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Original Research

# Neuropathic Pain Symptom Inventory (NPSI) Questionnaire-Persian Version Can Differentiate Neuropathic from Non-Neuropathic Pain

Seyed Pezhman Madani, M.D., Khatereh Abdolmaleki, M.D.*, Tannaz Ahadi, M.D., Kourosh Mansoori, M.D., Gholam Reza Raissi, M.D.

*From the Neuromusculoskeletal Research Center, Iran University of Medical Sciences, Tehran, Iran*

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ABSTRACT

*Background:* Neuropathic pain (NP) is a common condition that impacts life negatively. This type of pain responds poorly to treatment. Neuropathic Pain Symptom Inventory (NPSI) is a common instrument used for the assessment of NP response to the treatment.
*Aim:* The current study aims to validate the Persian version of NPSI (PV-NPSI).
*Methods:* The current study has been conducted on 162 patients experiencing pain from neuropathic or non-neuropathic origin. The Persian version of NPSI was proposed through standard protocol and responded to by patients twice: at baseline within an interval of 3 hours and then again within 1 month. Its correlation with the patient global impression of change (PGIC) and the clinical global impression of change (CGIC) was assessed. In addition, the validity and reliability of the PV-NPSI was evaluated.
*Results:* The reliability Cronbach's alpha of PV-NPSI was 0.834 and test-retest intraclass-coefficient was calculated as 0.983 (95% confidence interval [CI]: 0.977-0.988; $p < .001$). In addition, the measured coefficient sensitivity to change based on PGIC and CGIC was 0.859 for both. Receiver operating characteristic (ROC) curve for the diagnosis of NP revealed area under curve (AUC) of 0.936 ($p < .001$; 95%CI: 0.894-0.978).
*Conclusions:* Based on the current study's findings, the PV-NPSI is a reliable and valid means for the differentiation of NP from the other types of pain in patients with several musculoskeletal pain complaints, but we cannot determine a cutoff point for it. Also, this questionnaire can be efficiently used for the assessment of response to NP treatment.


Neuropathic pain (NP) accounts for 6.8% to 8.2% of pain-related referrals in the general population to outpatient clinics (Torrance et al., 2006). Many conditions can lead to NP, such as cerebrovascular accidents, diabetes, malignancies, post-surgical pain, spinal cord injury, herpetic and other viral infections, and multiple sclerosis (Martinez, Fletcher et al., 2010; Kaki et al., 2005; Martinez et al., 2007; Kerba et al., 2010; de Andrade et al., 2010).

This type of pain affects the quality of life of patients, and its associated symptoms may lead to insomnia, depression, inattention, anxiety, and decreased appetite (Euasobhon et al., 2016). In general, NP is remarkably more difficult to manage than the other types of pain. It poses considerably more medical care expenses, with a profound negative impact on the patient's quality of life (Meyer-Rosberg et al., 2001). Therefore, a systematic, thorough assessment of neuropathic pain symptoms is crucial to diagnose early and concisely, provide optimal care, decrease medication-related costs, and improve the quality of life among patients experiencing NP (Meyer-Rosberg et al., 2001).

Patients with NP represent characteristics such as "prickling sensation," "electric shock," and "burning sensation" to introduce their pain features, which necessitates the sub-grouping of neuropathic pain into specific multidimensional categories (Attal et al., 2008). In this regard, several tools have been proposed for the differentiation of neuropathic from non-neuropathic pain, such as Neuropathic Pain Diagnostic Questionnaire (DN4) (Bouhassira et al., 2005), the Leeds assessment of neuropathic symptoms and signs (LANSS) (Bennett, 2001), painDETECT (Freynhagen et al., 2006) and ID-Pain (Portenoy, 2006). Other tools assess response to the management, including the Neuropathic Pain Scale (Galer & Jensen, 1997), and Neuropathic Pain Symptom Inventory (NPSI) (Bouhassira et al., 2004).

NPSI is a self-administered questionnaire designed to assess the diverse symptoms of neuropathic pain in five clinical domains. This questionnaire was first proposed by Bouhassira et al. (2004) and

* Address correspondence to Khatereh Abdolmaleki, M.D., Neuromusculoskeletal Research Center, Iran University of Medical Sciences, Tehran, Iran
*E-mail address:* khatereh.abd@gmail.com (K. Abdolmaleki).

