Validation of the Short-Form McGill Pain Questionnaire-2 (SF-MPQ-2) in Acute Low Back Pain

Robert H. Dworkin,*1,†,‡ Dennis C. Turk,§ Jeremiah J. Trudeau,‖ Carmela Benson,¶ David M. Biondi,§ Nathaniel P. Katz,‖,# and Myoung Kim§

Departments of *Anesthesiology and 1Neurology, University of Rochester School of Medicine and Dentistry, Rochester, New York.  
1Center for Human Experimental Therapeutics, University of Rochester School of Medicine and Dentistry, Rochester, New York.  
2Department of Anesthesiology and Pain Medicine, University of Washington, Seattle, Washington.  
3Analgesic Solutions, Natick, Massachusetts.  
4Janssen Scientific Affairs, LLC, Raritan, New Jersey.  
5Department of Anesthesiology, Tufts University, Boston, Massachusetts.

Abstract: The Short-form McGill Pain Questionnaire (SF-MPQ-2) assesses the major symptoms of both neuropathic and nonneuropathic pain and can be used in studies of epidemiology, natural history, pathophysiologic mechanisms, and treatment response. Previous research has demonstrated its reliability, validity, and responsiveness in diverse samples of patients with chronic pain. However, the SF-MPQ-2 has not been evaluated for use in patients with acute pain. Data were examined from a double-blind, randomized clinical trial of immediate-release tapentadol versus immediate-release oxycodone in patients with acute low back and associated radicular leg pain (N = 666). Analyses of internal consistency, convergent validity, and confirmatory factor structure were conducted using baseline data, and analyses of responsiveness were conducted using baseline and endpoint data. The SF-MPQ-2 total score and its 4 subscale scores (continuous pain, intermittent pain, predominantly neuropathic pain, and affective descriptors) generally showed good psychometric properties and 1) were internally consistent, 2) displayed good convergent validity, 3) fit the a priori factor structure, and 4) were highly responsive to analgesic treatment. These data extend previous evidence of the reliability, validity, and responsiveness of the SF-MPQ-2 in patients with chronic pain to those with acute low back and associated radicular leg pain.

Perspective: Considered together with the results of other recent studies, the data suggest that the SF-MPQ-2 can provide a valid, responsive, and efficient assessment of both neuropathic and non-neuropathic pain qualities for clinical trials and other clinical research examining patients with various acute and chronic pain conditions.

© 2015 by the American Pain Society

Key words: Short-form McGill Pain Questionnaire-2, SF-MPQ-2, acute pain, low back pain, pain quality.
The McGill Pain Questionnaire (MPQ) has been used for the assessment of the sensory, affective, and evaluative qualities of pain for more than 30 years, and its reliability and validity have been extensively documented. The Short-form McGill Pain Questionnaire (SF-MPQ) was developed to provide a less time-consuming measure that includes 15 pain descriptors, and it has also shown excellent reliability and validity.

Although the MPQ and SF-MPQ were developed for the assessment of all types of pain, they were not explicitly designed to assess the characteristics of neuropathic pain. This was probably because the prevalence of neuropathic pain in the general population and its adverse impact on quality of life were not widely recognized until the 1990s. In spite of this, the SF-MPQ has been used in a substantial number of studies of neuropathic pain, including evaluation of the responsiveness of different symptoms to treatment in clinical trials. Nevertheless, the SF-MPQ does not include several symptoms that are very common in patients with neuropathic pain or that are thought to reflect its pathophysiologic mechanisms (eg, reports of allodynia).

There has been increasing interest in using symptoms and signs to identify pain mechanisms and thereby potentially provide therapeutic targets for a mechanism-based approach to the treatment of acute and chronic pain. Multiple measures have been developed to assist in distinguishing neuropathic and nonneuropathic pain and to assess characteristic symptoms of neuropathic pain. Although these measures provide important information about neuropathic pain, they were not designed to assess the symptoms of nonneuropathic pain or to be used in randomized clinical trials (RCTs) and other clinical research on patients with nonneuropathic pain or with mixed nonneuropathic and neuropathic pain conditions.

To provide a single measure of the major symptoms of both neuropathic and nonneuropathic pain for use in research on the epidemiology, natural history, mechanisms, and treatment response of acute and chronic pain conditions, the SF-MPQ was expanded by adding 7 symptoms relevant to neuropathic pain and by replacing its 4-point verbal rating scale with a 0 to 10 numerical rating scale (NRS), which potentially provides increased responsiveness. The resulting Short-form McGill Pain Questionnaire-2 (SF-MPQ-2) has demonstrated evidence of reliability, validity, and/or responsiveness in a community sample of individuals with various chronic pain conditions; in U.S. veterans and Iranian multidisciplinary pain clinic patients with a range of pain conditions; in inpatients with nonneuropathic pain or with mixed nonneuropathic and neuropathic pain conditions.

