

A cross-cultural adaptation study on the validity and test-retest reliability of pain assessment tools in Albanian older adults with low back pain



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ABSTRACT

Introduction: Over the years, several standardized pain assessment tools have been developed, each with its own strengths, to help quantify pain intensity and its impact on patients' lives.

Methods: To assess the validity of the four pain scales, the ability of participants was evaluated to accurately measure the construct of pain intensity. To evaluate the reliability of the pain intensity scales, were conducted tests for both internal consistency and test-retest reliability.

Results: Two hundred patients (53.0% male mean age 68.59; SD 6.39) completed all four pain intensity scales. All instruments showed good to excellent test-retest reliability, with intraclass correlation coefficients (ICC) ranging from 0.825 for Faces Pain Scale (FPS) to 0.922 for Visual Analog Scale (VAS). Internal consistency was high across all scales (Cronbach's $\alpha = 0.90$ – 0.96). Construct validity was supported by strong component loadings (>0.90) and significant correlations between the scales. The VAS demonstrated the highest reliability (ICC = 0.922) and sensitivity (MDC = 0.061), while the Numeric Rating Scale (NRS), FPS, and Brief Pain Inventory Interference Scale (BPI-IS) also showed good reliability and validity, making all four appropriate for clinical use in Albanian older adults with low back pain.

Conclusion: The VAS, NRS, FPS and BPI-IS are valid and reliable scales for the pain intensity measurement in Albanian population with low back pain.

Trial registration: The study was registered at clinical trial.gov before the data collection with ID. NCT04131998.

Introduction

Pain intensity is a subjective experience that varies widely among individuals, making its assessment a challenging but crucial component in clinical practice and research.^{1,2} Accurate and reliable pain assessment is essential for providing effective clinical care to patients of all ages experiencing acute and chronic pain. Although pain is multidimensional, pain intensity remains the most widely used outcome and the primary focus for guiding pain management decisions.³

Over the years, several standardized pain assessment tools have been developed, each with its own strengths, to help quantify pain intensity and its impact on patients' lives. Among the most used scales are the Visual Analog Scale (VAS), Numeric Rating Scale (NRS), Faces Pain Scale (FPS), and the Brief Pain Inventory Interference Scale (BPI-IS).^{4–6} These tools differ in format but share the common goal of

providing reliable and valid measures of pain, thereby improving patient provider communication and treatment decisions.⁷

The NRS has been widely researched in studies involving adults.⁸ Studies have demonstrated the validity of self-reported NRS pain intensity scores through their strong and positive correlations with other pain intensity measures.⁹ NRSs are generally preferred by most patients across diverse populations and cultures compared to other pain intensity measures, such as VAS or FPS.^{10,11} The FPS is particularly useful in pediatric and cognitively impaired populations, where visual cues help patients express their pain levels.¹² The BPI-IS, on the other hand, offers a more comprehensive view by not only measuring pain intensity but also exploring how pain interferes with various aspects of life.^{13,14}

Despite the extensive use and validation of these scales in many populations, no prior study has assessed their psychometric properties in the Albanian population. This lack of validation represents a critical research gap, given that cultural factors strongly influence how pain is perceived, expressed, and reported. Cultural differences significantly influence pain perception, expression, and management. In the Albanian context, socio-cultural characteristics shaped by

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collectivism, historical transitions, and regional health practices play a crucial role. Additionally, Albania's healthcare system, with its evolving resources and practices, might shape patient-physician interactions and pain management strategies. Without validation, applying these scales in Albania may risk misinterpretation of patients' pain experiences and limit the accuracy of clinical decision-making.

For the Albanian population, the use of valid and reliable pain measurement scales helps to improve the quality of health care. They enable care providers to better understand the subjective experience of patients and provide more personalized treatments. Therefore, this study aims to fill this gap by assessing, for the first time, the validity and reliability of four internationally recognized scales (VAS, NRS, FPS, and BPI-IS) in Albanian older adults with low back pain.

