Original Article

Development and validation of Arabic version of the Neuropathic Pain Questionnaire-Short Form

ABSTRACT

Introduction: The Neuropathic Pain Questionnaire-Short Form (NPQ-SF) is the shortest diagnostic tool for the assessment of neuropathic pain, designed with the goal to differentiate between neuropathic and nonneuropathic pain. The aim of this study was to translate, culturally adapt, and validate the NPQ-SF questionnaire in Arabic.

Methods: A systematic translation process was used to translate the original English NPQ-SF into Arabic. After the pilot study, the Arabic version was validated among patients with chronic pain in two tertiary care centers. Reliability of the translated version was examined using internal consistency, test-retest reliability, and intraclass correlation coefficient (ICC). We examined the validity of the Arabic NPQ-SF via construct validity, concurrent validity (associations with the numeric pain scale, Brief Pain Inventory, and Self-completed Leeds Assessment of Neuropathic Symptoms and Signs [S-LANSS]), face validity, and diagnostic validity. To investigate the responsiveness, the translated NPQ-SF questionnaire was administered twice among the same group of patients.

Results: A total of 142 subjects (68 men, 74 women) were included in the study. Cronbach's α were 0.45 (95% CI: 0.29, 0.61) and 0.48 (95% CI: 0.33, 0.63), and the ICC was 0.78 (95% CI: 0.72, 0.85). The NPQ-SF was moderately to strongly associated with the S-LANSS questionnaire. Results showed our Arabic NPQ-SF to have good diagnostic accuracy, with area under the curve of 0.76 (95% CI: 0.67, 0.84). Results from the receiver operating characteristic analysis identified a cut-off score of $\geq$0.52 as the best score to distinguish between patients with or without neuropathic pain, which was higher than the recommended cut-off score ($\geq$0) in the original study. With both sensitivity and specificity of 71%. Most patients found the NPQ-SF questionnaire to be clear and easy to understand.

Conclusion: Our translated version of NPQ-SF is reliable and valid for use, thus providing physicians a new tool with which to evaluate and diagnose neuropathic pain among Arabic-speaking patients.

Key words: Anesthesia; Arabic; Neuropathic Pain Questionnaire; reliability; short form; validity

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Introduction

Neuropathic pain is defined by the International Association for the Study of Pain (IASP) as "pain arising as a direct consequence of a lesion or disease affecting the somatosensory system."[1] Neuropathic pain is a large-scale healthcare problem. In the United Kingdom, about 8% of chronic pain sufferers also experience neuropathic pain.[2] It was reported that, in Germany, approximately 4% of the general adult population experienced back pain with a neuropathic component.[3] Proper identifications of this type of pain is of paramount importance as the response to different analgesics is dependent on the nature of this type of pain and its underlying mechanism.

Neuropathic Pain Questionnaires (NPQs) are generally easy to administer and have been found to be valuable assessment tools for neuropathic pain in clinical practice and research. Multiple diagnostic NPQs have been developed, including the Self-completed Leeds Assessment of Neuropathic Symptoms and Signs (S-LANSS),[4] Douleur Neuropathique 4 questionnaire (DN4),[5] painDETECT,[6] ID-Pain,[7] and NPQ.[8] In 2003, Backonja and Krause[9] determined that 3 items out of the original 12 comprehensive NPQ items were sufficient to predict diagnostic group membership into neuropathic versus nonneuropathic pain, without statistically significant loss of predictive accuracy. The three items were tingling pain, numbness, and increased pain due to touch, which subsequently became the NPQ-Short Form (NPQ-SF).

To the best of our knowledge, the NPQ-SF questionnaire was never translated and validated in Arabic language, the aim of this study is to translate, culturally adapt, and validate the NPQ-SF questionnaire into Arabic language.

Methods

A repeated measures study was conducted between September 2014 and December 2016 in two tertiary hospitals in Riyadh – Saudi Arabia; King Faisal Specialized Hospital (KFSH) (Institutional Review Board [IRB] approval No. 2141 101) and King Fahad Medical City (KFMC) (IRB approval No. 14-107, Riyadh, Saudi Arabia). The same sample was also administered the Arabic version of the DN4 questionnaire, report of which is also available in this issue.[10]

In our clinical practice, neuropathic pain is defined as "pain arising as a direct consequence of a lesion or disease affecting the somatosensory system," as per the Special Interest Group on Neuropathic Pain (NeuPSIG).[1] The diagnosis of neuropathic pain was performed using the grading system proposed by NeuPSIG group: (1) negative or positive sensory signs, confined to the innervation territory of the lesioned nervous structure (mainly by bedside sensory examination), and (2) diagnostic test confirming a lesion or disease explaining neuropathic pain (e.g., neuroimaging or neurophysiological methods). If both criteria are present, the patient will be diagnosed as having "definite neuropathic pain." If only one criterion is present, the patient will be diagnosed as having "probable neuropathic pain." Patients with "probable" diagnoses were excluded from the accuracy analyses in the current study.

