Turkish Version of the painDETECT Questionnaire in the Assessment of Neuropathic Pain: A Validity and Reliability Study

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Abstract

Objectives. The aim of this study was to develop a Turkish version of the painDETECT questionnaire (PD-Q) and assess its reliability and validity.

Methods. Two hundred and forty patients who were diagnosed by expert pain physicians in daily clinical practice and classified as having either neuropathic, nociceptive, or mixed pain for at least 3 months were enrolled in this study. After the usual translation process, the Turkish version of the PD-Q was administered to each participant twice with an interval of 48 hours. The Leeds Assessment of Neuropathic Symptoms and Signs (LANSS), Douleur Neuropathique en 4 questions (DN4) and a pain visual analog scale were assessed along with the PD-Q. Chronbach's α was calculated to evaluate internal consistency of the PD-Q. Intraclass correlation coefficient was calculated to examine test-retest reliability. Convergent validity was assessed by correlating the scale with LANSS and DN4. Discriminant statistics—sensitivity, specificity, Youden index, positive predictive value, negative predictive value—were also assessed.

Results. A total of 240 patients with chronic pain, 80 patients in each neuropathic, nociceptive, and mixed pain group, were included in this study. Mean age of the patients was 54.1 years, and majority of the patients were female (52.9%). Chronbach's α of the Turkish version of the PD-Q was 0.81. The test-retest reliability of the Turkish version of the PD-Q was determined as 0.98 for the total score and ranged from 0.86 to 0.99 for individual items. The Turkish version of the PD-Q was possitively and significantly corralated with LANSS (r 0.89, $P < 0.001$) and DN4 (r 0.82, $P < 0.001$). When the two cutoff values in the original version were used, sensitivity was found 77.5% for a cutoff value ≤19, and specificity was 82.5%. Sensitivity and specificity were 90% and 67.5%, respectively, for the other cutoff value ≤12. Scores ≤12 represents a negative predictive value = 87%, and scores 19≤ represents a positive predictive value = 82%. When mixed pain patients were included in the neuropathic pain group, discriminant values were reduced as expected.

Conclusions. The Turkish version of the PD-Q is a reliable and valid scale to be used to determine neuropathic component of chronic pain in Turkish patients.

Key Words. Neuropathic Pain; Chronic Diseases; Pain Assessment; Questionnaires

Introduction

Management of patients presenting with chronic pain is a common problem in medical care. The accurate assessment of pain type in chronic pain patients is important to improve the therapeutic outcome. Chronic pain can be classified as three main categories: nociceptive pain, neuropathic pain, and mixed pain as the coexistence of nociceptive and neuropathic pain [1,2]. Because nociceptive

and neuropathic components require different pain management strategies, certain diagnosis of pain type is required [2].

The International Association for Study of Pain defined neuropathic pain recently as "pain caused by a lesion or disease of the somatosensory system" [3]. There are no accurate data for the overall prevalence of neuropathic pain, but it is considered that chronic neuropathic pain is underrecognized and undertreated [4]. Neuropathic pain is not a single disease, but a syndrome caused by a range of different diseases and lesions, which has a considerable impact on the quality of life [2,5]. Despite being related to various type of nerve lesions, neuropathic pain syndromes share similar clinical symptoms and signs that are the result of particular mechanisms and require specific management [6]. Neuropathic pain screening tools have gained increasing acceptance in the medical community. There are several instruments that allow to screen neuropathic pain components of patients with chronic pain. The purpose of these diagnostic tools is to help the clinician to identify patients with neuropathic pain, but they are not intended to replace clinical examination and clinical judgement [7]. Clinical examination, including accurate sensory examination, is the basis of neuropathic pain diagnosis [8].

Various screening tools and questionnaires have been developed in different countries for detecting neuropathic pain component of patients with chronic pain based on verbal pain description, with or without physical examination [9–15]. The use of these tools in different languages and cultures could contribute to increase the recognition of neuropathic pain. Although some of these instruments are available in Turkish, the painDETECT questionnaire (PD-Q) validation process in Turkish population has not been done [16–18]. The PD-Q was developed and validated to detect neuropathic pain components especially in chronic low back pain patients in Germany. It is also available in several other languages [19,20]. The PD-Q is a reliable screening tool with high sensitivity, specificity, and positive predictive accuracy [15,19]. The PD-Q is a simple, self-administered, useful screening questionnaire that was designed to screen for neuropathic signs and symptoms without physical examination [15].

Although these tools are based on descriptors, their linguistic adaptation and validation into different languages is feasible and ensures their reliability and validity in languages other than those in which they were initially developed [21]. The aim of this study was to validate the PD-Q into Turkish and to check its psychometric properties in the Turkish population.

