Original Article

Development and Preliminary Validation of the NePIQoL: A Quality-of-Life Measure for Neuropathic Pain

Helen M. Poole, PhD, CPsychol, Peter Murphy, PhD, CPsychol, and Turo J. Nurmikko, MD, PhD
School of Psychology (H.M.P.), Faculty of Science, Liverpool John Moores University; Pain Research Institute (H.M.P., T.J.N.); Walton Centre for Neurology and Neurosurgery NHS Trust (P.M., T.J.N.); and Division of Neurological Science (T.J.N.), School of Clinical Sciences, University of Liverpool, Liverpool, United Kingdom

Abstract

Neuropathic pain is frequently associated with negative effects on quality of life (QoL), affecting physical, social, and psychological functioning. Of many existing scales used to measure QoL, none have been validated in a neuropathic pain patient population. This study reports on the development and preliminary psychometric evaluation of the Neuropathic Pain Impact on Quality-of-Life questionnaire (NePIQoL), a measure to assess QoL in neuropathic pain. In Phase I, focus groups with 27 patients and a panel of experts identified QoL issues for inclusion in the measure. Initial items (152) and response categories were pretested using cognitive interviewing (18 patients). Following this, the number of items was reduced to 91. In Phase II, the 91-item version of the NePIQoL was administered to a further 112 patients, poorly performing items were identified, and internal consistency was examined. In Phase III, the revised NePIQoL was administered to a further 110 patients on two occasions to examine validity and test-retest reliability. Qualitative and quantitative pretesting led to extensive revision, resulting in a final measure of 42 items. Finally, Phase IV tested the concurrent validity and responsiveness of the NePIQoL. The authors conclude that the NePIQoL is an acceptable, patient-derived, neuropathic pain-specific measure with evidence of reliability, validity, and temporal stability.

J Pain Symptom Manage 2009;37:233–245. © 2009 U.S. Cancer Pain Relief Committee. Published by Elsevier Inc. All rights reserved.

Key Words
Quality of life, neuropathic pain, outcome assessment, patient-centered approach
Introduction

The underlying mechanisms, presenting characteristics and therapeutic interventions of neuropathic pain are different from those associated with nociceptive pain. Neuropathic pain is frequently described as having burning, paroxysmal, and lancinating or sharp qualities and patients commonly show sensory abnormalities such as hypesthesia, dysesthesia, alldynia, and hyperpathia. It is apparent that the specific features of neuropathic pain, along with its chronicity, may lead to detrimental effects for the sufferer’s health-related quality of life (QoL).

The potential impact that chronic musculoskeletal pain can have on an individual’s QoL in terms of psychological, social, and physical functioning is well documented. Evidence in the neuropathic pain literature is less so. Existing data are generally secondary, with the majority coming from studies of treatment efficacy.

There is increasing recognition of the need to provide assessment of multiple components of QoL as an integral part of evaluation of patients with neuropathic pain. In addition to the neuropathic condition itself, pain adds to the burden of illness, leading to increased physical and psychological disability. Compared to other chronic pains, neuropathic pain tends to be associated with poorer QoL. In painful neuropathy, there is a suggestion that QoL may predict a patient’s response to analgesic therapy.

Existing condition-specific measures in neuropathic pain predominantly focus on differential diagnosis and quality and intensity of symptoms. An exception is the Brief Pain Inventory (BPI), which has been adapted for some neuropathic pain conditions, for example, painful diabetic neuropathy. However, the BPI is not comprehensive, but rather a brief (seven-item) measure of interference with the following: general activity, mood, walking ability, normal work, relations with others, sleep, and enjoyment of life. Thus, the ability to measure QoL in neuropathic pain with a condition-specific tool remains a challenge.

Furthermore, the need to incorporate patient perspectives into outcome evaluation has also been recognized. Not all QoL measures have been developed in consultation with patients and/or systematically validated for use with specific populations. We aimed to address this in the context of neuropathic pain.

There is a clear need for a disease-specific instrument with good content, construct validity, stability, and sensitivity to assess QoL of patients with neuropathic pain. The aim of the present study was to develop a new measure, the Neuropathic Pain Impact on Quality-of-Life questionnaire (NePIQoL), able to capture the patient’s perception of his or her condition with the psychometric properties required for use in clinical and research settings. This article reports on its conception, development, and preliminary psychometric testing.
Methods

Participants

Throughout the study, a total of 305 participants were recruited from two UK sites. The majority (96%) were recruited from a neuropathic pain clinic run by the third author (TJN) at a specialist pain center. The remaining were recruited from a district general hospital pain clinic.

