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What determines whether a pain is rated as mild, moderate, or severe? The importance of pain beliefs and pain interference

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Abstract

Reliable and valid measures of pain intensity are needed to accurately evaluate the efficacy of pain treatments. Perhaps with the exception of FACES pain intensity scales, which are thought to reflect both pain intensity and pain affect, the other most commonly used pain intensity scales – Numerical Rating Scales (NRSs), Visual Analogue Scales, and Verbal Rating Scales (VRSs) – are all thought to reflect primarily pain intensity or the magnitude of felt pain. However, to our knowledge, this assumption has not been directly tested for VRSs. Here we evaluated whether VRS pain severity ratings are influenced by pain beliefs, catastrophizing, or pain interference over and above any effects of pain intensity, as measured by a NRS, in four samples of individuals with physical disabilities and chronic pain. As hypothesized, and while controlling for pain intensity as measured by a NRS, higher scores on factors representing pain interference with function, pain catastrophizing, and a number of pain-related beliefs were all associated with a tendency for the study participants to rate their pain as more severe on a VRS. These findings indicate VRSs of pain severity cannot necessarily be assumed to measure only pain intensity; they may also reflect patient perceptions about pain interference and beliefs about their pain. Clinicians and researchers should take these findings into account when selecting measures and when interpreting the results of studies using VRSs as outcome measures.

Keywords

pain assessment; pain rating; psychosocial factors; individuals with disabilities

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INTRODUCTION

Advances in our understanding of the causes of and treatments for pain require the availability of valid and reliable pain measures. Of the many domains that can be measured in pain research, *pain intensity* is the domain assessed most often in clinical and research settings [1–4]. Four types of rating scales are often used to assess pain intensity, and each one has its strengths and weaknesses; these are the Numerical Rating Scales (NRSs), the Visual Analogue Scales (VASs), the Verbal Rating Scales (VRSs), and the FACES pain rating scales [3]. There is general agreement that NRSs have more strengths and fewer weaknesses than the other scales, and so should be considered as a first choice for many if not most settings and applications [3]. However, some studies have shown that NRSs (as well as VASs) can be more difficult to use than VRSs, especially among the elderly [5–7].

FACES scales are a viable alternative when NRSs are not appropriate, although research indicates that FACES scores reflect more than just pain intensity. Specifically, the facial expressions included in these scales that represent increasing levels of pain can also be viewed as representing increasing levels of emotional distress [8]. As a result, FACES scores may represent some combination of pain intensity and distress, weakening the validity of FACES scales as "pure" measures of pain intensity. This is particularly true for the Wong-Baker FACES Pain Rating Scale, which ranges from a smiling face for "No pain" to a crying/tearful face for "Extreme pain" [9]. However, it may also be true for the revised Faces Pain Scale (FPS-R; [10]), which has a strongly grimacing face as representing "Extreme pain," and could therefore potentially be interpreted by the respondent as indicating extreme upset or pain unpleasantness, and not just extreme pain intensity. Support for this possibility comes from research showing that the FPS-R is not correlated as strongly to other pain intensity measures as the NRS or the VRS, at least among older individuals [11, 12]. Similar results have also been obtained when testing for the agreement of the scores provided with an electronic version of the FPS-R (eFPS-R) and other scales (e.g., eNRS, eVAS) in a sample of adolescents [13].

VRSs are another option when NRSs are deemed inappropriate. However, they also suffer from some weaknesses, including (1) a limited number of response options (e.g., the 4-point VRS has just four response options: "None", "Mild", "Moderate", and "Severe") and (2) a lack of ratio scale properties (e.g., the difference in severity between "Mild" and "Moderate" is not the same as that between "Moderate" and "Severe") [3]. These weaknesses are thought to reduce the sensitivity of VRSs (relative to VASs or NRSs) and also make the use of parametric statistics inappropriate. To our knowledge, however, no one has suggested that the VRS assesses anything other than pain intensity, in the same way that the FACES scales are thought to reflect both pain intensity and pain affect.

