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Translation and cross-cultural adaptation of Polish version of Neuropathic Pain Questionnaire (NPQ-PL) and its comparisons with different questionnaires

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ABSTRACT

Aim of the study. The aim of this study was to assess the validity and reliability of the Polish version of the Neuropathic Pain Questionnaire (NPQ-PL), and to compare it to other diagnostic tools.

Clinical rationale for the study. Neuropathic pain is a burdensome condition, of which the exact prevalence is difficult to estimate. During initial screening, pain questionnaires are helpful in alerting clinicians about the need for further evaluation.

Material and methods. The NPQ-PL has been developed following the guidelines for translation and cultural adaptation. A total of 140 patients with chronic pain (ChP), 90 with neuropathic pain (NP), and 50 with nociceptive pain (NoP), were enrolled into this study.

Results. The study group consisted of 60.71% women and 39.29% men; the mean age of patients (standard deviation, SD) was 53.22 years (15.81), and the average NPQ-PL score (SD) was 0.49 (1.27). Statistically significant relationships were found between higher age distribution and greater pain intensity in the NP group compared to the NoP group. There were also significant differences in pain levels between people of different ages, with the predominance in the elderly. Cronbach's alpha coefficient of the whole questionnaire was 0.85 and the intraclass correlation coefficient (ICC) for test-retest reliability was 0.635. Using receiver-operating characteristic (ROC) curve analysis, the area under the curve (AUC) was 0.97 and the best cut-off value was 0.002, which resulted in the highest sensitivity (93.3%) and specificity (96.0%).

Conclusions and clinical implications. The NPQ-PL is a valid tool for discriminating between neuropathic and nociceptive pain. It can be used by physicians of various disciplines when assessing patients with ChP of various origins.

Keywords: ageing, cross-cultural adaptation, neuropathic pain, neuropathic pain questionnaire, nociceptive pain

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Introduction

Neuropathic pain (NP) syndrome rates are fairly high, with an estimated prevalence of 7–10% of the general population [1, 2]. Pain that persists beyond the normal healing time, and usually lasts or recurs for more than 3–6 months, is considered chronic and affects 20% of people worldwide. Chronic NP is classified as one of chronic pain subtypes [3, 4]. Studies have shown a worse prognosis with a higher degree of impairment for patients with NP compared to individuals with nociceptive pain (NoP) [5–7]. Nonetheless, the burden of chronic pain (ChP) should be considered by clinicians, together with

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somatic and mental disorders as well as professional status [8, 9], and family and social environment [10].

Neuropathic pain is defined by the International Association for the Study of Pain (IASP) as: 'pain caused by a lesion or disease of the somatosensory nervous system'. NP cannot be considered as a single disease because it can be caused by multiple mechanisms or have different aetiologies [11]. NP may be clinically characterised by a combination of negative and positive symptoms, and manifests as a constellation of different signs that are determined by different mechanisms. Positive symptoms include abnormal painful sensations (gain-of-function), while negative phenomena usually embrace neurological sensory deficits (loss-of-function) in the painful area and other deficits which are determined by the location of the lesion [12–15].

Clinical rationale for the study

Along with a suggestive patient history, pain questionnaires are useful tools in initial screening to alert clinicians to the need for further evaluation [16, 17]. In a large-scale study conducted in 15 European countries and Israel, the percentage of the total European population using a pain scale was 9%. Poland had one of the lowest rates, at 5% [18].

The objectives of this study were to validate i.e. translate and adapt the Polish version of the Neuropathic Pain Questionnaire (NPQ), as well as to compare this questionnaire to other diagnostic tools. Additionally, we wished to highlight the importance of translation and validation of different scales into other languages, which would be essential in objective assessment in future population studies, as well as in clinical and research settings [19, 20].

Material and methods

A single-centre prospective observational study was designed, accepted and approved by the Ethics Committee of the Medical University of Lublin, Poland (KE-0254/147/2020).