All patients were recruited from two large pain clinics in Merseyside, UK, with the majority from the neuropathic pain clinic run by the third author (TJN). For inclusion, participants were required to be between 18 and 75 years old, and to have a primary diagnosis of neuropathic pain. All patients were diagnosed by a specialist in pain medicine on the basis of their clinical examination and, when appropriate, confirmatory laboratory and electrophysiological tests and radiological imaging. Patients were further categorized as having central, peripheral, or combined neuropathic pain; for example, trigeminal neuralgia and diabetic neuropathy (peripheral); poststroke pain (central); and postherpetic neuralgia (combined). Those with a significant coexisting major medical illness or psychiatric disorder based on Diagnostic and Statistical Manual of Mental Disorders IV criteria were excluded, as were those with severe motor deficit and those who would have difficulty understanding the focus group procedures and/or completing the questionnaire. Similarly, those with concomitant non-neuropathic pain of any significance were excluded, including those with low back pain. Significant pain was considered to be present if the patient felt it in any way interfered with average daily living or required treatment. Patients with chronic sciatica were only recruited if they confirmed any coexisting low back pain to be insignificant. Characteristics of participants from each phase of the study are presented in Table 1.

The study was approved by all relevant local research ethics committees and research governance committees, and written informed consent was obtained from all participants.

NePIQoL Development

The NePIQoL was developed in three stages and further tested alongside other measures. First, a qualitative stage defined the concept and content of the instrument, generated items, and pretested the first draft of the measure (Phase I). Second, an item reduction stage identified poorly performing items and examined internal consistency (Phase II). This was followed by a repeated-measure survey, which looked at validity and test-retest reliability (Phase III). Subsequently, the concurrent (convergent) validity and responsiveness of the NePIQoL were examined by administering the measure before and after treatment in conjunction with existing gold standard measures detailed below (Phase IV).

Phase I: Generation of Items and Pretesting. This was informed by data from one health professional focus group and three focus groups of patients with neuropathic pain. The health professional group comprised 11 individuals with extensive experience in the management of neuropathic pain who represented the following disciplines: psychology (n = 3), nursing (n = 2), physiotherapy (n = 2), occupational therapy (n = 1), and pain medicine (n = 3). The primary purpose of the health professional group was to elicit their views and

Table 1

<table>
<thead>
<tr>
<th>Description of Study Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptives</td>
</tr>
<tr>
<td>Mean age (yrs)</td>
</tr>
<tr>
<td>SD (yr)</td>
</tr>
<tr>
<td>Mean pain duration (yrs)</td>
</tr>
<tr>
<td>SD (yr)</td>
</tr>
<tr>
<td>Male (%)</td>
</tr>
<tr>
<td>Female (%)</td>
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<tr>
<td>Diagnostic category</td>
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<td></td>
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</tbody>
</table>
experiences on the ways in which patients report that their QoL is affected by neuropathic pain. Data from this group together with the background literature formed the framework for the participant focus groups.

Three participant focus groups were held, each lasting about two hours. The groups were facilitated by the first two authors and attended by a total of 27 patients representing a wide range of central, peripheral, and combined central and peripheral neuropathic pain conditions (focus group sizes: \( n = 9 \), \( n = 8 \), \( n = 10 \)). The primary purpose of the groups was to gain the participants’ perspectives and individuals were encouraged to discuss their experience of neuropathic pain and its effect on their QoL. Topics derived from the health professionals group were used to initiate discussion and participants were given the opportunity to expand upon or refute them and to introduce additional topics. Focus groups were taped with the written permission of participants, transcribed verbatim, and analyzed using a variant of Interpretative Phenomenological Analysis, whereby emergent themes were identified and their interrelationships noted. Subsequently, some themes were clustered together into broader categories. This process provided face and content validity and ensured that the draft instrument reflected the experiences of patients living with neuropathic pain.

The final themes identified from the focus group data were labeled: pain/symptoms, interpersonal relationships, negative emotions, positive feelings, cognition, social, role, physical, and self-care, and a brief description of each is provided:

**Pain/symptoms**: These were related to descriptions of pain and other sensory symptoms, their unpredictability, and “strangeness.”

**Interpersonal relationships**: These included narratives on the extent to which neuropathic pain had changed relationships with friends, family, and colleagues as well as discussion about intimacy with partners.

**Negative emotions**: These were described in terms of feelings such as distress, low mood, worry, anger, and guilt.

**Positive feelings**: These were related to enjoyment and achievement.

**Cognition**: These incorporated discourse on poor memory, confusion, and slowed-down thinking processes.

**Social role**: These included descriptions of changes to social activities and hobbies.

**Physical**: These integrated descriptions of problems with physical activities and functions such as walking, standing, sleep, and fatigue.

