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RESEARCH ARTICLE

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Transcultural adaptation and validation of the Spanish version of the Global Pain Scale

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Abstract

The aim of this study was to perform a cross-cultural adaption and validation of the Global Pain Scale (GPS) to produce a Spanish-language version (GPS-Sp) and to determine the psychometric properties of this instrument. The GPS was cross-culturally translated into Spanish following the guidelines of the International Society for Pharmacoeconomics and Outcomes Research. The initial study population was composed of 384 patients recruited from February to May 2021. All participants were aged at least 18 years and were currently experiencing pain. All gave signed informed consent to take part and completed the Brief Inventory-Sp and GPS-Spain questionnaires. Cronbach's *α* and test/retest reliability values were calculated and floor/ceiling effects analyzed. Construct validity was assessed by confirmatory factor analysis (CFA). The 370 patients included in the final analysis presented the following characteristics: 36.2% were male and 63.8% were female; mean age 42.6 (19–88) years; mean body mass index 24.99. Internal consistency was good. The Cronbach's *α* for GPS-Sp was 0.86 and the intraclass correlation coefficient was 0.94 (95% CI; 0.87–0.97). Five main explanatory factors were identified by CFA, which produced the following values: RMSEA = 0.057; CFI = 0.807; GFI = 0.809; NFI = 0.763. No floor/ceiling effect was observed. The GPS-Sp is a valid, reliable and sensitive instrument for assessing pain in a Spanish-speaking population and could facilitate pain relief in this population.

KEYWORDS

biomechanics, clinical outcomes, foot and ankle, low back pain, osteoarthritis

1 | INTRODUCTION

Pain is a global health problem[1] that is estimated to affect 20% of all adults, while another 10% are diagnosed with chronic pain each year.[2] Although pain affects all populations, regardless of age, sex, income, race/ethnicity, and geography, it is not equally distributed around the world. Moreover, it may be experienced acutely, chronically (defined as lasting for longer than 3 months) or intermittently, or even as a combination of all three.[3] The background and causes of pain are complex questions, which

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need to be addressed in a transdisciplinary approach.[4] The sequelae are often multiple and severe, and may include depression, inability to work, interrupted social relationships, and even suicidal tendencies. Pain should be viewed as a disease in its own right,[5] which should be alleviated as far as possible to reduce its global impact and associated problems. Special attention should be paid to minimizing the possibility of ineffective treatment and misdiagnosis.[2]

To be effective, pain management should be guided by a measure of its severity, as reported by the patient,[6] since the experience is subjective, a consideration that is of fundamental importance in any evaluation.[7] The context, the way in which pain is perceived and defined and the behavioral reactions produced will vary from one person to another. Accordingly, the person experiencing the pain must be comprehensively assessed by means of appropriate measurement instruments. When evaluating pain, the instruments or scale used should provide confirmed validity and reliability. The ultimate aim of this evaluation is to facilitate means of identifying and overcoming pain, its associated pathologies and the resulting negative impact on the quality of life.[7]

In certain diseases, such as rheumatoid arthritis, patients suffer from pain due to the disease and the structural adaptations required.[8–10] These circumstances can provoke physical and emotional deterioration, impacting all aspects of daily life. Moreover, pain in any area of the body reduces mobility, hampering, or preventing participation in recreational and social activities.[11]

Various pain assessment scales have been proposed as objective means of determining the severity and nature of pain, thus helping eliminate interpretive differences between the patient and health professionals and enhancing the evaluation of treatment effectiveness.[12] These instruments include the Visual Analog Scale, the Verbal Rating Scale, and the Numerical Rating Scale.[13]

However, the Global Pain Scale (GPS), proposed in 2011 by Gentile et al.[6] assesses multiple dimensions of pain, unlike other instruments in this context, providing a single score that can be used to track changes after treatment or clinical intervention. Moreover, it provides a repeated outcome measure that reflects change over time, whether in acute or chronic pain states. The GPS is widely used, presents good psychometric properties, and is considered one of the most important measures available for quantifying pain. The overall Cronbach's α is 0.89, while for the subscales it ranges from 0.72 to 0.96. Factor analysis highlights four factors that have strong internal consistency. Among other aspects, the GPS addresses perceptions of pain, related feelings, its impact on activities of daily living, and the clinical outcomes obtained. A Turkish-language version of the scale has also been validated, with good indicators of validity and reliability, and can be used with confidence in patients experiencing chronic pain.[14]

The aim of this study was to perform a cross-cultural adaption and validation of the GPS to produce a Spanish-language version (GPS-Sp), and then to determine its psychometric properties, to provide clinicians in this environment with an effective instrument for evaluating pain.