Patients

Eligible patients were identified at referral and asked to participate in the study. All participants received verbal information regarding the study procedures, and provided their written informed consent prior to participation. Further, in order to be enrolled, patients had to meet the following inclusion criteria: (1) age over 18 years; (2) men or women with ChP for ≥ 3 months; and (3) ability to speak and read Polish. Patients were excluded if they had cognitive or communication impairments that precluded administration of the questionnaire, or a history of severe psychiatric disease. Individuals with unidentifiable nerve injury, or pain syndromes associated with diffused pain were also excluded. When patients were doubtful about filling out the survey, the main physician or an assistant explained the content of the questionnaire and/or clarified the type of pain.

Instrument

The original version of the NPQ [21] consists of 12 items selected out of 32 items representing various aspects of pain quality. In this self-report assessment, patients' response to questions pertaining to symptom quality, exacerbating factors, and affective impact is measured. For these descriptors, subjects numerically rate their usual pain on a scale of 0 (no pain) to 100 (the worst pain imaginable) for each item. The obtained results are multiplied by the coefficient of the discriminant function, and then summed up using a given constant value [22]. A result equal to or greater than 0 indicates NP, while scores below 0 denote non-NP [21]. This questionnaire was originally developed in the United States, and provides a sensitivity of 66.6% and a specificity of 74.4%. The authors state that this instrument can be used in initial screening of NP patients, as well as for monitoring their treatment and treatment results [21]. The NPQ has been translated and validated for languages such as Swedish [23], Chinese [24], Turkish [25] and Persian [26], and has achieved quite good measurement properties and a Cronbach's Alpha Coefficient greater than 0.80. In order to conduct a test-retest reliability evaluation, a subgroup of 50 patients (31 with NP and 19 with NoP) completed the NPQ-PL questionnaire for a second time 14–21 days after their enrollment.

Other instruments used in analysis

The self-completed Leeds Assessment of Neuropathic Symptoms and Signs (S-LANSS) has been developed to identify pain of predominantly neuropathic origin based on the patient's current signs and symptoms. This tool arises from the Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) questionnaire, and unlike the original version does not require sensory testing. The sensitivity and specificity of S-LANSS for the cut-off point of 12 or more were 74% and 76%, respectively [27], while for the Polish version, measured for a cut-off of ≥ 11 points, they were 62% and 77% [28].

The Numerical Rating Scale (NRS) has been used since the 1950s. This tool has sufficient discriminatory power to characterise pain intensity in patients with ChP (non-malignant) [29]. Compared to the Visual Analogue Scale (VAS), the NRS features higher compliance and greater ease of use [30]. To assess the subjective severity of pain during the interview, the authors used an 11-scored NRS, where 0 corresponded to 'no pain' and 10 corresponded to 'the worst pain imaginable'. Participants were asked about their average pain experienced.

The Hamilton Rating Scale for Depression (HRSD) is a 17-variable tool intended to assess a patient's depression symptoms over the past week. In psychotherapeutic and psychiatric research, this scale is considered the gold standard [31, 32]. The HRSD produces the following scores: no depression (0–7); mild depression (8–16); moderate depression (17–23); and severe depression (≥ 24) [33]. For our trial, patients were

assessed once by a single evaluator. The use of this scale was aimed at estimating the impact of neuropathic or nociceptive pain on the appearance of depressive symptoms.

Translation

Permission to translate the NPQ into Polish was granted by Dr Miroslav Bačkonja, who created the original version of this tool. The Polish version of this questionnaire was firstly developed through translation and back-translation. In the first phase, linguistic adaptation was made in order to develop an NPQ-PL. The cross-cultural adaptation was based on the guidelines proposed by Beaton et al. [34]. The procedure involved two forward translations of the original version of the NPQ, performed by independent bilingual translators from different backgrounds, whose mother tongue is the target language. The next step was synthesis of the unified versions of the questionnaire. Then backward translation was made by two professional translators, both philologists unaware of the original versions of the questionnaire. The obtained versions were evaluated and compared to the original tool. Next, the prefinal versions, preserving the original meaning, were tested by patients who filled out a questionnaire and highlighted unclear sentences. All findings were re-evaluated, and the final version, approved and accepted by the scientists involved in the study, is included in this paper. Finally, the definitive Polish version was validated in a clinical setting.

