, electronic medical records, and existing participant/patient registries. All recruiting was done through email or telephone with initial screening conducted over the telephone. Eligible volunteers were then scheduled for an in-person visit where they underwent informed consent procedures. After providing written consent, participants completed an in-lab baseline survey battery. Lab visits typically lasted about 90 minutes. Participants were also given contact information for study personnel. Participants were compensated \$25 for the baseline visit.

Measures

Demographics and Clinical Characteristics—Participants completed a survey of their demographic data (e.g., sex, age, education, etc.) and clinical data. Self-reported clinical data (i.e., injury level and severity, date of injury) were confirmed through medical record review.

Medication Use was assessed with a medication survey that was part of the demographic form. Respondents were asked to report the name and dosage of prescription medications, over-the-counter medications, and herbal remedies they were *currently* taking. In addition, study participants were asked, “How frequently do you take the medication?” and to report the “Reason for taking the drug.” A list of all medications reported by study participants was compiled and reviewed by a physician who treats SCI patients (PC). All pain-relevant prescription and over-the-counter medications were assembled into 9 pain medication categories by drug type to aid in initial assessment of pain medications reported in the sample (see top of Table 2). The total number of pain medications was aggregated to create a count variable indicating number of pain medications used by each participant.

Pain Intensity was assessed with the adapted Brief Pain Inventory (BPI) [64, 65]. Participants rated their current, worst, and average pain intensity during the past 24 hours on an 11-point Numeric Rating Scales ranging from 0 (“no pain at all”) to 10 (“pain as bad as you can imagine”). A composite score, “characteristic pain,” was calculated by multiplying the mean of these three pain items by ten, for a possible range of 0-100, with higher scores indicating more pain intensity. This approach captures a more reliable hierarchy of pain intensity than using a single rating of average, current, or worst pain alone [66]. Cronbach's alpha for this composite pain intensity score was 0.82 in this sample.

Pain Distribution was assessed with the body diagram of the BPI [64, 65]. Participants were presented with two figures depicting the front and back of the body with “right” and “left” sides of the body labeled and were instructed to “shade the areas where you feel pain. Put an X on the area that hurts the most.” Similar to previously developed coding method,[67] a diagram with lines for boundaries between body areas was developed to indicate 49 distinct body regions [back/front/left/right: shoulder, upper arm, lower arm, hand, upper leg, lower leg; left/right: chest, upper back, lower back, knee, elbow, pelvis, buttock, foot; front/back: head, neck; sternum, abdomen, sacrum, lower back, upper back (for markings indicating specific midline pain in these regions). A single point (“1”) was marked for each body region that was shaded. Two research assistants independently coded all body diagrams using the same boundary coding diagram and discrepancies were identified and reconciled by the first author. Points were summed to compute a total pain distribution score, ranging from 0 – 49, where higher scores indicate more widespread pain.

Depressive Symptoms were assessed with the Patient Health Questionnaire-9 (PHQ-9; 68, 69]. Respondents rated how often they had been bothered by nine depressive symptoms in the last 2 weeks on a 4-point scale ranging from 0 (“not at all”) to 3 (“nearly every day”). Items were summed to produce a symptom-severity score with a range of 0-27, where higher values reflected worse depressive symptomatology [69]. The scale demonstrated good internal reliability in the sample with a Cronbach's alpha of 0.84.

Chronic Pain Acceptance was assessed with the Chronic Pain Acceptance Questionnaire (CPAQ) [38] which consists of 20-items in two subscales: activities engagement (11 items) and pain willingness (9 items). The activities engagement subscale measures behavioral participation in life activities in a way that is not determined or influenced by pain, including items such as “I am getting on with the business of living no matter what my level of pain is”. The pain willingness subscale measures responses to pain that do not reflect controlling or avoiding pain and includes items such as, “I need to concentrate on getting rid of pain” (items reverse scored). Participants rated the extent to which each item applied to them on a scale from 0 (“never true”) to 6 (“always true”). Items were summed for a total scale score ranging from 0-120, where higher scores indicate more pain acceptance. Previous studies support the validity, factor structure, and reliability of the CPAQ [38, 48]. Cronbach's alphas were 0.90 for the total scale (20 items), 0.86 for the pain willingness subscale (9 items), and 0.86 for the activities engagement subscale (11 items) in this sample.

Data Analyses

Descriptive statistics for study variables were calculated in order to analyze data distribution characteristics. Primary study hypotheses were examined using Poisson regression models for total pain medications (counts of medications). Binary logistic regression was used for opioid use and gabapentin use (used yes/no). All regression models included characteristic pain intensity, pain distribution, and depressive symptomatology (PHQ-9 total score) as covariates and were treated as scale variables. All analyses were completed using IBM SPSS Statistics for Windows, Version 24.0, Armonk, NY: IBM Corp.

Results

Sample Descriptive Statistics

133 persons with SCI were enrolled in the study (UM n = 71, WSU/RIM n = 29, UW n = 33) and completed baseline assessments. Two did not provide complete responses on the CPAQ and 11 did not complete the medication table; therefore, data from 120 participants were analyzed for this study. Those included in the study did not differ from those who were not in terms of age ($F(1, 130) = 2.02, p = 0.16$), sex (Chi-Square = 0.38, $p = 0.54$), or in average scores for characteristic pain ($F(1, 130) = 0.32, p = 0.58$), pain acceptance ($F(1, 130) = 0.07, p = 0.80$), pain distribution ($F(1, 130) = 0.04, p = 0.85$), or depressive symptoms ($F(1, 130) = 0.30, p = 0.59$). Descriptive statistics for the study sample are provided in Table 1. The sample was primarily male, self-identified as White, and represented a broad range of causes of SCI and mobility aid use. Average age was 46.93 years ($SD = 46.93$; range = 18-74) and time since injury was 14.57 years ($SD = 12.34$; range = 1-44).