2 | MATERIALS AND METHODS

2.1 | Participants

The participants were all patients of private podiatry and physiotherapy clinics in Spain, who were recruited from February to May 2021. In total, 370 participants met the inclusion criteria, namely being aged at least 18 years, capable of independently answering the questionnaire, and experiencing acute, chronic, or intermittent pain, in any part of the body. The exclusion criterion was a failure to provide signed informed consent.

2.2 | Translation and cross-cultural adaptation

After receiving permission from the original developer (D. A. Gentile), the GPS was translated into Spanish, following the guidelines of the International Society for Pharmacoeconomics and Outcomes Research and the Patient-Reported Outcomes Measurement Information System.[15] Forward translation was performed by two bilingual Spanish translators with knowledge in health sciences, working independently. Their two translations were then reconciled in a consensus meeting to produce the final version. This was then back-translated into English by two bilingual native English speakers, both of whom were experienced in the field of health sciences and blinded to the original version. The project leader reviewed the back translation against the source to check for discrepancies. A committee of experts and stakeholders, including the translators, podiatrists, nurses, and patients, was then asked to check that the translations were correct and comprehensive. Any item the participants found hard to understand was rewritten for greater clarity in the final translated version. This committee, moreover, verified the resulting cross-cultural equivalence and developed a final version for field testing. For cognitive debriefing and review, this final version was pretested with 20 Spanish patients and any necessary changes were made. The project leader checked there were no typos or other errors in either of the translated versions. Finally, the Flesch Kincaid Grade Level and Flesch Reading Ease tests were performed to assess the readability of the questionnaire. The above process is illustrated in the flowchart presented in Figure 1.

2.3 | Data collection

All patients were previously informed about the nature of the study and gave signed consent to take part. Each patient also had a face-to-face interview with a member of the research team, during which

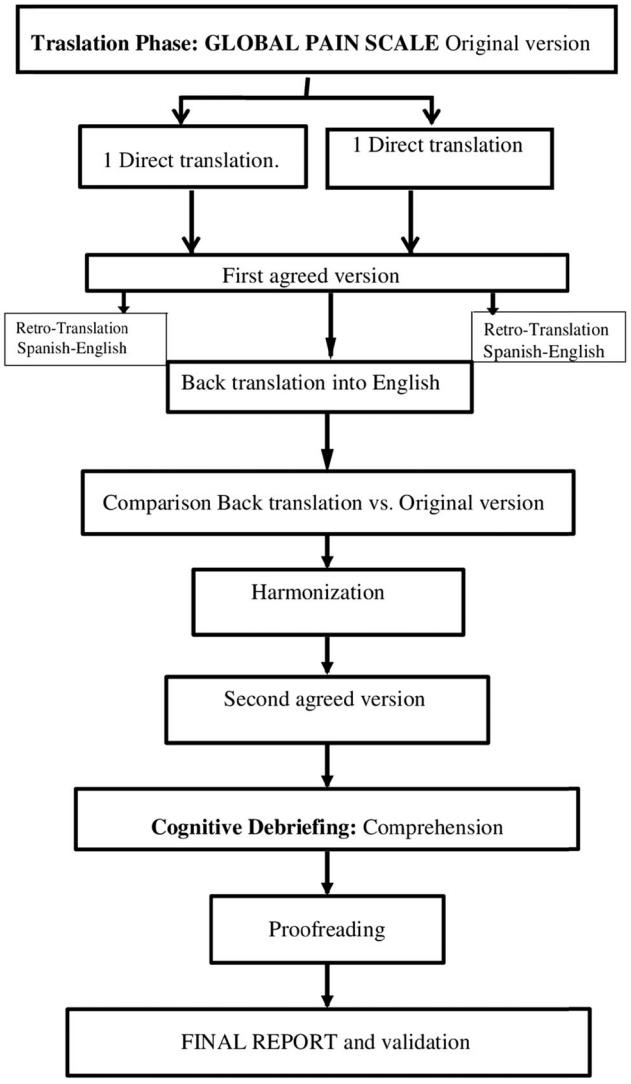

FIGURE 1 Cross-cultural adaptation process

demographic data (age, gender, height, weight, education level, marital status, location of pain, and treatment being received) were obtained, and the Spanish version of the Brief Pain Inventory (BPI) and the GPS-Sp were completed.