Methods

Participants

Albanian patients aged 50 to 80 with low back pain were recruited randomly for pain intensity measurements. While international studies frequently define "older adults" as those aged 65 years and older, in the Albanian context several demographic and cultural factors support the inclusion of individuals starting from age 50. Chronic musculoskeletal conditions such as low back pain commonly manifest earlier in this population due to occupational demands and lifestyle factors.^{15,16}

Participants with confirmed back pain of at least 3 weeks' duration, including those with lumbar trauma, fractures, lumbar disc herniation, or arthritis, were eligible for the study. Individuals with primary diagnoses of neurological disorders, tumors, or cardiovascular disease were excluded.

The study was approved by the Ethics Committee of the San Antonio Catholic University of Murcia (UCAM) under protocol number CE052107, as well as by the Ethics Committee of the Health Ministry in Albania, with protocol number 147/35. It was additionally registered on ClinicalTrials.gov before data collection, with the ID NCT04131998. All participants submitted written informed consent prior to participating in the study, and the research adhered to the principles outlined in the Declaration of Helsinki. This allowed participants to fully understand the study's objectives, procedures, and their rights, including the voluntary nature of their participation and their ability to withdraw at any time without consequence. The consent form also detailed the measures taken to protect participants' privacy and confidentiality. To safeguard privacy, data were collected anonymously, and personal identifiers were removed during analysis. Additionally, all data were stored in secure, password-protected systems accessible only to authorized personnel. By using culturally appropriate language and emphasizing privacy measures, was ensured that participants were fully informed and felt comfortable participating in the study. These measures were integral to maintaining ethical standards throughout the research process.

The number of participants in this study was calculated based on COSMIN guidelines for factor analysis with a recommended minimum of 100–200 participants. Our sample size of 200 participants aligns with comparable studies in this field,^{8,11,14} which included similar numbers of participants, to investigate the four pain assessments in Albanian participants with low back pain.

Procedure

Qualified older adults' participants were given suitable explanations about the study's objectives via their medical records, which allowed them to express their assent. All assessments were

conducted in outpatient clinic consultation rooms, in a quiet environment to minimize external distractions.

The four pain intensity scales were administered in a fixed order to ensure procedural consistency: first the Numeric Rating Scale (NRS), followed by the Faces Pain Scale (FPS), the Visual Analog Scale (VAS), and finally the Brief Pain Inventory Interference Scale (BPI-IS). Participants were asked to complete each scale sequentially in the same session, under the guidance of the assessor.

To minimize variability, the same trained assessor conducted both the initial test and the retest for each participant. The retest was carried out under similar conditions, between 1 and 7 days after the initial assessment.

Concretely the same complete set of four scales was administered during both the initial test session and the retest session. The retest was carried out under the same conditions, with the same assessor, and at a single time point for each participant. While the test–retest interval varied between 1 and 7 days across participants due to scheduling and availability, all four scales were always repeated together within the same session for each individual.

For the NRS, participants were asked to make a single mark on a 10-cm horizontal scale, marked with "no pain" on the left end and "worst possible pain" on the right end. The FPS (0–10) was presented at the same time, with participants asked to select the face that best represented their current back pain. For the VAS, participants placed a mark on the line indicating their pain intensity, measured in centimeters from the "no pain" anchor. As per the BPI-IS, patients rated their level of interference on a scale ranging from 0 (no interference) to 10 (complete interference). Higher scores indicated a greater degree of pain-related disruption.

Both the initial and retest sessions followed the same order of scale administration and were completed in one sitting.

Pain intensity outcomes

The VAS and NRS are both simple and widely used tools for assessing pain intensity.¹⁷

The VAS, requiring patients to mark a point on a 10 cm line, provides continuous data, allowing for subtle distinctions in pain intensity. The NRS, in contrast, asks patients to rate their pain on a numeric scale (typically 0–10), which is easier to understand and quicker to administer, though it offers less sensitivity in detecting small changes compared to the continuous nature of the VAS.^{18,19}

The FPS, which uses facial expressions to represent different pain levels, is particularly effective for pediatric populations, older adults, or those with cognitive impairments, as it visually represents pain intensity in a format that may be easier for some to interpret.^{20–23}

The BPI-IS differs from these tools as it assesses not only pain intensity but also the degree to which pain interferes with daily functioning.^{24,25}