To provide a single measure of the major symptoms of both neuropathic and nonneuropathic pain for use in research on the epidemiology, natural history, mechanisms, and treatment response of acute and chronic pain conditions, the SF-MPQ was expanded by adding 7 symptoms relevant to neuropathic pain and by replacing its 4-point verbal rating scale with a 0 to 10 numerical rating scale (NRS), which potentially provides increased responsiveness. The resulting Short-form McGill Pain Questionnaire-2 (SF-MPQ-2) has demonstrated evidence of reliability, validity, and/or responsiveness in a community sample of individuals with various chronic pain conditions; in U.S. veterans and Iranian multidisciplinary pain clinic patients with a range of pain conditions; in individuals with irritable bowel syndrome, persistent pain following caesarean delivery, and advanced cancer, and in clinical trials of fibromyalgia and painful diabetic peripheral neuropathy. The SF-MPQ-2 is being used in ongoing phase 2 and 3 RCTs, and it has been translated into 35 languages.

These previous and ongoing studies have examined the SF-MPQ-2 in patients with various chronic pain conditions. Because the SF-MPQ-2 is also intended for use in studies of acute pain conditions, the primary objective of the research described in this article was to determine the psychometric properties, including responsiveness to treatment effects, of the SF-MPQ-2 in an RCT of patients with acute low back and associated radicular leg pain.

**Methods**

In this article, we describe secondary analyses of data from a 10-day double-blind, parallel-group RCT of immediate-release tapentadol versus immediate-release oxycodone in 666 patients with a clinical diagnosis of acute low back pain with associated radicular leg pain. This sample of 666 patients includes 2 patients who were excluded from the primary study analyses because they either did not take medication or had no verifiable drug exposure. Because these 2 patients did provide baseline data, they are included in the analyses in which baseline data are used. Institutional review board approval was obtained by all study sites prior to their initiating the clinical trial, and all subjects provided informed consent before beginning any study procedures.

**Subjects**

Eligible patients were required to have had onset of their low back pain no more than 30 days prior to screening, a low back pain score at baseline of at least 5 on a 0 to 10 NRS, and associated radicular leg pain on at least one side. The clinical presentation was to be consistent with the Quebec Task Force Classification (QTFC) for Spinal Disorders categories 3, 4, and 6. These QTFC categories include acute low back pain and pain radiating below the knee with or without neurologic signs on physical examination suggestive of lumbosacral radiculopathy with or without evidence of nerve root compression on imaging. If neurologic signs were present, the leg with these signs was considered the “index” leg; if no neurologic signs were present, the leg with more intense radiating pain was considered the “index” leg. Patients with neurologic signs in both legs were not eligible for the study.

**Measures**

Analyses were conducted on study measures collected at baseline, except for analyses of responsiveness and predictive validity, both of which used data from day 5 of treatment, the time point used in defining the prespecified primary endpoint of the clinical trial from which these data are drawn.

**SF-MPQ-2**

As described above, the SF-MPQ-2 is an expanded and revised version of the SF-MPQ that includes 7 symptoms relevant to neuropathic pain and uses a 0 to 10 NRS rather than a verbal rating scale. There is a total of 22 items, each representing a different quality of pain or related symptoms. On the basis of the initial analyses, prior research on human experimental pain, and characteristic symptoms and signs in patients with neuropathic and nonneuropathic
pain, 4 SF-MPQ-2 subscales were established. Three of these subscales consist of sensory descriptors, and the fourth consists of affective (ie, emotional) descriptors, as follows: 1) continuous pain descriptors (6 items): throbbing pain, cramping pain, gnawing pain, aching pain, heavy pain, tender; 2) intermittent pain descriptors (6 items): shooting pain, stabbing pain, sharp pain, splitting pain, electric-shock pain, piercing; 3) predominantly neuropathic pain descriptors (6 items): hot-burning pain, cold-freezing pain, pain caused by light touch, itching, tingling or pins and needles, numbness; 4) affective descriptors (4 items): tiring-exhausting, sickening, fearful, punishing-cruel. The 4 SF-MPQ-2 subscale scores are calculated as the mean of the items in each subscale, and the total score is calculated as the mean of all 22 items. Higher subscale or total scale scores indicate that patients have more intense symptoms.