The BPI is a self-administered, straightforward questionnaire that addresses two dimensions of pain: intensity (four items) and its interference with activities of daily living (seven items). Each item is scored on a numerical scale ranging from 0 to 10, where 0 = absence of pain/interference in daily life, 1–4 = mild effects, 5–6 = moderate effects, and 7–10 = severe impact (worst pain imaginable/maximum impact on daily life). These 11 items provide two summary scores, one for each dimension. The questionnaire also presents 15 additional items that assess the level of relief obtained by pain-relief treatment, identify the location of the pain and describe its causes.[16] The Cronbach's α value for each dimension is reported to be 0.89 and 0.87, respectively, in a validity and reliability study made of the Spanish version of the BPI for patients with neoplasm-related pain.[17]

The GPS has 33 items grouped into four subscales reflecting the chronic pain experienced. The first subscale focuses on current pain status, ranking the minimum, maximum, and average pain severity experienced during the past week. The second subscale considers whether the patient had felt depressed, anxious, afraid, hopeless, exhausted, or terrified during the same week. The third subscale explores the effect of treatment on clinical outcomes, and the fourth examines whether the patient was able to perform the activities of daily life. This scale is scored using a 10-point Likert system in which 0 points = no pain, 1–4 points = mild pain, 5–6 points = moderate pain, and 7–10 points = severe pain (the total score possible, thus, ranges from 0 to 100).[6]

2.4 | Statistical analysis

All statistical analyses were performed with SPSS v.24.0. and SPSS Amos v.26 statistical software (IBM Corporation).

Descriptive statistics of the variables were obtained and the normality of their distribution was confirmed by the Kolmogorov–Smirnov test. Depending on the presence or absence of normal distribution, either the Pearson's or the Spearman's correlation was obtained. In every case, the corresponding 95% confidence interval was calculated.

For the clinimetric validation, interobserver and test–retest reliability was evaluated using the Pearson's correlation and intraclass correlation (ICC) coefficients. An ICC value of >0.7 was considered "excellent," 0.60–0.74 "good," 0.40–0.59 "fair," and <0.40 "poor."[18] Test–retest reliability was recorded for 20 patients at baseline and at 1 week. Internal consistency was assessed by Cronbach's α, with values of 0.7, 0.8, and 0.9 considered to represent fair, good, and excellent internal consistency, respectively.

Exploratory factor analysis was performed to assess construct validity and to confirm that the internal structure and the factors defined in the original version were correct. Convergent validity was assessed by testing the relationship between GPS-Sp and BPI-Sp. The Kaiser–Meyer–Olkin (KMO) test was performed to assess the sample parameters (a test result ≥0.9 was classed as very good). Bartlett's test of sphericity was performed to determine whether the factor model was appropriate. A p-value <0.05 meant that the study variables could be subjected to factor analysis. Convergent validity was assessed according to the relationship between the GPS-Sp and the BPI-Sp. Content validity was assessed by the distribution of the scores and the presence or otherwise of floor-ceiling effects. This question was analyzed using descriptive statistics and the effects were considered to be present if >15% of respondents recorded the lowest or highest possible score.[19] To assess factor structure, a confirmatory factor analysis (CFA) was performed, and the evaluated model was then fitted to the following parameters: the penalizing function (X^2/df), which is indicative of a good fit with values less than 3; the root mean square error of approximation (RMSEA); and confidence intervals (CI 90%), taking the value of 0.05 as cut-off of good fit. These parameters were used to obtain the Normed Fit Index (NFI), the Comparative Fit Index (CFI), and the Goodness of Fit Index (GFI). A value of >0.90 was associated with a good fit.

3 | RESULTS

Of the initial study population of 384 patients, 14 did not fully complete the GPS-Sp and were excluded. Thus, 370 were finally selected for analysis. Of these participants, 36.2% were male and 63.8% were female. The patients' mean age was 42.6 (19–88) years and the mean body mass index was 24.99. The majority were married (60.3%) and in employment (68.9%), and almost half had a high level of education (47.6%). 80.1% presented pain in one or more of the forms considered (chronic, acute, and intermittent). This pain was most frequently located in the legs and feet (24.3%) followed by the back (15.4%) and the treatment most commonly received was anti-inflammatory drugs (21.5%). The mean duration of this pain was 1687 days (Table 1).