This makes it particularly valuable in chronic pain assessment, where understanding pain's impact on activities and quality of life is critical.²⁶

While more comprehensive, the BPI-IS is more time-consuming to administer and analyze compared to the simpler VAS, NRS, and FPS, and may not be as practical for quick assessments in busy clinical environments.²⁷

Validity and reliability

The criterion validity of the four scales was determined by evaluating the relationship, represented by an eigenvalue, between each scale and a factor score that accounted for the variance across all four measures.¹¹

To assess the validity of the pain intensity scales, we evaluated their ability to accurately measure the construct of pain intensity as reported by participants.²⁸

Construct validity was determined by comparing the scores from the VAS, NRS, FPS and BPI-IS with established benchmarks for pain assessment, such as clinician evaluations and other validated pain measurement tools.²⁹

Criterion validity was examined by analyzing correlations between the scales and clinical outcomes, including pain management effectiveness, functional limitations, and patient-reported recovery. Additionally, content validity was ensured through expert review, ensuring that the scales adequately cover the range of pain experiences relevant to the patient population being studied.^{11,30,31}

To evaluate the reliability of the pain intensity scales, were conducted tests for both internal consistency and test-retest reliability. Internal consistency was measured using Cronbach's alpha, ensuring that the items or ratings on the scales were consistently capturing the same construct of pain intensity across different participants.^{9,32}

Test-retest reliability was assessed by administering the pain scales to participants at two different time points, under similar conditions, and calculating the intraclass correlation coefficient (ICC) to determine the stability of the results over time.³³

Additionally, inter-rater reliability was examined by having multiple healthcare providers independently assess the same patients' pain levels using the scales, with the level of agreement between their ratings analyzed using Cohen's kappa. These methods ensured that the scales provided consistent and reproducible measurements of pain intensity across different contexts and evaluators.³⁴

To ensure consistency in inter-rater reliability tests, healthcare providers underwent a structured training program that included theoretical instruction on the pain assessment scales before the data collection. By implementing this thorough training and monitoring process, was ensured that healthcare providers performed inter-rater reliability tests with a high degree of consistency.

Data analysis

Initially were calculated descriptive statistics for demographic and pain history variables, as well as for responses to the pain intensity scales. This included means and standard deviations (SD) for continuous variables, and counts and percentages for categorical variables, in order to characterize the study sample and the measures used.

To assess the relative validity of the four scales, a principal components analysis on the scale responses was performed. This analysis was expected to reveal a single factor representing pain intensity, which was confirmed using a scree test.

The loadings of each scale were assessed based on the factor identified through the factor analysis. These loadings would provide an indication of the validity of each scale as a measure of pain intensity.

The intra-class correlation coefficient (ICC) was determined using a two-way mixed effects model to assess absolute agreement in the scores. ICC values ranging from 0.8 to 0.9 were considered indicative of good test-retest reliability, while values greater than 0.9 represented excellent test-retest reliability.³⁵ The Minimal Detectable Change (MDC) was calculated using the Standard Error of Measurement (SEM) with the following formula: $MDC = z \times SEM \times \sqrt{2}$; where z is the z -score corresponding to the desired confidence level (e.g., 1.96 for 95 % confidence).

Results

Two hundred patients completed the four pain intensity scales for both the initial test and the retest. Among these patients, 53.0 % were male, with an average age of 68.59 years (SD=6.39), a mean height of 177 cm (SD=7.97), and weight of 82.95 kg (SD=9.34). The mean age of total participants was 69.77 (SD= 6.33), the mean height 168.59 cm (SD= 11.52) and the mean weight was 76.93 kg (SD=11.76). Out of the 94 female participants, 18 were still employed. Additionally, among the 106 male participants, 48 were retired. In terms of civil status with mean 2.43(SD=0.93), most participants were married, including 71 males and 59 females. [Table 1](#) provides detailed information regarding the characteristics of the participants.

All pain measurements were fully completed by the 200 participants within the 1–7-day frequency range ([Table 2](#)). The component loadings of the four pain intensity scales VAS, NRS, FPS, and BPI-IS showed strong associations with the single component identified in each analysis, with all eigenvalues exceeding 0.90. [Table 2](#) reveals that the component loadings for gender across each scale were generally consistent and similar. With a slight variation compared to the other scales, the VAS exhibited the highest loading for both genders.