Translation and cultural adaptation

Initial translation (forward translation)

Five bilingual translators, from five Arabic countries (Syria, Saudi Arabia, Yemen, Sudan and Egypt) with different dialects, were assigned. All translators spoke Arabic as their mother language. Two of them were naive translators with no prior knowledge of the concepts being quantified, and they were not from the medical field. Each translator produced a written report of the translation that they completed, after which all the translators met to discuss the translation and came to a consensus of the translated version of the instrument.

Backward translation

Two translators who were totally blind to the original (English) questionnaire were assigned to translate the final Arabic version back into the English language. This is a process of validity check to make sure that the translated version reflects the same item content as the original version. English (the source language) was the mother tongue for these two translators, and they were not aware of the concepts being explored.

An expert committee

It was composed of a methodologist, health professionals, and language professionals. The expert committee's role was to consolidate all the versions of the questionnaire and develop the prefinal version of the questionnaire for field-testing. The committee eventually reviewed all the translations and reached consensus on any discrepancy.

Measures

Numerical rating scale

Numerical rating scale (NRS) is an 11-point pain intensity score used to assess current overall pain intensity (from 0 = "no pain" to 10 = "pain as bad as you can imagine").[11]

Neuropathic Pain Questionnaire-Short Form

The NPQ-SF consists of 3 items assessing tingling pain, numbness, and increased pain due to touch. Patients rate each item on a scale from 0 (no pain) to 100 (worst imaginable pain/greatest intensity). After multiplying each item score by

a discriminant function coefficient (tingling: 0.017, numbness: 0.015, increased pain due to touch: 0.011), the scores are summed and incorporated with a set constant value (-1.302) to create a discriminant function score. A score of <0 predicts nonneuropathic pain, whereas a score of 0 or above predicts neuropathic pain.[9]

Brief Pain Inventory

The Brief Pain Inventory (BPI) is used to assess patients' pain in clinical settings. Two domains of pain are assessed with the BPI – pain severity and pain interference. Pain severity is measured with four items, assessing pain at its "worst," "least," "average," and "now" (current pain). The intensity of pain is rated from 0 (no pain) to 10 (pain as bad as you can imagine). Pain interference is measured with seven items, assessing the extent to which pain has interfered with seven daily activities (general activity, walking, work, mood, enjoyment of life, relations with others, and sleep). Patients rated, from 0 (does not interfere) to 10 (completely interferes), how pain has interfered with their functioning.[12] We used the MD Anderson Cancer Center Arabic BPI-SF version, a previously translated and validated version.[13] In the current study, Cronbach's alpha (α) was 0.82 and 0.87 for pain severity and pain interference, respectively.

Self-completed Leeds Assessment of Neuropathic Symptoms and Signs

The S-LANSS includes seven items assessing pain of primarily neuropathic origin. It comprises a 7-item pain scale, including the sensory descriptors and items for sensory examination. A score of 12 or above with the S-LANSS suggests pain of predominantly neuropathic origin.[4] We used a previously translated and validated Arabic version of the questionnaire.[14] Cronbach's α was 0.59 in the current sample.

Study protocol

An Arabic version of the NPQ-SF questionnaire was administered twice to chronic pain patients in the pain clinic. This questionnaire was part of a package that contained other questionnaires (the BPI, S-LANSS, and NRS) as validating questionnaires (all in Arabic). Eligible patients were between 17 and 80-year-old and reported chronic pain of at least 3 months' duration. Exclusion criteria included psychosis, significant visual impairment, physical disability, or patient's refusal to participate in the study. The patients completed the questionnaire for the first time (Time 1) in the clinic, after the researcher explained the purpose of the study, obtained verbal consent, and answered all queries. The questionnaire was completed the second time (Time 2) by telephone interview after at least 3 days. Electronic data-capturing template was made to standardize data collection and maintain quality.

Pilot study

The prefinal version was pilot tested on a group of 34 patients (19 males and 15 females, data not shown). Both interviews (Time 1 and Time 2) were completed in person, after which the participants were asked about their experience and thoughts about the current version. No specific constructive feedback was received. The committee met at this point and approved the prefinal version as final [the final Arabic version is presented in the Appendix 1]. No changes were implemented to the prefinal version.