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**Table 1**
The Etiology of Pain in the Studied Population

| | Etiology | Number | Frequency |
|---|---|---|---|
| Neuropathic pain (N=81) | Lumbosacral radiculopathy | 13 | 16.04% |
| | Carpal tunnel syndrome | 22 | 27.2% |
| | Cervical radiculopathy | 18 | 22.2% |
| | Chemotherapy-induced peripheral neuropathy | 1 | 1.2% |
| | Spinal cord injury | 1 | 1.2% |
| | Diabetic polyneuropathy | 6 | 7.4% |
| | Post stroke pain | 1 | 1.2% |
| | Chronic inflammatory demyelinating polyneuropathy | 5 | 6.2% |
| | Entrapment neuropathy | 11 | 13.6% |
| | Pure sensory neuropathy | 1 | 1.2% |
| | Trigeminal neuralgia | 2 | 2.5% |
| Non-neuropathic pain (N=81) | Osteoarthritis | 22 | 27.2% |
| | Mechanical low back pain | 17 | 21% |
| | Rotator cuff tendonitis | 13 | 16% |
| | Mechanical neck pain | 4 | 4.9% |
| | Plantar fasciitis | 16 | 19.8% |
| | Soft tissue | 3 | 3.7% |
| | Tennis elbow | 1 | 1.2% |
| | Trigger finger | 3 | 3.7% |
| | Coccycodynia | 2 | 2.5% |

LR = lumbosacral radiculopathy; NP = neuropathic pain; CTS = carpal tunnel syndrome; CR = cervical radiculopathy; CIPN = chemotherapy-induced peripheral neuropathy; SCI = spinal cord injury; DPN = diabetic polyneuropathy; PSP = post stroke pain; CIDP = chronic inflammatory demyelinating polyneuropathy; EN = entrapment neuropathy; PSN = pure sensory neuropathy; TN = trigeminal neuralgia.

determined the NP characteristics into five categories: Superficial Spontaneous Pain, Deep Spontaneous Pain, Paroxysmal Pain, Evoked Pain, and Dysesthesia/Paresthesia to assess the response of a NP to the treatment (Bouhassira, Attal et al. 2004). To date, the German (Sommer et al., 2011), Italian (Padua et al., 2009), Portuguese (de Andrade et al., 2011), and Japanese (Matsubayashi et al., 2015) versions of this questionnaire have been validated.

The current study aims to validate the Persian version of NPSI (PV-NPSI) for the response to the treatment using a validated Persian questionnaire of DN4 as the standard instrument for the differentiation of NP from the other types of pain (Madani et al., 2014), in the community of Iran. The Ethical Committee of our university approved the study protocol. The protocol was then explained to the patients, and we assured them that their personal information would be kept confidential. All patients signed written consent.

## Methods

### *Study Population*

A convenience sample of 162 participants were enrolled after providing informed consent. The main investigator provided the informed consent to the patients. The sample was obtained from an outpatient clinic at the Physical Medicine and Rehabilitation Neuromusculoskeletal Research Center at Tehran University from 2017 to 2019. Inclusion criteria were aged 18 years or greater, pain complaint of 3 months or more, pain severity rating of four or greater based on an 11-point numerical pain scale. Exclusion criteria were: syndromes with unknown pain origin, pains presumably of mixed origin (e.g., Lumbar radiculopathy, cancer), diffuse pain (i.e., fibromyalgia), malignancy-induced pain, complex regional pain syndrome (CRPS), headaches, visceral pain, severe depression, chronic alcoholism, drug abuse, addiction, inability to understand the questions, inappropriate responses to the questionnaires, or greater than 20% of defects in the answers.

One by one, along with a patient diagnosed with neuropathic pain, a person with non-neuropathic pain entered the study. An expert physical medicine and rehabilitation specialist made the diagnosis of neuropathic versus non-neuropathic pain based on clinical assessment, thorough physical examinations, and paraclinical studies.

This study is double-blinded, and the interviewers were not aware of the pain type (neuropathic versus non-neuropathic). The patients' demographic and clinical information, including gender, age, educational level, occupation, administration of any medications, body mass index (BMI), and pain duration, were documented in the checklist. The information was obtained by two independent physiatrists who were unaware of the exact diagnosis. They completed a separate written questionnaire for each patient. The same questionnaires were filled out again after 3 hours to evaluate the Test-Retest reliability. In addition, we filled it out over the next 4 weeks to assess its value in the evaluation of response to treatment.