**Self-care**: These involved daily activities such as washing, bathing, dressing, etc.

Extensive quotations representing each theme were collated and used to generate 480 potential items. These items were arranged into subscales dependent upon their topic content to reflect the themes and categories derived from the focus group data. The potential items were kept in the vernacular wherever possible and independently reviewed by all authors for suitability. Items deemed ambiguous (e.g., “I get defensive when people do things for me.”), too specific (e.g., “Shaving can trigger a painful reaction.”), or colloquial were automatically deleted. Those considered ambiguous but judged by two or more of the team to be potentially important were reworded and retained. Items for which no consensus was reached were omitted. This left a total of 152 items for inclusion in the first draft of the questionnaire. During this process, the scaling properties of the measure were also considered.

After consultation with the above sources and in line with established recommendations, five-point scales ranging from “strongly agree” to “strongly disagree” and “always” to “never” were selected, with higher-item scores representing greater pain-related interference in QoL.

The 152-item NePIQoL was critiqued by a new group of 18 patients with neuropathic pain in the context of an individual “cognitive interview.” During the interview, participants were asked to complete a copy of the NePIQoL while being encouraged to “think out loud” and verbalize their thoughts on both the content and their understanding of individual items, together with the decision processes used to respond to them. They also were given the opportunity to identify irrelevant items and determine what, if any, topics were not covered by the instrument. Using this process, participants commented on the length, face validity, content validity, and response format of the NePIQoL and its subscales, as well as the lack of ambiguity, social desirability, and offensiveness of individual items.
The above process resulted in the removal of a further 61 items, leaving a total of 91 items. In addition, a number of response options were changed and some items reworded to improve the clarity of the content.

**Phase II: Assessing Internal Consistency and Performance.** The second version of the NePIQoL comprising 91 items with Likert scale response options was sent to a different group of 190 patients by post. One hundred twelve were returned, equivalent to a response rate of 59%. All patients were recruited from outpatient clinics at a specialist pain center. On examination of item endorsement patterns and internal consistency statistics for each subscale and the total scale, a further 39 items were removed, leaving a total of 52 items.

**Phase III: Further Assessment of Internal Consistency and Temporal Stability.** The third version of the NePIQoL (52 items) was used in a test-retest survey. The NePIQoL was sent to 252 patients whose names were taken consecutively from an existing database of patients with neuropathic pain who had taken part in an audit of services. None had taken part in the previous phases of questionnaire development. Those who completed and returned the first questionnaire were sent a second one within two weeks. One hundred ten first questionnaires were returned (44% response rate). Of these, 90 also completed and returned the second questionnaire (82% response rate).

Given the moderate response rate to the first questionnaire in this phase, nonresponders were compared to responders on the data available (age, gender, duration of pain, scores on the Neuropathic Pain Scale [NPS]). With the exception of the item on itch on the NPS ($t = 2.50$ (78), $P < 0.05$), we found no significant differences between responders and nonresponders.

**Phase IV: Concurrent Validity and Responsiveness (Sensitivity Testing).** The final version of the NePIQoL (42 items) was completed before and six weeks after treatment by 58 patients. This sample comprised inpatients undergoing microvascular decompression for trigeminal neuralgia ($n = 16$), those having a spinal cord stimulator fitted for chronic neuropathic pain ($n = 3$), and patients with chronic neuropathic pain attending a specialist outpatient pain center ($n = 39$). To examine concurrent validity and compare the responsiveness of the NePIQoL to existing measures, patients also completed the SF-36, the BPI, and the Hospital Anxiety and Depression Scale (HADS) in addition to the NePIQoL.

**Additional Measures**

**Neuropathic Pain Scale.** This scale was administered alongside the NePIQoL in the postal surveys to ensure that the subcomponents of pain sensations were well represented. The NPS discriminates between 10 perceptual qualities of neuropathic pain. All are measured using an 11-point Numerical Rating Scale (NRS). The original work supports discriminant validity of the scale and some work has been done to investigate whether the scale predicts the painful condition.

**Pain Numerical Rating Scale.** An 11-point self-report scale, from 0 (no pain) to 10 (worst pain ever), was used to assess pain intensity.

A questionnaire booklet comprising the above and the following additional measures was administered alongside the NePIQoL in Phase IV to assess concurrent validity.