The sample average characteristic pain intensity was 52.74 ($SD = 16.73$; range = 10-90) and the median number of painful body regions was 8 (mean = 9.40, $SD = 7.41$). A histogram depicting the pain distribution scores for the sample in Figure 1 shows that reporting 10 or fewer painful body areas was common, while a sizeable minority ($n=35$; 29.1%) reported more than 10 painful body regions. Scores on the PHQ-9 indicate a sample average in the “mild depression” range (mean=7.86, $SD = 5.59$, range = 0-24); 34.4% reported no/minimal depressive symptoms, 32.8% had mild, 20.8% had moderate, 9.6% had moderately severe, and 2.4% had severe depressive symptoms. Average pain acceptance (total score) was 66.07 ($SD = 19.84$, range = 13-112) with subscale averages for pain willingness of 25.89 ($SD = 10.65$, range = 1-53) and for activities engagement of 40.18 ($SD = 11.44$, range = 6-61).

The medications reported by participants and their classifications are given in Table 2. Fifty-four (45.0%) reported taking a gabapentinoid and 49 (40.8%) reported taking at least one opioid medication. Of those who reported taking opioid medications, 10 (12%) were taking two opioid medications and 2 (1.7%) were taking three opioid medications; because few people used multiple opioids, opioid use was dichotomized (yes/no). Figure 2 shows the distribution of the number of pain medications reported. Notably, 22.9% ($n=30$) reported taking no pain medications, and 68.7% ($n=90$) reported taking between one to three different medications for pain.

Regression Models Results

Regression models for total pain acceptance scores indicated that higher pain acceptance was related to a significantly lower number of pain medications used, above and beyond the effects of pain intensity, number of painful body areas, and depressive symptoms. Among these covariates, only number of painful body areas was significantly associated with medication use, such that more painful body areas corresponded to greater pain medication use. Total pain acceptance scores were significantly associated with opioid use such that higher acceptance scores were related to lower risk of opioid use. For every 1-unit increase in the pain acceptance score (with scores ranging from 0-120), there was a 3% lower odds of using an opioid. Pain acceptance was not associated with gabapentinoid use, although the association approached significance ($p = 0.08$). In these regression models, few of the covariates corresponded with pain medication use. None of the covariates, that is, pain intensity, pain distribution, and depressive symptoms, were significantly related to opioid use. Only number of painful body areas was positively associated with gabapentin use.

In contrast to expectations, neither pain willingness nor activities engagement were independently significantly associated with the sum of pain medications, above and beyond the effects of relevant covariates; among these covariates, only pain distribution was related to total number of pain medications. Activities engagement but not pain willingness was significantly and negatively related to opioid use such that for every 1-unit increase in the activities engagement subscale score, there was a 6% decreased odds of taking an opioid medication. None of the covariates in the model were related to opioid use. In contrast, pain willingness but not activities engagement was significantly and negatively associated with gabapentin use such that for every 1-unit increase in the pain willingness subscale score, there was a 6% decrease in the odds of taking a gabapentinoid. In this model, pain distribution was the only covariate significantly related to gabapentin use.

Discussion

Serious risks associated with pain medications, particularly for some clinical groups such as SCI, coupled with low efficacy for management of chronic pain point to the need to identify low-risk approaches for managing pain that can decrease reliance on pain medications. In this study we examined whether chronic pain acceptance, which is related to myriad positive outcomes [41-51], has the added benefit of being related to diminished reliance on pain medication in people with chronic pain and SCI. Results from this study suggest that greater pain acceptance is associated with using fewer pain medications overall, and with a lower likelihood of using opioid medications and gabapentinoids (when considering pain willingness, specifically). These associations were above and beyond the effects of pain intensity level, pain distribution, and depressed mood.

In contrast to expectations that pain willingness would be the more robust component of pain acceptance, both pain acceptance components played roles in predicting pain medication use. In terms of the total pain medication outcome in particular, the two components demonstrated a synergistic relationship, as neither subscale on its own was a significant independent predictor of total pain medication use. When the components of pain acceptance were disaggregated into their respective subscales, the association with the use of

opioids and gabapentinoids suggests a rather nuanced relationship. Pain willingness was independently and negatively related to gabapentin use, but activities engagement was not. In contrast, the activities engagement subscale was the more robust component in terms of predicting opioid use, but not gabapentinoid use. Given that pain acceptance subscales were inconsistent in their respective relationship to various medication types, further examination of these specific associations and more in depth exploration of what may explain them is warranted.

Pain intensity did not have a robust association – either positive or negative – with pain medication usage in any of the regression models. This is interesting from a number of perspectives, whether following the assumption that greater pain intensity would relate to greater pain medication use, as found in other populations [70], or that greater pain medication use would be related to lower pain ratings (in cases of successful analgesia). It is plausible that this lack of association reflects a combination of both such that those with higher pain use more medications, and experience some level of relief from those medications. Alternatively, pain intensity may not be the primary driver of pain medication use. In this sample, pain distribution was a more robust predictor than pain intensity with respect to the number of pain medications taken. This may be explained by the notion that greater pain distribution may indicate different types of pain, such as pain due to nociceptive and neuropathic pain in the same individual, which may call for different medications. The association of pain distribution to gabapentinoid use makes sense due to the fact that this class of drugs is used primarily to treat neuropathic pain, which classically presents as pain that is widespread and characterized by a progressive spread of pain across regions of the body, often following dermatomal or peripheral nerve pathways [71, 72]. In this sample, with each additional painful body area there was a corresponding 8% increase in the odds of gabapentinoid use. Neuropathic pain was not assessed in this study, so its role cannot be directly assessed. Taken together, these findings suggest that it is not enough to simply ask about pain intensity level characterizing an individual's pain problem. Although the ability to assess pain distribution with “body maps” has long been an option [65, 67, 73], and there have been recent efforts to develop and validate new measures of pain distribution [74], relatively few published pain studies examine pain distribution and most pain research continues to be focused on pain intensity as the main outcome of interest [75].