As anticipated, the screen test for the principal components analyses clearly indicated that the four scales measured a single overarching domain across all four pain intensity areas. The first eigenvalue varied between 3.63 and 3.59, while the second eigenvalue ranged from 0.21 to 0.24 ([Table 2](#)). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy showed a KMO value of 0.812 for males and 0.836 for females. The Bartlett's test of sphericity was found to be significant for both gender ($p < 0.001$) ([Table 2](#)).

The means (SD) of the four scales are detailed in [Table 3](#). The high ICC value of VAS (0.922, 95 % CI 0.898–0.940) indicated excellent reliability between test -retest measurements, suggesting that the VAS provides consistent results across different raters or measurements. The low MDC value (0.061) indicated that small changes in pain intensity were detectable, making the VAS sensitive to even slight variations in a patient's pain level. The NRS showed good reliability with ICC of 0.834 (95 % CI 0.786–0.871), though slightly lower than the VAS, which still makes it appropriate for routine clinical use, especially in contexts where simplicity is preferred. The MDC value

Table 1
Participants characteristics as per gender distribution.

Gender		Age	Height	Weight	Professional status		Civil Status			
					Employed (n = 58)	Retiree (n = 48)	Single (n = 11)	Widower (n = 17)	Married (n = 71)	Divorced (n = 7)
Male N = 106	Mean (SD)	68.594(6.391)	177.141(7.969)	82.952(9.347)	1.452(0.500)		2.283(0.859)			
	Minimum	57 yers	157cm	63 kg						
	Maximum	88 years	189cm	101 kg						
Female N = 94	Mean (SD)	71.085(6.033)	158.946(5.943)	70.138(10.455)	1.808(0.395)		2.585(0.999)			
	Minimum	55 years	150 cm	60 kg						
	Maximum	79 years	180 cm	91 kg						

SD=Standard Deviation.

Table 2

Component loading of participants for the pain intensity scales.

	Male				Female			
	VAS	NRS	FPS	BPI-IS	VAS	NRS	FPS	BPI-IS
Component loading	0.987	0.933	0.925	0.968	0.979	0.950	0.956	0.907
<i>First two eigenvalues</i>	3.637				3.596			
	0.213				0.249			
<i>Kaiser-Meyer-Olkin Measure</i>	0.812				0.836			
<i>Bartlett's Test of Sphericity</i>	614.075				481.648			

VAS=Visual Analogue Scale; NRS=Numeric rating Scale; FPS=Face Pain Scale; BPI-IS = Brief Pain Inventory Interference Scale.

Table 3

Statistical analysis of test-retest reliability for pain intensity measurement scales.

Pain intensity measurements	Test, mean (SD)	Retest, mean (SD)	ICC agreement (95 % CI)	Cronbach's Alpha	SEM	MDC
VAS	3.510(0.782)	3.540(0.819)	0.922(0.898–0.940)	0.960	0.022	0.061
NRS	3.465(0.728)	3.480(0.679)	0.834(0.786–0.871)	0.909	0.029	0.080
FPS	3.47(0.736)	3.465(0.679)	0.825(0.775–0.864)	0.904	0.030	0.083
BPI-IS	3.59(0.771)	3.54(0.701)	0.853(0.809–0.886)	0.921	0.028	0.077

SD=Standard Deviation; VAS=Visual Analogue Scale; NRS=Numeric rating Scale; FPS=Face Pain Scale; BPI-IS = Brief Pain Inventory Interference Scale; CI= Confidence Interval; SEM= Standard Error Measurement; MDC= Minimal Detectable Change.