**SF-36.** As a generic self-report measure designed to provide an assessment of an individual's health-related QoL, it comprises 36 items that measure eight dimensions: physical functioning; social functioning; role limitations due to physical problems; role limitations due to emotional problems; mental health; energy and vitality; pain; and general perception of health. An additional item questions changes in health over the previous 12 months. Responses to items are coded, summed, and transformed into a scale from 0 to 100 for each dimension, where 0 = worst possible health status and 100 is equivalent to best possible health status. The SF-36 demonstrates good face validity and reliability, with Cronbach’s alphas ranging from 0.73 (social functioning) to 0.96 (physical role limitations). The SF-36 has been shown to be sensitive to treatment changes in randomized trials of patients with neuropathic pain.
Brief Pain Inventory. The self-report BPI requires patients to rate their pain at its “worst,” “least,” and “average,” using an 11-point (0–10) NRS. Following this, patients are asked to complete further 0–10 rating scales to indicate how much their pain interferes with mood, walking, general activity, work, relations with others, sleep, and enjoyment of life (0 = no interference, 10 = interferes completely). The mean of these seven ratings is used to indicate patients’ overall level of pain interference.

Hospital Anxiety and Depression Scale. HADS is a 14-item scale that provides a brief state measure of anxiety and depression. Anxiety and depression are scored from 0 to 21 from seven items on each subscale. Both subscales have good validity and internal consistency, with Cronbach’s alpha measured as 0.90 for depression and 0.93 for anxiety.

Analysis Plan

SPSS version 14 was used to analyze the data. Distribution of scores and missing data were examined to identify skewed items or those that did not discriminate between participants, that is, more than 75% endorsing one response option, or any items that had responses endorsed by less than 5%. Cronbach’s alpha and item-total correlations were computed for each scale and the whole instrument to assess internal consistency. Items with correlations below 0.15 or above 0.7 were deleted following Kline’s recommendations. Temporal stability was assessed by examining intraclass correlations between subscale and total scores for test-retest questionnaires. To determine concurrent validity, relationships between NePIQoL and NPS, BPI, SF-36, and HADS were examined using Pearson’s r correlations. Mean differences between pre- and post-treatment scores for Phase IV data were evaluated using t-tests. Finally, effect sizes and standardized response means (SRMs) were calculated as indices of responsiveness for these data.

Results

Phase I: Development and Pretesting of the NePIQoL

Qualitative pretesting of the NePIQoL identified a number of issues relating to the content and wording of the items, and the format of response categories. Items were presented in the form of statements rather than questions to allow us to retain the language used by focus group informants. This was commented on positively by participants during cognitive interviewing, and a decision was made to retain this format. Participants also identified a number of double negative statements and these were reworded to ensure the meaning was explicit.

The biggest change to the questionnaire concerned the items relating to family and friends. The initial version contained a total of 24 repetitive family and friends items, for example, the item “I involve myself with my family as much as I used to despite the pain” was followed by “I involve myself with my friends as much as I used to despite the pain,” and so on. It was apparent during the interviewing that participants did not discriminate between these two groups specifically, but rather spoke of people they were close to vs. people they were not close to, and those they declared relevant to their QoL were people they were close to. For this reason these items were replaced with 12 single items to reflect this, for example, “I involve myself with people I am close to as much as I used to despite the pain.”

In addition to the above qualitative pretesting, item responses were also considered. Items that lacked discriminant validity, that is, responses were endorsed by less than 5% or more than 75%, or their content was covered by other items, were removed.

Following the above processes, items in the subscales relating to positive feelings, negative emotions, and cognition were collapsed to form one “psychological” scale and the pain/symptoms subscale was renamed symptoms. This left a total of six subscales: psychological, physical, symptoms, personal care, relationships, and social/work activity.

Phase II: First Field Test

Examination of item endorsement patterns and Cronbach’s alpha for each subscale and the total scale led to the removal of a further 39 items. As before, decisions regarding which items to retain were based on statistical and theoretical grounds. The reasons for item deletion were: redundancy, that is, the content was
covered by other items \((n = 17)\); not applicable being endorsed by the majority of participants \((n = 4)\); low endorsement of one response option \((n = 9)\); high endorsement of one response option \((n = 3)\); high or low intraclass correlation \((n = 6, n = 5, \text{ respectively})\); skewed \((n = 2)\); and ambiguous wording \((n = 1)\). Some items are included in more than one category, leaving a total of 52 items. Internal consistency was high, with Cronbach’s alpha for the six subscales all above 0.7: psychological (0.84); social/work activity (0.85); relationships (0.71) symptoms (0.73); physical (0.83); and personal care (0.84).