At the same time, we completed other questionnaires, including Numerical Rating Scale (NRS) for pain, the Patient's Global Impression of Change (PGIC), and the clinical global impression of change (CGIC) for each patient to evaluate the response to treatment. All completed questionnaires were returned to the primary investigator and stored in a secured place. No one had access to the named data except the primary investigator. There was no audio record. Illiteracy was not common, but due to the low literacy of some of the participants, we decided to fill out the questionnaires by interview. Each subject was interviewed by two clinicians.

### *Instruments*

Bouhassira et al. had primarily proposed the Neuropathic Pain Symptoms Inventory (NPSI) questionnaire in 2004, which contains 12 items in 5 subscales. The subscales include superficial and deep spontaneous pain, paroxysmal pain, evoked pain, and dysesthesia/paresthesia. Among the 12 items, 10 are scored using a numerical rating scale (NRS), ranging from 0 to 10, assessing the severity of experienced neuropathic pain within the previous 24 hours. Higher scores of NPSI indicate more severe peripheral neuropathy. The other remaining two items independently evaluate spontaneous pain duration and paroxysmal pain frequency. The English versions of the NPSI have demonstrated the remarkable Cronbach's

**Table 2**
The Assessment of Validity and Reliability of Neuropathic Pain Symptoms Inventory Persian Version Questionnaire

| Question | Dimensions | Internal Consistency Spearman's r Coefficient ($p$) | Reliability Cronbach's Alpha Coefficient | Test-Retest Intra-class Coefficient ($p$) | Inter-Rater Agreement Kappa-Cohen Coefficient ($p$) |
|---|---|---|---|---|---|
| Superficial spontaneous neuropathic pain | | | | | |
| 1 | Burning | 0.662; ($p < .001$) | | 0.957; (95%CI: 0.942-0.968); ($p < .001$) | 0.694; (SEM = 0.04); ($p < .001$) |
| Deep spontaneous neuropathic pain | | | | | |
| 2 | Squeezing | 0.567; ($p < .001$) | 0.568 | 0.965; (95%CI: 0.953-0.974); ($p < .001$) | 0.747; (SEM = 0.041); ($p < .001$) |
| 3 | Pressure | 0.619; ($p < .001$) | | 0.941; (95%CI: 0.921-0.950); ($p < .001$) | 0.634; (SEM = 0.041); (< .001) |
| Paroxysmal neuropathic pain | | | | | |
| 5 | Electric shock | 0.760; ($p < .001$) | 0.382 | 0.970; (95%CI:0.960-0.978); ($p < .001$) | 0.707; (SEM = 0.04); ($p < .001$) |
| 6 | Stabbing | 0.440; ($p < .001$) | | 0.963; (95%CI: 0.950-0.973); ($p < .001$) | 0.699; (SEM = 0.06); ($p < .001$) |
| Evoked neuropathic pain | | | | | |
| 8 | Evoked by brushing | 0.519; ($p < .001$) | 0.329 | 0.974; (95%CI: 0.965-0.981); ($p < .001$) | 0.674; (SEM = 0.049); ($p < .001$) |
| 9 | Evoked by pressure | 0.267; ($p < .001$) | | 0.964; (95%CI: 0.951-0.973); ($p < .001$) | 0.651; (SEM = 0.040); ($p < .001$) |
| 10 | Evoked by cold stimuli | 0.717; ($p < .001$) | | 0.975; (95%CI: 0.966-0.981); ($p < .001$) | 0.786; (SEM = 0.041); ($p < .001$) |
| Dysesthesia/ paresthesia | | | | | |
| 11 | Pins and needles | 0.837; ($p < .001$) | 0.978 | 0.975; (95%CI: 0.966-0.982); ($p < .001$) | 0.786; (SEM = 0.036); ($p < .001$) |
| 12 | Tingling | 0.831; ($p < .001$) | | 0.989; (95%CI: 0.985-0.992); ($p < .001$) | 0.731; (SEM = 0.038); ($p < .001$) |
| Total score | | - | 0.834 | 0.983 (95%CI: 0.977-0.988); ($p < .001$) | - |

SEM = standard error of mean; CI = confidence interval.

alpha levels of 0.9 and construct validity levels (Bouhassira et al., 2004).