Assessing face validity

After completing the NPQ-SF for the first time, patients responded to five statements regarding the NPQ-SF items on a 5-point Likert type scale: 1 = totally disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree. The five statements were: (1) questions were clear and easy; (2) questions covered all your problem areas with your pain; (3) you would like the use of this questionnaire for future assessments; (4) the questionnaire lacks important questions regarding your pain; (5) some of the questions violate your privacy.

Data analysis

All data analyses were performed in R version 3.3.2 (2016-10-31). Descriptive statistics (mean, standard deviation [SD], minimum, maximum[15]) were presented for the total NPQ-SF items and total score, NRS, BPI items, and the S-LANSS composite score.

Reliability

The internal consistency of the NPQ-SF was examined using Cronbach's α. Cronbach's α ranges from 0 (no internal consistency; none of the items are correlated with each other) to 1 (perfect internal consistency; all of the items are perfectly correlated with each other). Cronbach's α was computed for the three NPQ-SF items. An instrument with $\alpha \geq 0.70$ is typically considered to have adequate internal consistency.[16]

Test-retest reliability was assessed by a second administration (Time 2) of the NPQ-SF, after at least 72 h of the first administration (Time 1). The stability of the individuals' responses was estimated using the Pearson's correlation coefficients (r) between their responses in the two administrations. Pearson correlation coefficient (r) between the two assessments was computed for the NPQ-SF total scores. Test-retest reliability was considered to be weak if $r < 0.3$, moderate if $0.3 \geq r < 0.5$, and strong if $r \geq 0.5$. Intraclass correlation coefficients (ICCs) were also computed, with ICC $\geq$0.70 considered to indicate good test-retest reliability.[17]

Validity

The diagnostic validity of the NPQ-SF in distinguishing between patients with and without neuropathic pain was assessed using receiver operating characteristic (ROC) analysis. Area under the curve (AUC) was calculated, with an AUC < 0.60 considered as negative, 0.61–0.80 as doubtful, 0.81–0.90 as good, and >0.91 as very good.[18] For each cut-off value of the NPQ-SF, sensitivity, specificity, positive and negative predictive value (PPV and NPV) were calculated. The Youden Index was computed (sensitivity + specificity − 1) to identify the optimum cut-off point.[19] In addition, Cohen's kappa coefficient[20] was computed to examine the agreement of neuropathic pain diagnosis between the NPQ-SF (cut-off ≥0) and the reference clinical diagnosis. A kappa of <0 is indicative of no agreement, 0–0.2 as slight agreement, 0.2–0.4 as fair agreement, 0.4–0.6 as moderate agreement, 0.6–0.8 as substantial agreement, and >0.8 as almost perfect agreement.[21]

Construct validity of the NPQ-SF was examined by investigating the association between the NPQ-SF neuropathic pain score and the NRS. To establish concurrent validity of the NPQ-SF, the extent to which the NPQ-SF is correlated with two other validated measures of pain, the BPI and the S-LANSS. Pearson's correlation coefficient (r) was used to evaluate the strength of the associations; $r < 0.3$ was considered to be weak, moderate if $0.3 \geq r < 0.5$, and strong if $r \geq 0.5$.

Results

A total of 142 patients (68 men, 74 women) participated in the validation study of the NPQ-SF questionnaire. The average age was 51 (SD = 15.5), with average body mass index of 32 (SD = 7.6). Most patients had university-level education (42.3%), with fewer proportions having received some high school (30.7%), less than high school (11.7%), or no education (15.3%). The majority of these patients were married (84%), whereas 9% were single, 3% were divorced, and 4% were widowed. Of the enrolled patients, 27% were rated as 1, 52% were rated as 2, 27% were rated as 3, and 27% was rated as 4 on the American Society of Anesthesiologists score. One hundred and nine (76.8%) patients were from KFSH, and 33 (23.2%) from KFMC. Most patients (92.3%) reported having current pain.

Excluding 18 patients with "probable neuropathic pain," 124 patients had definite diagnoses of neuropathic pain (yes/no) or not having neuropathic pain were included in the diagnostic accuracy analysis. Among these patients, 77 (62%) were diagnosed "definite neuropathic pain." Demographic characteristics of patients diagnosed with and without neuropathic pain are presented in Table 1. Eighteen patients were diagnosed as having "probable neuropathic pain" and were excluded from the neuropathic diagnostic accuracy analyses. These patients had the following clinical diagnoses: failed back surgery syndrome ($n = 7$), unknown etiology ($n = 4$), complex regional pain syndrome ($n = 2$), sacroiliitis ($n = 2$), trigeminal neuralgia ($n = 2$), fibromyalgia ($n = 1$), mechanical neck pain ($n = 1$), and occipital neuralgia ($n = 1$).