Phase III: Test-Retest Survey

Examination of item endorsement patterns and Cronbach’s alpha for each subscale and the total scale led to the removal of a further 10 items. The reasons for item deletion were: high or low intraclass correlation \((n = 5, n = 6, \text{ respectively})\), and contribution to low Cronbach’s alpha for the scale \((n = 4)\). In addition, when determining which items to delete to improve internal consistency, wording was again considered. Redundancy, that is, that the content could be considered to be covered by other items, led to the deletion of a further three, while imprecise wording was the reason for another three deletions. Finally, the item “I get defensive when others do things for me” had a low item-total correlation and on reflection was deemed by the authors to be potentially value laden; hence, it was deleted. The Appendix contains a list of the final 42 items and scales.

The number of items and Cronbach’s alpha for each of the six subscales of the 42-item questionnaire are shown in Table 2. Correlations between individual items at Time 1 and Time 2 ranged from 0.5 to 0.9 for the remaining 42 items. The correlations between NePIQoL subscales at both time points are also shown in Table 2.

Table 2
 Phase III: Cronbach’s Alpha, and Test-Retest Correlations for Each Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Number of Items</th>
<th>Cronbach’s Alpha at Time 1</th>
<th>NePIQoL (Pearson’s r*)</th>
<th>Correlation between Time 1 and Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological</td>
<td>8</td>
<td>0.90</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Social activity</td>
<td>8</td>
<td>0.91</td>
<td>0.84</td>
<td>0.84</td>
</tr>
<tr>
<td>Relationship</td>
<td>5</td>
<td>0.82</td>
<td>0.71</td>
<td>0.82</td>
</tr>
<tr>
<td>Symptoms</td>
<td>8</td>
<td>0.87</td>
<td>0.72</td>
<td>0.87</td>
</tr>
<tr>
<td>Physical</td>
<td>7</td>
<td>0.93</td>
<td>0.86</td>
<td>0.93</td>
</tr>
<tr>
<td>Personal care</td>
<td>6</td>
<td>0.91</td>
<td>0.86</td>
<td>0.91</td>
</tr>
</tbody>
</table>

\(P < 0.0005.\)

Concurrent Validity and Responsiveness

Statistically significant correlations \((P < 0.05 \text{ or less})\) between NePIQoL, SF-36, HADS, BPI, and NRS (pain) are shown in Table 4. Statistically significant differences were found between pre- and post-treatment scores on the HADS-Anxiety, BPI, SF-36 Social Functioning scale, and the NePIQoL Social Activity scale (Table 5). Similarly, these scales demonstrated significant SRMs and effect sizes (Table 6). The remaining scales did not demonstrate significant changes between pre- and post-treatment administration of the questionnaires (Table 5), and for these, effect sizes and SRMs were too small to be meaningful.

Discussion

The current study aimed to develop a specific QoL measure that addresses the perceptions and concerns of people experiencing neuropathic pain, using patient-centered methods. The objective of the study, that is, to develop a valid, reliable instrument of acceptable length and content, applicable to neuropathic pain patients, was used for reference throughout the process. As the results demonstrate, the NePIQoL satisfies these criteria. Care was taken throughout these studies to ensure the robustness and validity of the findings by conducting each stage of the analysis.
using different samples of patients with neuropathic pain.

The final version of the NePIQoL contains 42 items in six domains: psychological, physical, symptoms, personal care, relationships, and social/work activity. The measure demonstrates good face, content, and concurrent validity, as well as internal consistency and temporal stability.

Pretesting procedures used during the development of the NePIQoL enabled the authors to sustain a patient-centered approach, which allowed refinement of both the items and their response categories. The cognitive interview is relatively infrequently used in the development of health outcome measures, although its use is increasing as developers become more concerned about the effect response error can have on the quality of data obtained. Indeed, as Harris-Kojetin et al. note, cognitive interviews can also provide a deeper understanding and awareness of the way responders interpret questions and can identify problems with wording and recall that may not be immediately obvious. In this study, cognitive interviewing identified redundant items whose content was addressed through others and also confirmed the face and content validity of the measure and its sub-scales. We are confident, therefore, that the content of the questionnaire covers the concerns of patients with neuropathic pain and includes relevant determinants of QoL.