of NRS (0.080) showed that only moderate changes in pain would be reliably detected, which means it may be less sensitive to small changes in pain compared to the VAS. Similar to the NRS, the FPS also demonstrates good reliability (ICC = 0.825; 95 % CI 0.775–0.864), making it suitable for use, especially for populations who may have difficulty with numeric scales. The MDC of 0.083 suggests that small changes in pain may not be as easily detected as with the VAS, but it can still identify moderate shifts in pain levels. The BPI-IS showed strong reliability (ICC = 0.853; 95 % CI 0.809–0.886), making it suitable for assessing pain interference in clinical practice. It was slightly less reliable than the VAS but still offers consistent measurements across raters. The MDC value of 0.077 showed that the BPI-IS was sensitive to moderate changes in pain interference, which was useful for tracking improvements or deterioration in daily function due to pain (Table 3). In summary, these tools showed good to excellent reliability (ICC values above 0.80), with the VAS being the most sensitive to small changes in pain intensity (lowest MDC). The NRS and FPS were also reliable but less sensitive, making them appropriate in different clinical contexts depending on the patient population and the level of detail required. The BPI-IS, with its focus on pain interference, also provided valuable insights for monitoring the broader impact of pain. Cronbach's α values confirmed excellent internal consistency across all scales: VAS = 0.960, NRS = 0.909, FPS = 0.904, and BPI-IS = 0.921 (Table 3).

Discussion

This study provides the first evidence on the cross-cultural validity and reliability of the VAS, NRS, FPS, and BPI-IS in the Albanian population with LBP. The assessment of these tools in Albania is particularly important, as data from LBP patients across different cultures are frequently combined in systematic reviews, potentially overlooking cultural influences on pain perception and reporting.³⁶ Although these pain scales have demonstrated good construct validity globally, meaning they correlate well with other measures of pain and clinical indicators,³³ their applicability in Albania had not been previously assessed.

In the present study, all four scales demonstrated good test-retest reliability (ICC>0.80) and small MDC, indicating that they can reliably detect meaningful changes in pain over time. Specifically, the VAS showed excellent reliability (ICC = 0.922) and low MDC (0.061), consistent with global findings where the VAS is considered one of the most reliable and sensitive tools for pain assessment.^{37,38} The NRS

and FPS also performed well (ICC 0.83–0.85), offering simpler alternatives and catering to populations with lower literacy, respectively.³⁹ The BPI-IS demonstrated good reliability (ICC = 0.853), although cultural factors in Albania may influence responses, as individuals may underreport pain-related interference due to social norms emphasizing resilience.⁴⁰

These findings are aligned with previous literature^{35,38–42}; Karcioğlu et al. reported that these scales reliably differentiate between pain intensity levels and are sensitive to changes over time.³⁹ Matteson et al. documented an ICC of 0.82 for the VAS in patients with polymyalgia rheumatica over one week,³⁵ and Leung et al. reported ICCs between 0.8 and 0.9 across multiple patient populations, confirming good to excellent test-retest reliability.³⁸ Copay et al. emphasized that these tools could capture real and meaningful changes in pain intensity, highlighting the clinical relevance of small MDC values.⁴⁰

Cultural considerations are particularly relevant in the Albanian context. The strong performance of the VAS may reflect both its continuous visual scale, which facilitates interpretation regardless of literacy levels, and familiarity among healthcare providers due to previous exposure in training or research. In contrast, the NRS, while simple, may present challenges for certain subgroups, such as older adults or individuals with limited education, in accurately reporting numerical ratings. The FPS, designed for children and low-literacy populations, may also be influenced by cultural tendencies toward restrained pain expression, which could reduce sensitivity in detecting subtle changes. The BPI-IS, which measures interference of pain with daily activities, may underestimate the true impact of pain because of social norms that discourage overt reporting of discomfort.⁴

From a clinical perspective, these findings provide guidance for the selection of pain assessment tools in Albania. The VAS is recommended when high sensitivity and precision are required, such as in clinical trials or closely monitored interventions. The NRS is suitable for quick and straightforward assessments in routine practice. The FPS is advantageous for low-literacy populations or when visual cues enhance comprehension, while the BPI-IS can provide insights into pain-related interference, although clinicians should consider cultural influences that may affect patient responses. Incorporating these validated tools is likely to improve the accuracy of pain assessments, support treatment decisions, and facilitate the monitoring of patient progress in both clinical and research settings.

Several limitations warrant consideration. The sample predominantly included older adults with LBP, which may limit

generalizability to younger populations or individuals with other pain conditions, such as migraines or post-surgical pain. Pain perception and reporting may vary by age, type of pain, or comorbidities, potentially influencing the applicability of these findings across diverse groups. Future studies should include more heterogeneous samples to further validate these scales in Albania and examine cross-cultural differences in pain expression.