On average, the patients were contacted for the second interview 7.4 (SD = 50) days after their initial participation. The majority of the patients (93%) completed the second interview within 10 days after the initial interview.

Table 1 illustrates the differences in NPQ-SF, BPI, S-LANSS, and NRS scores between patients who were previously diagnosed with neuropathic pain and those who were not. Results from linear regression models showed that patients previously diagnosed with neuropathic pain had statistically significantly higher scores in all the pain measures (all Ps < 0.05), except BPI current pain.

The descriptive statistics of the NPQ-SF, BPI, S-LANSS, and NRS for all patients in this study are presented in Table 2. Of the 142 patients, 101 (71.13%) and 93 (65.49%) met the diagnostic cut-off for neuropathic pain at Time 1 and Time 2, respectively.

Reliability

Cronbach's α for the NPQ-SF is 0.45 (95% CI: 0.29, 0.61) and 0.48 (95% CI: 0.33, 0.63) for Time 1 and Time 2, respectively. Results suggested a moderate internal consistency for the three NPQ-SF items.

Test-retest reliability

Test-retest reliability was computed using patients ($n = 142$) with complete NPQ-SF data for both interviews; none of the patients had missing NPQ-SF data. The correlation coefficient (r) between the two interviews was 0.79 (95% CI: 0.72, 0.85), and ICC was 0.78 (95% CI: 0.72, 0.85). Results suggested good test-retest reliability for the NPQ-SF total score.

Validity

Diagnostic validity

The diagnostic validity of the NPQ-SF was evaluated using only patients ($n = 124$) with valid neuropathic/nonneuropathic pain diagnosis. The AUC was 0.76 (95% CI: 0.67, 0.84). Using the cut-off of ≥0 of the NPQ-SF discriminant score, the NPQ-SF showed a sensitivity of 86%, specificity of 51%, a PPV of 76%, and a NPV of 63% [Appendix 2].

Table 1: Descriptive statistics between patients diagnosed with neuropathic pain and those not diagnosed with neuropathic pain

	Neuropathic pain patients ($n=77$)	Nonneuropathic pain patients ($n=47$)	*P*
Gender (female) (%)	38 (49.4)	27 (57.4)	0.49
Age	51.97 (14.77)	49.85 (15.81)	0.45
Clinical diagnoses (%)	Radiculopathy=55 (71.4) Nerve injury/trauma=8 (10.4) Spinal stenosis=3 (3.9) Postamputation=2 (2.6) Spinal cord injury=2 (2.6) Spondylolisthesis with radiculopathy=2 (2.6) Carpal tunnel syndrome=2 (2.6) Diabetic neuropathy=1 (1.3) Meralgia paresthetica=1 (1.3) Thoracic outlet syndrome=1 (1.3)	Osteoarthritis=10 (21.3) Musculoskeletal=10 (21.3) Mechanical low back pain=9 (19.1) Radiculopathy=9 (19.1) Sacroiliitis=3 (6.4) Mechanical neck pain=2 (4.3) Rotator cuff tear=1 (2.1) Faceculopathy=1 (2.1) Chronic headache=1 (2.1) Spondylosis=1 (2.1)	NA
NPQ-SF			
Tingling	49.47 (33.69)	30.94 (35.71)	0.004
Numbness	58.1 (28.81)	28.23 (29.61)	<0.001
Increased pain to touch	48.77 (34.54)	32.02 (38.77)	0.01
Total	156.34 (65.55)	91.19 (66.97)	<0.001
S-LANSS	14.68 (5.54)	8.26 (5.62)	<0.001
BPI			
Worst pain	8.26 (1.62)	7.26 (2.17)	0.004
Least pain	4.73 (2.47)	3.47 (2.15)	0.005
Average pain	6.55 (1.82)	5.49 (2.21)	0.005
Current pain	6.17 (2.3)	5.23 (3.02)	0.05
Pain severity	6.43 (1.62)	5.4 (1.89)	0.002
Pain interference	5.75 (2.22)	4.25 (2.33)	<0.001
NRS	7.23 (1.62)	6.26 (1.95)	0.003

Descriptive statistics for gender are presented as *n* (%), and the remaining descriptive statistics are presented as mean (SD). Linear regression models were used to examine differences in pain scores between neuropathic pain and nonneuropathic pain patients. SD: Standard deviation; NPQ-SF: Neuropathic Pain Questionnaire-Short Form; BPI: Brief Pain Inventory; S-LANSS: Self-Completed Leeds Assessment of Neuropathic Symptoms and Signs; NRS: Numerical Rating Scale; NA: Not available

Table 2: Descriptive statistics of the Neuropathic Pain Questionnaire-Short Form, Brief Pain Inventory, Self-Completed Leeds Assessment of Neuropathic Symptoms and Signs, and Numerical Rating Scale for all patients in this study