*Adaptation and Validation of the Questionnaire*

The English version of the NPSI questionnaire was translated to Persian by a panel of four expert specialists. Three of them were Iranian physical medicine and rehabilitation specialists, experts in questionnaire preparation, and proficient in English and Persian. The last one was a skilled translator. There was no appropriate synonym for 'tingling'; therefore, they utilized two words in the Persian version. Then an English panel consisting of three experts, including two physical medicine and rehabilitation specialists and a skilled translator, proficient in English and Persian and blinded to the study's scopes, inverted the new Persian version to English. The semantic and literal evaluations of the two versions were performed by a specialist panel of three physical medicine and rehabilitation specialists and a methodologist who were completely expert at both Persian and English languages.

Finally, the PV-NPSI questionnaire was analyzed based on Iranian cultural characteristics without any contradiction.

*Statistical Analysis*

All data were entered into the Statistical Package for Social Sciences (version 22, IBM Corporation, Armonk, NY, USA). The descriptive data were presented in mean, standard deviation (SD), absolute numbers, and percentages.

The normality of the variables was assessed using the Kolmogorov-Smirnov test. The continuous variables were compared using independent $t$ test for normal distributed variables and Mann-Whitney test for those with an abnormal distribution. To analyze the qualitative variables, the $\chi^2$ test was administered. A $p$ value of less than .05 was considered significant.

The reliability of the data was assessed by the measurement of Cronbach's alpha, internal consistency coefficient. Kappa–Cohen coefficient was used to determine the inter-rater agreement.

To assess the validity of the NPSI Persian version, the content and construct validity were calculated. The construct validity was measured by evaluating the correlation between the NPSI score and 11-point NRS (NRS-11) or DN4. Face validity was measured by the assessment of responses to each of the questions.

## Results

In the current study, 200 patients were assessed for eligibility. A total of 162 patients met the inclusion criteria. All recruited patients completed the study. The studied population consisted of 81 patients with neuropathic pain and the remained 81 ones with non-neuropathic pain.

The mean age of the studied population was 50 $\pm$ 13.12 years and gender distribution of 116 (71.6%) females and 46 (28.4%) males. Sixty-three (39%) patients were unemployed, 90 patients (55.6%) were under medical treatment, and the mean BMI of the studied population was 27.77 $\pm$ 4.39 kg/m$^2$. There is no significant difference between the two groups in terms of demographic characteristics.

Table 1 demonstrates the underlying etiology of pain among patients suffering from neuropathic and non-neuropathic pain. The most common neuropathic pain etiologies were carpal tunnel syndrome (27.2%), cervical (22.2%), and lumbosacral (16.04%) radiculopathy. The most common non-neuropathic pain etiologies included osteoarthritis (27.2%), mechanical low back pain (21%), and plantar fasciitis (19.8%).

We have statistically analyzed the validity, reliability, internal consistency, test-retest reliability, inter-rater agreement, sensitivity to change, and receiver operating characteristics of the PV-NPSI.

**Table 3**
Test-Retest Reliability Measurement Based on the Type of Pain

| Groups | Test-Retest Reliability | | |
|---|---|---|---|
| | The First Evaluation Mean (SD) | The Second Evaluation Mean (SD) | ICC |
| All patients (n = 162) | 29.51 (22) | 29.89 (21.87) | 0.983; (95%CI: 0.977-0.988); ($p < .001$) |
| Neuropathic pin (n = 81) | 45.86 (16.69) | 46.18 (15.95) | 0.971; (95%CI: 0.955-0.981); ($p < .001$) |
| Non-neuropathic pain (n = 81) | 13.22 (12.51) | 11.64 (10.29) | 0.941; (95%CI: 0.909-0.961); ($p < .001$) |

ICC = intra-class correlation; SD = standard deviation; CI = confidence interval.

*Validity Analysis*

Face validity and convergent validity were tested to determine the validity of PV-NPSI.

Face validity was defined as any response above zero to the questions of PV-NPSI. In all, 60% of patients responded above zero to all items of the PV-NPSI, except for the stabbing question, to which 40% of them responded above zero.