Study design

For the purposes of this study, 140 patients with ChP were invited to complete some questionnaires. Each patient was interviewed and medically examined to assess their type of pain (i.e. neuropathic or non-neuropathic) as well as to collect socio-demographic characteristics. The diagnosis of neuropathic or nociceptive pain was evaluated according to the IASP guidelines. The study was conducted between January 2021 and December 2022 in a single centre, the Independent Clinical Hospital No. 4 in Lublin, affiliated to the Medical University of Lublin, Poland. The NPQ-PL was compared to the Polish version of self-completed S-LANSS, NRS, and HDRS. All obtained results were compared in order to find correlations between the scales.

Statistical calculations

A database was developed using Statistica software (version 13.3, StatSoft, Lublin, Poland). Frequencies and descriptive statistics were examined for each variable. Statistical comparisons were performed between the neuropathic and nociceptive subgroups concerning demographic characteristics and the results of particular questionnaires. The Chi-squared test (χ^2) was used to compare the relationships between variables expressed in the qualitative scale. Statistical differences between nondependent groups were calculated using the nonparametric Mann–Whitney U test.

The Cronbach's alpha (α) coefficient was calculated for this 12-item questionnaire, as well as after removing each of the items. The higher the value obtained, the better the internal consistency of the tool. Good and very good strength of agreement is seen for values of 0.61 to 0.80 and above 0.80, respectively [35]. The Spearman's correlation coefficient (R) [36] was used to calculate the correlations between different scales used and to assess the associations between variables. To determine test–retest reliability, the intraclass correlation coefficient (ICC) with corresponding 95% confidence intervals (CI) between first and second total scores for NPQ was calculated. An ICC value of ≥ 0.75 was considered good, while a value of 0.5-0.75 was considered moderate [37].

The predictive validity was estimated using receiver operator characteristic (ROC) curves. The area under the curve (AUC), known as a measure of the diagnostic power of the test, and its 95% CI for the ROC curve, were calculated. A result exceeding 0.81 is considered as good, and > 0.91 as very good. Also, to maximise the sum of sensitivity and specificity for all the possible values of the cut-off point, the Youden index was calculated [38]. Data expressed on a qualitative scale was presented as the number or mean and standard deviation (SD), percentage of a sample. A value of $p < 0.05$ was set for statistical significance.

Independently from the missing data, if the entire NPQ questionnaire was completed, patients were included in the analysis. Incomplete or unclear data from other questionnaires used was omitted from statistical analysis.

Results

The final version of the NPQ-PL is presented as Supplementary Material. Following the universal guidelines for translation and cultural adaptation, the authors collected quantitative data from the validation process and tried to reach the maximum equivalence between the original and Polish documents.

Clinical and demographical characteristics

A total of 140 patients, 90 with NP and 50 with NoP, were enrolled into this study. Clinical and demographic variables concerning the whole group of patients are set out in Table 1 and Supplamentary Table 1, while Figure 1 sets out detailed data of the NP group. The study group included 60.71% women (n = 85) and 39.29% men (n = 55). The mean age (SD) of patients was 53.22 (15.81). Taking into account division by gender, the age of the patients (SD) was 52.42 (16.44) for women and 54.45 (14.85) for men. There was no significant difference between the sex distribution of the two groups, Pearson's $\chi^2 = 0.35$, $p > 0.05$.