Pain Intensity

Average and current low back and index leg pain intensity were assessed using 0 to 10 NRSs; such ratings have been recommended as providing core outcome measures for chronic pain clinical trials.14

Brief Pain Inventory–Short Form (BPI-SF)

The BPI-SF is a self-administered measure for assessing the severity of pain and its impact on daily activities.10 The BPI-SF has been used extensively in patients with chronic pain conditions (eg, cancer pain, osteoarthritis pain, and low back pain) as well as with acute pain conditions (eg, acute postoperative pain). The BPI-SF has been recommended as a reliable and valid measure of pain interference with functioning,14 and its interference scale assesses the extent to which pain interferes with 1) general activity; 2) mood; 3) walking ability; 4) work both inside and outside the home; 5) relations with people; 6) sleep; and 7) enjoyment of life. Each item is rated using a 0 to 10 NRS of the extent to which pain has interfered with these activities in the past 24 hours. A total pain interference score was calculated as the average of the 7 items, and the sleep item was examined separately to assess the extent to which pain interferes with patients’ sleep. For these scores, a higher mean score indicates higher pain interference.

Roland and Morris Disability Questionnaire (RMDQ)

The RMDQ is a self-administered 24-item questionnaire for assessing physical disability due to low back pain.46,47 This questionnaire is suitable for observing short-term changes in back pain or short-term changes in response to treatment. The questionnaire has been used in research on acute and subacute back pain40 and also chronic low back pain.47 Patients completing the RMDQ indicate the number that corresponds to each statement if it applies to how they feel “today,” and higher scores indicate more physical disability.

Hospital Anxiety and Depression Scale (HADS)

The HADS assesses common symptoms of anxiety and depression with patient ratings of the degree to which these symptoms have been experienced in the “past week.”48 All items are rated on a 4-point response scale, with higher anxiety and depression subscale scores indicating a greater severity of symptomatology. The HADS has been shown to be a reliable and valid measure in general and in those with chronic medical populations.6,41,56 Detailed analyses of the validity and responsiveness of the HADS data collected in this clinical trial will be presented elsewhere.

Statistical Analysis

The primary hypothesis of the clinical trial from which the data were drawn was that tapentadol would be non-inferior to oxycodone for the relief of acute low back pain over 5 days.5 The primary endpoint was the sum of pain intensity differences using the 0 to 10 NRS, and secondary endpoints included the BPI-SF, patient and clinician global impression of change ratings, a 7-point patient satisfaction with treatment rating scale, and the SF-MPQ-2. The primary hypothesis of the study that the efficacy of tapentadol treatment was noninferior to oxycodone treatment was confirmed, but tests for noninferiority were not conducted for the secondary endpoints, including the SF-MPQ-2, all of which generally showed comparable improvements in both treatment groups.5

SF-MPQ-2 subscale scores were computed as the average of answered items, and patients were excluded from the analyses if they were missing 2 or more items on any subscale score. HADS scores were summed with up to 1 missing item imputed from the mean of the other subscale items, or the entire scale was considered missing if there were 2 or more missing items within a subscale. BPI individual item scores were not imputed if missing. Patients with missing data from measures other than the SF-MPQ-2 were omitted only from analyses requiring those measures (eg, convergent validity) but remained in analyses of SF-MPQ-2 data for which those data were not required (eg, factor analyses).

The approach to evaluating the SF-MPQ-2 involved several analyses. The presence of floor and ceiling effects was assessed by examination of response distributions for the total score and the 4 subscales. In addition, descriptive statistics and internal consistency reliability coefficients (ie, Cronbach’s α) were calculated for the total score and the 4 subscales; internal consistency was considered acceptable if Cronbach’s α was at least .7.50 Construct validity was evaluated by examining the associations between the SF-MPQ-2 total and subscale scores and the other measures of pain and physical and emotional functioning using Pearson correlation coefficients. Responsivity to change was evaluated by determining whether the SF-MPQ-2 total and subscale scores improved from baseline to 5 days following treatment initiation with tapentadol and oxycodone.
Confirmatory factor analysis (CFA) provides a more direct and informative approach to evaluating measurement models than conventional exploratory factor analysis. With CFA, the investigator specifies a model of how covariances between a group of variables are hypothesized to have been caused by underlying factors or latent structures. Using this model, the CFA program estimates a solution covariance matrix and then compares the estimated covariance matrix with the actual covariance matrix. A model that produces a solution that closely matches the input covariance matrix provides a good fit to the data. Each solution is direct and unique, and therefore no rotation is necessary for interpretation. Moreover, tests can be performed with CFA to determine if the estimates of sample covariances using the a priori model are consistent with the actual sample covariances or, in other words, whether the data confirm the substantively generated model.

