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ORIGINAL RESEARCH

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The Impairment and Functioning Inventory Revised-English version: A validation study in individuals with disabilities and bothersome pain

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Abstract

Background: Despite the relevance of daily function in individuals with chronic pain, few questionnaires have been designed to assess this domain in individuals with musculoskeletal pain. In addition, the Impairment and Functioning Inventory-Revised (IFI-R) is the only instrument that assesses perceived decreases in levels of daily activity after the onset of pain.

Objective: To evaluate the psychometric properties of the English version of the IFI-R.

Design: Cross-sectional study.

Setting: A database of individuals with medical conditions commonly associated with chronic pain maintained by the University of Washington.

Patients: A total of 470 individuals with chronic pain.

Methods: Factorial validity was analyzed by conducting a confirmatory factor analysis via structural equation modeling. Internal consistency was evaluated by calculating Cronbach's α coefficients. Convergent validity was assessed by calculating Pearson correlation coefficients between the two scales of the IFI-R and the Patient Reported Outcome Measurement Information System (PROMIS) Pain Interference Scale. Criterion validity was analyzed by regression analysis via structural equation modeling.

Main Outcome Measures: The English version of the IFI-R (IFI-R-EV) for individuals with chronic pain.

Results: The IFI-R-EV consists of 30 items with two related subscales: The Daily Function subscale ($\alpha = .86$). and the Impairment subscale ($\alpha = .89$). A significant correlation was found between these subscales and a measure of pain interference ($r's = -.33$, and .35 respectively; $p's < .01$). We also found statistically significant associations ($p < .05$) between daily function and depression ($\beta = -.14$) and pain intensity ($\beta = -.13$), between impairment and depression ($\beta = .14$) and pain intensity ($\beta = .16$), and between daily function and pain acceptance ($\beta = .14$).

Conclusions: The findings indicate that the IFI-R-EV provides valid and reliable measures of daily function and impairment in English-speaking individuals with a disability and chronic pain. These results are consistent with those obtained with the Spanish version.

INTRODUCTION

Chronic pain is a worrisome health and economic problem worldwide. Depending on the method used, its prevalence ranges from 6% to 60% in adult populations in developing and developed countries.[1] In addition to the direct and indirect economic burden on health care systems, chronic pain can have significant negative effects on the individuals with this condition. For example, chronic pain is the leading cause of disability worldwide.[2,3] The Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) consensus group found that chronic pain has a negative impact on emotional well-being, daily function, and participation in family, social, and work life.[4]

Daily function is one of the most commonly measured domains in chronic pain research.[5] The relevance of this domain was highlighted by the results of a meta-analysis, which found that the primary reason for health care use among patients with chronic pain was not the severity of the pain, but the extent to which pain interferes with daily activities.[6] In addition, clinical guidelines recommend that clinicians should assess disability as the highest priority.[7] Hence, both disability and daily activity should be considered when evaluating the impact of pain on people's lives and in determining the efficacy of chronic pain treatment.[8]

Notwithstanding the relevance of daily function in individuals with chronic pain, few questionnaires have been designed to assess this domain in patients with musculoskeletal pain. A recent review[7] recommended the use of several questionnaires to measure physical function in individuals with chronic low back pain. Although disability and activity are related, and both are related to physical functioning, the recommended questionnaires assess only disability: none of them assess daily activity. In addition, no current questionnaire compares the current level of activity with the level of activity before the onset of chronic pain (ie, to determine the level of impairment produced by chronic pain). Verbunt et al[9,10] concluded that a perceived decrease in activity, rather than perceived current activity, is of greater relevance when evaluating the effect of activity-related changes in patients with chronic pain. Therefore, false conclusions could be drawn regarding levels of impairment if the patients' perceived levels of current functioning are assessed in the absence of knowledge of their level of activity before the onset of pain.