Materials and Methods

The study protocol was approved by the Institutional Review Board of the University (registration number: B.30.2.PAU.0.20.05.09/66, date of approval; March 6, 2012) and each patient provided written informed consent to participate this study. Patients with each sex, aged 18 years or over, able to speak, and understand Turkish language, of whom diagnosis of pain type was concurred by two pain specialists and had chronic pain for at least 3 months with pain visual analog scale (VAS) score three or more, were included in this study. Pain intensity was evaluated by a 10 cm VAS, asking for the pain experienced during the last week. Exclusion criteria were: painful syndromes of unknown origin or associated with diffuse pains (e.g., fibromyalgia), being illiterate, having altered mental status; being in an analgesic situation and not referring pain due to pharmacological or nonpharmacological treatments. This study was carried out in the University Faculty of Medicine, pain management units of Physical Medicine and Rehabilitation and Neurology Departments between April and August 2012.

After demographic information was obtained, detailed medical history and physical examination including anthropometric measures for determination of body mass index were performed. Patients were diagnosed by two expert pain physicians in daily clinical practice and classified as having either neuropathic, nociceptive, or mixed pain. Differential diagnosis of patients was based on medical history, detailed clinical examinations, and appropriate diagnostic techniques including neuroimaging and electrophysiological studies when indicated. The diagnosis of neuropathic pain made by two expert pain physicians was considered as the gold standard. Each patient was examined by two experienced pain specialists working independently of each other. Patient was included in the validation study only if the two specialists concurred in the diagnosis of pain type. Then the patients were evaluated by another investigator who was blinded to the pain classification to apply Turkish version of the PD-Q along with Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) and Douleur Neuropathique en 4 Questions (DN4). The Turkish version of the PD-Q was administered to the same patients twice, 2 days apart, by the same investigator. The result of the experts physicians was then compared with results of the PD-Q.

Description of the PD-Q

The PD-Q is simple, self-administered, useful screening questionnaires that allow to detect neuropathic pain components in patients with chronic pain. The PD-Q was developed in Germany in individuals with chronic low back pain. The PD-Q consists of four main sections. The first section contains three items with 11-point Likert scale format with anchor terms in the scale ends (0 = no pain, 10 = maximum pain), accompanied by a color grading scale representing pain intensity in analog format. These items assess intensity of pain at the moment, the average and the maximum pain intensity during the past 4 weeks. The first section used to diagnose the presence of pain but not included in the questionnaire scoring. In the second section, patients were asked to mark one of the four graphs that best describe their pain course patterns. The possible patterns and their scores are determined as follows: persistent pain with slight fluctuations (0 points), persistent pain with pain attacks (–1 point), pain attacks without pain

between them (1 point), and pain attacks with pain between them (1 point). The third section includes a sensory map representing homunculus along with questions asking to mark the pain zone, a dichotomous item about the presence of radiating pain and showing the direction of radiating pain with an arrow. The positive answer about the presence of radiating pain is scored with two points. In the last section, there are seven Likert type items asking about the intensity of the sensation marked over the homunculus. These items are scored with a 6-point Likert format, with corresponding ordinal anchor terms (0 = never, 1 = hardly noticed, 2 = slightly, 3 = moderately, 4 = strongly, 5 = very strongly). These Likert-type items ask about the following sensations: burning, tingling or prickling, allodynia, pain attacks, temperature evoked pain, numbness, and pressure-evoked pain. This last section provides scores between 0 and 35 points. The final score is obtained summing up the scores of the last three sections with a total score of –1 to 38. Two cutoff values are used by developer of PD-Q for the presense of neuropathic pain. Scores ≤12 state that a neuropathic pain component is unlikely, and scores ≤19 indicate that neuropathic component is very likely to be present. Scores between 12 and 19 suggest that the result is unclear [15].

LANSS

LANSS is based on analysis of sensory description and bedside examination of sensory dysfunction. LANSS contains five symptom and two clinical examination items. The first part consist five dichotomous items asking the patient about the kind of pain experienced in the last week. In the second part, presence of allodynia and altered pinprick perception threshold are explored by health care professional. Each item should be marked as present or absent, and the presence of each sign has different score. The possible scores range from 0 to 24, with a score of 12 or greater considered to be suggestive of neuropathic pain [9].

DN4

DN4 is a clinician-administered questionnaire contains seven items related to symptoms and three related to clinical examination. A score of 1 is given to each positive item and a score of 0 to each negative item. The total score is calculated as the sum of the 10 items, and a total score of 4 or more out of 10 suggests neuropathic pain [12].

Pain VAS

Pain intensity was evaluated by a 10 cm VAS asking for the pain experienced during the last week (0, no pain; 10, worst possible pain).