	Time 1			Time 2		
	Mean (SD)	Minimum	Maximum	Mean (SD)	Minimum	Maximum
NPQ-SF						
Tingling	45.8 (35.8)	0.00	100	41.5 (34.5	0.00	100
Numbness	48.0 (31.8)	0.00	100	44.8 (32.5)	0.00	100
Increased pain due to touch	42.9 (36.8)	0.00	100	38.4 (36.5)	0.00	100
Total	136.7 (72.1)	0.00	300	124.6 (72.7)	0.00	300
BPI						
Worst pain	7.9 (1.9)	1.00	10	7.5 (2.1)	1.00	10
Least pain	4.3 (2.4)	0.00	10	4.2 (2.3)	0.00	10
Average pain	6.2 (2.1)	0.00	10	6.0 (2.1)	0.00	10
Current pain	5.9 (2.6)	0.00	10	5.6 (2.7)	0.00	10
Pain severity	6.1 (1.9)	0.75	10	5.8 (1.9)	0.25	10
Pain interference	5.3 (2.4)	0.71	10	5.1 (2.4)	0.00	10
S-LANSS	12.6 (6.2)	0.00	24	11.8 (6.5)	0.00	24
NRS	6.9 (1.9)	1.00	10	6.4 (2.1)	0.00	10

SD: Standard deviation; NPQ-SF: Neuropathic Pain Questionnaire-Short Form; BPI: Brief Pain Inventory; S-LANSS: Self-Completed Leeds Assessment of Neuropathic Symptoms and Signs; NRS: Numerical Rating Scale

There was fair agreement between the diagnosis of neuropathic pain using the NPQ-SF cut-off ≥0 and the prior clinical diagnosis (Cohen's kappa = 0.35, 95% CI = 0.18, 0.52, $P = 0.001$). Results from the ROC analysis identified a cut-off score of ≥0.52 as the best score to distinguish between patients with and without neuropathic pain [Figure 1], which was higher than the recommended cut-off score (≥0).

Construct validity

The construct validity of the NPQ-SF was assessed by examining the correlations between the NPQ-SF and the numerical pain scale. The three NPQ-SF items are weakly associated with the numerical pain scale (*r*s = 0.20–0.23, all *P*s < 0.05), and the total NPQ-SF score is moderately correlated with the numerical pain scale (*r* = 0.31, *P* < 0.0001).

To investigate the concurrent validity of the NPQ-SF, the extent to which the NPQ-SF items and total score were associated with the BPI and S-LANSS was examined. As shown in Table 3, the NPQ-SF items and total score were weakly to moderately correlated with BPI pain severity (*r*s = 0.27–0.42, all *P*s < 0.01). With the exception of the numbness question, the other two NPQ-SF items and total score were also weakly correlated with BPI pain interference (*r*s = 0.20–0.28, all *P*s < 0.05). The NPQ-SF total score was moderately associated with the four BPI items assessing the worst, least, average, and current pain (*r*s = 0.31–0.44, all *P*s < 0.001). The NPQ-SF items and total score were also moderately to strongly associated with neuropathic pain assessed with S-LANSS (*r*s = 0.38–0.65, all *P*s < 0.001).

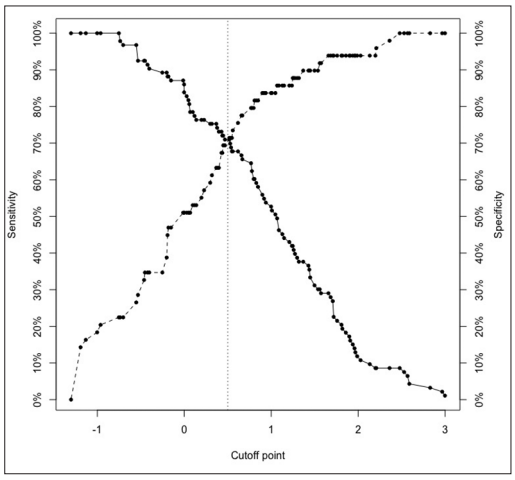

Figure 1: Cut-off point in the Neuropathic Pain Questionnaire-Short Form optimizing the sensitivity and specificity to distinguish between patients with or without neuropathic pain using the original discriminant function coefficients

Face validity

Patients' responses to the five questions assessing the face validity of the NPQ-SF are presented in Table 4. The majority of the patients endorsed agree or strongly agree for the first three questions assess face validity. Results showed that most patients found the NPQ-SF questions to be clear and easy to understand, the questionnaire items covered all their problem areas regarding their pain, and that most would like to use the NPQ-SF for their long-term follow-up assessment. Most patients disagreed that the NPQ-SF lacks important questions regarding their pain, suggesting that the NPQ-SF addressed most, if not all, of the important issues associated with their pain. Finally, most patients felt that the NPQ-SF questions did not violate their privacy.