TABLE 1 Characteristics of the participants

		(*n* = 370)
Gender		
Male		134 (36.2%)
Female		236 (63.8%)
	Media	**SD**
Age	42.6	(10.43)
Height	166.8	(9.52)
Weight	70.3	(13.50)
BMI	24.9	(3.66)
GPS-Sp	79	(7)
BPI	50	(6)

Abbreviations: BMI, body mass index; BPI, Brief Pain Inventory; GPS-Sp, Global Pain Scale Spanish.

3.1 | Readability

On average, the participants required 15–17 min to complete the GPS-Sp, without help from the administrator. The following readability scores were obtained: Flesch Reading Ease test, 33.1; Flesch-Kincaid Grade Level, 20.3.

3.2 | Construct validity

In the exploratory factor analysis, the correlation matrix was found to be appropriate, according to the following test results: KMO, 0.903; Bartlett's test of sphericity, 765.69 ($p < 0.001$) (Figure 2).

As shown in the scree plot graph (Table 2), a five-factor solution was obtained, which explained 66.69% of the total variance. In this analysis, the questionnaire items were grouped as follows: Factor 1 (items 22–33); Factor 2 (items 6–13); Factor 3 (items 1–4); Factor 4 (items 15–19); and Factor 5 (items 5, 14, 20, and 21).

CFA confirmed the goodness of fit obtained by this model, with the following results: relative X^2 (X^2/df; 2048.57/490, $p < 0.001$), RMSEA 0.057, comparative fit index (CFI) 0.807, goodness of fit index (GFI) 0.809, normed fit index (NFI) 0,763, and Tucker–Lewis index (TLI) 0,779. The criteria for multinormality were met (Figure 3).

3.3 | Discriminatory power

According to the receiver operating characteristic curve, the model obtained a discrimination score ≥95 points to identify patients with pain (area under the curve, AUC = 0.81, $p < 0.001$) (Figure 4). The optimal cut-off value assumed for the Youden Index was 0.64. Questionnaire result values >64 reflect the presence of chronic pain.

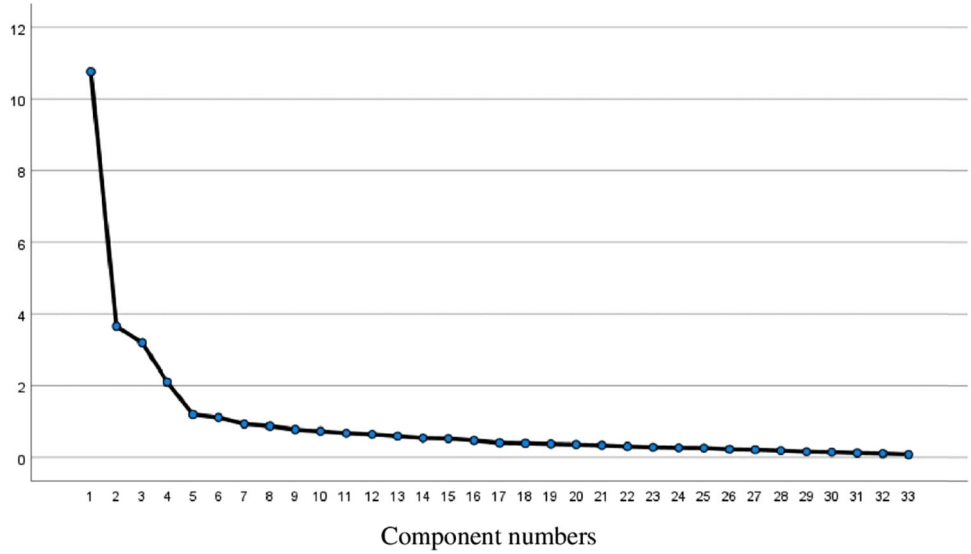

FIGURE 2 Scree plot [Color figure can be viewed at wileyonlinelibrary.com]