Linguistic Adaptation

Translation and cross-cultural adaptation of the PD-Q into Turkish was carried out after the usual process for the adaptation and validation of patient-reported questionnaires [22,23]. The adaptation procedure was supervised

by an expert committee including experts in pain medicine and expert in methodology and validation of instruments. In the first phase, the English version of the PD-Q that was developed in Germany was translated into Turkish by two independent translators who were a native Turkish speaker fluent in English. Both forward translators were discussed the forward translations item by item that was highly concordant. After discrepancies had been discussed, the translation is combined into a new version with the assistance of an expert committee. The completed new Turkish version was evaluated for cultural appropriateness in Turkish patients with chronic pain to assess initial feasibility and potential understanding problems. In the back-translation phase, the final Turkish version of the PD-Q was translated back into English by two independent English native speaker who were blinded to the original scale, not have medical background, and not informed about the concept of PD-Q. Both back translators were discussed item by item to test concordance with the original instrument. The original questionnaire and the forward and back translations were discussed by all translators. The differences between translated versions were evaluated, and a satisfactory compliance with the original scale was achieved by consensus of the translators and expert committee. The translation and back-translation phase of the PD-Q produced Turkish version of the questionnaire (see Supplemental at link http://www.pau.edu.tr/tipftr/tr/sayfa/pain-detect-turkce-versiyonu).

Psychometric Validation

During the first examination, participants were interviewed to gather information about sociodemographic characteristics, and the PD-Q was administered to patients, along with the LANSS scale (administered by the clinician), DN4, and the pain VAS. All subjects were re-evaluted 48 hours later. In the second examination, the PD-Q was administered again to assess time stability of measurements. The assessment of the psychometric properties of the PD-Q focused on reliability and validity with methodological methods, as described in Spanish validation study [19]. Feasibility was assessed with difficulties found by patients when answering items, and the number of items not answered by patients.

Sample size was calculated assuming that at least 240 patients were needed to validate a scale, 80 in each group (nociceptive, mixed, and neuropathic). A sample size of 73 produces two-sided 95% confidence interval with a distance from the mean to the limits that is equal to 1.4, with an estimated standard deviation of 6.0 for Pain Detect score. Assuming a 10% data loss or unevaluable questionnaries, the final sample size should be 240 patients.

Statistics

All statistical analyses were performed using SPSS version 15.0 for Windows (Statistical Package for Social Sciences Inc., Chicago, IL, USA). Descriptive statistics were used to

describe demographic characteristics. For continuous variables, the significance of the differences was analysed using the one-way analysis of variance (ANOVA) and Student's t-test, while categorical variables was analyzed with chi-squared test. For reliability analysis, Cronbach's α was used to assess the scale internal consistency, and intraclass correlation coefficient between test and retest scores was used to assess stability over time. Convergent validity was assessed by examining correlation between PD-Q with LANSS and DN4 scores. To evaluate the discriminant validity, patients with nociceptive and neuropathic pain were compared in all scale items and in the PD-Q overall score (one-way ANOVA, post-hoc Tukey honestly significant difference, Student's t, chi-squared test); Post-hoc Tukey test was performed to correct for the effect of multiple comparisons when the difference was detected between the groups. PD-Q sensitivity and specificity indexes were computed using it for diagnostic classification of patients compared with clinical judgement. For each total PD-Q score, sensitivity and specificity were computed and graphed in a receiver operating characteristic (ROC) curve. The ROC curved was used to select optimal cutoff PD-Q scores for screening patients

who present a neuropathic pain component. The Youden's index, positive predictive value, negative predictive value, and positive and negative likelihood ratio were also obtained. In all analyses, P values <0.05 were considered as statistically significant.

Results

A total of 258 patients were eligible for this study, 18 of whom had to be excluded from the analysis. Therefore, 240 patients with chronic pain; 80 patients in each neuropathic, nociceptive and mixed pain group, were included in this study. A total of 18 patients were excluded from the study; 11 of them had pain medication, four had pain lower than 3 on VAS scale, and three were unable to understand and answer the questionnaire. The mean age of the patients was 54.1 years, and the majority of the patients were female (52.9%). Neuropathic pain patients had higher mean age and duration of pain than the mixed and also nociceptive pain group ($P < 0.05$). There were no difference in sociodemographical characteristics by main diagnosed pain type except age and duration of pain as shown in Table 1 ($P > 0.05$). Patients in each pain group