Although depression was not of primary interest in the analysis, it is interesting to note that it was not related to pain medication use, particularly given past findings of associations between emotional distress and medication use and misuse [76, 77]. This includes using analgesic medication to “self-medicate” non-pain symptoms [78], and the fact that the affective component of pain, rather than pain intensity, has been found to be the primary predictor of analgesic use in an SCI sample [14]. Findings from this current study suggest that depression does not play a prominent role in the use of pain medication for chronic pain in SCI.

There are a number of ways to characterize pain medication use. We chose a rather straightforward approach of considering how many different pain medications a person took and whether or not a person used an opioid or gabapentinoid medication, two medication categories that are commonly used to treat pain in SCI and with relatively high risk profiles.

We chose the total number of pain medications based on the assumption that each additional pain medication confers an additional and unique side effect risk profile in addition to potential drug interactions. From a clinical standpoint, the use of four different pain medications, for example, demonstrates a different reliance on pain medication than the use of a single pain medication, even if it is particularly potent. Using multiple pain medications requires a higher level of vigilance to administration for determining whether and when to take *pro re nata* (PRN) medications and non-PRN medications. In the case of opioid medications, one common way to quantify usage is through calculating daily morphine equivalence (ME). Use of MEs for clinical and research purposes is not without controversy, due in part to a lack of universally-supported ME conversion factors [79] and individual differences in how effective and risky opioids are (e.g., an effective dose for one may be the dose at which another person has an overdose) [80]. In addition, the cross-sectional design of this study could not assess dosage taken on a day-to-day basis, and that not every participant reported opioid dosage when taking those medications, further supporting our decision to treat opioid use as binary variable. We had a similar rationale for characterizing gabapentinoid usage as a dichotomous variable. There is substantial need to develop standardized ways of quantifying medication use in a way that will produce the most valid and meaningful data for individuals [80].

Study Strengths and Limitations

The generalizability of study findings to the broader population of people with chronic pain and SCI is not clear. We excluded volunteers who could not use the study device, so the relevance of these findings to individuals with greater physical impairment may be limited. Because chronic pain was not operationalized during screening and recruitment, it is possible that the study sample included people with pain duration less than 3 months, the typical temporal criteria for chronic pain. Data on participation rate (e.g. declines, screen fails) were not collected at the study sites. We did not assess previous exposure to behavioral treatment for pain, and thus cannot speak to the degree to which pain acceptance was naturally occurring versus learned. Chronic pain in SCI is especially complex due to the multiple and concurrent ways it often presents, and often in the context of other comorbid conditions and physical symptoms (e.g., fatigue) [21]; therefore research conducted in SCI calls for replication in other populations to assess broad-based relevance of the findings. This is a cross-sectional study that assessed pain medication use in general, although day-to-day fluctuations in medication use are expected. Future studies that assess daily contributions of pain self-management strategies to day-to-day variability in pain medication consumption are needed and would provide a much more nuanced examination of how people use available pain coping tools, including medication, in everyday life. Moreover, we relied on self-report of current pain medication use; although we had access to the medical records of all participants we did not collect medication data at the time of the study. In our opinion self-report constituted a more reliable assessment of what participants were actually taking at the time of data collection given the difficulties in recreating historical medication regimens from medical records and given the possibility that the medications noted as prescribed in the medical record may not have been filled or taken by the patient. Furthermore, over-the-counter medications are usually not noted in the medical record and

medications listed as active in the medical record may have been discontinued. Given that this analysis used cross-sectional data, conclusions about causal direction cannot be made.

Future Directions

Previous studies have shown that pain acceptance increases as a result of acceptance-oriented interventions, such as ACT and MBSR function [28, 33-36], cognitive behavioral therapy for pain [31], as well as multidisciplinary pain treatment programs [32]. Given that acceptance appears readily modifiable through multiple behavioral/psychosocial treatment modalities, future research on the impact of changes in acceptance on alterations in pain medications is a logical next step to build on these preliminary results. Unfortunately, psychological interventions for pain are used at a much lower rate in those with SCI compared to the use of medication and interventional treatments [10, 12], despite the fact that there is growing evidence that psychological interventions result in significant reductions in pain and increases in functional outcomes in SCI [81-83]. While it is difficult to make firm clinical recommendations based on these initial findings without replication, they do raise the possibility that reliance on pain medications could be reduced as a result of treatment that increased pain acceptance. Given the riskier side effect profile of medications compared to behavioral/psychological interventions, integration of pain acceptance interventions into practice may not only reduce the potential complications in an already complex condition, but improve outcomes and even preclude the initiation of multiple pain medications, particularly opioids.

Individuals with pain typically use a number of different management approaches. These can include a combination of taking pain medication(s), undergoing interventional procedures, and engaging in behavioral self-management strategies. Amongst these approaches, only behavioral self-management strategies present few known risks or side-effects, whereas there can be numerous risks for medically-based treatments. These findings highlight the need for future trials of interventions aimed at increasing acceptance (e.g., ACT) to assess medication use as a treatment outcome and for all behaviorally-based trials to consider how adoption of more self-management strategies may correspond with abandonment of medically-based pain management tools that may become unnecessary and undesirable in cases where the approach also causes problems (e.g. side effects) for the patient. Although this cross-sectional study provides important preliminary evidence for an association between pain acceptance and pain medication use, future research that employs longitudinal and/or daily process (e.g., daily diary, ecological momentary assessment) methods are necessary to provide insights as to how people utilize available pain self-management strategies in real life. Future studies may also incorporate medication categories that were not included in this study, but may have an affect on chronic pain in persons with SCI, particularly anti-spasticity medications.