However, there are reasons to question the extent to which VRSs measure only or primarily pain intensity. Although it would certainly be expected that people with very high levels of pain intensity would be more likely to classify their pain as "Severe" than "Moderate," it would also seem reasonable for two pain problems that have the same overall magnitude to be evaluated differently with a VRS if they vary on domains other than just intensity. For example, a pain problem rated as having an intensity of "6" on a 0–10 scale that markedly

interferes with function, that is thought to be uncontrollable, and that the patient catastrophizes about might be more likely to be rated as “Severe” than a pain problem of that same intensity that does *not* interfere with function, is viewed as controllable, and is not associated with catastrophizing thoughts.

Knowing whether VRSs are or are not biased or influenced by factors other than pain intensity – and if so, what those factors are – is important for a number of reasons. For example, the World Health Organization’s cancer pain ladder bases clinical decisions regarding when and what type of medications should be given to patients based on the severity of their pain as indicated by a VRS, with non-opioid analgesics recommended for mild to moderate pain, and opioid analgesics recommended for moderate to severe pain (http://www.who.int/cancer/palliative/painladder/en/). However, if patient ratings are influenced, at least in part, by psychosocial and behavioral factors such as perceived pain controllability, catastrophizing and/or pain interference (all of which are amendable to psychosocial treatments), patients who report their pain as “Severe” because of these factors might end up being prescribed the strongest analgesics (which can have many negative side effects), when in fact the primary issues may be their perceptions of pain control, amount of catastrophizing, and/or the amount of pain interference, and not the magnitude of pain intensity. As a result, these patients may end up getting an inappropriate treatment for the pain issues they are dealing with. In addition, knowledge regarding the factors other than pain intensity that influence VRS severity ratings would help clinicians and researchers to better interpret those ratings.

As suggested above, it would be reasonable to expect that at least three factors might influence the VRS pain severity rating chosen, over and above any effects of pain intensity. These include pain beliefs (e.g., [14]), pain interference (e.g., [15]), and pain catastrophizing ([16]). Given these considerations, the aim of this study was to determine the extent to which pain beliefs, pain interference, and pain catastrophizing influence the rating of pain as “None”, “Very Mild”, “Mild”, “Moderate”, ”Severe” or “Very Severe”, after controlling for pain intensity as rated by 0–10 numerical ratings scales, in a sample of adults with chronic pain and physical disabilities. We hypothesized that measures of pain interference, catastrophizing, and pain beliefs would each demonstrate unique associations with the severity level of the verbal descriptor used to rate pain severity. Specifically, we hypothesized that pain interference and cognitive responses viewed as “maladaptive” (e.g., pain catastrophizing, the belief in oneself as disabled, the belief that medications are appropriate for chronic pain) would show positive unique associations with a tendency to classify the same pain intensity as more severe, while cognitive responses viewed as “adaptive” (e.g., the belief in pain as a controllable experience) would evidence negative unique associations with a tendency to rate the same pain intensity as more severe on a verbal rating scale, even after controlling for pain intensity as measured on a 0–10 NRS.

METHODS

Source of data

The data for this study came from a large scale survey study of pain and quality of life in four groups of individuals with disabilities: spinal cord injury (SCI), acquired amputation

(AMP), neuromuscular disease (NMD), and multiple sclerosis (MS). Although papers describing a number of findings from this survey have been published (e.g., [17–23]), no paper has been published using these data that has examined the question which is the focus of this paper.