A CFA was performed to evaluate the 4 subscales identified in previous research on the SF-MPQ-2.\textsuperscript{15} Acceptability of fit of the factor solutions for the CFA was evaluated based on the goodness of fit index (GFI; with >.90 considered acceptable), standardized root mean residuals (SRMRs; with <.08 considered acceptable), and root mean square error of approximation (RMSEA; with <.08, .08–.1, and >.1 considered acceptable, mediocre, and poor, respectively).\textsuperscript{30,34} Finally, paired sample t-tests for the SF-MPQ-2 total and subscale scores between baseline and the end of treatment (day 5) were used to determine responsiveness for each of the QTFC groups\textsuperscript{48} as a result of treatment group.

### Results

Approximately half of the patients enrolled in the trial were male (50.6%), 71.5% were white, and the mean age was 45 years. Patients reported moderately severe back pain (mean = 7.5, standard deviation = 1.3) and leg pain (mean = 6.8, standard deviation = 1.9) on 0 to 10 NRSs of average pain intensity at baseline.

### Descriptive Statistics and Internal Consistency Reliability

Basic psychometric properties were analyzed for the entire sample at baseline for the SF-MPQ-2 total and subscale scores and are presented in Table 1; the BPI-SF pain and interference scales, baseline NRS pain measures, RMDQ, and HADS are also presented in this table because they are used in subsequent convergent validity analyses. Patients used the full 0 to 10 response range for all SF-MPQ-2 scales, with few patients at either the absolute bottom (floor) or absolute top (ceiling) of any of the scales. The SF-MPQ-2 Neuropathic and Affective subscales did have 12.5% and 15.1% of patients at the floor, but this is consistent with their overall lower mean and the potential applicability of the Neuropathic subscale to only a subset of patients with pain. These 2 subscales also showed some rightward skew (ratio of skewness to standard error of skew greater than 2),\textsuperscript{42} but given the relatively mild overall intensity of these pain qualities in the sample, this level of skewness was not considered problematic. Cronbach’s $\alpha$ coefficients were computed for the total score and each subscale and ranged from .77 to .93, all above commonly accepted thresholds for acceptable to excellent internal consistency reliability.

### Table 1. Descriptive Statistics and Internal Consistency Reliability for SF-MPQ-2 Total and Subscale Scores and Other Measures of Pain and Function

<table>
<thead>
<tr>
<th>SCALE</th>
<th>M (SD)</th>
<th>MEDIAN</th>
<th>MINIMUM/ MAXIMUM</th>
<th>% FLOOR/ % CEILING</th>
<th>SKEW</th>
<th>CRONBACH’S $\alpha$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-MPQ-2 Total</td>
<td>4.2 (2.0)</td>
<td>4.0</td>
<td>.23/10</td>
<td>0/3</td>
<td>.37</td>
<td>.93</td>
</tr>
<tr>
<td>Continuous</td>
<td>5.2 (2.2)</td>
<td>5.2</td>
<td>0/10</td>
<td>.5/1.1</td>
<td>-.02</td>
<td>.77</td>
</tr>
<tr>
<td>Intermittent</td>
<td>5.0 (2.4)</td>
<td>5.0</td>
<td>0/10</td>
<td>1.8/2.1</td>
<td>-.09</td>
<td>.82</td>
</tr>
<tr>
<td>Neuropathic</td>
<td>2.9 (2.3)</td>
<td>2.5</td>
<td>0/10</td>
<td>12.5/3</td>
<td>.58</td>
<td>.80</td>
</tr>
<tr>
<td>Affective</td>
<td>2.6 (2.8)</td>
<td>3.25</td>
<td>0/10</td>
<td>15.1/1.7</td>
<td>.46</td>
<td>.84</td>
</tr>
<tr>
<td>Total</td>
<td>4.2 (2.0)</td>
<td>4.0</td>
<td>.23/10</td>
<td>0/3</td>
<td>.37</td>
<td>.93</td>
</tr>
<tr>
<td>HADS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>7.7 (3.9)</td>
<td>7.0</td>
<td>0/21</td>
<td>.8/2</td>
<td>.42</td>
<td>.70</td>
</tr>
<tr>
<td>Depression</td>
<td>6.7 (3.9)</td>
<td>6.0</td>
<td>0/21</td>
<td>2.9/2</td>
<td>.38</td>
<td>.80</td>
</tr>
<tr>
<td>Total</td>
<td>14.4 (6.9)</td>
<td>14.0</td>
<td>0/36</td>
<td>.2/0</td>
<td>.31</td>
<td>.86</td>
</tr>
<tr>
<td>BPI-SF Interference</td>
<td>6.6 (1.8)</td>
<td>6.7</td>
<td>2.9/10</td>
<td>0/1.4</td>
<td>.52</td>
<td>.89</td>
</tr>
<tr>
<td>RMDQ</td>
<td>13.7 (5.6)</td>
<td>14</td>
<td>1/24</td>
<td>0/2</td>
<td>.26</td>
<td>N/A</td>
</tr>
<tr>
<td>BPI-SF Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-h worst</td>
<td>8.3 (1.3)</td>
<td>8.0</td>
<td>4/10</td>
<td>0/18.5</td>
<td>-.61</td>
<td>N/A</td>
</tr>
<tr>
<td>24-h least</td>
<td>5.7 (1.9)</td>
<td>6.0</td>
<td>0/10</td>
<td>.9/2.7</td>
<td>-.18</td>
<td>N/A</td>
</tr>
<tr>
<td>24-h average</td>
<td>7.0 (1.4)</td>
<td>7.0</td>
<td>1/10</td>
<td>0/3</td>
<td>-.29</td>
<td>N/A</td>
</tr>
<tr>
<td>Current</td>
<td>7.0 (1.6)</td>
<td>7.0</td>
<td>1/10</td>
<td>0/3.5</td>
<td>-.51</td>
<td>N/A</td>
</tr>
<tr>
<td>Average low back pain</td>
<td>7.5 (1.3)</td>
<td>7.0</td>
<td>5/10</td>
<td>0/7.4</td>
<td>.03</td>
<td>N/A</td>
</tr>
<tr>
<td>Current low back pain</td>
<td>7.1 (1.4)</td>
<td>7.0</td>
<td>5/10</td>
<td>0/4.2</td>
<td>.16</td>
<td>N/A</td>
</tr>
<tr>
<td>Average leg pain</td>
<td>6.8 (1.9)</td>
<td>7.0</td>
<td>0/10</td>
<td>.5/6.8</td>
<td>-.59</td>
<td>N/A</td>
</tr>
<tr>
<td>Current leg pain</td>
<td>6.3 (2.0)</td>
<td>6.0</td>
<td>0/10</td>
<td>1.5/4.5</td>
<td>-.69</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Abbreviations: M, mean; SD, standard deviation; N/A, not applicable.
Although the $\alpha$ greater than .9 for total score may be suggestive of some redundancy, this is not surprising given the high correlations between the subscales.