Previous studies have investigated the role of a number of variables in relation to the effects of chronic pain on daily function. These variables include pain acceptance, depression, and pain intensity. Specifically, studies have found an association between higher levels of pain acceptance and higher levels of function and lower levels of impairment.[11-18] On the other hand, associations have been found between higher levels of depression and pain intensity and lower levels of physical activity.[19-21]

The present study aims to evaluate the psychometric properties of the Impairment and Functioning Inventory Revised-English version (IFI-R-EV), which is a measure designed to assess the impact of pain on daily activity. The original version of the IFI was in Spanish and developed in 2003 and 2004.[22,23] In 2015, the IFI was revised using data from a Spanish sample of 483 individuals with back pain who were treated at primary care centers, and 137 patients with various pain conditions who were treated at a pain clinic.[24] This process resulted in the revised version of the IFI (IFI-R). The 30-item measure has two subscales that assess Daily Function and Impairment, each having four factors (ie, activities related to household, autonomous behavior, leisure, and social relationships). Overall, the findings support the validity and reliability of the IFI-R scores for measuring daily function and impairment in Spanish individuals with chronic pain.[12-14,16-18,25-27] However, as noted, no similar measures have been developed in the English language.

Thus the aim of the present study was to evaluate the psychometric properties of an English version of the IFI-R (IFI-R-EV) in a sample of individuals from the United States with bothersome pain. We hypothesized that the psychometric properties of the IFI-R-EV would be adequate providing it met the following criteria: (1) a factor structure consistent with the original IFI-R; (2) an internal consistency (Cronbach's alpha) of at least .60; (3) valid scores, as demonstrated by moderate and significant correlations between scores on the two scales of the IFI-R-EV and scores on the Patient Reported Outcome Measurement Information System (PROMIS) Pain Interference Scale (ie, convergent validity); and (4) statistically significant associations between the IFI-R-EV subscales and measures of depression, pain intensity, and pain acceptance (ie, criterion validity).

METHOD

Participants and procedures

A database of individuals with medical conditions commonly associated with chronic pain was used to recruit participants. The University of Washington maintained this database. Inclusion criteria were as follows: (1) having chronic pain (defined as a constant or recurrent bothersome pain during the last 3 months for at least half of the days during this period); and (2) having access to a computer or smartphone with an internet connection. The study data were collected and managed using Research Electronic Data Capture (REDCap) electronic data capture tools[28] hosted at the University of Washington. REDCap is a secure web-

based application designed to support data capture for research studies.

In total, 2871 potential participants were contacted via email. Of these, 899 individuals expressed an interest in participating and were then shown a set of screening questions. However, 212 individuals did not meet the inclusion criteria (ie, they did not have chronic pain). The remaining 687 individuals who qualified for the study were shown an informed consent statement to be signed digitally if they wanted to participate. After providing their signed consent, they were given the first survey question. In total, 470 participants provided written and informed consent and answered all the survey questions.

Participation was voluntary, and they were not compensated for their collaboration. Before starting the study, the University of Washington Institutional Review Board reviewed the protocols and considered the study to be of "minimal" risk and exempt from a full board review. Two other studies have been published using data from the same data set.[29,30] However, both of these studies addressed research questions that differed from those of the present study. Furthermore, neither study used data obtained using the IFI-R-EV.

Instruments

Demographic variables

Participants provided basic demographic information (age, sex, race or ethnicity, diagnosis, educational level, and work status).

Impairment and Functioning level

The original Impairment and Functioning Inventory for Patients with Chronic Pain-Revised was developed in the Spanish language (IFI-R).[24] It comprises 30 items referring to activities associated with one of the following areas: household, autonomous behavior, leisure, and social relationships. Respondents are asked whether or not they engaged in a number of daily activities (eg, sweeping the house, driving a car, getting dressed by themselves, visiting friends) during the previous week (for most activities) or during the previous month (for others). If the answer is yes, then they are asked how often they perform it. If the answer is no, they are then asked if they used to perform this activity before the onset of chronic pain. The total score on daily function is calculated as the total number of times the respondent engaged in the activities. Subsequently, a pain-related impairment score is calculated by summing the number of activities that were avoided due to pain. Higher scores indicate greater pain-related impairment. This approach differentiates between present function and impairment. Therefore, the IFI-R provides two indexes: Daily Function ($\alpha = .93$) and Impairment ($\alpha = .98$).[24] In addition, the two primary subscales of the IFI-R have different factor structures: The Daily Function subscale has a four-factor structure and the Impairment subscale has a one-factor structure. Scores on the four factors on the Daily Function subscale were all shown to have acceptable internal consistency and reliability (Household Activities: 11 items, $\alpha = .95$; Independent Function: 7 items, $\alpha = .81$; Leisure Activities: 5 items, $\alpha = .71$; and Social Activities: 5 items, $\alpha = .65$). In order to maximize internal consistency and reliability, two items (22 and 26) were not used when calculating the Daily Function total score. Therefore, the Daily Function subscale contains 28 items and the Impairment subscale contains 30 items.