Participants

Of the 807 individuals who provided data for the survey study, 594 (74%; AMP = 132, MS = 124, NMD = 212, SCI = 126) reported that they had pain in the past three months other than occasional headaches or menstrual cramps; the data from these individuals were used for the present analyses. Basic descriptive and pain information for the study participants overall, and also broken down by diagnostic group, is presented in Table 1. As can be seen, most of the participants were fairly educated (overall, 74% had had some college, were college graduates, or had attended graduate school). The majority (93%) classified their race/ethnicity as Caucasian. Average pain intensity in the past week was rated as 4.74 on a 0–10 NRS; average pain intensity ranged from 4.46 (NMD group) to 5.08 (SCI group). About half (46% overall; range among the four diagnostic groups was 45% to 52%) of the participants classified their usual pain as “Moderate” on the 6-point VRS, with about half of the remaining (28% of the entire sample) classifying their usual pain as something less than moderate (i.e., “None”, “Very Mild”, or “Mild”), and the other half (25% of the entire sample) classifying their usual pain severity as something more than moderate (i.e., “Severe” or “Very Severe”). [Insert Table 1 about here]

Procedures

The sources of subjects for the survey study were different for each diagnostic group, but all were samples of convenience. Most of the AMP participants were individuals who had participated in previous survey studies, post-amputation studies, or clinical trials conducted by our group and who had indicated a willingness to participate in additional surveys. The participants in the current study with MS had all come from a registry of individuals who had completed previous survey studies and expressed a willingness to participate in the current survey. Participants with NMD were recruited primarily from the National Institutes of Health (NIH)-funded Registry of Myotonic Dystrophy *and* Facioscapulohumeral Muscular Dystrophy Patients and Family members (http://www.urmc.rocherst.edu/nihregistry/). Finally, participants with SCI were all individuals who had participated in previous SCI research projects and were on an active registry of individuals with SCI who expressed an interest in participating in additional studies. All participants were paid $25 for returning completed questionnaires. The study procedures were approved by the University of Washington Institutional Review Board, and informed consent was obtained from all of the study participants.

Measures

Pain intensity and pain severity—Two measures were used to assess pain intensity and pain severity in this study: a 0–10 Numerical Rating Scale (NRS) and a 6-point Verbal Rating Scale (VRS). The NRS asked participants to rate their average pain intensity during the past week on a 0 (“No pain”) to 10 (“Pain as bad as could be”) scale. The VRS used was

the pain severity item from the SF-36 Bodily Pain scale [24]. With this item, participants were asked to indicate how much bodily pain they have had in the past 4 weeks on a 6-point categorical scale: “None”, “Very Mild”, “Mild”, “Moderate”, “Severe”, and “Very Severe”. A great deal of support exists for the reliability and validity of both the NRS and VRS for assessing pain intensity and severity in adults with and without disabilities [3].

Pain interference—Pain interference was assessed using a modified version of the 7-item Brief Pain Inventory (BPI) Pain Interference scale [25, 26]. The original BPI Pain Interference scale assesses the respondent’s perception of how much pain interferes with seven activities of daily living, including general activity, normal work (including housework), walking, and relationships with other people, sleep, and enjoyment of life. To make the measure more valid for use with disabled populations, some of whom are not ambulatory, we modified the walking item to assess interference with “mobility (ability to get around).” Respondents indicated the amount of pain interference with each activity on a 0 (“Does not interfere”) to 10 (“Completely interferes”) numerical scale. The total score is computed as an average of the item responses, with higher scores indicating more pain interference. The modified BPI has been used in previous research in individuals with disabilities, and has demonstrated good psychometric properties in these populations [27, 28]. The modified BPI evidenced excellent (Cronbach’s alpha = .93) internal consistency in the current sample.

Catastrophizing—Catastrophizing was assessed using the 6-item Catastrophizing scale of the Coping Strategies Questionnaire [29]. This scale measures perceptions of pain-related helplessness and pessimistic beliefs about pain. Respondents indicate the frequency with which they thought each cognition described by the items on a 0 (“Never”) to 7 (“Always”) Likert scale. These ratings are averaged to form the scale score, with higher scores indicating more catastrophizing. This measure is widely used in the pain literature, and has demonstrated excellent psychometric properties [29–31]. The Catastrophizing scale had good internal consistency (Cronbach’s alpha = .89) in the current sample.