The decision to include patients with neuropathic pain of both peripheral and central origin was based on the similarity of the two conditions in regard to symptom formation, psychological comorbidity, and treatment approaches. We excluded patients with severe motor deficits to avoid any confounding effect such additional disability might cause. Exclusion of patients with concomitant non-neuropathic pain was considered essential; however, those with limited non-neuropathic pain either revealed during examination (e.g., secondary myofascial tender spots) or during the interview were included as long as the examining specialist attributed the pain primarily and

### Table 3

**Phase III Descriptive Data for 42-Item Scale**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Time 1</th>
<th></th>
<th></th>
<th></th>
<th>Time 2</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Range</td>
<td>Mean</td>
<td>SD</td>
<td>Range</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Psychological</td>
<td>36.35</td>
<td>7.94</td>
<td>17–53</td>
<td>36.05</td>
<td>8.14</td>
<td>20–52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social activity</td>
<td>27.89</td>
<td>7.35</td>
<td>10–43</td>
<td>27.78</td>
<td>7.26</td>
<td>9–43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship</td>
<td>15.73</td>
<td>4.05</td>
<td>5–23</td>
<td>15.73</td>
<td>4.05</td>
<td>5–23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>38.10</td>
<td>8.02</td>
<td>19–52</td>
<td>38.05</td>
<td>7.02</td>
<td>22–60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>27.27</td>
<td>7.53</td>
<td>9–40</td>
<td>26.75</td>
<td>7.35</td>
<td>8–40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal care</td>
<td>14.39</td>
<td>5.46</td>
<td>5–25</td>
<td>14.37</td>
<td>5.52</td>
<td>5–25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 4

**Significant Correlations (P < 0.05) between NePIQoL and Other Questionnaires**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Psychological</th>
<th>Relationships</th>
<th>Social Activity</th>
<th>Physical Activity</th>
<th>Personal Care</th>
<th>Symptom</th>
<th>NePIQoL Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-36</td>
<td>-0.27</td>
<td>-0.35</td>
<td>-0.33</td>
<td>-0.69</td>
<td>-0.50</td>
<td>-0.50</td>
<td>-0.59</td>
</tr>
<tr>
<td>Physical functioning</td>
<td>-0.46</td>
<td>-0.46</td>
<td>-0.56</td>
<td>-0.40</td>
<td>-0.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional role limitations</td>
<td>-0.51</td>
<td>-0.51</td>
<td>-0.28</td>
<td>-0.35</td>
<td>-0.41</td>
<td>-0.40</td>
<td>-0.52</td>
</tr>
<tr>
<td>Pain</td>
<td>-0.36</td>
<td>-0.36</td>
<td>-0.35</td>
<td>-0.52</td>
<td>-0.36</td>
<td>-0.34</td>
<td>-0.45</td>
</tr>
<tr>
<td>Mental health</td>
<td>-0.58</td>
<td>-0.54</td>
<td>-0.36</td>
<td>-0.50</td>
<td>-0.42</td>
<td>-0.44</td>
<td>-0.63</td>
</tr>
<tr>
<td>General health perception</td>
<td>-0.34</td>
<td></td>
<td>-0.44</td>
<td></td>
<td>-0.28</td>
<td>-0.31</td>
<td></td>
</tr>
<tr>
<td>Energy vitality</td>
<td></td>
<td>-0.34</td>
<td>-0.44</td>
<td></td>
<td>-0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brief Pain Inventory</td>
<td>0.45</td>
<td>0.38</td>
<td>0.54</td>
<td>0.54</td>
<td>0.37</td>
<td>0.46</td>
<td>0.56</td>
</tr>
<tr>
<td>HADS-Anxiety</td>
<td>0.59</td>
<td>0.45</td>
<td>0.35</td>
<td>0.42</td>
<td>0.52</td>
<td></td>
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<tr>
<td>HADS-Depression</td>
<td>0.49</td>
<td>0.61</td>
<td>0.56</td>
<td>0.36</td>
<td>0.36</td>
<td></td>
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</tr>
<tr>
<td>NRS pain</td>
<td>0.55</td>
<td>0.50</td>
<td>0.34</td>
<td>0.50</td>
<td></td>
<td></td>
<td>0.47</td>
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</table>
predominantly to a neuropathic mechanism and the patient confirmed that the other pain had no relevance to their everyday living. Inspection of our data suggests that, at all stages of the questionnaire, patients with central, peripheral, and combined neuropathic pain responded remarkably similarly to the items. We, therefore, suggest that the NePIQoL is generalizable across neuropathic pain conditions, with the restriction regarding severe motor disability.

Intuitively, it might be expected that less pain would be associated with less impairment of QoL, and there is evidence to support this view. Indeed, Phases III and IV of the current study also found a significant positive linear relationship between pain intensity and the majority of QoL dimensions measured by the NePIQoL, whereby greater pain was associated with greater interference in QoL. The exception to this was the symptoms subscale (see Appendix). This scale reflects the presence or frequency of pain and other symptoms, though our intention is not that this will provide a measure to differentiate between neuropathic pain and non-neuropathic pain. However, as this scale addresses other sensory aspects associated with neuropathic pain, for example, numbness or tingling, the lack of association is not incongruent and may be expected. Nevertheless, pain reduction is not always associated with QoL improvement. Reasons for this might include the side effects of treatments for neuropathic pain or the presence of comorbid conditions, or as Galvez et al. suggest, may be due to the measurement of QoL “using a generic, rather than a specific questionnaire for pain or neuropathic pain” (p. 11). Again, highlighting the importance of specificity in the tools used to assess these constructs.