The IFI-R was translated into English and included as an appendix in the 2015 publication.[24] The translation procedure consisted of two steps. First, the original Spanish version of the IFI-R was simultaneously and individually translated into English by two native-English translators. Subsequently, they discussed any differences in their translations to reach a consensus and create a unique English version. The resulting English items were then back-translated and compared with the original Spanish items. These English items were deemed to be consistent with the original Spanish items, and so no further revisions of the English items were needed.

Pain intensity

Participants were asked to rate their least, average, and worst pain during the previous week, as well as their current pain intensity level, on numerical rating scales (NRSs) ranging from 0 ("No pain") to 10 ("Worst pain possible"). These ratings were then averaged into a single composite measure of characteristic pain intensity.[31] Pain research commonly uses NRSs, which provide valid and reliable measures of pain intensity.[32]

Pain acceptance

The Chronic Pain Acceptance Questionnaire (CPAQ-8[33,34]) was used to measure pain acceptance. Respondents rate how true each acceptance item is for them on a scale ranging from 0 ("Never true") to 6 ("Always true"). For example, one of the items is "When my pain increases, I can still take care of my responsibilities." The CPAQ-8 total score has been shown to provide reliable and valid measures of pain acceptance in chronic pain populations.[33] In the present study, the total score demonstrated a marginal level of reliability (Cronbach's alpha = .63).

Depressive symptoms

Depressive symptoms were assessed using the 8-item PROMIS Emotional Distress-Depression Scale short form.[35] Respondents indicate how frequently they have experienced eight depressive symptoms over the past 7 days on a scale ranging from 1 (“Never”) to 5 (“Always”). For example, one of the items is “I felt depressed.” This scale has been shown to provide reliable and valid scores that show the frequency of depressive symptoms in chronic pain patients.[35] In the present sample, the internal consistency of the scale was excellent ($\alpha = .94$).

Pain interference

The 6-item PROMIS Pain Interference Scale (PROMIS-PI)[35] was used to assess pain interference. Respondents indicate to what degree pain has interfered with their day-to-day activities over the past 7 days on a scale ranging from 1 (“Not at all”) to 5 (“Very much”). For example, one of the items is “How much did pain interfere with your day-to-day activities?” This scale has been shown to provide a reliable and valid measure of pain interference in chronic pain patients.[35] In the current sample, the internal consistency of the scale was excellent ($\alpha = .95$).

Data analyses

In order to describe the sample, we first calculated the means, standard deviations (SDs), and percentages of the demographic and pain variables. To determine if the data set was suitable for factor analysis, we first conducted the Kaiser-Meyer-Olkin (KMO) test and Bartlett’s sphericity test. Confirmatory factor analysis was then performed via structural equation modeling using the LISREL 8.30 software package.[36] These analyses were used to test the validity of the four-factor structure of the Daily Function subscale and the one-factor structure of the Impairment subscale.[24] Analyses were performed using the polychoric covariance matrix of the IFI-R-EV items via the Maximum Likelihood estimation method. We used several goodness-of-fit indexes for the two alternative models. The Satorra-Bentler fit index corrects the statistic under distributional violations.[37] To reduce the sensitivity of χ^2 to sample size, the index is divided by the degrees of freedom. Ratios of 3 or less indicate an acceptable fit of the model.[38] The Comparative Fit Index[38] and the Non-Normed Fit Index[39] measure the proportional improvement in fit by comparing a hypothesized model with a more restricted baseline model (a null model is the most commonly used baseline model). The Comparative Fit Index and Non-Normed Fit Index range from 0 (absolute lack of fit) to 1 (perfect fit); values of more than 0.90 indicate a good fit.[40] The root mean square error of approximation is an absolute misfit index; the closer to zero, the better the fit. Values less than 0.08 indicate an adequate fit, and values less than 0.06 indicate a good fit.[40,41]

We then calculated Cronbach’s alpha coefficients for each score on the IFI-R-EV scales to measure their internal consistency. Convergent validity was evaluated by calculating Pearson correlation coefficients between scores on the two scales of the IFI-R-EV and scores on the PROMIS-PI. Finally, the criterion validity of the scores on the IFI-R-EV subscales was tested by regression analysis of the (exogenous) determinant variables (pain acceptance, pain intensity, and depressive symptoms) and of the (endogenous) criterion variables (the IFI-R-EV subscales). This analysis was performed via structural equation modeling using the LISREL 8.30 software package.[36] We used maximum likelihood estimation on a covariance matrix of the observable variables. In the regression analyses via structural equation modeling, the β parameters represent the directional effects of the exogenous variables on the endogenous variable and the t values indicate whether the β parameters are significant. All the determinant variables (exogenous) were entered in the model.