The division of the study group according to the age of the participants was as follows: age 21–40 — 26.43% (NoP 19 and NP 18 subjects), age 41–60 — 36.43% (NoP 19 and NP

Table 1. Clinical and demographic characteristics of total group

		N	%	Mean (SD)
Gender	Male	55	39.29	
	Female	85	60.71	
Group characteristics	NP	90	64.29	
	NoP	50	35.71	
Age	Total	140		53.22 (15.81)
	NP	90		55.82 (15.26)
	NoP	50		48.54 (15.87)
NPQ	Total	140		0.49 (1.27)
	NP	90		1.22 (0.91)
	NoP	50		–0.84 (0.55)
S-LANSS	Total	140		11.30 (7.16)
	NP	90		14.90 (5.45)
	NoP	50		4.82 (4.96)
NRS	Total	140		6.49 (2.27)
	NP	90		7.20 (1.82)
	NoP	50		5.20 (2.43)
HDRS	Total	140		9.14 (7.89)
	NP	90		10.37 (8.04)
	NoP	50		6.92 (7.15)

HDRS — Hamilton Depression Rating Scale; NoP — nociceptive pain group; NP — neuropathic pain group; NPQ — Neuropathic Pain Questionnaire; NRS — Numerical Rating Scale; S-LANSS — self-completed Leeds Assessment of Neuropathic Symptoms and Signs; SD — standard deviation

	Central pain	CIDP	Metabolic neuropathy	Malignant neuropathy	Trigeminal neuralgia	Postherpetic neuralgia	Painful polyneuropathy	Painful radiculopathy	
								Low back pain	Cevical pain
Group size (n)	15	9	17	9	4	3	8	20	5
Age (±SD) [years]	51.93 (12.24)	58.22 (13.26)	60.29 (17.57)	68.56 (8.31)	56.75 (7.89)	53.33 (14.84)	55.13 (13.79)	50.50 (15.84)	48.20 (22.52)
Gender (F/M)	8/7	4/5	12/5	5/4	3/1	2/1	4/4	11/9	4/1
Symptoms duration (±SD) [months]	37.53 (42.97)	49.11 (26.61)	78.35 (92.28)	21.44 (37.46)	24.50 (28.20)	12.33 (10.21)	36.86 (57.73)	53.00 (86.36)	8.00 (4.06)

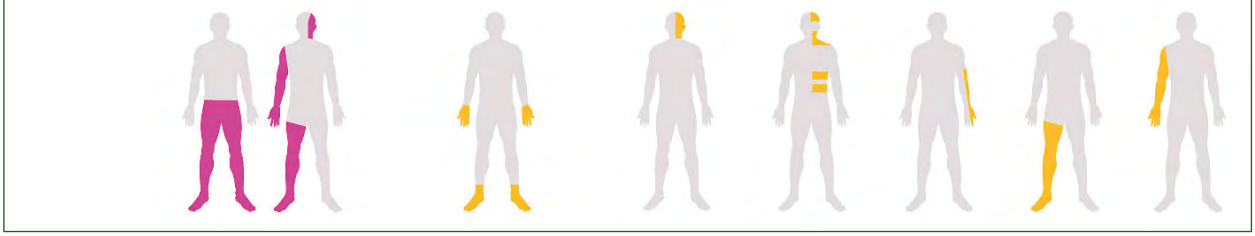

Figure 1. Detailed data on NP group. CIDP — chronic inflammatory demyelinating polyneuropathy; F — female; M — male; SD — standard deviation

32 subjects), and age 61+ — 37.14% (NoP 12 and NP 40 subjects). A significant relationship was found between the age distribution of the NP and NoP groups, $\chi 2 = 7.61$, $p < 0.05$. This may be related to the higher age of patients with NP. Also, using Yates's $\chi 2$ test, a significant difference was found in the occurrence of NP according to the NPQ-PL between the NP and NoP groups, $\chi^2 = 104.52$, $p < 0.001$.