Convergent validity was calculated by assessing the correlation between PV-NPSI with DN4 questionnaire used for the diagnosis of NP (Madani et al., 2014) and the severity of pain by NRS. Pearson correlation test was utilized to assess the correlation between DN4, NRS, and the total score of PV-NPSI. This assessment revealed a significant correlation between pain severity based on NRS and the total scores of PV-NPSI ($p < .001$, r = 0.316) as well as DN4 and PV-NPSI ($p < .001$, r = 0.876).

*Internal Consistency*

Spearman correlation was administered to evaluate the validity of PV-NPSI. All of the assessed entities revealed significant correlation, whereas the highest correlation level was found in pins and needles (r = 0.837). The least was for questions about evoked by pressure (r = 0.267) and stabbing (r = 0.440), respectively (Table 2).

*Reliability*

An inter-rater and test-retest reliability assessment was done to minimize the patient and evaluator related bias. At the same time, Douleur Neuropathique 4 (DN4) Questionnaire (Bouhassira et al., 2005) was filled out.

To assess the reliability of the Persian questionnaire, Cronbach's alpha was calculated. As reported in Table 2, the measured Cronbach's alpha for the questionnaire in total was 0.834. The highest level of Cronbach's alpha was found in assessing the dysesthesia/paresthesia entity (Cronbach's alpha = 0.978) and the lowest in the evoked neuropathic pain (Cronbach's alpha = 0.329).

Test-retest evaluation with the interval of 3 hours was performed. Further evaluations in terms of comparing NP versus non-NP showed a significant intra-class correlation (ICC) in both groups (Table 3). Evaluation of all of the questions showed significant test-retest ICC (ICC = 0.983; 95% confidence interval [CI]: 0.977-0.988; $p < .001$).

In addition, the assessment of inter-rater agreement among the patients suffering from neuropathic (ICC = 0.983; 95%CI: 0.973-0.989; $p < .001$) and non-neuropathic (ICC = 0.967; 95%CI: 0.949-0.979; $p < .001$) pain revealed significant ICC (Table 4).

*Sensitivity to Change*

In order to assess the sensitivity to change, the correlation of differences in the PV-NPSI scores between the first visit (baseline) and the second one (within 1 month) was assessed with PGIC and CGIC which revealed a significant correlation (r = 0.859 for both), respectively (Fig 1).

*Receiver Operating Characteristics*

Receiver operating characteristics (ROC) curve showed that the PV-NPSI could be efficient for the diagnosis of NP, and the measured area under the curve (AUC) was 0.936 ($p < .001$; 95%CI: 0.894-0.978) (Fig. 2).

*Discussion*

In recent decades the necessity of intelligible self-administered questionnaires for the diagnosis, management, and investigation of diverse medical conditions has been well-established in many clinical trials (Guyatt et al., 1993). NP is usually irritating and hard to manage. Therefore, proposing a reasonable, validated thorough means for proper investigation of NP and its diverse aspects is essential. NPSI is a questionnaire designed to assess NP in various entities, including superficial and deep spontaneous, paroxysmal, evoked neuropathic pain, and dysesthesia/paresthesia (Padua et al., 2009).

This study revealed good psychometric validity and reliability for PV-NPSI. We achieved Cronbach's alpha, inter-rater reliability, and test-retest reliability of 0.83, 0.98, and 0.99, respectively, which are compatible with the previous studies (Sommer et al., 2011) (Padua et al., 2009; de Andrade et al., 2011; Matsubayashi et al., 2015).

PV-NPSI was directly correlated with the other tools of assessing pain and its characteristics, including NRS and DN4, show its intelligibility for the Persian people. These findings are in line with the previous studies investigating the versions of NPSI in other languages (Euasobhon, 2016; Bouhassira et al., 2005; Farhangi et al., 2019).

The principle aim of the NPSI design was to provide a simple and easy-to-use instrument for daily clinical practice and studies. Therefore, the original version of NPSI has restricted the dimensions to five subtypes, including superficial and deep spontaneous ongoing pain, spontaneous paroxysmal pain, evoked pain (i.e., allodynia/hyperalgesia to mechanical or thermal stimuli), and paresthesia/ dysesthesia (Torrance et al., 2006). However, it should be noted that spontaneous neuropathic pain, by itself consisted of two types of presentations, "burning," which is a manifestation of a superficial part of pain sensation and "squeezing" or "pressure" that reflects deep components (Martinez et al., 2010). The total NPSI score represents an overview of the pain intensity. It evaluates the spontaneous NP but cannot distinguish between the deep and superficial dimensions.