RESULTS

Sample characteristics

The final sample included 470 individuals with chronic pain. Their average age was 59 years ($SD = 11.6$). Most of the participants were women (63%) and Caucasian (90%); some participants (3%) reported themselves as belonging to more than one race. At the time of the study, 43% of the participants were retired, 11% were unemployed due to pain, 18% were unemployed for other reasons, 14% were in full-time employment, and 11% were in part-time employment. A total of 84% of participants had attended university or graduate school. Regarding clinical variables, the most frequent diagnoses were back pain (43%), multiple sclerosis (37%), osteoarthritis (20%), and spinal cord injury (20%). The primary pain sites were the back (71%), legs (66%), shoulders (55%), and neck (52%). Average pain intensity was 5.21 (range 0-10; $SD = 1.93$).

Confirmatory factor analysis and reliability

The confirmatory factor analysis performed via structural equation modeling supported the factorial structure previously obtained[24] (ie, the four-factor structure in the Daily Function subscale and a one-factor model in the Impairment subscale. Table 1 shows all the goodness-of-fit indexes of the tested models.

Daily function scale

The KMO test yielded a value of 0.858, which can be considered adequate, and Bartlett's test of sphericity yielded a statistically significant score: χ^2 (435) = 4255.74, $p < .001$. The results of the two tests showed that this data set was suitable for factor analysis. To examine the dimensionality of the scale, a confirmatory factor analysis (CFA) was performed via structural equation modeling using the LISREL 8.30 software package.[36]

A cut-off value of .30 was used to identify the items that loaded on each factor. Only item 4 ("Did you visit any relatives?") presented a loading of less than .30 (.25). However, when the item was deleted, there was no improvement in the internal consistency of the scores on the Daily Function scale, the Social Activities factor (alpha would change from .70 to .68), or the Daily Function scale (alpha would not change). Therefore, item 4 was retained in the instrument. On the other hand, according to the results suggested by the modification index, item 20 ("Go shopping"; in Spanish "*Hacer la compra*" which can also be translated as "grocery shopping"), could be included in the Leisure Activities factor, although it was originally in the Household Activities factor. Moreover, the goodness-of-fit statistics slightly improve when item 20 is included in the Leisure Activities factor. Therefore, in the IFI-R-EV, item 20 has been moved to the factor Leisure Activities. Table 2 shows the means, SDs, and corrected item-factor correlations of the items of the Daily Function scale, as well as the internal consistency coefficients and factor loadings. In the IFI-R-EV, items 22 and 26 did not impair the reliability of their respective subscale scores, and thus, in the English version, they are included when calculating the Daily Function subscale. This is also the case for the original version of the IFI.[42] In summary, these results are consistent with those obtained with the Spanish version of the IFI-R (except for items 20, 22, and 26).

Impairment scale

The KMO test yielded a value of 0.887, which can be considered adequate, and Bartlett's sphericity test yielded a statistically significant score: χ^2 (435) = 4183.98, $p < .001$. The results of the two tests showed that this data set was suitable for factor analysis. The CFA performed via structural equation modeling showed that a one-factor structure was adequate and that the loadings obtained were all appropriate. Table 3 shows the means, SDs, corrected item-factor correlations, and factor loadings of each item included in the Impairment Scale. These results are also consistent with those obtained with the Spanish version of the IFI-R.

Convergent validity

Validity analyses were performed using the total scores of the two subscales of the IFI-R-EV. Convergent validity was assessed by calculating Pearson correlations between the two IFI-R-EV subscales and the PROMIS-PI[35] (mean = 17.85, SD = 6.44), which is another measure of pain limitation during different daily activities. A moderate significant correlation[43] was found between both subscales and the PROMIS-PI: the correlation was negative in the case of the Daily Function subscale ($r = -0.33$, $p < .01$) and positive in the case of the Impairment subscale ($r = 0.35$, $p < .01$).