Conclusion

This study expands on the literature supporting the important role of pain acceptance in chronic pain management, and suggests that greater pain acceptance is related to lower pain medication use in person with chronic pain and SCI. A better understanding of this relationship has important clinical implications as to where clinicians may focus their efforts

and how they educate patients regarding the multimodal treatment approach to managing chronic pain. Given substantial concerns regarding the limited efficacy and adverse effects of pain medications for chronic pain in both the SCI and general population, and the safety profile and efficacy of psychological interventions, improving pain acceptance may be a promising strategy that can reduce reliance on pain medications and improve pain to enhance overall health and wellbeing in persons with SCI.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

We thank Siera Goodnight, Kristen Pickup, Daniela Ristova-Trendov, Christopher Garbaccio, Jessica Mackelprang-Carter, and Angela Garza for collecting and managing these data.

Research reported in this publication was supported by the Craig H. Neilsen Foundation under award number 287372 (PI: Kratz). The content is solely the responsibility of the authors and does not necessarily represent the views of the Craig H. Neilsen Foundation. Dr. Kratz was supported during manuscript preparation by a grant from the National Institute of Arthritis and Musculoskeletal and Skin Diseases (award number K01AR064275).

References

1. Finnerup NB, Johannesen IL, Sindrup SH, Bach FW, Jensen TS. Pain and dysesthesia in patients with spinal cord injury: A postal survey. *Spinal Cord*. 2001; 39:256–62. [PubMed: 11438841]
2. Siddall PJ, Loeser JD. Pain following spinal cord injury. *Spinal Cord*. 2001; 39:63–73. [PubMed: 11402361]
3. Bonica JJ. History of pain concepts and pain therapy. *Mt Sinai J Med*. 1991; 58:191–202. [PubMed: 1875956]
4. Ataoglu E, Tiftik T, Kara M, Tunc H, Ersoz M, Akkus S. Effects of chronic pain on quality of life and depression in patients with spinal cord injury. *Spinal Cord*. 2013; 51:23–6. [PubMed: 22547044]
5. Summers JD, Rapoff MA, Varghese G, Porter K, Palmer RE. Psychosocial factors in chronic spinal cord injury pain. *Pain*. 1991; 47:183–9. [PubMed: 1762813]
6. Cairns DM, Adkins RH, Scott MD. Pain and depression in acute traumatic spinal cord injury: origins of chronic problematic pain? *Arch Phys Med Rehabil*. 1996; 77:329–35. [PubMed: 8607754]
7. Budh CN, Osteraker AL. Life satisfaction in individuals with a spinal cord injury and pain. *Clin Rehabil*. 2007; 21:89–96. [PubMed: 17213246]
8. Raichle KA, Osborne TL, Jensen MP, Cardenas D. The reliability and validity of pain interference measures in persons with spinal cord injury. *The journal of pain : official journal of the American Pain Society*. 2006; 7:179–86. [PubMed: 16516823]
9. Bloemen-Vrencken JH, Post MW, Hendriks JM, De Reus EC, De Witte LP. Health problems of persons with spinal cord injury living in the Netherlands. *Disabil Rehabil*. 2005; 27:1381–9. [PubMed: 16321920]
10. Heutink M, Post MW, Wollaars MM, van Asbeck FW. Chronic spinal cord injury pain: pharmacological and non-pharmacological treatments and treatment effectiveness. *Disabil Rehabil*. 2011; 33:433–40. [PubMed: 20695788]
11. Warme CA, Turner JA, Marshall HM, Cardenas DD. Treatments for chronic pain associated with spinal cord injuries: Many are tried, few are helpful. *Clin J Pain*. 2002; 18:154–163. [PubMed: 12048417]
12. Cardenas DD, Jensen MP. Treatments for chronic pain in persons with spinal cord injury: A survey study. *J Spinal Cord Med*. 2006; 29:109–17. [PubMed: 16739554]