TABLE 2 Factor matrix for the 33-item GPS-Sp

Factors	1	2	3	4	5
GPS_ACT_7	0.847	0.068	0.148	−0.011	−0.110
GPS_ACT_6	0.826	0.156	−0.011	−0.008	−0.063
GPS_ACT_8	0.798	0.078	0.196	−0.033	−0.096
GPS_ACT_5	0.789	0.245	0.036	−0.070	0.016
GPS_ACT_4	0.788	0.084	0.041	−0.063	0.035
GPS_ACT_2	0.784	0.275	0.130	−0.075	0.027
GPS_ACT_11	0.749	0.097	0.128	−0.041	−0.030
GPS_ACT_9	0.724	0.167	0.288	−0.067	−0.043
GPS_ACT_1	0.722	0.183	0.056	−0.088	0.069
GPS_ACT_10	0.693	0.165	0.306	−0.109	−0.038
GPS_ACT_12	0.687	0.244	0.102	−0.073	0.008
GPS_ACT_3	0.625	0.221	0.307	−0.067	−0.041
GPS_Feelings_3	0.097	0.807	0.071	−0.018	0.111
GPS_Feelings_4	0.148	0.796	0.136	−0.018	−0.042
GPS_Feelings_2	0.209	0.796	0.117	−0.124	0.094
GPS_Feelings_7	0.170	0.756	0.131	0.025	−0.058
GPS_CO_2	0.236	0.706	0.236	−0.042	−0.047
GPS_Feelings_5	0.279	0.689	0.230	−0.095	−0.055
GPS_Feelings_6	0.172	0.648	0.210	0.042	0.024
GPS_CO_1	0.098	0.614	0.147	−0.022	0.042
GPS_Pain_4	0.208	0.298	0.874	−0.011	0.015
GPS_Pain_3	0.159	0.227	0.864	−0.014	0.075
GPS_Pain_1	0.232	0.230	0.809	−0.034	−0.066
GPS_Pain_2	0.255	0.282	0.782	−0.076	−0.041
GPS_CO_6	−0.090	−0.039	−0.088	0.852	0.093
GPS_CO_5	−0.045	−0.025	0.063	0.827	0.042
GPS_CO_4	−0.064	−0.048	−0.039	0.794	0.117
GPS_CO_8	0.000	−0.023	−0.040	0.604	0.403
GPS_CO_7	−0.229	−0.216	−0.193	0.482	0.219
GPS_CO_10	−0.052	−0.100	0.046	0.114	0.740
GPS_Feelings_1	0.052	0.152	0.022	0.135	0.655
GPS_CO_9	−0.082	−0.015	−0.256	0.231	0.555
GPS_CO_3	−0.088	0.155	0.104	0.423	0.503

Abbreviations: ACT, activities; CO, clinical outcomes.

3.4 | Test–retest validity

The GPS-Sp had good test–retest reliability, with a global ICC of 0.94 (95% CI; 0.87–0.97). The standard error of the mean and the minimal detectable change were 2.69 and 10.56, respectively.

3.5 | Internal consistency

The GPS-Sp showed good internal consistency, with a Cronbach's *a* of 0.86. Good results were also obtained for each of the subscales: Factor 1 (22–23): 0.943; Factor 2 (6–13): 0.896; Factor 3 (1–4): 0.925; Factor 4 (15–19): 0.811, and Factor 5 (5, 14, 20, 21: 0.554).

3.6 | Convergent validity

Good values were obtained for the correlation between GPS-Sp and the Spanish version of the BPI (Pearson's coefficient = 0.588; $p < 0.001$).

3.7 | Floor and ceiling effects

No ceiling or floor effects were found for the GPS-Sp total score. None of the participants recorded the highest possible score and only 0.8%, the lowest.

4 | DISCUSSION

The aim of this study was to perform a cross-cultural adaption and validation of the GPS to produce a GPS-Sp and to determine its psychometric properties, thus providing clinicians in Spanish-speaking environments with a useful instrument to assess patients' experience of pain. This assessment would address both physical and psychological dimensions, in areas such as perceived pain, feelings, clinical outcomes, and interference or otherwise with activities of daily living. Our results show that the Spanish version of the instrument is both valid and reliable for these purposes.