Criterion validity

Figure 1 shows the results of the regression analyses on the criterion validity of the IFI-R-EV scores. To obtain a parsimonious model of the relationships between the variables, we examined the path coefficients and deleted the non-statistically significant path from the model. Thus the path from pain acceptance to impairment was not statistically significant and was deleted. The goodness-of-fit indexes calculated for the standard error of the mean (SEM) indicated that the estimated model provides a good fit to the data (non-normed fit index [NNFI] = 0.98; comparative fit index [CFI] = 1.00; root mean square error of approximation [RMSEA] = 0.04; adjusted goodness-of-fit index [AGFI] = 0.98). The results showed a significant association between more depressive symptoms and pain intensity and lower daily activities and greater impairment. On the other hand, higher pain acceptance was only associated with higher levels of daily activities.

TABLE 1 Confirmatory factor analysis of the IFI-R-English version

		χ^2/ d.f.*	NNFI	CFI	RMSEA
Daily Function	Four-factor model	2.0	0.97	0.98	0.04
Impairment	One-factor model	2.3	0.93	0.94	0.05

Abbreviations: NNFI, non-normed fit index; CFI, comparative fit index; RMSEA, root mean-square error of approximation.
Goodness-of-fit Indexes.
*χ^2/ d.f.: Satorra-Bentler chi-square divided by degrees of freedom.

TABLE 2 Daily function scale: means, standard deviations, corrected item-factor correlations, factor loadings, and internal consistency

Daily function (30 items) α = .86				
Items during the past week, how many times did you…	**Mean**	**SD**	**Corrected item-factor correlations**	**Factor loadings**
Household Activities (10 items) α = .81				
1. Sweep your house?	0.77	0.78	0.54	0.62
3. Wash the dishes?	1.96	1.34	0.58	0.71
5. Mop the floor?	0.44	0.65	0.52	0.59
7. Do the dusting?	0.66	0.77	0.60	0.67
9. Do the laundry?	1.47	1.15	0.52	0.67
11. Make the beds?	1.63	1.36	0.53	0.70
13. Clean the bathroom?	0.89	0.84	0.56	0.62
14. Iron the clothes?	0.27	0.69	0.37	0.52
15. Hang the clothes out?	0.32	0.76	0.32	0.44
18. Cook a meal?	2.02	1.33	0.48	0.59
Independent Function (7 items) α = .74				
2. Climb the stairs?	1.40	1.65	0.33	0.46
8. Drive your car?	2.49	1.55	0.55	0.73
19. Dress by yourself?	3.17	1.22	0.64	0.83
21. Get in and out of bed without help?	3.14	1.30	0.61	0.79
24. Shave (him) or put on makeup (her) without help?	2.18	1.47	0.35	0.49
27. Eat without help?	3.55	1.01	0.39	0.67
29. Pick up heavy objects?	0.97	1.081	0.43	0.53
Social Activities (6 items) α = .70				
4. Visit any relatives? (per month)	1.06	1.01	0.34	0.25
10. Phone any relatives or any friends?	2.33	1.21	0.38	0.66
16. Visit friends?	1.21	1.02	0.59	0.94
22. Go to any meetings, for example, with neighbors? (per month)	1.05	1.19	0.44	0.82
25. Talk to a neighbor?	1.45	1.14	0.49	0.68
28. Go to church?	0.66	1.08	0.33	0.41
Leisure Activities (7 items) α = .60				
6. Eat outside your home? (per month)	1.70	1.08	0.45	0.55
12. Go for a walk?	0.96	1.20	0.37	0.52
17. Go to a bar or caf ?	0.83	0.98	0.52	0.54
20. Go shopping?	1.67	1.10	0.43	**0.71**
23. Go swimming?	0.24	0.74	0.23	0.37
26. Carry out some leisure activity outside the home? For example, go to a gym, go to painting classes, play cards (please indicate which one)	1.14	1.22	0.44	0.52
30. Go to the cinema or theater? (per month)	0.42	0.68	0.32	0.39

Final instrument

The IFI-R-EV comprises 30 items with two related subscales ($r = -0.54$, $p < .001$): Daily Function and Impairment (see Appendix 1). The CFA confirmed the one-factor model for the Impairment subscale. This subscale maintained the 30 items of the original scale, and the Daily Function subscale maintained the four-factor structure. However, item 20 should be included in the Leisure Activity subscale of the IFI-R-EV, rather than in the Household Activities subscale. Although in the original version of the IFI-R, items 22 and 26 should not be included when calculating the Daily Function score, in the English version, both items should be included in their subscales (Social and Leisure Activities) and in the total score. The subscales showed good internal consistency, and the scores obtained for the four Daily Function factors demonstrated acceptable reliability.