13. Mehta S, McIntyre A, Janzen S, Loh E, Teasell R. Spinal Cord Injury Rehabilitation Evidence T. Systematic Review of Pharmacologic Treatments of Pain After Spinal Cord Injury: An Update. *Arch Phys Med Rehabil.* 2016; 97:1381–1391 e1. [PubMed: 26797114]
14. Norrbrink Budh C, Lundeborg T. Use of analgesic drugs in individuals with spinal cord injury. *Journal of rehabilitation medicine.* 2005; 37:87–94. [PubMed: 15788343]
15. Manchikanti L, Abdi S, Atluri S, Balog CC, Benyamin RM, Boswell MV, Brown KR, Bruel BM, Bryce DA, Burks PA, Burton AW, Calodney AK, Caraway DL, Cash KA, Christo PJ, Damron KS, Datta S, Deer TR, Diwan S, Eriator I, Falco FJ, Fellows B, Geffert S, Gharibo CG, Glaser SE, Grider JS, Hameed H, Hameed M, Hansen H, Harned ME, Hayek SM, Helm S 2nd, Hirsch JA, Janata JW, Kaye AD, Kaye AM, Kloth DS, Koyyalagunta D, Lee M, Malla Y, Manchikanti KN, McManus CD, Pampati V, Parr AT, Pasupuleti R, Patel VB, Sehgal N, Silverman SM, Singh V, Smith HS, Snook LT, Solanki DR, Tracy DH, Vallejo R, Wargo BW. American Society of Interventional Pain P. American Society of Interventional Pain Physicians (ASIPP) guidelines for responsible opioid prescribing in chronic non-cancer pain: Part I--evidence assessment. *Pain Physician.* 2012; 15:S1–65. [PubMed: 22786448]
16. Jones CM, Mack KA, Paulozzi LJ. Pharmaceutical Overdose Deaths, United States, 2010. *Jama-J Am Med Assoc.* 2013; 309:657–659.
17. Chou R, Turner JA, Devine EB, Hansen RN, Sullivan SD, Blazina I, Dana T, Bougatsos C, Deyo RA. The effectiveness and risks of long-term opioid therapy for chronic pain: a systematic review for a National Institutes of Health Pathways to Prevention Workshop. *Ann Intern Med.* 2015; 162:276–86. [PubMed: 25581257]
18. Gabriel SE, Jaakkimainen L, Bombardier C. Risk for Serious Gastrointestinal Complications Related to Use of Nonsteroidal Antiinflammatory Drugs - a Metaanalysis. *Ann Intern Med.* 1991; 115:787–796. [PubMed: 1834002]
19. Perneger TV, Whelton PK, Klag MJ. Risk of Kidney Failure Associated with the Use of Acetaminophen, Aspirin, and Nonsteroidal Antiinflammatory Drugs. *N Engl J Med.* 1994; 331:1675–1679. [PubMed: 7969358]
20. Ortinski P, Meador KJ. Cognitive side effects of antiepileptic drugs. *Epilepsy Behav.* 2004; 5:S60–S65. [PubMed: 14725848]
21. Finnerup NB. Pain in patients with spinal cord injury. *Pain.* 2013; 154(Suppl 1):S71–6. [PubMed: 23375163]
22. Bell TJ, Panchal SJ, Miaskowski C, Bolge SC, Milanova T, Williamson R. The Prevalence, Severity, and Impact of Opioid-Induced Bowel Dysfunction: Results of a US and European Patient Survey (PROBE 1). *Pain medicine.* 2009; 10:35–42. [PubMed: 18721170]
23. Bell T, Annunziata K, Leslie JB. Opioid-induced constipation negatively impacts pain management, productivity, and health-related quality of life: findings from the National Health and Wellness Survey. *Journal of opioid management.* 2009; 5:137–44. [PubMed: 19662923]
24. Woller SA, Hook MA. Opioid administration following spinal cord injury: implications for pain and locomotor recovery. *Exp Neurol.* 2013; 247:328–41. [PubMed: 23501709]
25. Williams AC, Eccleston C, Morley S. Psychological therapies for the management of chronic pain (excluding headache) in adults. *Cochrane Database Syst Rev.* 2012; 11:CD007407. [PubMed: 23152245]
26. Heutink M, Post MW, Luthart P, Schuitemaker M, Slangen S, Sweers J, Vlemmix L, Lindeman E. Long-term outcomes of a multidisciplinary cognitive behavioural programme for coping with chronic neuropathic spinal cord injury pain. *Journal of rehabilitation medicine.* 2014; 46:540–5. [PubMed: 24818861]
27. Burns AS, Delparte JJ, Ballantyne EC, Boschen KA. Evaluation of an interdisciplinary program for chronic pain after spinal cord injury. *PM R.* 2013; 5:832–8. [PubMed: 23684779]
28. Veehof MM, Trompetter HR, Bohlmeijer ET, Schreurs KM. Acceptance- and mindfulness-based interventions for the treatment of chronic pain: a meta-analytic review. *Cogn Behav Ther.* 2016; 45:5–31. [PubMed: 26818413]
29. Hayes SC, Levin ME, Plumb-Villardaga J, Villatte JL, Pistorello J. Acceptance and commitment therapy and contextual behavioral science: examining the progress of a distinctive model of behavioral and cognitive therapy. *Behav Ther.* 2013; 44:180–98. [PubMed: 23611068]

30. Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and commitment therapy: model, processes and outcomes. *Behav Res Ther.* 2006; 44:1–25. [PubMed: 16300724]
31. Akerblom S, Perrin S, Rivano Fischer M, McCracken LM. The Mediating Role of Acceptance in Multidisciplinary Cognitive-Behavioral Therapy for Chronic Pain. *The journal of pain : official journal of the American Pain Society.* 2015; 16:606–15. [PubMed: 25840330]
32. Baranoff J, Hanrahan SJ, Kapur D, Connor JP. Acceptance as a process variable in relation to catastrophizing in multidisciplinary pain treatment. *European journal of pain.* 2013; 17:101–10. [PubMed: 22610541]
33. McCracken LM, Sato A, Taylor GJ. A trial of a brief group-based form of acceptance and commitment therapy (ACT) for chronic pain in general practice: pilot outcome and process results. *The journal of pain : official journal of the American Pain Society.* 2013; 14:1398–406. [PubMed: 24035351]
34. McCracken LM, Vowles KE, Eccleston C. Acceptance-based treatment for persons with complex, long standing chronic pain: a preliminary analysis of treatment outcome in comparison to a waiting phase. *Behav Res Ther.* 2005; 43:1335–46. [PubMed: 16086984]
35. Vowles KE, McCracken LM. Acceptance and values-based action in chronic pain: a study of treatment effectiveness and process. *J Consult Clin Psychol.* 2008; 76:397–407. [PubMed: 18540733]
36. Buhrman M, Skoglund A, Husell J, Bergstrom K, Gordh T, Hursti T, Bendelin N, Furmark T, Andersson G. Guided internet-delivered acceptance and commitment therapy for chronic pain patients: a randomized controlled trial. *Behav Res Ther.* 2013; 51:307–15. [PubMed: 23548250]
37. Lauwerier E, Caes L, Van Damme S, Goubert L, Rosseel Y, Crombez G. Acceptance: what's in a name? A content analysis of acceptance instruments in individuals with chronic pain. *The journal of pain : official journal of the American Pain Society.* 2015; 16:306–17. [PubMed: 25584430]
38. McCracken LM, Vowles KE, Eccleston C. Acceptance of chronic pain: component analysis and a revised assessment method. *Pain.* 2004; 107:159–66. [PubMed: 14715402]
39. McCracken LM. Toward understanding acceptance and psychological flexibility in chronic pain. *Pain.* 2010; 149:420–1. [PubMed: 20207482]
40. Trompetter HR, Bohlmeijer ET, Fox JP, Schreurs KM. Psychological flexibility and catastrophizing as associated change mechanisms during online Acceptance & Commitment Therapy for chronic pain. *Behav Res Ther.* 2015; 74:50–9. [PubMed: 26409158]
41. McCracken LM, Eccleston C. Coping or acceptance: what to do about chronic pain? *Pain.* 2003; 105:197–204. [PubMed: 14499436]
42. McCracken LM, Spertus IL, Janeck AS, Sinclair D, Wetzel FT. Behavioral dimensions of adjustment in persons with chronic pain: pain-related anxiety and acceptance. *Pain.* 1999; 80:283–9. [PubMed: 10204741]
43. McCracken LM. Learning to live with the pain: acceptance of pain predicts adjustment in persons with chronic pain. *Pain.* 1998; 74:21–7. [PubMed: 9514556]
44. Viane I, Crombez G, Eccleston C, Poppe C, Devulder J, Van Houdenhove B, De Corte W. Acceptance of pain is an independent predictor of mental well-being in patients with chronic pain: empirical evidence and reappraisal. *Pain.* 2003; 106:65–72. [PubMed: 14581112]
45. Viane I, Crombez G, Eccleston C, Devulder J, De Corte W. Acceptance of the unpleasant reality of chronic pain: Effects upon attention to pain and engagement with daily activities. *Pain.* 2004; 112:282–288. [PubMed: 15561383]
46. Kratz AL, Davis MC, Zautra AJ. Pain acceptance moderates the relation between pain and negative affect in female osteoarthritis and fibromyalgia patients. *nn Behav Med.* 2007; 33:291–301.
47. Gauthier LR, Rodin G, Zimmermann C, Warr D, Moore M, Shepherd F, Gagliese L. Acceptance of pain: a study in patients with advanced cancer. *Pain.* 2009; 143:147–54. [PubMed: 19321264]
48. Vowles KE, McCracken LM, McLeod C, Eccleston C. The Chronic Pain Acceptance Questionnaire: confirmatory factor analysis and identification of patient subgroups. *Pain.* 2008; 140:284–91. [PubMed: 18824301]
49. McCracken LM, Eccleston C. A comparison of the relative utility of coping and acceptance-based measures in a sample of chronic pain sufferers. *European journal of pain.* 2006; 10:23–9. [PubMed: 16291295]

50. Kratz AL, Hirsh AT, Ehde DM, Jensen MP. Acceptance of Pain in Neurological Disorders: Associations With Functioning and Psychosocial Well-Being. *Rehabil Psychol*. 2013; 58:1–9. [PubMed: 23437995]
51. Kratz AL, Ehde DM, Bombardier CH, Kalpakjian CZ, Hanks RA. Pain Acceptance Decouples the Momentary Associations Between Pain, Pain Interference, and Physical Activity in the Daily Lives of People With Chronic Pain and Spinal Cord Injury. *The journal of pain : official journal of the American Pain Society*. 2017; 18:319–331. [PubMed: 27919770]
52. Jensen MP, Smith AE, Alschuler KN, Gillanders DT, Amtmann D, Molton IR. The role of pain acceptance on function in individuals with disabilities: a longitudinal study. *Pain*. 2016; 157:247–54. [PubMed: 26431422]
53. Hoffman BM, Papas RK, Chatkoff DK, Kerns RD. Meta-analysis of psychological interventions for chronic low back pain. *Health Psychol*. 2007; 26:1–9. [PubMed: 17209691]
54. Devineni T, Blanchard EB. A randomized controlled trial of an internet-based treatment for chronic headache. *Behav Res Ther*. 2005; 43:277–92. [PubMed: 15680926]
55. Strom L, Pettersson R, Andersson G. A controlled trial of self-help treatment of recurrent headache conducted via the Internet. *J Consult Clin Psychol*. 2000; 68:722–7. [PubMed: 10965647]
56. McCracken LM, Carson JW, Eccleston C, Keefe FJ. Acceptance and change in the context of chronic pain. *Pain*. 2004; 109:4–7. [PubMed: 15082120]
57. Fejer R, Jordan A, Hartvigsen J. Categorising the severity of neck pain: establishment of cut-points for use in clinical and epidemiological research. *Pain*. 2005; 119:176–82. [PubMed: 16298059]
58. Jensen MP, Smith DG, Ehde DM, Robinsin LR. Pain site and the effects of amputation pain: further clarification of the meaning of mild, moderate, and severe pain. *Pain*. 2001; 91:317–22. [PubMed: 11275389]
59. Paul SM, Zelman DC, Smith M, Miaskowski C. Categorizing the severity of cancer pain: further exploration of the establishment of cutpoints. *Pain*. 2005; 113:37–44. [PubMed: 15621362]
60. Serlin RC, Mendoza TR, Nakamura Y, Edwards KR, Cleeland CS. When is cancer pain mild, moderate or severe? Grading pain severity by its interference with function. *Pain*. 1995; 61:277–84. [PubMed: 7659438]
61. Turner JA, Franklin G, Heagerty PJ, Wu R, Egan K, Fulton-Kehoe D, Gluck JV, Wickizer TM. The association between pain and disability. *Pain*. 2004; 112:307–14. [PubMed: 15561386]
62. Zelman DC, Dukes E, Brandenburg N, Bostrom A, Gore M. Identification of cut-points for mild, moderate and severe pain due to diabetic peripheral neuropathy. *Pain*. 2005; 115:29–36. [PubMed: 15836967]
63. Kratz AL, Kalpakjian CZ, Hanks RA. Are intensive data collection methods in pain research feasible in those with physical disability? A study in persons with chronic pain and spinal cord injury. *Qual Life Res*. 2017; 26:587–600. [PubMed: 28097459]
64. Cleeland, CS. Measurement of pain by subjective report. In: Chapman, CR., Loeser, JD., editors. *Advances in Pain Research and Therapy*. New York, NY: Raven Press; 1989. p. 391–403.
65. Cleeland CS, Ryan KM. Pain assessment: global use of the Brief Pain Inventory. *Ann Acad Med Singapore*. 1994; 23:129–38. [PubMed: 8080219]
66. Von Korff M, Ormel J, Keefe FJ, Dworkin SF. Grading the severity of chronic pain. *Pain*. 1992; 50:133–49. [PubMed: 1408309]
67. Margolis RB, Tait RC, Krause SJ. A rating system for use with patient pain drawings. *Pain*. 1986; 24:57–65. [PubMed: 2937007]
68. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. *JAMA*. 1999; 282:1737–44. [PubMed: 10568646]
69. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001; 16:606–13. [PubMed: 11556941]
70. Sawyer P, Bodner EV, Ritchie CS, Allman RM. Pain and pain medication use in community-dwelling older adults. *The American journal of geriatric pharmacotherapy*. 2006; 4:316–24. [PubMed: 17296537]
71. Campbell JN, Meyer RA. Mechanisms of neuropathic pain. *Neuron*. 2006; 52:77–92. [PubMed: 17015228]