The study participants were mostly young women, with a high level of education and in paid employment. The pain experienced was particularly present in the lower limbs, neck, and back. Pain-relief medication was taken only occasionally. This restraint may be a consequence of the patients' cultural and educational level, as they sought alternatives such as exercises or other activities to reduce the pain,[20] or conservative medical treatment that did not involve powerful medication such as opioids or nonsteroidal anti-inflammatory drugs.[21,22] Our study population had a majority of female participants, as was also the case in the Turkish-language adaptation[14] but not in the original English version.[6] Previous studies did not identify the participants' educational background, but they did report that most women were not employed outside the home, which might be interpreted as reflecting a lower level of education, thus explaining the higher intake of medication among this population and their feelings about pain.

As in the original and Turkish versions of the GPS, as in other transcultural adaptations of self-administered questionnaires, women outnumber men.[23–25] This imbalance could be due to the fact that

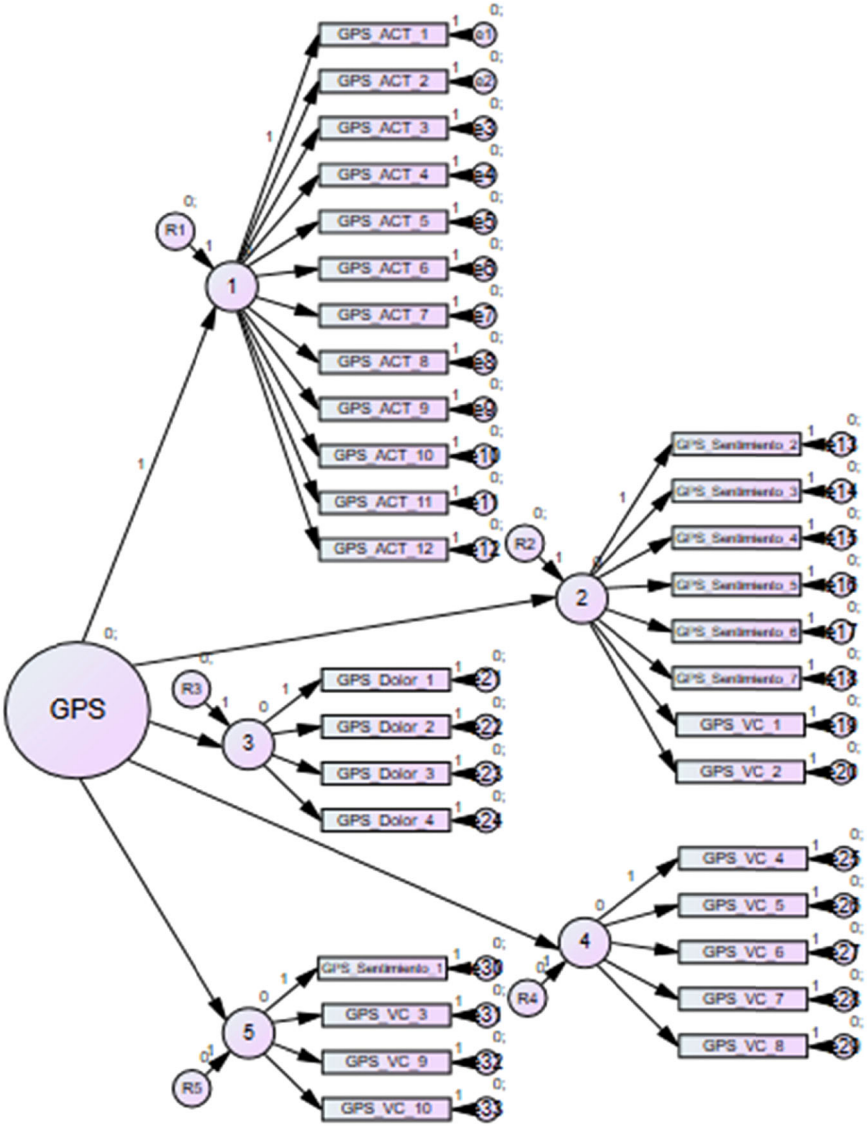

FIGURE 3 Confirmatory factor structure of GPS-Sp [Color figure can be viewed at wileyonlinelibrary.com]

although pain is multifactorial in its evolution and development, there is evidence of a direct relationship between age[26] and female gender,[27] with joint and musculoskeletal pain being especially common in women aged 45 –55 years.[28,29]

Regarding the psychometric properties of the GPS-Sp, our results corroborate its validity and reliability, with a five-factor construct that accounts for 66.69% of the total variance, unlike the English and Turkish versions, for which only four factors were identified. Our findings show that the factors "Your pain" and "Your activities" contained the same items in all versions. However, an overlap was observed with respect to the factor "Clinical outcomes," as this would also include the items corresponding to "Medical care and medication." This circumstance might be explained by the fact that the participants in the adaptation had a higher level of education and presented greater intercultural differences than those included in other studies and differentiated the need for medication or medical care from other actions taken to improve their situation or alleviate the pain. The optimal cut-off value assumed for the Youden Index was 0.64. Questionnaire results values >64 reflect the presence of chronic pain.