TABLE 3 Impairment scale: means, standard deviations, corrected item-factor correlations, factor loadings, and internal consistency

Impairment (30 items) $\alpha = .89$				
Items (If patients did not perform the activity presented in the daily function scale). Did you use to do this before the pain began?	**Mean**	**SD**	**Corrected item-factor correlations**	**Factor loadings**
1. Sweep your house?	0.21	0.41	0.57	0.59
2. Climb the stairs?	0.31	0.46	0.44	0.42
3. Wash the dishes?	0.10	0.30	0.53	0.60
4. Visit any relatives? (per month)	0.16	0.36	0.28	0.30
5. Mop the floor?	0.33	0.47	0.53	0.51
6. Eat outside your home? (per month)	0.09	0.28	0.41	0.46
7. Do the dusting?	0.24	0.42	0.54	0.51
8. Drive your car?	0.11	0.31	0.47	0.52
9. Do the laundry?	0.13	0.33	0.52	0.59
10. Phone any relatives or any friends?	0.03	0.18	0.28	0.41
11. Make the beds?	0.14	0.34	0.54	0.59
12. Go for a walk?	0.34	0.47	0.51	0.49
13. Clean the bathroom?	0.19	0.39	0.50	0.51
14. Iron the clothes?	0.26	0.43	0.55	0.51
15. Hang the clothes out?	0.16	0.37	0.47	0.46
16. Visit friends?	0.18	0.38	0.37	0.38
17. Go to a bar or caf ?	0.26	0.44	0.43	0.41
18. Cook a meal?	0.11	0.31	0.49	0.56
19. Dress by yourself?	0.04	0.18	0.38	0.58
20. Go shopping?	0.08	0.27	0.46	0.52
21. Get in and out of bed without help?	0.06	0.22	0.33	0.48
22. Go to any meetings, for example, with neighbors? (per month)	0.15	0.36	0.40	0.44
23. Go swimming?	0.38	0.48	0.36	0.31
24. Shave (him) or put on makeup (her) without help?	0.07	0.25	0.41	0.49
25. Talk to a neighbor?	0.10	0.30	0.33	0.37
26. Carry out some leisure activity outside the home? For example, go to a gym, go to painting classes, play cards (please indicate which one)	0.21	0.40	0.39	0.34
27. Eat without help?	0.03	0.15	0.21	0.38
28. Go to church?	0.13	0.33	0.33	0.34
29. Pick up heavy objects?	0.27	0.44	0.43	0.40
30. Go to the cinema or theater? (per month)	0.31	0.46	0.45	0.41

DISCUSSION

This study evaluated the psychometric properties of the English version of the Impairment and Functioning Inventory-Revised (IFI-R-EV) in a sample of individuals with chronic pain. Consistent with our hypotheses, the CFA supported the factorial structure previously obtained in the original IFI-R[24]: that is, a four-factor structure in the Daily Function subscale and a one-factor model in the Impairment subscale. However, there are some slight differences between the original Spanish (IFI-R) and English versions (IFI-R-EV) of the questionnaire. Specifically, item 20 ("Go shopping", in Spanish "*Hacer la compra*") should be included in the factor Leisure Activities in the English version, and not in the factor Household Activities. In hindsight, a better translation might have been "go to the grocery store," because in English "*go shopping*" can refer to a leisure activity. Despite this difference, the scores on both the IFI-R and IFI-R-EV subscales have acceptable levels of reliability.