Table 1 Demographic characteristics by main diagnosed pain type

	Nociceptive (N = 80)	Mixed (N = 80)	Neuropathic (N = 80)	P
Gender, N (%)				0.626
Women	43 (53.8%)	39 (48.8%)	45 (56.2%)	
Men	37 (46.2%)	41 (51.2%)	35 (43.8%)	
Age (years) (mean ± SD)	52.54 ± 14.18	51.78 ± 14.01	58.05 ± 11.51	0.006
				Neu > Nos p* = 0.025
				Neu > Mix p* = 0.009
Duration of pain (month) (mean ± SD)	24.44 ± 41.22	22.89 ± 44.52	49.72 ± 71.04	0.002
				Neu > Nos p* = 0.01
				Neu > Mix p* = 0.006
BMI (kg/m²) (mean ± SD)	27.71 ± 4.18	28.39 ± 4.14	28.56 ± 4.37	0.412
Educational level, N (%)				0.109
Primary	46 (57.5%)	49 (61.2%)	61 (76,3%)	
High	20 (25%)	19 (23.8%)	13 (16.2%)	
University	14 (17.5%)	12 (15%)	6 (7.5%)	
Occupation, N (%)				0.226
Government official	7 (8,8%)	8 (10%)	6 (7.5%)	
Employee	16 (20%)	22 (27.5%)	23 (28.8%)	
Retired	28 (35%)	21 (26.2%)	14 (17.5%)	
Home-maker	28 (35%)	27 (33,8%)	36 (45%)	
Student	0 (0%)	2 (2.5%)	0 (0%)	
Unemployed	1 (1.2%)	0 (0%)	1 (1.2%)	
Marital status, N (%)				0.399
Married	71 (88.8%)	72 (90%)	70 (87.5%)	
Single	7 (8.8%)	6 (7.5%)	4 (5%)	
Widow(er)	2 (2.5%)	2 (2.5%)	6 (7.5%)	

BMI = body mass index; Mix = mixed pain group; Neu = neuropathic pain group; Nos = nociceptive pain group; p* = post-hoc Tukey honestly significant difference test; SD = standard deviation.

did not differ according to sex, occupation, educational level, or marital status. This enabled us to interpret that there was no difference in level of understanding of the questionnaires in each group.

The majority of patients in neuropathic pain group were diagnosed as diabetic neuropathy (47.5%), followed by painful polyneuropathy (25%), central neuropathic pain (20%), and post-herpetic neuralgia (7.5%). In the mixed pain group, the more frequent etiology was radiculopathy (37.5%). Other etiologies were peripheral entrapment syndrome (32.5%), pain related to oncological disease (11.2%), mechanical low back pain (11.2%), and complex regional pain syndrome (7.6%) in the mixed pain group. The prevalent diagnosis included in nociceptive pain group were osteoarthritis (37.5%), and the other diagnosis were myofascial pain syndrome (21.3%), impingement syndrome (18.8%), epicondylitis/bursitis (13.7%), and mechanical low back pain (8.7%), respectively.

All PD-Q items, except pain course patterns and radiating pain, were answered by all patients, showing that they were well understood. Five patients did not mark any pain course patterns: two of them in nociceptive, two of them in neuropathic, and one in mixed pain group. All these patients stated that none of the available graphs describe their pain course patterns. All of them had mentioned persistent pain in the same intensity with no fluctuations or attacks. Only one patient forgot to fill the radiating pain item whom pain was nociceptive. Multiple choice were not observed for any item. The distribution of responses for the seven Likert-type items did not have ceiling or floor effect as shown in Table 2. Items 3 and 5 accumulated more than 30% of responses in the lower category

suggesting a possible floor effect. On the other hand, when only responses of the neuropathic pain group were considered, the percentage of responses in the low category did not reach 9%. The most frequently selected pain pattern was pain attacks with pain between them (33.3%) in the whole sample, and the presence of radiating pain were reported by 30% of all patients. There were no statistically significant difference in distribution of responses for pain course paterns and radiating pain between pain group.

The mean overall score of PD-Q score was significantly higher in the neuropathic pain group than both nociceptive and mixed pain group ($P < 0.001$). The mixed pain group attained a mean overall score in between the other two groups, which was significantly lower than the neuropathic pain group and higher than nociceptive pain group ($P < 0.05$). Mean scores of the maximum and the average pain intensity experienced during the past 4 weeks were higher in the neuropathic pain group than both nociceptive and mixed pain group; however, the mean pain intensity in the moment of examination did not differ significantly between groups (Table 3). Mean Likert-type item scores were significantly different for the neuropathic, nociceptive, and mixed pain groups ($P < 0.001$). Mean score for each individual item was always higher in the neuropathic pain group than in the nociceptive group, supporting the discriminative capability of the individual items.

Mean score for the LANSS scale and also DN4 were significantly higher in the neuropathic pain group than both nociceptive and mixed pain group; also, mixed pain group was presented statistically significantly higher mean

Table 2 Frequency distribution of response categories in patients with chronic pain

	No N (%)	Hardly Noticed N (%)	Slightly N (%)	Moderately N (%)	Strongly N (%)	Very Strongly N (%)
Burning sensation	58 (24.2)	27 (11.3)	31 (12.9)	52 (21.7)	43 (17.9)	29 (12.1)
Tingling or prickling	46 (19.2)	34 (14.2)	35 (14.6)	55 (22.9)	49 (20.4)	21 (8.8)
Painful light touching	88 (36.7)	28 (11.7)	43 (17.9)	34 (14.2)	27 (11.3)	20 (8.3)
Sudden pain attacks	51 (21.3)	40 (16.7)	42 (17.5)	52 (21.7)	38 (15.8)	17 (7.1)
Temperature evoked pain	75 (31.3)	29 (12.1)	41 (17.1)	47 (19.6)	32 (13.3)	16 (6.7)
Numbness sensation	57 (23.8)	9 (3.8)	35 (14.6)	57 (23.8)	56 (23.3)	26 (10.8)
Pressure evoked pain	56 (23.3)	29 (12.1)	39 (16.3)	44 (18.3)	43 (17.9)	29 (12.1)
Pain course pattern						
Persistent pain with slight fluctuations	47 (19.6)					
Persistent pain with pain attacks	51 (21.3)					
Pain attacks without pain between them	57 (23.8)					
Pain attacks with pain between them	80 (33.3)					
Missing responses (not answered)	5 (2.1)					
Does the pain radiate to other regions of your body?						
Yes	72 (30)					
No	167 (69.7)					
Missing responses (not answered)	1 (0.4)					