Cronbach's α coefficient, test-retest reliability, and ROC/reliability and validity

The NPQ-PL showed very good reliability, with a value of the Cronbach's α coefficient of 0.85. As a result of the division into NP and NoP, the Cronbach's α coefficients were 0.74 and 0.73, respectively. Cronbach's α coefficient was also calculated after removing individual items from

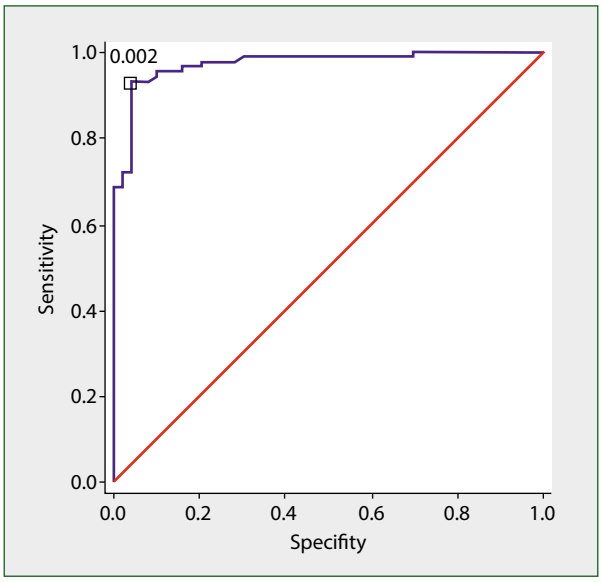

Figure 2. Polish version of Neuropathic Pain Questionnaire receiver operating characteristic curve

NPQ-PL comparisons with different questionnaires/construct validity

NPQ-PL and S-LANSS

In the NP group, there was no significant difference between the assessment of NP using the S-LANSS questionnaire and the assessment of NPQ-PL. For this data, the results are very consistent, Yate's $\chi^2 = 1.00$, $p > 0.05$. Similarly to the results for NPQ-PL ($p < 0.001$), according to the S-LANSS questionnaire, a significant difference in the occurrence of NP was found between the NP and NoP groups, $\chi^2 = 50.89$, $p < 0.001$.

NRS

There was no significant difference in the intensity of pain between women and men, $\chi^2 = 0.18$, $p > 0.05$. However, there were significant differences in pain levels between people of different ages, $\chi^2 = 11.83$, $p < 0.05$. This means that greater intensity of pain is more common in older patients (Suppl. Tab. 3) and/or that the pain sensation or intensity may increase with age. Also, the NP group reported significantly greater pain intensity compared to the NoP group; data are shown in Supplementary Table 4, $\chi^2 = 23.37$, $p < 0.001$.

Table 2. Correlations between NPQ-PL and S-LANSS, NRS and HDRS

	R		
	S-LANSS	NRS	HDRS
NPQ-PL NP group	0.39*	0.20	0.09
NPQ-PL NoP group	0.26	0.44*	–0.01

HDRS — Hamilton Depression Rating Scale; NoP — nociceptive pain; NP — neuropathic pain; NPQ-PL — Polish version of Neuropathic Pain Questionnaire; NRS — Numerical Rating Scale; R — Spearman's rank correlation coefficient (* $p < 0.001$); S-LANSS — self-completed Leeds Assessment of Neuropathic Symptoms and Signs

the scale. In the case of the NP group, the exclusion of item numbers 4 (numbness), 7 (squeezing pain), and 8 (freezing pain) increased the reliability of Cronbach's α by 0.75, 0.75, and 0.76, respectively.

Reproducibility of the results was assessed using ICC, which ranges from 0 to 1. The closer the score is to 1, the more reliable the scale. The ICC value for the NPQ-PL was 0.635, which equates to moderate reliability. The NPQ-PL demonstrated outstanding diagnostic ability, with an AUC of 0.97. The ROC curve analysis identified a score of 0.002 as the best discriminating cut-off value betweetn NP and NoP (Fig. 2). This consistently resulted in the highest sensitivity (93.3%) and specificity (96.0%) of this translated version of the 12-item questionnaire.

Psychometric properties of NPQ-PL

The average NPQ-PL score (SD) was 0.49 (1.27) (Tab. 1), dividing the group into NP and NoP, the results being 1.22 (0.91) and –0.84 (0.55), respectively. Noteworthy is the slightly higher result of women compared to men (Suppl. Tab. 1). Mean scores (SD) for each response, divided into NP, NoP and the entire group, are presented in Supplementary Table 2.