In the IFI-R-EV and the original IFI-R, the Daily Function subscale contains 30 items. A total score can be obtained on both scales. Previous studies have shown the usefulness of the total scores of daily function and impairment.[12,17,44]

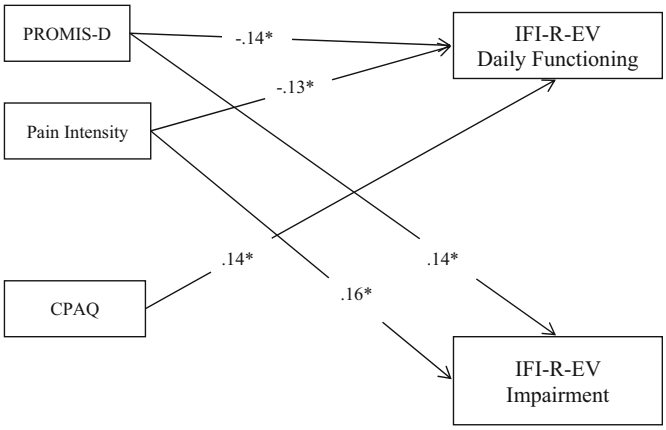

FIGURE 1 Results of the regression analyses examining criterion validity.
Note: The coefficients presented are standardized β coefficients. PROMIS-D, Patient Reported Outcome Measurement Information System depression subscale; IFI-R-EV, Impairment and Functioning Inventory Revised English version; CPAQ, chronic pain acceptance questionnaire. *$p < .05$

Regarding convergent validity, an expected significant association was found between the total scores on the IFI-R-EV subscales and the PROMIS-PI scale,[35] which assesses the ways in which pain limits an individual's physical, social, and recreational activities.[5] The results showed a negative association between PROMIS-PI and scores on the Daily Function subscale of the IFI-R-EV and a positive association between PROMIS-PI and scores on the Impairment subscale of the IFI-R-EV. Therefore, scores on the IFI-R-EV subscale showed good convergent validity.

To assess the criterion validity of the scores on the IFI-R-EV subscales, we tested a number of hypotheses regarding the relationship between depression, pain intensity, pain acceptance, daily function, and impairment. These hypotheses were confirmed by the results: a significant association was found between higher levels of depression and pain intensity and lower levels of daily function and higher levels of impairment. These findings are consistent with several studies that have shown an association between pain intensity and disability.[20,21,45] Regarding depressive symptoms, other studies have shown an association between depression and pain-related disability.[20,46,47] Our results are consistent with these results.

As hypothesized, an association was found between pain acceptance and better daily function. This result is consistent with the results of previous studies, which view acceptance as individuals continuing to function and participate in daily activities even while they are experiencing pain.[48] Moreover, previous empirical studies have obtained the same result.[11,12,15,17,18] However, the relationship between pain acceptance and impairment was not statistically significant. Despite this unexpected result, these findings support the criterion-related validity of the scores on the IFI-R-EV subscales.

LIMITATIONS

This study has some limitations that should be considered when interpreting the findings. Self-reporting was the only method included in the analyses. Future research could use other objective measures of function (eg, function and impairment ratings of participants by those who know them, actigraphy to detect movement, and so on). Furthermore, the cross-sectional study design makes it impossible to draw causal conclusions regarding the associations found. Thus prospective studies are warranted. Another limitation of this study is the relatively high education of the sample and relative lack of racial/ethnic diversity, which limits the generalizability of the findings. Finally, in future research, the IFI-R-EV's sensitivity to change and responsiveness to treatment should be analyzed.

CONCLUSION

Despite the study's limitations, the findings indicate that the IFI-R-EV provides valid and reliable measures of daily function and impairment in English-speaking individuals with disabilities and bothersome pain. The four factors included in the Daily Function scale of the IFI-R-EV could provide clinicians with more information on those areas of activity that would increase the patients' levels of function or even on those areas in which they show a good level of activity. Therefore, the Daily Function subscale could have descriptive value in a clinical setting. In addition, the IFI-R-EV can be used to assess a perceived decrease in activity levels (ie, impairment). In fact, impairment could be an even better indicator of well-being than daily function.[49] Given that the scale is quite short and addresses a relatively large number of domains, researchers could also include the scale in their protocols to further investigate the variables that interfere with the levels of daily function and impairment of patients with chronic pain.

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DISCLOSURES

No potential conflict of interest was reported by the authors. All procedures involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained individually from all study participants. This article does not refer to any animal studies conducted by any of the authors. The human subjects division of the University of Washington approved this study. The institutional review board of the University of Washington reviewed the protocols and considered the study of "minimal" risk and exempt from a full board review.

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