Table 3 Pain scores of patients by main diagnosed pain type

	Nociceptive (N = 80) (Mean ± SD)	Mixed (N = 80) (Mean ± SD)	Neuropathic (N = 80) (Mean ± SD)	P	Post-hoc Tukey p*
Pain VAS	6.35 ± 1.93	6.28 ± 1.79	6.66 ± 1.63	0.363	NA
painDETECT first score	9.05 ± 7.11	18.45 ± 6.03	21.49 ± 6.26	<0.001	Neu > Nos p* < 0.001 Neu > Mix p* = 0.009 Mix > Nos p* < 0.001
Pain intensity now	6.25 ± 2.17	6.31 ± 1.93	6.74 ± 1.88	0.246	NA
Pain intensity average	6.58 ± 1.87	6.96 ± 1.81	7.57 ± 1.47	0.002	Neu > Nos p* = 0.001
Pain intensity maximum	8.34 ± 1.83	8.25 ± 1.79	9.04 ± 1.26	0.005	Neu > Nos p* = 0.02 Neu > Mix p* = 0.006
painDETECT score retest	8.99 ± 7.09	17.75 ± 6.07	20.95 ± 6.11	<0.001	Neu > Nos p* < 0.001 Neu > Mix p* = 0.005 Mix > Nos p* < 0.001
LANSS	4.71 ± 5.52	12.80 ± 4.52	15.76 ± 4.52	<0.001	Neu > Nos p* < 0.001 Neu > Mix p* < 0.001 Mix > Nos p* < 0.001
DN4	2.10 ± 2.39	5.65 ± 2.05	7.14 ± 1.64	<0.001	Neu > Nos p* < 0.001 Neu > Mix p* < 0.001 Mix > Nos p* < 0.001

DN4 = Douleur Neuropathique en 4 Questions; LANSS = Leeds Assessment of Neuropathic Symptoms and Signs; Mix = mixed pain group; NA = not applicable; Neu = neuropathic pain group; Nos = nociceptive pain group; p* = post-hoc Tukey honestly significant difference test; SD = standard deviation; VAS = visual analog scale.

scores than the nociceptive group (P < 0.001) (Table 3). In the neuropathic pain group, 81.2% of patients scored 12 or above, which is the cutoff value in LANSS, in comparison with 65% in the mixed pain group and 11.2% in the nociceptive pain group. Furthermore, 96.2% of the patients in the neuropathic pain group scored 4 or above from DN4 in comparison with 82.2% in the mixed pain group and 18.8% in the nociceptive pain group. Pearson correlation between the LANSS scale and PD-Q scores was high and statistically significant (r 0.89, P < 0.001). Also, there was a positive and statistically significant correlation between PD-Q and DN4 (r 0.82, P < 0.001).

Internal consistency for the whole Turkish version of the PD-Q scale was 0.81 assessed by Cronbach's α; however, when only the Likert items were considered, Cronbach's α was slightly reduced to 0.80. The mean

overall score of the PD-Q was 16.33 ± 8.35 at baseline and 15.9 ± 8.17 at the retest measurement. The test-retest reliability of the Turkish version of the PD-Q was determined as 0.98 for the total score and ranged from 0.86–0.99 for individual items.