Pain Beliefs—Pain beliefs were measured using the Survey of Pain Attitudes (SOPA; [14]). This measure includes 57 items that assess seven domains, specifically beliefs in: control over pain, emotions impacting pain, oneself as disabled by pain, hurt indicating physical damage, the appropriateness of medications for managing chronic pain, the appropriateness of solicitous responses from family, and a medical cure for pain. Respondents indicated their level of agreement with each belief item on a 0 (“This is very untrue for me”) to 4 (“This is very true for me”) scale. Scale scores are computed as the average of the responses to the items on each scale. Previous research supports the validity and reliability of the SOPA scale scores [14, 32–34]. In the current sample, three of the SOPA scales had adequate internal consistencies (Cronbach’s alphas = .75 – .76 for the Emotion, Medication, and Solicitude scales) and four scales had marginal internal consistencies (Cronbach’s alphas = .65 – .67 for the Control, Disability, Harm, and Medical Cure scales). While lower than ideal, these internal consistency coefficients are adequate for obtaining reliable results when the sample size is large, as it is in the current analyses.

Data analysis

We first examined the distributions of the independent variables (skewness and kurtosis) and also computed the variance inflation factors for the predictors (to evaluate potential multicollinearity), to ensure that the study variables met the assumptions for the planned regression analyses. In the event that significant multicolinearity was found in the data, we planned to perform a principal components analysis of the predictor variables using a varimax rotation, in order to create factor scores which could be used as predictor variables that represented unique (i.e., not associated substantially with each other) domains. We also examined the correlation between the NRS and VRS ratings to determine how much variance in one was explained by the other. We then performed an initial regression analysis to determine if there is empirical support for testing the primary study hypothesis by collapsing across the diagnostic groups, or if four separate analyses (one for each group) were indicated. In this initial analysis, pain severity as measured by the 6-point VRS was the dependent variable. We entered the 0–10 NRS rating of average pain intensity in step 1 to control for the effects of this estimate of pain magnitude on the severity rating. We then entered sex and age as control variables in step 2. In step 3, we entered diagnostic group (dummy coded) and then entered the primary independent variables (measures of pain interference, catastrophizing, and pain beliefs) in step 4 as a block. Finally, we entered terms representing all possible Diagnostic Group X Independent Variable interaction effects, stepwise, to determine if the associations between any independent variables and the level of pain severity as rated by the VRS differed as a function of diagnosis. If no interaction effects involving diagnosis emerged, we planned to test the study hypothesis using a second regression analysis (step 1: pain intensity as rated by the 0–10 NRS, step 2: age and sex; step 3: independent variables) using all of the study subjects, collapsed across diagnostic groups. In the event that a significant interaction effect involving diagnosis was found, we planned to test the study hypothesis using a series of four regression analyses (one for each group). In either case, support for the study hypothesis would be found if the measures of pain interference, catastrophizing, and pain beliefs were shown to predict unique variance in the VRS rating of pain severity, when controlling for the 0–10 rating of pain intensity. To help understand the role that any of the independent variables may play in determining the verbal pain severity classification made by the participants over and above the effects of average pain intensity, as indicated by a significant effect associated with the independent variables, we planned to separate patients as scoring relative high or low on each independent variable using a median split. Next, we planned to compute and examine the percentages of participants who classified their pain severity as “None/Very Mild/Mild”, “Moderate”, or “Severe/Very Severe”, separately for each of three categories of pain intensity as measured by the 0–10 NRS; specifically, the levels traditionally labeled as no or mild pain (0–4), moderate pain (5–6), and severe pain (7–10) [35].