### Convergent Validity

Correlations are reported in Table 2 between SF-MPQ-2 subscales and the BPI-SF and NRS measures of pain intensity to indicate whether expected associations occur among these measures, all of which reflect overall pain intensity or pain intensity of specific qualities of pain. SF-MPQ-2 total and subscale scores were significantly correlated with BPI-SF ratings of 24-hour worst, 24-hour least, 24-hour average, and current pain as well as with NRS ratings of current and 24-hour average low back pain and current and 24-hour average leg pain. These correlations ranged from .21 to .42, with most in the .30 range. Correlations of this magnitude suggest that these measures all assess pain intensity to a shared extent but are not redundant, with each one assessing unique aspects of the pain experience.

The SF-MPQ-2 total and subscale scores were also significantly correlated with the BPI-SF pain interference scale, the BPI-SF sleep interference item, the RMDQ, and the HADS total score and Anxiety and Depression subscales. These correlations were all moderate in magnitude, ranging from .21 to .52 (all $P < .001$), indicating that more severe pain on the SF-MPQ-2 is associated with greater disruptions in physical and emotional functioning and sleep. As would be predicted, the SF-MPQ-2 Affective scores were more highly correlated with the HADS scores than were the SF-MPQ-2 total and other subscale scores, but the differences in the magnitudes of these correlations were minimal (HADS total = .41 vs .29–.39; HADS Anxiety = .44 vs .28–.41; HADS Depression = .29 vs .21–.28); as noted above, detailed analyses of the HADS data will be presented elsewhere. Relationships between pain and physical and emotional functioning are well established, and the overall pattern of these correlations provides support not only for the convergent validity of the SF-MPQ-2 but also for the “nomological network” of predictions involving acute pain that is consistent with construct validity.12

The SF-MPQ-2 total and subscale scores all showed statistically significant differences between the QTFC category 3 and category 4 or 6 patients (Table 3). The latter patients presumably have a greater involvement of neuropathic pain mechanisms, and patients with neuropathic pain generally report greater pain intensity than those with nonneuropathic pain. In our data, the QTFC category 4 or 6 patients had higher baseline pain. When the baseline BPI-SF average pain score was used as a covariate to adjust for these differences in a series of analyses of variance, the differences between the 2 QTFC groups were no longer significant for the SF-MPQ-2 Continuous and Intermittent scales but remained significant for the SF-MPQ-2 total scores and the Neuropathic and Affective subscales. These results support the validity of the SF-MPQ-2 Neuropathic subscale as a measure that assesses aspects of neuropathic pain that are independent of overall pain intensity. In addition, the data suggest that patients with acute low back pain and greater involvement of neuropathic pain mechanisms may have greater affective distress.