72. Zimmermann M. Pathobiology of neuropathic pain. *Eur J Pharmacol.* 2001; 429:23–37. [PubMed: 11698024]
73. Melzack R. The McGill Pain Questionnaire: major properties and scoring methods. *Pain.* 1975; 1:277–99. [PubMed: 1235985]
74. Brummett CM, Bakshi RR, Goesling J, Leung D, Moser SE, Zollars JW, Williams DA, Clauw DJ, Hassett AL. Preliminary validation of the Michigan Body Map. *Pain.* 2016; 157:1205–12. [PubMed: 26835782]
75. Sullivan MD, Ballantyne JC. Must we reduce pain intensity to treat chronic pain? *Pain.* 2016; 157:65–9. [PubMed: 26307855]
76. Phifer J, Skelton K, Weiss T, Schwartz AC, Wingo A, Gillespie CF, Sands LA, Sayyar S, Bradley B, Jovanovic T, Ressler KJ. Pain symptomatology and pain medication use in civilian PTSD. *Pain.* 2011; 152:2233–40. [PubMed: 21665366]
77. Jacobsen PB, Butler RW. Relation of cognitive coping and catastrophizing to acute pain and analgesic use following breast cancer surgery. *J Behav Med.* 1996; 19:17–29. [PubMed: 8932659]
78. Grattan A, Sullivan MD, Saunders KW, Campbell CI, Von Korff MR. Depression and prescription opioid misuse among chronic opioid therapy recipients with no history of substance abuse. *Annals of family medicine.* 2012; 10:304–11. [PubMed: 22778118]
79. Rennick A, Atkinson T, Cimino NM, Strassels SA, McPherson ML, Fudin J. Variability in Opioid Equivalence Calculations. *Pain medicine.* 2015
80. Fudin J, Pratt Cleary J, Schatman ME. The MEDD myth: the impact of pseudoscience on pain research and prescribing-guideline development. *Journal of pain research.* 2016; 9:153–6. [PubMed: 27042140]
81. Heutink M, Post MW, Bongers-Janssen HM, Dijkstra CA, Snoek GJ, Spijkerman DC, Lindeman E. The CONECISI trial: results of a randomized controlled trial of a multidisciplinary cognitive behavioral program for coping with chronic neuropathic pain after spinal cord injury. *Pain.* 2012; 153:120–8. [PubMed: 22100355]
82. Perry KN, Nicholas MK, Middleton JW. Comparison of a pain management program with usual care in a pain management center for people with spinal cord injury-related chronic pain. *Clin J Pain.* 2010; 26:206–16. [PubMed: 20173434]
83. Ehde D, Jensen M. Psychological Treatments for Pain Management in Persons with Spinal Cord Injury: Cognitive Therapy and Self-Hypnosis Training. *Topics in Spinal Cord Injury Rehabilitation.* 2007; 13:72–80.

Figure 1.
Histogram of number of painful body areas for the study sample (possible range = 0-49).

Figure 2.
Histogram of total number of medications indicated for pain.