RESULTS

Assumptions testing and associations between the NRS and VRS ratings

None of the study variables demonstrated high levels (i.e., > 2.0) of skewness (range, −.58 to 1.18) or kurtosis (range, −1.12 to .98), indicating adequately normal distributions for the independent and criterion variables. However, a number of variance inflation factors were

larger than 10 (the standard cutoff used for determining that there is substantial multicolinearity among the predictor variables [36]). Therefore, we performed a principal components analysis (PCA) with varimax rotation to create predictor factors that were not associated substantially with one another to use in the planned regression analyses (the results are presented in the next section). The correlation between the NRS and VRS ratings was $r = .64$ ($p < .001$). Thus, 41% of the variance of the VRS rating is explained by pain intensity as assessed by the 0–10 NRS, leaving 59% of unexplained variance.

Principal Components Analysis

The PCA of the catastrophizing, pain interference, and pain beliefs scores yielded three factors that explained 63% of the variance. Five of the nine predictors loaded on the first factor: the BPI pain interference scale (loading = .72), the PCS catastrophizing scale (.72), and the SOPA Control (negative loading, −.71), Disability (.77), and Harm (.66) scales. We labeled this factor Pain-Related Dysfunction Beliefs. Two predictors loaded on the second factor: the SOPA Emotion (.85) and Solicitude (.67) scales. We labeled this factor Pain-Related Emotionality Beliefs. Finally, two predictors loaded on the third scale: the SOPA Medication (.75) and Medical Cure (.83) scales. We labeled this factor Biomedical Beliefs. Consistent with the procedures used (i.e., varimax rotation), the correlation coefficients among the factor scores were all .00 and the variance inflation factors were all 1.00.

Independent effects of the factors assessing pain interference, catastrophizing, and pain beliefs on the verbal descriptor chosen

The initial regression analysis to identify any moderating effects of diagnostic group yielded no significant interaction effects, indicating similar patterns of associations between the predictor variables and criterion variable across the diagnostic groups. Therefore, all subsequent analyses were collapsed across the diagnostic groups. The results of four regression analysis predicting the VRS pain intensity ratings from the three predictor factors, controlling for the 0–10 NRS pain intensity ratings and the demographic variables of age and sex for each of the diagnostic groups are presented in Table 2. As can be seen, significant effects were found for each of the three predictor factor scores, with somewhat stronger effects ($\beta = .24$, $p < .001$) for the Pain-Related Dysfunction Beliefs factor than either the Pain-Related Emotionality Beliefs factor ($\beta = .10$, $p < .01$) or the Biomedical Beliefs factor ($\beta = .10$, $p < .01$). In every case, higher scores on the predictor factors were associated with a tendency to rate pain as more severe on the VRS, when controlling for the pain rating provided on the NRS.

Understanding the effects of the predictors on verbal pain severity ratings

Table 3 presents the percentages of participants in each pain intensity classification group (as measured by the 0–10 scale, classified as reporting average pain magnitudes of 0–4, 5–6, and 7–10) who rated their pain severity into each of three verbal descriptor classes (None/Very Mild/Mild, Moderate, or Severe/Very Severe). Based on commonly used cutoffs for classifying pain intensity on the 0–10 scale as Mild, Moderate, and Severe (e.g., [35]), we anticipated that, in general, the plurality of participants would classify pain intensity in the 0–4 range as “None”, “Very Mild” or “Mild”, pain intensity in the 5–6 range as “Moderate” and pain intensity in the 7–10 range as “Severe” or “Very Severe”. This assumption was

supported in the sample overall, as can be seen by an examination of the rates of participants along the diagonal in Table 3 (e.g., more participants who rated their pain as 5–6 on the NRS also rated their pain as “Moderate” on the VRS than rated their pain as “None/Very Mild/ Mild” or “Severe/Very Severe” on the VRS).