The significant correlations between the NePIQoL and existing measures of related constructs are encouraging and highlight logical relationships to demonstrate reasonable concurrent validity. Similarly, the associations between pain intensity and the NePIQoL are interpreted to indicate that high pain is “related to” high interference in QoL, rather than NePIQoL scores being simply a reflection of pain intensity. It should be noted that while these associations are significant, the r values associated with them are moderate and do not seem to suggest redundancy between measures. Indeed, one could speculate that they

### Table 5

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean Difference</th>
<th>Confidence Intervals</th>
<th>t</th>
<th>Significance</th>
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<td>NePIQoL</td>
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<tr>
<td>Psychological</td>
<td>0.61</td>
<td>−0.99, 2.23</td>
<td>0.77</td>
<td>0.44</td>
</tr>
<tr>
<td>Relationships</td>
<td>0.28</td>
<td>−0.49, 1.05</td>
<td>0.74</td>
<td>0.46</td>
</tr>
<tr>
<td>Social activity</td>
<td>−3.05</td>
<td>−4.46, −1.64</td>
<td>−4.37</td>
<td>0.0005</td>
</tr>
<tr>
<td>Physical</td>
<td>1.2</td>
<td>−0.54, 2.75</td>
<td>1.58</td>
<td>0.12</td>
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<tr>
<td>Symptoms</td>
<td>0.26</td>
<td>−1.33, 1.38</td>
<td>0.38</td>
<td>0.97</td>
</tr>
<tr>
<td>Personal care</td>
<td>0.37</td>
<td>−0.97, 1.70</td>
<td>0.56</td>
<td>0.58</td>
</tr>
<tr>
<td>NePIQoL total</td>
<td>2.44</td>
<td>−3.57, 8.45</td>
<td>0.82</td>
<td>0.42</td>
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<tr>
<td>SF-36</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Physical functioning</td>
<td>3.00</td>
<td>−3.80, 9.80</td>
<td>0.89</td>
<td>0.37</td>
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<td>Physical role limitations</td>
<td>−11.76</td>
<td>−26.56, 2.84</td>
<td>−1.64</td>
<td>0.11</td>
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<td>Social functioning</td>
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<td>−15.77, −0.18</td>
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<tr>
<td>Emotional role limitations</td>
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<td>−19.87, 9.06</td>
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<td>0.45</td>
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<tr>
<td>Pain</td>
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<td>−10.83, 6.27</td>
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<td>0.59</td>
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<tr>
<td>Mental health</td>
<td>−1.17</td>
<td>−6.05, 3.71</td>
<td>−0.48</td>
<td>0.65</td>
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<tr>
<td>General health perception</td>
<td>0.87</td>
<td>−4.47, 6.21</td>
<td>0.33</td>
<td>0.74</td>
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<td>Energy vitality</td>
<td>−4.76</td>
<td>−9.98, 0.46</td>
<td>−1.84</td>
<td>0.07</td>
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<tr>
<td>Brief Pain Inventory</td>
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<td>0.30, 10.90</td>
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<tr>
<td>HADS-Anxiety</td>
<td>1.22</td>
<td>0.25, 2.18</td>
<td>2.55</td>
<td>0.01</td>
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<tr>
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<td>−1.39, 0.97</td>
<td>−0.36</td>
<td>0.72</td>
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</tbody>
</table>

### Table 6

<table>
<thead>
<tr>
<th>Scale</th>
<th>ES</th>
<th>SRM</th>
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<tbody>
<tr>
<td>NePIQoL social activity</td>
<td>0.57</td>
<td>0.70</td>
</tr>
<tr>
<td>SF-36 social functioning</td>
<td>0.27</td>
<td>0.10</td>
</tr>
<tr>
<td>Brief Pain Inventory</td>
<td>0.32</td>
<td>0.35</td>
</tr>
<tr>
<td>HADS-Anxiety</td>
<td>0.24</td>
<td>0.43</td>
</tr>
</tbody>
</table>
are in fact a further indication of the extent to which symptoms others than pain account for some of the variance in QoL seen in these patients.