Table 1
Sample descriptive statistics (N=120)

	n	%
Sex (Female)	32	27
Race		
White	86	71.7
Black/African American	25	20.8
Asian	2	1.7
American Indian	1	0.8
Multiracial	3	2.5
Other/Not Provided	3	2.3
Education		
< 12 th grade education	8	6.7
High school grad/GED	22	20.8
Vocational/Tech School	6	5.0
Some college	42	35.0
College degree (BA/BS)	27	22.5
Advanced degree (MA, PhD)	11	9.2
No response/Not provided	1	0.8
Spinal cord injury etiology		
Motor Vehicle Accident	40	33.3
Fall	22	18.3
Diving	10	8.3
Other Sports/Recreation	9	7.5
Gunshot wound/Other violence	21	17.5
Medical/Surgical Accident	4	3.3
Other	14	11.7
Primary means of mobility		
Walk without assistance	14	11.7
Use cane or walker	16	13.3
Push self in manual/hybrid chair	56	46.7
Power wheelchair	32	26.7
Pushed by someone else	2	1.7
Complete injury		
Yes	65	54.2
No	45	37.5
Injury level		
Paraplegia	68	56.6
Tetraplegia	46	38.4
Unknown/Missing	6	5.0

Note. GED = General educational development certificate

Table 2

Pain Medications Reported as Currently Used

Gabapentinoids (n=54)	SNRI (n=11)	Tricyclic Anti-depressants (n=14)	Opioids (n=49)	NSAIDs (n=25)	Topical (n=7)	Intrathecal (n=1)
gabapentin (n=44) pregabalin (n=10)	duloxetine (n=6) venlafaxine (n=4) desvenlafaxine (n=1)	nortriptyline (n=7) amitriptyline (n=6) Doxepin (n=1)	morphine (n=7) fentanyl (n=3) Vicodin/Norco (n=16) methadone (n=2) Percocet (n=5) oxycodone (n=23) tramadol (n=1) buprenorphine (n=3) hydrocodone (n=2) Vicoprofen (n=1)	ibuprofen (n=13) naproxen (n=4) celecoxib (n=2) diclofenac (n=2) aspirin (n=4) meloxicam (n=2)	capsaicin (n=3) lidoderm (n=3) Biofreeze (n=2)	ziconotide (n=1)
Muscle Relaxant (n=1) carisoprodol (n=1)						
Acetaminophen (n = 17)						

Note. SNRI = serotonin-norepinephrine reuptake inhibitors; NSAID = non-steroidal anti-inflammatory drug; n's for the major categories indicate the number of participants who reported taking a drug in that category. Some participants reported using more than one type of medication within a medication category.

Table 3

Regression results for the association between pain acceptance and medication use, controlling for pain intensity and distribution and depressive symptoms.

Poisson Regression Variables	Estimate	SE	Sig.	Wald Chi-Square	Wald 95% Confidence Interval
<i>Criterion = Total Number Pain Medications</i>					
Pain Intensity	0.00	0.005	0.99	0.00	-0.009 – 0.01
# of painful body areas	0.03	0.009	0.001	11.38	0.01 – 0.05
Depressive Symptoms	-0.02	0.02	0.34	0.91	-0.05 – 0.02
Pain Acceptance	-0.02	0.005	0.003	7.60	-0.03 – -0.006
Logistic Regression Variables					
	Estimate	SE	Sig.	Exp(B)	95% CI for Estimate
<i>Criterion = Opioid Use</i>					
Pain Intensity	0.02	0.01	0.12	1.02	0.99 – 1.05
# of painful body areas	0.04	0.03	0.18	1.04	0.98 – 1.10
Depressive Symptoms	-0.07	0.05	0.16	0.93	0.85 – 1.03
Pain Acceptance	-0.03	0.01	0.03	0.97	0.94 – 0.99
<i>Criterion = Gabapentinoid Use</i>					
Pain Intensity	-0.01	0.01	0.30	0.99	0.96 – 1.01
# of painful body areas	0.08	0.03	0.02	1.08	1.01 – 1.17
Depressive Symptoms	-0.02	0.05	0.61	0.98	0.89 – 1.07
Pain Acceptance	-0.03	0.01	0.08	0.98	0.95 – 1.00

Note. SE = standard error; Sig. = p-value; CI=confidence interval; Exp(B) = exponentiation of the B coefficient, also known as the odds ratio.

Table 4

Regression results for the association between the two facets of pain acceptance – pain willingness and activities engagement - and medication use, controlling for pain intensity and distribution, and depressive symptoms.

Poisson Regression Variables	Estimate	SE	Sig.	Wald Chi-Square	Wald 95% Confidence Interval
<i>Criterion = Total Number Pain Medications</i>					
Pain Intensity	0.00	0.005	0.99	0.00	-0.01 – 0.10
# of painful body areas	0.03	0.009	0.001	11.27	0.01 – 0.05
Depressive Symptoms	-0.02	0.02	0.86	2.92	-0.05 – 0.02
Activities Engagement	-0.02	0.009	0.09	2.92	-0.03 – 0.002
Pain Willingness	-0.02	0.01	0.10	2.92	-0.04 – 0.003
Logistic Regression Variables	Estimate	SE	Sig.	Exp(B)	95% CI for Estimate
<i>Criterion = Opioid Use</i>					
Pain Intensity	0.03	0.01	0.07	0.03	0.99 - 1.05
# of painful body areas	0.04	0.03	0.15	0.04	0.99 - 1.10
Depressive Symptoms	-0.08	0.05	0.11	0.92	0.84 - 1.02
Activities Engagement	-0.06	0.03	0.03	0.95	0.90 - 0.99
Pain Willingness	-0.003	0.03	0.90	0.99	0.95 - 1.05
<i>Criterion = Gabapentinoid Use</i>					
Pain Intensity	-0.02	0.01	0.56	0.98	0.96 – 1.01
# of painful body areas	0.08	0.03	0.01	1.08	1.01 – 1.16
Depressive Symptoms	0.003	0.05	0.94	0.99	0.90 – 1.08
Activities Engagement	0.01	0.03	0.53	0.53	0.95 – 1.05
Pain Willingness	-0.06	0.03	0.04	0.94	0.89 – 1.00

Note. SE = standard error; Sig. = p-value; CI=confidence interval; Exp(B) = exponentiation of the B coefficient, also known as the odds ratio.