Correlations between NPQ-PL and different scales used in study

The Spearman correlation coefficient (R) was calculated separately for the NP and NoP groups. The NP scores were reasonably correlated with the S-LANSS ($R = 0.39$, $p < 0.001$) but poorly correlated with NRS and HDRS ($R = 0.20$ and $R = 0.09$, respectively). The NoP scores revealed a statistically significant, fairly positive, correlation with the NRS ($R = 0.44$, $p < 0.001$; Tab. 2).

Discussion

Obtaining the most accurate assessment of the prevalence of NP, despite the continual development of research and increasing awareness, still requires a great deal of effort. The best current estimates come from studies using validated questionnaires [1, 39]. However, these instruments only detect pain at the level of 'possible NP' [16, 40]. Some authors have claimed that, regardless of the validation of the tools in the conditions of a pain clinic, their predictive value remains unknown and may overestimate the results for the general population [5]. Nevertheless, due to their ease of use and simplicity, their use in everyday clinical practice as a screening tool [41] is undeniably advantageous.

This study has demonstrated the good reliability and validity of the Polish version of the NPQ in distinguishing between neuropathic and nociceptive types of ChP. Our analysis also showed high sensitivity and specificity of the questionnaire, as well as good internal consistency of the test measured by Cronbach's α of 0.85. This result is comparable to the results revealed by previous versions of language adaptations [24–26]. Reproducibility of the questionnaire by using the ICC value has been calculated in Persian [26] and Turkish [25] versions, and demonstrated good test-retest reliability (ICC value of ≥ 0.75). This result may be related to the earlier retest time (the test was repeated after three days in both cases) compared to our study.

In the original version of the questionnaire, the authors reported that the sensitivity and specificity of NPQ were 66.6% and 74.4%, respectively [21]. We obtained results of 93.3% and 96.0%, respectively, which is higher than that reported in previous studies [23, 24, 26]. Despite the availability of questionnaire formats for self-completion by the patient, we decided to conduct an interview completion of the questionnaires, taking into account only patients with ChP. We suppose that this contributed to the high accuracy of our obtained results. A similar phenomenon was observed in the validation of the S-LANSS [27], in which the authors compared unaided completion to interviewed completion of the questionnaire. We did not compare self- and assisted formats in our patients, with the expectation that the self-completion format would be used in epidemiological studies. Additionally, features shared by NPQ and S-LANSS questionnaires, therefore symptoms such as prickling, tingling, hot or burning sensations, or pain evoked by a light touch [42], may account for the consistency between these tools.

On the other hand, patients with mixed pain syndromes were also included in our study, which may have influenced the results. Mixed pain is a condition which is still poorly defined and clinically manifests as a combination of the different types of pain, such as neuropathic, nociceptive and nociplastic, which act simultaneously, concurrently and/or overlap [43, 44]. The diagnosis of mixed pain is based on a detailed history-taking, physical examination, and clinical evaluation, rather than fulfilling diagnostic criteria. Therefore, this diagnosis still seems demanding. Nevertheless, it is allowed to use validated screening instruments to detect the presence of NP component [44]. Many studies have excluded patients with mixed pain conditions from their analysis, and research that has included these patients has not had consistent results regarding changes in specificity and/or sensitivity, thereby limiting the generalisability of the results [45].