### Factor Structure

A CFA model to test an SF-MPQ-2 factor structure of the 4 subscales is presented in Table 4, which shows the GFI, RMSEA, and SRMR for the model (factor structures with coefficients are presented in Fig 1). The model fit for the Continuous subscale was strong across all 3 evaluation statistics, whereas the Intermittent and Affective subscales showed acceptable fit on 2 of the 3 statistics, GFI and SRMR, but poor fit on RMSEA. The Neuropathic subscale had acceptable fit on SRMR, slightly below acceptable on GFI, and unacceptable fit on RMSEA. Because of the relatively poor fit of the Neuropathic subscale, the CFA was conducted again, splitting the sample by QTFC to see if differences between patient groups

### Table 2. Correlations Between SF-MPQ-2 Total and Subscale Scores and Other Pain Measures

<table>
<thead>
<tr>
<th>SF-MPQ-2 SUBSCALE</th>
<th>BPI-SF 24-H WORST</th>
<th>BPI-SF 24-H LEAST</th>
<th>BPI-SF 24-H AVERAGE</th>
<th>BPI-SF CURRENT PAIN</th>
<th>AVERAGE BACK PAIN INTENSITY</th>
<th>AVERAGE LEG PAIN INTENSITY</th>
<th>CURRENT BACK PAIN INTENSITY</th>
<th>CURRENT LEG PAIN INTENSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>.308</td>
<td>.357</td>
<td>.370</td>
<td>.379</td>
<td>.343</td>
<td>.371</td>
<td>.335</td>
<td>.350</td>
</tr>
<tr>
<td>P</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Intermittent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>.350</td>
<td>.301</td>
<td>.336</td>
<td>.370</td>
<td>.314</td>
<td>.383</td>
<td>.336</td>
<td>.360</td>
</tr>
<tr>
<td>P</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Neuropathic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>.211</td>
<td>.336</td>
<td>.327</td>
<td>.320</td>
<td>.237</td>
<td>.366</td>
<td>.266</td>
<td>.389</td>
</tr>
<tr>
<td>P</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Affective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>.240</td>
<td>.325</td>
<td>.315</td>
<td>.277</td>
<td>.268</td>
<td>.350</td>
<td>.226</td>
<td>.332</td>
</tr>
<tr>
<td>P</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>.321</td>
<td>.378</td>
<td>.387</td>
<td>.389</td>
<td>.334</td>
<td>.423</td>
<td>.337</td>
<td>.412</td>
</tr>
<tr>
<td>P</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
mighthave been degrading the fit-to-factor structure. However, the
results did not appear to substantially differ in their
fit to the 4-factor model (data not shown).

Responsiveness

The responsiveness of an outcome measure reflects its
ability to detect changes over time or with treatment. The results of t-tests comparing baseline SF-MPQ-2 total
and subscale scores with those following 5 days of treat-
manship show significant improvements from baseline to
day 5 for the entire sample of patients (Table 5) and also for the 2 treatment arms (data not shown). Consider-
ted together, these data indicate that the SF-MPQ total score and its 4 subscales are all responsive to change,
which is a critical criterion in the selection and develop-
ment of outcome measures for analgesic clinical tri-
als.14,33 The data were also examined to determine
whether the SF-MPQ-2 total or subscale scores showed
different degrees of improvement between the 2 treat-
ment groups, and none of these group differences
were statistically significant (data not shown).

Discussion

We have presented the results of analyses designed to
provide additional support for the reliability, validity,
and responsiveness of the SF-MPQ-2 by examining data
from a large sample of patients with acute low back

Table 3. QTFC Group Differences in SF-MPQ-2
Scores at Baseline

<table>
<thead>
<tr>
<th>SF-MPQ-2 Subscale</th>
<th>QTFC 3 M (SD)</th>
<th>QTFC 4 or 6 M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>4.99 (2.22)</td>
<td>5.39 (2.09)</td>
</tr>
<tr>
<td></td>
<td>t(661) = -2.42, P = .016</td>
<td></td>
</tr>
<tr>
<td>Intermittent</td>
<td>4.85 (2.32)</td>
<td>5.24 (2.37)</td>
</tr>
<tr>
<td></td>
<td>t(661) = -2.13, P = .034</td>
<td></td>
</tr>
<tr>
<td>Neuropathic</td>
<td>2.6 (2.23)</td>
<td>3.25 (2.23)</td>
</tr>
<tr>
<td></td>
<td>t(661) = -3.7, P = 0</td>
<td></td>
</tr>
<tr>
<td>Affective</td>
<td>3.2 (2.65)</td>
<td>3.9 (2.87)</td>
</tr>
<tr>
<td></td>
<td>t(661) = -3.29, P = .001</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.97 (2.03)</td>
<td>4.49 (2.04)</td>
</tr>
<tr>
<td></td>
<td>t(661) = -3.29, P = .001</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: M, mean; SD, standard deviation.
NOTE. All t-tests are significant, with the patients in the QTFC 4 or 6 group showing higher scores on every subscale.