Discussion

In this study, we translated into Arabic and validated the NPQ-SF questionnaire among Arabic speaking patients with chronic pain in two major medical centers. We strived to develop a questionnaire that can easily administered to Arabic-speaking patients speaking different dialects. Our

Table 3: Pearson correlation coefficients between Neuropathic Pain Questionnaire-Short Form, Neuropathic Pain Scale, Brief Pain Inventory, and Self-Completed Leeds Assessment of Neuropathic Symptoms and Signs among patients

	NPQ-SF				NPS	BPI					
	Tingling	Numbness	Increased pain due to touch	Total		Worst pain	Least pain	Average pain	Current pain	Severity	Interference
NPQ-SF											
Numbness	0.38***										
Increased pain due to touch	0.15	0.12									
Total	0.74***	0.69***	0.64***								
NPS	0.21*	0.20*	0.23**	0.31***							
BPI											
Worst pain	0.22**	0.18*	0.23**	0.31***	0.57***						
Least pain	0.34***	0.34***	0.23**	0.44***	0.55***	0.43***					
Average pain	0.18*	0.24**	0.25**	0.32***	0.70***	0.62***	0.63***				
Current pain	0.18*	0.14	0.30***	0.31***	0.67***	0.41***	0.56***	0.60***			
Severity	0.28***	0.27**	0.31***	0.42***	0.77***	0.73***	0.82***	0.86***	0.82***		
Interference	0.20*	0.13	0.23**	0.28**	0.52***	0.38***	0.36***	0.46***	0.37***	0.48***	
S-LANSS	0.38***	0.44***	0.53***	0.65***	0.33***	0.25**	0.26**	0.26**	0.31***	0.33***	0.30***

*P<0.05, **P<0.01, ***P<0.001. NPQ-SF: Neuropathic Pain Questionnaire-Short Form; NPS: Neuropathic Pain Scale; BPI: Brief Pain Inventory; S-LANSS: Self-Completed Leeds Assessment of Neuropathic Symptoms and Signs

Table 4: Descriptive statistics for face validity

	Mean (SD)	Percentage of totally disagree	Percentage of disagree	Percentage of undecided	Percentage of agree	Percentage of strongly agree
Questions were clear and easy	4.3 (0.59)	0	0.7	5.6	60.6	33.1
Questions covered all my problem areas with my pain	4.0 (0.80)	0	4.9	16.9	50.7	27.5
I would like the use of this questionnaire for future assessments	4.1 (0.67)	0	2.8	10.6	63.4	23.2
The questionnaire lacks important questions regarding my pain	2.5 (0.85)	7	47.2	31.7	12.0	1.4
Some of the questions violate my privacy	1.6 (0.69)	49	43.7	5.6	2.1	0.0

SD: Standard deviation

results demonstrated reliability and validity of the Arabic version of the NPQ-SF.

The fact that the internal consistency of the NPQ-SF was only in moderate range raised a concern (αs < 0.50 for both time points it this study). As internal consistency refers to how well the scale items are measuring the same underlying construct – neuropathic pain, items in the same scale need to be at least moderately correlated with one another to achieve good internal consistency. If a scale has limited internal consistency, we cannot be confident that the total score of the scale reflects the seriousness (or extremeness) of neuropathic pain (i.e., a patient with more pain may score high on two items, but low on one, and vice versa). Our findings suggested that the inter-item correlation among the three NPQ-SF items is relatively low. A closer examination of the correlation coefficients [Table 3] showed that only the first two NPQ-SF items were moderately correlated with each other, whereas the third item was not.

There are three possible reasons for these findings: (1) problematic translation, (2) patients' misinterpretation of the question items, especially the third item which required examination of the pain area, or (3) the three items are not assessing one single construct – neuropathic pain, suggesting that neuropathic pain may consist of more than one unrelated components. Considering that the current translated version had been forward and backward translated, we do not believe the results were due to problematic translation. To examine whether the results were attributable to patients' misinterpretation, we examined the internal consistencies of the corresponding three items from the S-LANSS (previously validated and used to assess construct validity in our study), and the DN4 questionnaire (administered in the same study population and presented in another paper in the current issue).[10]

The corresponding items for numbness, tingling pain, and increased pain due to touch are #1, 7, and 3 in the S-LANSS, and #6, 4, and 10 in the DN4. Cronbach's αs for the three items were 0.49 and 0.44 for S-LANSS and DN4, respectively. Consistent with the NPQ-SF findings, results showed that the third item not as correlated with the other two corresponding items in both S-LANSS and DN4. It is unlikely that the patients in this study misinterpreted all of these items. These findings suggested that neuropathic pain might consist of more than one component that are not necessarily correlated with one another among patients in the current study.