One problem was to explain the word "pressure" for patients which led to excessive explorations. On the other hand, a surprising finding was a high ICC score for the word "tingling," as we have no exact Persian equivalent for it but gained high coefficient scores.

The highest ICC scores were found in questions assessing dysesthesia/paresthesia, including pins and needles (r = 0.837) and tingling (r = 0.831). As we could not find an exact Persian equivalent word for tingling, this high coefficient score shows the utilized word's appropriateness, demonstrating a definite conception. Contrary to dysesthesia/paresthesia, questions about evoked by pres-

**Table 4**
Inter-Rater Agreement Measurement Based on the Type of Pain

| Groups | Test-Retest Reliability | | |
|---|---|---|---|
| | The First Evaluation Mean (SD) | The Second Evaluation Mean (SD) | ICC |
| All patients (n = 162) | 29.54 (22) | 29.74 (22.06) | 0.90; (95%CI: 0.986-0.993); ($p < .001$) |
| Neuropathic pin (n = 81) | 45.86 (16.69) | 46.67 (16.45) | 0.983; (95%CI: 0.973-0.989); ($p < .001$) |
| Non-neuropathic pain (n = 81) | 13.22 (12.51) | 12.81 (11.34) | 0.967; (95%CI: 0.949-0.979); ($p < .001$) |

ICC = intra-class correlation; SD = standard deviation; CI = confidence interval.

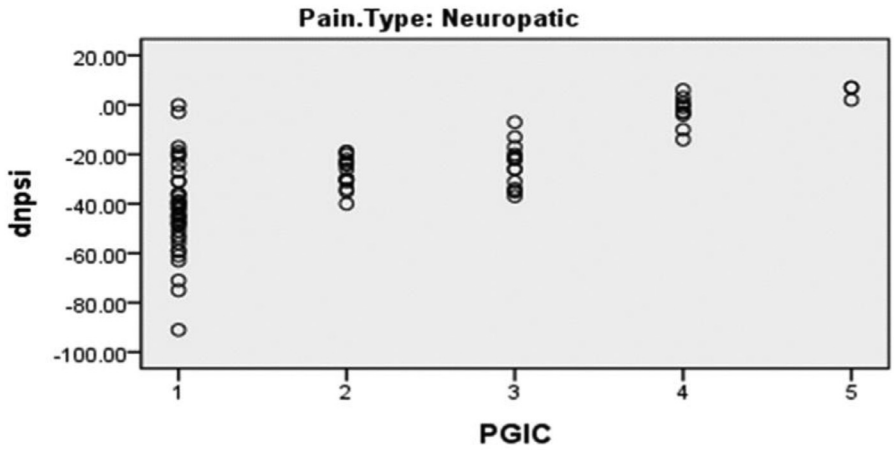


**Figure 1.** The correlation between PV-NPSI changes (dNPSI) and PGIC. PV-NPSI = Persian version Neuropathic Pain Sympton Inventory; dNPSI = differences in Persian version Neuropathic Pain Sympton Inventory; PGIC = patient global impression of change.

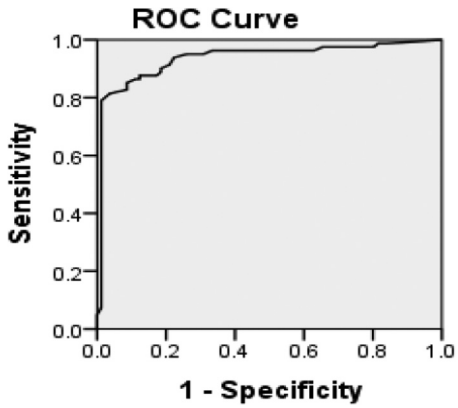


**Figure 2.** ROC curve of Neuropathic Pain Symptoms Inventory. AUC = 0.936 ($p < .001$, 95%CI: 0.894-0.978). ROC = receiver operating curve; AUC = area under the curve; CI = confidence interval.

sure (r = 0.267), stabbing (r = 0.440), and evoked by brushing (r = 0.519) gained the least coefficients, respectively.