Given that item wording and content (Appendix) were derived from patients themselves to reflect QoL issues related to neuropathic pain, and that the majority of items ask about pain related to particular activities, we are confident that the questionnaire assesses the impact neuropathic pain has on QoL. The positive comments of patients on the face and content validity further support this.

That the sample did not demonstrate changes on all the measures used in Phase IV may be due to several reasons: first, they did not change on all parameters measured; second, the six-week period between administrations of the questionnaires may not have been long enough to achieve significant change; or third, that they did change, but none of the questionnaires were sensitive enough to detect some of these changes. Nevertheless, as previously stated, concurrent validity between the NePIQoL and the other measures was high and when measuring the same construct, that is, social activity, the NePIQoL demonstrated considerably greater sensitivity than the SF-36. Work is currently ongoing to collect follow-up data of longer duration to further evaluate responsiveness.

The NePIQoL meets accepted levels of statistical integrity. A minimum correlation coefficient of 0.85 or greater is necessary to indicate that the instrument has an acceptably low level of random measurement error.47 The total NePIQoL scale meets this criterion, as do four of the six subscales, with the remainder above 0.7.

The NePIQoL has been designed for clinical and research settings and to evaluate the efficacy and effectiveness of therapeutic interventions. The measure could also be used to determine which aspects of QoL neuropathic pain affects in different groups as well as to look at change in those aspects.

**Limitations**

We acknowledge that some bias in the sample may have occurred, as participants predominantly attended one specialist pain center and presented with peripheral neuropathic pain. Nevertheless, as the content and acceptability of the NePIQoL were informed by patient-centered methods, we are optimistic about its validity in general neuropathic pain populations. Furthermore, the study participants are broadly consistent with other UK general pain clinic populations in terms of their age, gender, and pain duration.48,49

This is the first report of the psychometric qualities of the NePIQoL and we recognize that further work is needed. We adopted a patient-centered approach throughout, using classical test theory. At this stage, verification of the subscales has been based on face and content validity. Given larger samples, it would be possible to validate these using factor analytic techniques. Similarly, validity and reliability are sample specific and we recommend further evaluation on other populations, at other centers, and in other countries. Future work should also include evaluation of the NePIQoL’s discriminant validity, that is, the extent to which it can differentiate between patients with neuropathic and non-neuropathic pain and also between patients with different types of neuropathic pains. Further study is ongoing to ascertain the measure’s sensitivity to change and to develop the evidence base of the NePIQoL. Once further validation is completed, the questionnaire will provide a valuable tool for assessing the QoL of patients with neuropathic pain in clinical and research contexts.

**Acknowledgments**

The authors wish to express their thanks to Dr. Peter Williams who assisted with recruitment to Phase I of the study, and to Ms. Fiona Brailsford and Ms. Lorna Roberts who assisted with recruitment and data entry in the latter phases of the study.

**References**


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Appendix
Neuropathic Pain Impact on Quality-of-Life Questionnaire

Symptoms
Excessive cold makes the pain worse
Light or gentle touch makes the pain worse
Heavy or firm touch makes the pain worse
I feel tingling in the painful area(s)
I feel numbness in the painful area(s)
I feel a cold sensation in the painful area(s)
I feel a hot sensation in the painful area(s)
Washing/showering/shaving can make the pain worse

Relationships
The pain affects my relationships with those I am close to
I involve myself with people I am close to as much as I used to despite the pain
People I am close to find it difficult because I am in pain
The pain affects my sex life
I am dependent upon those I am close to because of the pain

Psychological
I worry about the next painful attack
I get frustrated when I can’t do the things I used to be able to do
I get angry with myself because of the pain
I feel isolated because of the pain
I have difficulty concentrating when the pain is bad
I can distract myself from the pain
I can cope with the pain
I worry about the treatment I may need to have in the future

Social activity
The pain affects my ability to do my daily work
I still enjoy my hobbies/leisure activities despite the pain
The pain restricts my traveling, e.g., by car, bus, train, etc.
I no longer go on holiday because of the pain
I get exhausted because of the pain
It takes me so much longer to do anything because of the pain
I want to be on my own when the pain is bad
I don’t go out as much as I used to

Physical
Physical activity makes the pain worse
I can’t walk as far as I used to
I have difficulty standing because of the pain
I have problems with my balance because of the pain
I have difficulty sitting because of the pain
I find it hard to get to sleep
The pain disturbs my sleep

Personal care
Washing/showering/shaving is difficult because of the numbness
Washing/showering/shaving is difficult because of the pain
Going to the toilet can be difficult for me
Some types of clothes make the pain worse, e.g., fitted or loose
Dressing/undressing can be difficult because of the pain