and associated radicular leg pain enrolled in an RCT. These analyses indicate that the SF-MPQ-2 had generally
excellent psychometric properties. The overall results of a CFA were consistent with the 4 subscales included
in the measure, although it is important to acknowledge that the model fit of the Neuropathic subscale was
relatively less acceptable than the 3 other subscales in this sample of patients with acute low back pain. Previous
confirmatory and exploratory factor analyses of the SF-
MPQ-2 have been conducted in individuals with various
chronic pain conditions, including a community sam-
p,15 U.S. veterans,33 multidisciplinary pain clinic pa-
ients,1 patients with advanced cancer,23 and participants
in a clinical trial of painful diabetic peripheral neuropathy.15 The results of these prior analyses provide support for the 4 subscales included in the
SF-MPQ-2, although some fit indices fell below tradi-
tional thresholds of acceptability in some studies (espe-
cially the RMSEA in this study and others15,33), which
may reflect the correlations among the subscales.23,33
Considered within this context, our CFA results suggest
that the SF-MPQ-2 is suitable for studies of acute pain as it is for studies of chronic pain.

Although the SF-MPQ-2 has 7 more items than the
SF-MPQ, we found no evidence of participant fatigue,
and there was a generally low level of missing responses
(ie, a total of 34 missing item responses, 31 of which
came from 2 subjects who were excluded from the
analyses).

In addition, analyses of changes occurring with anal-
gesic treatment provided evidence of the responsiveness
of the SF-MPQ-2 total score and the 4 subscales. Respons-
iveness is a primary consideration in evaluating the suit-
ability of outcome measures for use in clinical trials.14,16,51,53 It is important to emphasize that our
analyses demonstrated that the SF-MPQ-2 had excellent
responsiveness to change in patients who were being
treated with 1 of 2 efficacious analgesics; however, we
did not evaluate an equally important aspect of respons-
iveness, that is, whether the SF-MPQ-2 was responsive to
differences between an analgesic treatment and match-
ing placebo.

There are only 3 other measures that comprehensively
assess pain symptoms besides the SF-MPQ-2. The Multi-
dimensional Affect and Pain Survey29,31 assesses various
pain qualities and pain-associated affects but has not
been studied in patients with neuropathic pain. The Pain Quality Assessment Scale (PQAS)27,28,52 is a revision
and expansion of the Neuropathic Pain Scale21 that
includes nonneuropathic pain qualities. The Patient-
Reported Outcome Measurement Information System
(PROMIS) pain quality item bank25 includes items rele-
vant to neuropathic and nonneuropathic pain but has
not been studied in well-defined diagnostic groups.

Although similar pain qualities are assessed by the SF-
MPQ-2, the PQAS, and the PROMIS item bank,
the wording used by the SF-MPQ-2 for several items is quite
different. For example, the PQAS and the PROMIS item
bank assess numb, itchy, and tingling pain, whereas
these symptoms are not described as painful in the
SF-MPQ-2 but are rather considered nonpainful

Table 4. Confirmatory Factor Analysis Results
for the SF-MPQ-2 Subscales

<table>
<thead>
<tr>
<th>SF-MPQ-2 Subscale</th>
<th>GFI</th>
<th>RMSEA</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>.988</td>
<td>.054</td>
<td>.0268</td>
</tr>
<tr>
<td>Intermittent</td>
<td>.957</td>
<td>.111</td>
<td>.0459</td>
</tr>
<tr>
<td>Neuropathic</td>
<td>.889</td>
<td>.191</td>
<td>.0740</td>
</tr>
<tr>
<td>Affective</td>
<td>.983</td>
<td>.129</td>
<td>.0250</td>
</tr>
</tbody>
</table>

NOTE. Acceptability of fit of the CFA factor solutions was evaluated based on GFI ≥ .90, which was considered acceptable; SRMR ≤ .08, which was considered acceptable; and RMSEA with .08, .08–.1, and >.1 considered acceptable, mediocre, and poor, respectively.
dysesthesias and paresthesias. In addition, the PQAS assesses skin sensitivity to light touch without using the word pain,” whereas the SF-MPQ-2 assesses “pain caused by light touch,” a phrase used to adhere to the current definition of allodynia, typically considered a sign rather than a patient-reported symptom; the PROMIS item bank does not include an item for allodynia.