Clinically numbness and tingling are spontaneous symptoms and frequently go together, whereas pain due to touch (allodynia) is evoked and relatively infrequent (according to a few surveys).[22] Considering that these three symptoms may have different underlying mechanisms that are associated with pain, our findings suggested that neuropathic pain may consist of symptoms that are independent from each other. There may be different mechanisms that are associated with neuropathic pain.

Using the discriminant function coefficients proposed in the original study, a cut-off score of ≥ 0.52, rather than the original cut-off score of >0, was found to be the best score to distinguish between patients with or without neuropathic pain. It is possible that the discriminant function coefficients need to be revised for adaptation in the translated version of the NPQ-SF. Our study provided the first step in developing a short and valid neuropathic assessment tool for use among Arabic patients, future studies should administer the Arabic version of the NPQ-SF to examine whether the discriminant function coefficients need to be revised to provide a better diagnostic cut-off score among Arabic-speaking patients.

Conclusion

To our knowledge, our study is the first cross-cultural validation of the NPQ-SF among Arabic-speaking patients. Our translated version of NPQ-SF is reliable and valid for use, thus providing physicians a new tool with which to evaluate and diagnose neuropathic pain among Arabic-speaking patients.

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Conflicts of interest

There are no conflicts of interest.

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Appendices

استبيان عن الآلام ذات المنشأ العصبي – نموذج قصير

من أجل تقييم وعلاج الألم لديك، نحن بحاجة لاستيضاح طبيعة هذا الألم والعوامل المؤثرة علية، سواءً كان الألم يتغير مع الوقت أو لا، وقد يكون الألم بمكان واحد في الجسم أو في أماكن متعددة.

فضلا حدد مكان الألم **الأشد أو الأقسى** لديك (مثلا: الذراع ، القدم ، إلخ):

.....

أرجو تقييم الألم الذي أشرت إليه في السؤال السابق في جميع الأسئلة القادمة :

فضلا استخدم المساحة أدناه للتعبير عن الألم الذي تشعر به بطريقتك الخاصة :

.....

استخدم المقاييس بالأسفل لتقييم الألم المعتاد لديك وذلك بوضع رقم معين، حسب المقياس (من صفر إلى مائه).

مثال: إذا لم يكن لديك ألم وخزي ، فإنك ستقيم الألم الوخزي بـ " صفر " ، وإذا كان الألم الوخزي هو الأسوأ على الإطلاق فإنك ستقيمه بـ " 100 " ، أما إذا كان بينهما بمقدار ما اختر الرقم الذي يناسب مقدار الألم لديك :

1- ألم وخزي

0 ⟶==========⟵ 100

لا يوجد ألم وخزي — أسوأ ألم وخزي متوقع

فضلاً ضع الرقم الذي يقيم التنميل المعتاد لديك : .....

2- تنميل (الخَدَران)

0 ⟶==========⟵ 100

لا أشعر بالتنميل — أسوء تنميل متوقع

فضلاً ضع الرقم الذي يقيم التنميل المعتاد لديك : .....

نحن أيضا مهتمون بمعرفة العوامل التي تؤثر على الألم لديك . فضلاً أكتب الرقم الذي يمثل مقدار كل مما يلي :

3- زيادة الألم عند اللمس

0 ⟶==========⟵ 100

لا يزداد أبداً — أسوء زيادة يمكن تخيلها

فضلاً ضع الرقم الذي يقيم الألم المعتاد لديك : .....

TOTAL DISCRIMINANT FUNCTION SCORE = ...

Terkawi et al. Arabic version of (Neuropathic pain questionnaire-short form (NPQ-SF)), Page **1** of **1**

Appendix 1: Arabic version of the Neuropathic Pain Questionnaire-Short Form

Appendix 2: Receiver operating characteristic of the Neuropathic Pain Questionnaire-Short Form with different cut-off values for the diagnosis of neuropathic pain