Farhangi et al. (2019) investigated the use of English NPSI for neuropathic eye pain. They represented the best ICCs for burning, pressure, and stabbing, while in contrast to our study, the worst were found for tingling and pins and needles (Farhangi et al., 2019). Lu and colleagues' study assessed the use of the Chinese NPSI version on patients with colorectal cancer. They revealed the best ICC coefficient for pins and needles and tingling versus the least pressure and brushing scores, respectively (Lu et al., 2018). We assume that the differences between the found coefficients among those suffering from musculoskeletal pain and other types such as ocular or colorectal cancer-related pain may have occurred because of different pain perceptions in different conditions.

The Cronbach's alpha and test-retest reliability assessment of this study revealed excellent outcomes on evaluating the PV-NPSI totally and through the one-by-one evaluation of each subgroup. Similar results were presented by Bouhassira et al. (2004), who represented the original version of NPSI in French as they reported the test-retest coefficient of 0.94 (Bouhassira et al., 2004). Similar outcomes were achieved in the validations of this questionnaire in other languages, including Thai, Japanese, and Spanish, as well.

Sensitivity to change was the other assessed aspect of this study that revealed a significantly strong correlation of PV-NPSI with questionnaires, including NRS, PGIC, and CGIC. This finding shows the ability of this validated questionnaire to assess the response of NP to the treatment. These findings are in line with a de Andrade et al. (2011) study that similarly represented the strong correlation of PGIC and CGIC to NPSI. Simultaneously, it was moderately sensitive to change according to NRS while assessing the NPSI Portuguese version (de Andrade et al., 2011). Bouhassira and colleagues presented similar outcomes, as well. They reported that NPSI could appropriately evaluate response to the treatment based on the assessments by both patients and the examinators in general, but not through one-by-one evaluation of the different neuropathic pain dimensions. They claimed this condition has occurred due to lacking a standardized therapeutic approach to treat neuropathic pain. On the other hand, neuropathic pain presentations do not follow a particular pattern and not all of the involved dimensions respond similarly to a specific therapeutic approach (Torrance et al., 2006).

In the current study, we compared the NPSI results in two groups of patients with neuropathic and non-neuropathic pain. We found significantly more sensitive outcomes in the responses provided by those with NP. A novel and valuable assessment in the current study was to determine a cut-off for the PV-NPSI in evaluating NP intensity and responsiveness to the treatment. In the present study, we found that PV-NPSI had a notifying accuracy for the evaluation of NP. It could efficiently assess NP's response to the treatment and had an acceptable correlation with DN4; however,

no appropriate cut-off could be detected for differentiation of NP from the other types of pain despite the mentioned assessments.

The effort to determine a cut-off point for NP was made by Villoria (Villoria et al., 2011) and Sommer (Sommer et al., 2011) in the studies conducted to validate the Spanish and German versions of NPSI, as well; but the used discrimination analysis based on 10-score visual analog scale is not reliable enough and cannot provide an accurate response. For instance, a patient who provides a score of 10 to five assessed entities and gains a total score of 40 versus another patient who responds 2 to six questions and achieves an overall score of 12—which one should be considered as NP? Therefore, we assume that a novel questionnaire with a new method instead of NRS should be proposed to distinguish NP from other pain types.

*Limitations*

Although we could assess the validity and reliability of PV-NPSI for the differentiation of NP from the other types of pain with this sample population, the small size of the studied patients is the limitation of this study. The inclusion of a more significant number of patients based on the category of their pain using NPSI (spontaneous neuropathic pain, paroxysmal neuropathic pain, evoked neuropathic pain, and dysesthesia/paresthesia), can better distinguish the correlation of NP etiology with the related domain of pain presentation.

## Conclusion

Based on the current study's findings, the PV-NPSI is a reliable and valid means for differentiating NP from the other types of pain in patients with several musculoskeletal pain complaints. Also, this questionnaire is efficiently helpful in assessing response to the NP treatment. Still, we could not determine an exact score with the most specificity and sensitivity in differentiating pain types as a cut-off point.

## Conflict of interest

Authors declare no conflict of interest.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.pmn.2022.07.005.

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