When performing factor analysis, the consistency and adequacy of the sample must be ensured. In the present case, the sample adequacy, calculated as the KMO value, was appropriate for the factor analysis.

CFA reflected the structural validity of the model and enabled us to calculate the level of confidence. This conclusion was corroborated by comparison with the original version, although the factors were composed of different items. Thus, our original 33-item model produced an excellent fit between the data structure and the measurement model. These findings support the presence of construct validity and show that the total score obtained with the GPS-Sp can be used for evaluating the outcomes of clinical practice. Moreover, it had good internal consistency. The GP-Sp is recommended for situations in which the item scores are continuous, as reflected in the Cronbach's *a* score of 0.86, similar to that of the original version, although the Turkish version was even better in this

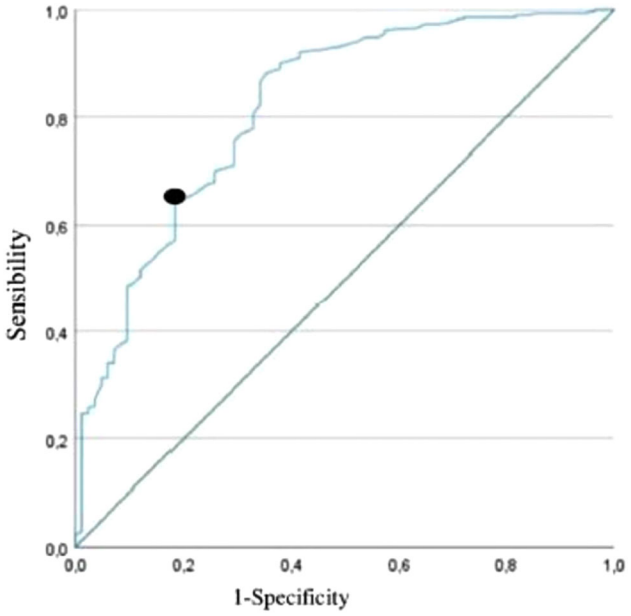

FIGURE 4 Curve ROC. ROC, receiver operating characteristic [Color figure can be viewed at wileyonlinelibrary.com]

respect, with a Cronbach´s *a* score of 0.95. In addition, our results showed that this scale is sensitive to change (previous versions did not evaluate this question).

Our study has certain limitations, chief among which concerns the location of the pain experienced. The study participants were recruited in podiatry and physiotherapy clinics in three Spanish cities, and so most of them presented localized pain in the lower limbs and back. Moreover, the sample presented a gender imbalance. Rasch analysis might usefully be performed to re-examine the internal structure. In future studies of this question, it would be useful to consider a larger sample and to focus exclusively on patients with localized pain. Finally, the question of reliability should be addressed by analyzing different age groups within the population sample.

The main strength of this study is the rigorous methodology employed, which ensured the validity and reliability of the evaluation scale obtained for use in the population considered.

5 | CONCLUSION

The GPS-Sp is a valid, reliable, and sensitive instrument for assessing perceptions of pain in a Spanish-speaking population.

AUTHOR CONTRIBUTIONS

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by (Ana Marchena-Rodriguez), (Gabriel Gijon-Nogueron), (Cristina Guerra-Marmolejo), (Esther Chicharro-Luna), and (Andres Reinoso-Cobo). The first draft of the manuscript was written by (Ana Belen Ortega-Avila) and (Pablo Cervera-Garvi), and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS STATEMENT

Institutional Review board approved the protocol for the study. Medical Research Ethics Committee of University of Málaga (CEUMA19-2021-H) and Miguel Hernández University. This study was approved by the corresponding Ethics Committee and was carried out in accordance with the Declaration of Helsinki and with established ethical standards for human experimentation. Signed informed consent was obtained from all participants.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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