However, the effects of the three independent variables that were significantly and uniquely associated with the pain severity verbal descriptor chosen can also be seen. Although these effects occurred across all levels of pain intensity as rated by the NRS, the effects for the Pain-Related Dysfunction Beliefs factor are most evidence for participants who rated their pain as 7–10 on the NRS. For those participants scoring low on this factor, the majority (69%) rated their pain as “Moderate” on the VRS, and only 23% rated it as “Severe” or “Very Severe.” On the other hand, participants with NRS ratings from 7 to 10 and high on this factor were more likely to rate their pain as “Severe” or “Very Severe” (57%) than Moderate (36%). The effects of the Biomedical Beliefs factor on how pain was rated on the VRS were similarly largest among those whose pain intensity was rated from 7 to 10 on the VRS.

On the other hand, the effects of the Pain-Related Emotionality Beliefs factor on VRS pain ratings appeared to be greatest among those who rated their pain intensity relatively low (0–4) on the NRS (see Table 3). Specifically, those who scored higher on this factor were more likely to rate their pain as “Moderate” on the VRS (50%) than “None”, “Very Mild”, or “Mild” (44%), whereas those who scored lower on this factor evidenced the opposite pattern (i.e., 41% vs. 55%, respectively).

DISCUSSION

The key finding from this study is that even when controlling for pain intensity as measured by a NRS, responses to the (commonly used) VRS of pain severity are influenced by factors representing pain interference, pain catastrophizing, and key pain-related beliefs. The findings have important implications for interpreting the effects of pain treatments on pain severity as measured by VRSs, as well as for the selection of pain intensity measures for use in research studies and in clinical settings.

The current findings indicate that researchers and clinicians should not assume that the NRS and VRS necessarily assess exactly the same domain. While VRS scores tend to be significantly associated with NRS ratings – a finding consistent with the fact that 41% of the variance in the VRS rating was explained by the 0–10 NRS rating (i.e., $r = .64$) in our sample – our findings indicate that a VRS score can also contain information about the patient’s perceptions regarding how pain interferes with function, pain catastrophizing, and beliefs about pain controllability, whether or not one is disabled by pain, and whether medications are appropriate. When patients tell us that their pain is “Severe,” they are telling us more than merely that their pain intensity is of high magnitude. In fact, relatively few – only 23% – of the participants whose pain intensity on the 0–10 NRS was 7 or higher and who were below the median with respect to perceptions of pain interference, pain catastrophizing, and disability beliefs described their pain as “Severe” or “Very severe.”

The findings suggest the possibility that treatment-related improvements in pain as measured by a NRS and VRS also may not mean the same thing, and that ratings of “pain intensity” may in fact reflect something more than just “pain intensity”. For example, based on the current findings, a treatment such as cognitive behavioral therapy, that targets pain beliefs, pain catastrophizing, and how much pain interference with function, might have an effect on pain intensity ratings due in part to the changes it has on these other pain-related domains. Thus, based on the results of the current study, researchers should be careful to keep in mind the factors that contribute to ratings on pain intensity scales when discussing and interpreting research findings as measured by these scales.

We also view the current findings as providing additional support for the selection of NRSs over other scales – in this case, VRSs – when the goal is to measure pain intensity. Measures that assess multiple domains and combine those domains into a single summary score are difficult to interpret; one cannot know which factor(s) contributed to any changes observed. However, it may not always be appropriate to use a NRS scale in a specific setting or for a specific clinical trial. In particular, NRSs may be less useful than VRSs in research in patients who are elderly or otherwise are at risk for cognitive deficits [37, 38]; VASs are even less appropriate for these populations [5, 39, 40]. For these populations, the viable alternative measures are FACES pain rating scales or VRSs. However, as mentioned in the Introduction, FACES scales may contain information about both the intensity component and the affective component of pain [11, 12].