Our analyses have a number of limitations. The results are based on secondary analyses of an RCT in which subjects were selected on the basis of a subset of QTFC categories that specifically identify patients with acute low back pain and associated radicular leg pain; it is therefore unknown whether our results would be applicable to patients with acute musculoskeletal low back pain without pain radiating below the knee or without neurologic signs. It is also not known whether our results would be applicable to patients with chronic lumbar-sacral radiculopathy or chronic musculoskeletal low back pain. Moreover, the sample was predominantly white, and the psychometric properties of the SF-MPQ-2 need to be further confirmed with other racial and ethnic groups. Finally, our analyses have been based on the original 4 subscales of the SF-MPQ-2. In future research, it will be important to examine the fit of other models to SF-MPQ-2 data from acute and chronic pain conditions, for example, a second-order CFA and a 3-factor model consisting of neuropathic, nonneuropathic, and affective descriptors.

There has been increasing attention to the diagnosis of neuropathic low back pain and the identification of “neuropathic components” in patients with what has

Table 5. SF-MPQ-2 Total and Subscale Scores in Response to Treatment

<table>
<thead>
<tr>
<th>SF-MPQ-2 Subscale</th>
<th>Baseline M (SD)</th>
<th>Day 5 M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>5.19 (2.19)</td>
<td>2.79 (2.13)</td>
</tr>
<tr>
<td></td>
<td>(t(527) = 26.36, P &lt; .01)</td>
<td></td>
</tr>
<tr>
<td>Intermittent</td>
<td>5.04 (2.34)</td>
<td>2.45 (2.15)</td>
</tr>
<tr>
<td></td>
<td>(t(527) = 27.75, P &lt; .01)</td>
<td></td>
</tr>
<tr>
<td>Neuropathic</td>
<td>2.94 (2.26)</td>
<td>1.47 (1.69)</td>
</tr>
<tr>
<td></td>
<td>(t(527) = 17.73, P &lt; .01)</td>
<td></td>
</tr>
<tr>
<td>Affective</td>
<td>3.5 (2.82)</td>
<td>1.56 (1.98)</td>
</tr>
<tr>
<td></td>
<td>(t(527) = 18.64, P &lt; .01)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.23 (2.05)</td>
<td>2.11 (1.77)</td>
</tr>
<tr>
<td></td>
<td>(t(527) = 27.31, P &lt; .01)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: M, mean; SD, standard deviation.
been considered “mixed” neuropathic and musculoskeletal low back pain.\(^{1,17,18,19,20}\) Although the patients we examined were not formally diagnosed using the most recent criteria for neuropathic pain,\(^ {21}\) they all had acute low back pain with leg pain radiating below the knee, were clinically assessed as QTFC categories 3, 4, or 6, and were therefore likely to have either acute neuropathic low back and leg pain or acute low back pain with a neuropathic component. In this regard, it must be emphasized that the primary purpose of the SF-MPQ-2 is not to differentiate patients with neuropathic pain from those who do not have neuropathic pain, an objective for which a number of validated screening measures exist.\(^ {22,26}\) Rather, the SF-MPQ-2 is intended to provide a comprehensive assessment and characterization of the symptoms of both neuropathic and nonneuropathic pain. However, when baseline BPI-SF average pain scores were used as a covariate, QTFC category 4 or 6 patients, who presumably are more likely to have neuropathic low back pain, had significantly higher scores on the SF-MPQ-2 Neuropathic subscale. This not only provides support for the validity of the Neuropathic subscale in characterizing neuropathic pain symptoms but also suggests that further research might show that the SF-MPQ-2 can be used in screening patients for neuropathic pain.

Conclusions

The SF-MPQ-2 was developed to provide a single measure of the major sensory and affective symptoms of both neuropathic and nonneuropathic pain. Our data suggest that the SF-MPQ-2 has generally excellent reliability, validity, and responsiveness in a large sample of carefully diagnosed patients with acute low back and associated radicular leg pain treated with analgesic medications with established evidence of efficacy for acute and chronic pain. Moreover, the results of CFAs provided additional support for 4 readily interpretable subscales—continuous pain, intermittent pain, predominantly neuropathic pain, and affective descriptors. Considered together with the results of other recent studies,\(^ {1,11,22,23,33,43,49}\) the data suggest that the SF-MPQ-2 can provide a valid, responsive, and efficient assessment of both neuropathic and nonneuropathic pain qualities for clinical trials and other clinical research examining patients with various acute and chronic pain conditions.

References


measure of disability in low back pain. Spine 8:141-144, 1983