Using the agreement between PD-Q scores and clinical diagnosis as the gold standard, ROC curve for PD-Q scores was estimated (Figure 1). Area under the ROC curve was 0.89 when comparing neuropathic and nociceptive groups. Discriminant statistics—sensitivity, specificity, Youden index, positive predictive value, negative predictive value for each possible PD-Q cutoff score—were given in Table 4 considering neuropathic and nociceptive pain groups only. In this study, when the two cutoff values in the original version was used sensitivity was found 77.5% for a cutoff value ≤19 and specificity was
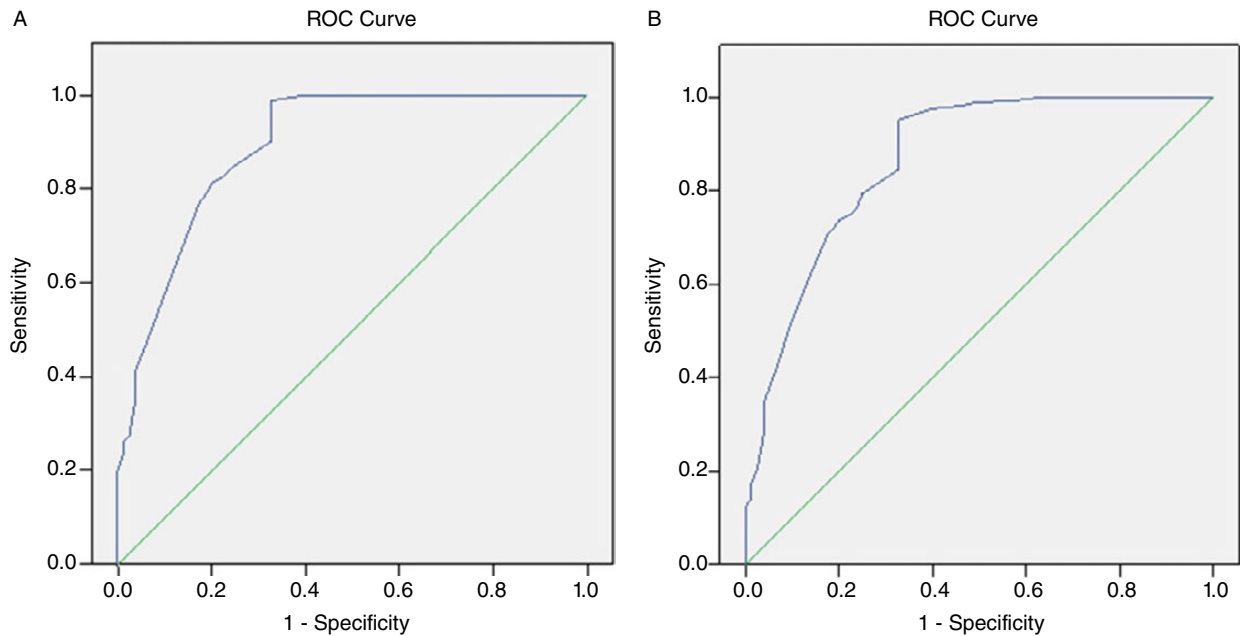
A
ROC Curve

B
ROC Curve

Figure 1 (A) Receiver operating characteristic curve for neuropathic pain presence. Area under the curve: 0.893. (B) Receiver operating characteristic curve for neuropathic and mixed pain presence. Area under the curve: 0.867.

82.5%. Sensitivity and specificity were 90% and 67.5%, respectively, for the other cutoff value ≤12. If we select only a single cutoff value, we could use the score ≤17 where sensitivity (81.3%) and specificity (80%) were simultaneously maximized with a higher value for the Youden index = 0.613. Scores ≤12 represents a negative predictive value = 87%, and scores ≤19 represents a positive predictive value = 82% (Table 4). When mixed pain patients were included in the neuropathic pain group and considered as a part of the patients with a neuropathic pain component, area under the ROC curve was slightly reduced to 0.86. On the other hand, when patients with mixed pain were included in the discriminant analysis, sensitivity was reduced to 70.6% and 84.4% for the original cutoff values 19 and 12, respectively, as shown in Table 5. When mixed pain patients were included in the neuropathic pain group, discriminant values are reduced as expected (Table 5). Therefore, a single cutoff value of ≤14 would be better when mixed pain patients were included in the neuropathic pain group with a higher sensitivity = 79.4% and specificity = 75%.

Discussion

The original version of the PD-Q that was designed to detect neuropathic pain components in patients with low back pain has been validated in about 8,000 patients with low back pain and reaches about 80% sensitivity and specificity [15]. The original authors suggested two cutoff points ≤12 with a negative predictive value 85% and ≤19 with a positive predictive value 90%. In the Spanish version of the PD-Q sensitivity, specificity and the positive

predictive value were 75%, 84%, and 92%, respectively, when the suggested cutoff value for neuropathic pain presence of 19 points or higher was used. On the other hand, when cutoff value of 12 points or below taken into consideration, sensitivity, specificity, and negative predictive value were 93%, 68%, and 80%, respectively [19]. Discriminant analysis of the Turkish PD-Q was also good, and the results of sensitivity, specificity, and positive and negative predictive value were consistent with these studies. On the other hand, when patients with mixed pain were included in the analysis, discriminative capability of PD-Q was reduced.

Turkish version of the PD-Q shows good psychometric properties in patients with chronic pain. The test-retest reliability of the Turkish version of the PD-Q seemed to be good. Stability over time was not assessed by the original developers [15]; however, in the Spanish validation study, intraclass correlation coefficient attained a value of 0.93, which is similar to our findings [19]. Moreover, internal consistency assessed by Cronbach's α attained a value of 0.81 for the Turkish version of the PD-Q scale that was considered good and also consistent with the results of the original scale [15]. Unlike to these studies, Cronbach's α attained a value of 0.86 that increased to 0.89 when only the Likert items were considered for the Spanish PD-Q [19].