There are a number of limitations of the current study that should be considered when interpreting the results. First, we did not assess the participant’s affective response to pain. Thus, we were unable to evaluate whether the VRS ratings were influenced or biased by affect. Similarly, we did not include a FACES pain rating scale in the study, so were unable to evaluate if the factors that influence the VRS and FACES scale are similar or different. These issues will be important to address in future research. Second, the NRS and VRS measures used in this study asked about pain over two different recall periods; specifically, one week and 28 days, respectively. Although we are not aware of any theoretical or practical reason for this difference in recall period to have influenced the results, it remains possible that the psychosocial factors examined here might have influenced perceptions of (VRS-rated) pain severity during the past 28 days in ways that differ from their influence on ratings of pain severity in the past week. Future research using measures that assess recalled pain over the same period should be able to address this issue. In addition, the participants’ diagnoses are most closely associated with neuropathic pain. The findings might have differed had the sample included substantial numbers of individuals with non-neuropathic pain problems (e.g., primary headache, arthritis). Given the possibility that the factors that contribute to VRS pain ratings might differ as a function of pain type, the extent to which the current findings generalize to populations with other pain conditions are not known. This supports the need for similar analyses in individuals with other pain conditions to determine the reliability of the study findings. The participants represented samples of convenience with one of four disability diagnoses. Thus, they are not necessarily representative of the populations of individuals who have these diagnoses and chronic pain. These considerations provide further support for the need to replicate the analyses in additional samples of individuals with chronic pain in order to determine the reliability of the findings.

Another issue concerns the amount of overlap found between the NRS and VRS in the current study (r = .64, indicating 41% of overlapping variance), and the fact that research shows that this overlap can vary widely from sample to sample. Some studies show associations stronger than that found in the current study. For example, Sendlbeck and colleagues [41] reported correlation coefficients between .80 and .82 between these measures assessed at three different time points in a sample of patients with rheumatoid arthritis. Such strong relationships have also been found in samples of patients with chronic cancer-related pain [42] and students rating the intensity of experimentally-induced pain in the laboratory [43]. On the other hand, coefficients less than this have been reported in a sample of patients with chronic pain attending a comprehensive pain treatment program (r = .52 [44]], individuals with spinal cord injury and chronic pain (Spearman's rho = .38 [45]) and youths with physical disabilities and chronic pain (r = .33 [46]). It is possible, even likely, that the factors which influence pain ratings may play a larger role in some samples than others, and that the strength of associations among different pain rating scales may indicate the extent of that influence (i.e., a weaker association among different measures may reflect a greater impact of factors other than pain intensity to play a role in the rating provided by respondents). Overall, though, these findings of variability in the strength of the associations among pain measures do not detract from the primary finding of the current study; measures of "pain intensity" likely reflect more than just the magnitude of pain. Researchers and clinicians would do well to keep this in mind when interpreting the scores from such measures.

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Table 1

Description of the study participants.