NPQ-SF discriminant score	Sensitivity	Specificity	PPV	NPV	Youden Index
−1.30	100.0	0	65	NA	0.00
−1.19	100.0	14	69	100	0.14
−1.13	100.0	16	69	100	0.16
−1.00	100.0	18	70	100	0.18
−0.96	100.0	20	70	100	0.20
−0.75	100.0	22	70	100	0.22
−0.74	97.8	22	71	85	0.20
−0.70	96.8	22	71	81	0.19
−0.55	96.8	27	71	79	0.23
−0.53	92.5	29	71	71	0.21
−0.46	92.5	33	72	70	0.25
−0.45	92.5	35	72	68	0.27
−0.42	91.4	35	72	68	0.26
−0.40	90.3	35	73	68	0.25
−0.25	89.2	35	73	67	0.24
−0.20	89.2	39	73	67	0.28
−0.19	88.2	45	73	66	0.33
−0.18	88.2	47	75	66	0.35
−0.15	87.1	47	75	66	0.34
−0.01	87.1	51	75	65	0.38
0.00	86.0	51	76	63	0.37
0.00	83.9	51	76	62	0.35
0.03	82.8	51	76	61	0.34
0.05	81.7	51	76	60	0.33
0.06	80.7	51	76	58	0.32
0.07	78.5	51	76	57	0.30
0.10	78.5	53	76	57	0.32
0.12	77.4	53	76	57	0.30
0.14	76.3	53	76	57	0.29
0.20	76.3	55	76	57	0.31
0.23	76.3	57	77	56	0.33
0.30	75.3	59	77	56	0.34
0.32	75.3	61	77	56	0.36
0.37	75.3	63	77	56	0.39
0.38	74.2	63	78	56	0.37
0.40	73.1	63	79	56	0.36
0.43	73.1	67	79	56	0.40
0.44	72.0	67	79	56	0.39
0.45	72.0	69	79	55	0.41
0.47	71.0	69	80	55	0.40
0.52	71.0	71	80	55	0.42
0.53	69.9	71	80	55	0.41
0.54	68.8	71	81	55	0.40
0.55	67.7	71	81	55	0.39
0.56	67.7	73	81	55	0.41
0.62	67.7	76	81	54	0.43
0.66	66.7	78	82	54	0.44
0.67	65.6	78	82	54	0.43
0.77	64.5	80	82	54	0.44
0.78	62.4	80	82	53	0.42
0.80	60.2	80	82	52	0.40
0.81	60.2	82	82	51	0.42
0.83	59.1	82	83	51	0.41
0.85	58.1	82	83	51	0.40
0.90	55.9	84	84	50	0.40
0.92	54.8	84	84	49	0.39
0.94	53.8	84	85	49	0.37
1.00	52.7	84	85	48	0.36
1.01	51.6	84	85	48	0.35
1.05	50.5	84	85	47	0.34
1.07	49.5	86	85	47	0.35
1.09	46.2	86	85	46	0.32
1.13	45.2	86	85	45	0.31
1.15	44.1	86	85	45	0.30
1.21	43.0	86	85	44	0.29
1.24	41.9	86	85	44	0.28
1.25	41.9	88	85	44	0.30
1.26	40.9	88	85	44	0.29
1.27	39.8	88	86	43	0.28
1.30	38.7	88	86	43	0.26
1.32	37.6	88	86	43	0.25
1.37	37.6	90	86	43	0.27
1.43	36.6	90	86	43	0.26
1.44	35.5	90	86	42	0.25
1.45	33.3	90	86	42	0.23
1.50	31.2	90	86	41	0.21
1.54	30.1	90	86	41	0.20
1.56	30.1	92	86	41	0.22
1.57	29.0	92	86	41	0.21
1.66	29.0	94	86	41	0.23
1.68	28.0	94	86	40	0.22
1.71	26.9	94	86	40	0.21
1.72	22.6	94	86	39	0.16
1.76	21.5	94	86	39	0.15
1.81	20.4	94	87	38	0.14
1.82	19.4	94	87	38	0.13
1.86	18.3	94	87	38	0.12
1.90	17.2	94	87	37	0.11
1.91	16.1	94	87	37	0.10
1.94	15.1	94	87	37	0.09
1.96	14.0	94	87	37	0.08
1.97	12.9	94	88	37	0.07
1.99	11.8	94	88	36	0.06
2.03	10.8	94	88	36	0.05
2.13	9.7	94	89	36	0.04
2.20	8.6	94	89	36	0.02
2.21	8.6	96	90	36	0.05
2.36	8.6	98	90	36	0.07
2.48	8.6	100	100	36	0.09
2.53	7.5	100	100	36	0.08
2.57	6.5	100	100	35	0.06
2.59	4.3	100	100	35	0.04
2.83	3.2	100	100	35	0.03
2.97	2.1	100	100	35	0.02
3.00	1.1	100	100	35	0.01
Infrequent	0.0	100	NA	35	0.00

NPQ-SF: Neuropathic Pain Questionnaire-Short Form; PPV: Positive predictive value; NPV: Negative predictive value; Youden Index: Sensitivity + specificity−1