Comparing PD-Q contents with that of LANNS, DN4, and 6-item identification pain questionnaire scales, the concepts assessed were similar, although the response method greatly varied [15]. However, in PD-Q, pain course

Table 4 Discriminant features in patients with neuropathic pain to nociceptive pain

Cutoff Score	Sensitivity (%)	Specificity (%)	Youden Index	PPV	NPV	PLR	NLR
0	100	1.2	0.012	0.5	1	1.01	0
1	100	3.7	0.037	0.51	1	1.03	0
2	100	7.5	0.075	0.52	1	1.08	0
3	100	12.5	0.125	0.53	1	1.14	0
4	100	23.7	0.237	0.57	1	1.31	0
5	100	36.2	0.362	0.61	1	1.57	0
6	100	41.2	0.412	0.63	1	1.70	0
7	100	51.2	0.512	0.67	1	2.05	0
8	100	53.7	0.537	0.68	1	2.16	0
9	100	60.0	0.600	0.71	1	2.50	0
10	98.8	67.5	0.663	0.75	0.98	3.04	0.02
11	93.8	67.5	0.613	0.74	0.92	2.89	0.09
12	90.0	67.5	0.575	0.73	0.87	2.77	0.15
13	87.5	71.2	0.587	0.75	0.85	3.04	0.18
14	85.0	75.0	0.600	0.77	0.83	3.4	0.20
15	83.8	76.2	0.600	0.78	0.82	3.52	0.21
16	82.5	77.5	0.600	0.79	0.82	3.67	0.23
17	81.3	80.0	0.613	0.80	0.81	4.06	0.23
18	78.8	81.2	0.600	0.81	0.79	4.19	0.26
19	77.5	82.5	0.600	0.82	0.79	4.43	0.27
20	67.5	86.2	0.537	0.83	0.73	4.89	0.38
21	57.5	90.0	0.475	0.85	0.68	5.75	0.47
22	47.5	93.7	0.512	0.88	0.64	7.53	0.56
23	41.3	96.2	0.375	0.92	0.62	10.87	0.61
24	35.0	96.2	0.312	0.90	0.60	9.21	0.68
25	27.5	97.5	0.250	0.92	0.57	11	0.74
26	26.3	98.7	0.250	0.95	0.57	20.23	0.75
27	23.8	98.7	0.225	0.95	0.56	18.31	0.77
28	20.0	100	0.200	1	0.56	NA	0.80
29	13.8	100	0.138	1	0.53	NA	0.86
30	8.8	100	0.088	1	0.52	NA	0.91
31	6.3	100	0.063	1	0.52	NA	0.93
32	5.0	100	0.050	1	0.51	NA	0.95
33	3.8	100	0.038	1	0.51	NA	0.96
34	2.5	100	0.025	1	0.51	NA	0.97
35	2.5	100	0.025	1	0.51	NA	0.97
36	1.3	100	0.013	1	0.50	NA	0.99
37	1.3	100	0.013	1	0.50	NA	0.99
38	0	100	0	NA	0.5	NA	1

NA = not applicable; NLR = negative likelihood ratio; NPV = negative predictive value; PLR = positive likelihood ratio; PPV = positive predictive value.

patterns and radiating pain, which particularly are important for back pain, are used through diagnostic items being different from other tools. Nevertheless, the item corresponding to radiating pain did not discriminate between pain groups in the Spanish validation study [19]. In accordance with this finding, we also found no difference between pain groups according to radiating pain. This may be because only patients with chronic back pain were included in the original study, whereas we enrolled all kinds of neuropathic pain groups similar to Spanish validation study. Moreover, the rates of responses for pain course paterns also did not differentiate between groups in our study, although the pattern of pain attacks with pain between them was relatively more often selected in the neuropathic pain group than the others; the difference could not reach statisctically significance. Although PD-Q is the first instrument using visual paterns for describing pain types, discriminative features of these patterns may be especially for the patients with chronic low back pain. The present data indicate that discriminant capability of pain course pattern and radiating pain items might be poor. Despite the differences in development of tools, the pain descriptors are almost similar in all instruments [24]. Pain evoked by mild pressure and pain evoked by heat or cold are the differences of PD-Q from other instruments [24]. On the other hand, the discriminative properties of

Table 5 Discriminant features together with neuropathic and mixed pain vs nociceptive pain