Variable	All participants N (%) or Mean (SD) (N = 594)	AMP N (%) or Mean (SD) (N = 132)	MS N (%) or Mean (SD) (N = 124)	NMD N (%) or Mean (SD) (N = 212)	SCI N (%) or Mean (SD) (N = 126)
Age (in years)	51.01 (13.26)	58.25 (14.38)	50.85 (10.79)	48.10 (13.06)	48.45 (11.76)
Sex					
Men	313 (53%)	100 (76%)	31 (25%)	91 (43%)	91 (72%)
Women	218 (47%)	32 (24%)	93 (75%)	121 (57%)	35 (28%)
Education level					
9th grade or less	6 (1%)	2 (2%)	1 (1%)	0 (0%)	3 (2%)
10th – 11th grade	12 (2%)	7 (5%)	1 (1%)	0 (0%)	4 (3%)
High School graduate/GED	82 (14%)	12 (9%)	12 (10%)	45 (12%)	13 (10%)
Some vocational or technical school	55 (9%)	18 (14%)	7 (6%)	15 (7%)	15 (12%)
Some college	170 (29%)	37 (28%)	36 (29%)	58 (27%)	39 (31%)
College graduate	158 (27%)	35 (27%)	37 (30%)	55 (26%)	31 (25%)
Graduate school	111 (19%)	21 (16%)	30 (24%)	39 (18%)	21 (17%)
Race/Ethnicity *					
Caucasian	551 (93%)	123 (93%)	119 (96%)	197 (93%)	112 (90%)
Native American	15 (3%)	2 (2%)	2 (2%)	3 (1%)	8 (6%)
Hispanic	14 (2%)	1 (1%)	1 (1%)	7 (3%)	5 (4%)
African-American	7 (1%)	4 (3%)	1 (1%)	0 (0%)	2 (2%)
Asian	11 (2%)	2 (2%)	2 (2%)	3 (1%)	4 (3%)
Pacific Islander	3 (1%)	0 (0%)	1 (1%)	2 (1%)	0 (0%)
NRS Pain Intensity	4.74 (2.45)	4.83 (2.52)	4.81 (2.37)	4.46 (.2.55)	5.08 (2.25)
VRS Pain severity					
None	10 (2%)	2 (2%)	1 (1%)	5 (2%)	2 (2%)
Very mild	50 (8%)	12 (9%)	9 (7%)	20 (9%)	9 (7%)
Mild	108 (18%)	20 (15%)	24 (19%)	53 (24%)	13 (10%)
Moderate	275 (46%)	58 (44%)	64 (52%)	96 (45%)	57 (45%)
Severe	126 (21%)	33 (25%)	23 (19%)	33 (16%)	37 (29%)
Very severe	25 (4%)	7 (5%)	3 (2%)	7 (3%)	8 (6%)

* Sums to > 594, as participants could endorse more than one category

Note: GED = (General Education Development); NRS = 0–10 Numerical Rating Scale of average pain intensity; VRS = 6-point Verbal Rating Scale of average pain severity.

Table 2

Results of the regression analyses predicting verbal descriptor scale score from 0–10 NRS ratings, sex, age, and factor scores representing pain interference, catastrophizing, and pain-related beliefs.

Step and predictor	R^2	ΔR^2	*F*-change	β
Step 1: 0–10 NRS	.40	.40	400.30***	.64***
Step 2:	.41	.01	4.34*	
Age				.09**
Sex				−.01
Step3:	.47	.06	20.85**	
Pain-Related Dysfunction Beliefs factor				.24***
Pain-Related Emotionality Beliefs factor				.10**
Biomedical Beliefs factor				.10**

* p < .05,

** p < .01,

*** p < .001

Note: NRS = Numerical Rating Scale.

Table 3

Pain severity classification as a function of high and low values on the independent variables identified as significantly associated with severity ratings.

		Verbal pain classification		
Pain Intensity (0–10)	**N (Low/High)***	**None/Very Mild/Mild (Low/High)***	**Moderate (Low/High)***	**Severe/Very Severe (Low/High)***
		Pain-Related Dysfunction Beliefs factor		
0–4	281(199/82)	55%/37%	44%/50%	1%/13%
5–6	151 (63/88)	18%/11%	60%/56%	22%/33%
7–10	162 (35/127)	19%4%	69%/36%	23%/57%
		Pain-Related Emotionality Beliefs factor		
0–4	281 (136/145)	55%/44%	41%/50%	4%/6%
5–6	151 (78/73)	12%/16%	58%/58%	31%/26%
7–10	162 (83/79)	7%/3%	33%/36%	60%/57%
		Biomedical Beliefs factor		
0–4	281 (152/129)	53%/46%	43%/50%	5%/5%
5–6	151 (73/78)	15%/13%	64%/51%	21%/36%
7–10	162 (72/90)	7%/3%	47%/29%	46%/69%

* Low = below median and High = above median for the independent variable effect examined.

Note: The effect of each independent variable on the verbal descriptor chosen for each range of pain intensity (0–4, 5–6, or 7–10) is evident in the differences in percentages in each cell (see text).