The results of our study showed a positive Spearman's correlation between the NP group and the S-LANSS, as well as between the NoP group and the NRS ($p < 0.001$), although there is little data available on correlation of the NPQ with other questionnaires. Yurdakul et al. [25], using the Pearson correlation test (r), correlated the total NPQ score with the NRS and LANSS, obtaining a moderate correlation with the NRS ($r = 0.43$, $p < 0.001$), and a high correlation with the LANSS ($r = 0.64$, $p < 0.001$). Regarding the latter, there are many common verbal descriptions in both questionnaires, which may be responsible for the high level of correlation. Another Turkish study investigated the relationship between LANSS, S-LANSS, VAS and NPQ [46]. Statistically significant concordances ($p < 0.01$) were found on S-LANSS total scores and all NPQ items, except for items 3, 4 and 7 ($p > 0.05$). Perhaps this fact coincides with the very good validity and reliability of the questionnaire; the sensitivity and specificity of the scale were 98% and 97% respectively.

The statistically significant positive correlation between the NRS and NoP groups may indicate a better interdependence between the NRS questionnaire and NoP. Nonetheless, most patients with NoP experienced moderate pain (NRS 4–7), while the NP group declared significantly higher pain intensity (Suppl. Tab. 4). Reports on this proposal are controversial, since some studies have confirmed these findings and others have not [47, 48]. Older patients not only suffered from NP more often, but also had greater pain intensity. An assessment of the prevalence of NP in the elderly is difficult, and often in fact impossible, due to the impairment of cognitive functions or communication difficulties of patients [49]. Consistent with our results, demographic data on the older age of patients with NP compared to NoP was also obtained by Dworkin et al. [50], who also reported different pain symptoms in both groups. Sharp and dull pain was noted in NoP patients, while pain quality was rated as hot, cold, itchy or tender in NP patients. Perhaps these differences may explain positive correlations between NoP and the NRS.

Some researchers have reported that the elderly tolerate acute pain better than persistent pain, which may be due to lower pain perception and/or an augmented pain threshold. In ChP, weaker outcome may be associated with poorer emotional pain processing, independent of a decrease in the pain sensitivity [51]. An important role may also be played by age-related changes in the functioning of endogenous mechanisms of pain inhibition [52, 53]. Both an elevated pain threshold and impaired inhibitory mechanisms contribute to later activation and insensitivity in the elderly. Nevertheless, over time, appraisal processes (such as compensatory mechanisms or reduced functional connectivity) and dysfunction of pain modulation processes may escalate and result in increased pain perception [52].

In our study, NP was also associated with depression. As shown in the tables, patients with NP had a higher rate of depression than patients with NoP. In addition, women's scores were slightly higher than men's. However, these differences are not significant. It is worth mentioning that in the NP group, of 53 women surveyed, only 25 (47%) did not have symptoms of depression, while 23 (43%) suffered from moderate, severe, or very severe depression. The same data applied to 38% of men and 42.5% of patients over 61 years of age. This confirms

previous data on the co-occurrence of depression and ChP [54] and its higher incidence in females [55]. By limiting the data on comorbidity to the group of elderly patients, they indicate that up to 13% of individuals comorbid high depressive symptom and chronic activity-limiting pain [56]. On the other hand, the comorbidity rate of NP and depression has been estimated at circa 30% [57]. This remains an important issue to consider and treat for any patient with NP or ChP, because pain increases the severity and frequency of depression symptoms [58], and this effect appears to be bidirectional [59].

Our results should be interpreted with some caution due to the limitations of our study. The inclusion of patients with mixed pain conditions may affect the psychometric properties and conclusions of the research. Also, the fact that we included only patients with ChP might limit the usefulness of the questionnaire. It is also undeniable that screening tools cannot be used as the diagnostic gold standard, which leads to a limitation of their use.

Clinical implications/future directions

To the best of our knowledge, our study is the first cross-cultural adaptation of NPQ for the Polish population. We have demonstrated that our translated version of NPQ is reliable and valid for use, has very good psychometric properties, and good internal consistency.

We believe that this tool will be of benefit to physicians of various specialisms when assessing patients with diverse types of pain, as well as in research settings.

The next step would be to use the self-completion format in epidemiological studies or to compare the use of the questionnaire in acute NP patients to that in chronic NP patients. Also, a multicentre epidemiological survey on the prevalence of NP and depression in ageing populations could provide valuable information.

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Conflicts of interest: *None declared.*

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