Cutoff Score	Sensitivity (%)	Specificity (%)	Youden Index	PPV	NPV	PLR	NLR
0	100	1.2	0.012	0.70	1	1.01	0
1	100	3.7	0.037	0.71	1	1.03	0
2	100	7.5	0.075	0.72	1	1.08	0
3	100	12.5	0.125	0.73	1	1.14	0
4	100	23.7	0.237	0.75	1	1.31	0
5	100	36.2	0.362	0.79	1	1.57	0
6	99.4	41.2	0.406	0.80	0.97	1.69	0.01
7	98.8	51.2	0.500	0.83	0.95	2.02	0.02
8	98.1	53.7	0.518	0.83	0.92	2.12	0.04
9	97.5	60.0	0.575	0.85	0.91	2.44	0.04
10	95.0	67.5	0.625	0.87	0.85	2.92	0.07
11	90.0	67.5	0.575	0.86	0.74	2.77	0.15
12	84.4	67.5	0.519	0.86	0.65	2.60	0.23
13	81.9	71.2	0.531	0.87	0.63	2.84	0.25
14	79.4	75.0	0.544	0.88	0.61	3.18	0.27
15	76.3	76.2	0.525	0.88	0.58	3.21	0.31
16	75.0	77.5	0.525	0.89	0.57	3.33	0.32
17	73.8	80.0	0.538	0.90	0.57	3.69	0.33
18	71.9	81.2	0.531	0.90	0.55	3.82	0.35
19	70.6	82.5	0.531	0.90	0.55	4.03	0.36
20	61.9	86.2	0.481	0.91	0.49	4.48	0.44
21	52.5	90.0	0.425	0.92	0.45	5.25	0.53
22	41.3	93.7	0.350	0.94	0.41	6.56	0.63
23	34.4	96.2	0.306	0.95	0.39	9.05	0.68
24	27.5	96.2	0.237	0.94	0.36	7.24	0.75
25	20.6	97.5	0.181	0.95	0.34	8.24	0.81
26	17.5	98.7	0.162	0.97	0.34	13.46	0.84
27	14.4	98.7	0.131	0.96	0.33	11.08	0.87
28	12.5	100	0.125	1	0.33	NA	0.87
29	7.5	100	0.075	1	0.32	NA	0.92
30	4.4	100	0.044	1	0.31	NA	0.96
31	3.1	100	0.031	1	0.31	NA	0.97
32	2.5	100	0.025	1	0.31	NA	0.97
33	1.9	100	0.019	1	0.30	NA	0.98
34	1.3	100	0.013	1	0.30	NA	0.99
35	1.3	100	0.013	1	0.30	NA	0.99
36	0.6	100	0.006	1	0.30	NA	0.99
37	0.6	100	0.006	1	0.30	NA	0.99
38	0	100	0	NA	0.30	NA	1

NA = not applicable; NLR = negative likelihood ratio; NPV = negative predictive value; PLR = positive likelihood ratio; PPV = positive predictive value.

seven Likert-type items corresponding to the sensory descriptors were very good like the other studies [15,19].

The LANSS scale and DN4 questionnaire use both interview questions and physical examination and achieve higher sensitivity and specificity than the screening tools that use only interview questions [9,12]. The higher diagnostic accuracy achieved by the LANSS scale and DN4 questionnaire is hardly surprising given that their scores also reflect physical tests and emphasizes the importance of clinical examination [7]. In contrast with DN4 and the LANSS scale, the PD-Q is a self-administered question-naire and therefore does not include sensory examination. PD-Q relies only on interview questions. Despite the differences between the DN4, LANSS, and PD-Q mentioned earlier, it appears that several items are common to these three questionnaires. Moreover, it is important to note that higher correlation between the LANSS, DN4 scale, and PD-Q were obtained in the present study.

In linguistic validation phase, the most difficult topic in ensuring the compliance is the definition of pain course paterns during the forward translation process. There were also minor differences among the translators during

the forward translation process in Likert-type items 3, 5 and 7 that were amended by expert panel. All PD-Q items, except pain course patterns and radiating pain, were answered by all patients, and multiple answers were not noted for any item, showing that they were well understood. On the basis of patient interviews, the most frequently asked issue during the test period are "how should I mark the pain intensity questions?" and "how should I draw the arrow?." Also when the outcome of all scores were taken into consideration, it is clear that the translation procedure was completed successfully. Adaptation of the PD-Q will help to prevent the existence of multiple versions of an instrument in Turkish. In this study, it was shown that the Turkish version of PD-Q can be used to discriminate between neuropathic and nociceptive types of pain in clinical practice when the mixed pain group is not taken into consideration.

However, this study has some limitations such as difficulty to determine if the outcome of PD-Q influenced by sociodemographic characteristics of participant due to small sample size. Moreover, this validation study was conducted in a single university hospital by the contributions of two separate departments, but the strength of representation of the whole Turkish community could be better if it was a multicenter study. Moreover, the present study was performed only in a clinical setting. Although these findings support the generalizability of the results, the precision of the test needs to be further evaluated in epidemiologic studies.

In conclusion, the Turkish version of the PD-Q shows good psychometric and discriminant properties for detecting the presence of a neuropathic component in patients with chronic pain. Further longitudinal studies with larger samples are needed to test the validation of this questionnaire for epidemiological purposes and also to evaluate the sensitivity of PD-Q response to treatment over time with proper treatment modality.

Acknowledgments

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