This study addresses a critical gap in the literature by providing the first validation of commonly used pain scales in the Albanian LBP population. The VAS, NRS, FPS, and BPI-IS demonstrate adequate reliability and meaningful responsiveness, with practical guidance for scale selection based on sensitivity, simplicity, and literacy considerations. Cultural factors should be carefully considered to ensure that pain assessments accurately reflect patient experiences.

Conclusion

This study highlights the reliability and validity of pain assessment scales in the Albanian context, providing valuable tools for healthcare providers. By ensuring that these scales, such as the VAS, NRS, FPS, and BPI-IS, are culturally appropriate and reliable, clinicians can make more accurate assessments of pain intensity and its impact on daily life. This, in turn, supports better clinical decision-making, enabling healthcare providers to tailor treatment plans more effectively, monitor pain progress, and evaluate the effectiveness of interventions.

Moreover, the use of standardized pain assessment tools can help minimize subjective biases in pain reporting, ensuring a more objective and consistent approach to pain management across different healthcare settings. Ultimately, these findings have the potential to improve patient outcomes by fostering more personalized and effective pain management strategies in Albania, especially in under-researched populations such as older adults with chronic pain. This study paves the way for future research and enhances the overall quality of pain care in the country.

Ethics committee information

An observational cross-cultural study was implemented in accordance with the Ethics Committee of Health Ministry and Social Defense, Tirana, Albania (prot nr. 147/35) and Catholic University of Murcia UCAM Ethics Committee (prot. CE052107).

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Author's contributions

Jasemin Todri and Orges Lena contributed to the conception, design, and data analysis. Jasemin Todri and Orges Lena were responsible for interpreting the data and drafting the manuscript. Both authors were responsible for critically revising the paper for intellectual content, providing final approval of the version to be published, and agreeing to be accountable for all aspects of the work.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability

Data are available upon reasonable request from the corresponding author.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Orges Lena: Writing – review & editing, Writing – original draft, Visualization, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jasemin Todri:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Methodology, Investigation, Data curation, Conceptualization.

References

- Ahluwalia SC, Giannitrapani KF, Dobscha SK, Cromer R, Lorenz KA. Sometimes you wonder, is this really true?: clinician assessment of patients' subjective experience of pain. *J Eval Clin Pr.* 2020;26(3):1048–1053.
- Collins PJ, Renedo A, Marston CA. Communicating and understanding pain: limitations of pain scales for patients with sickle cell disorder and other painful conditions. *J Health Psychol.* 2022;27(1):103–118.
- Castarlenas E, Jensen MP, von Baeyer CL. Psychometric properties of the numerical rating scale to assess self-reported pain intensity in children and adolescents: a systematic review. *Clin J Pain.* 2017;33(4):376–383. <https://doi.org/10.1097/AJP.0000000000000406>.
- Kang Y, Demiris G. Self-report pain assessment tools for cognitively intact older adults: integrative review. *Int J Older People Nurs.* 2018;13(2):e12170.
- Raval L, Umrana R, Patel B, Sanghavi P. Various tools for assessment of pain. *Int J Evid Bas Nurs.* 2021;4(1):61–69.
- Garg A, Pathak H, Churyukanov MV, Uppin RB, Slobodin TM. Low back pain: critical assessment of various scales. *Eur Spine J.* 2020;29:503–518.
- Shimoi K, Aida S. Pain measurements. *Chronic Pain Manag Gen Hosp Pract.* 2021:173–200.
- Bahreini M, Jalili M, Moradi-Lakeh M. A comparison of three self-report pain scales in adults with acute pain. *J Emerg Med.* 2015;48:10–18.
- Cho S, Kim YJ, Lee M, Woo JH, Lee HJ. Cut-off points between pain intensities of the postoperative pain using receiver operating characteristic (ROC) curves. *BMC Anesth.* 2021;21(1):29. <https://doi.org/10.1186/s12871-021-01245-5>.
- Firdous S, Berger A, Jehangir W, Fernandez C, Behm B, Mehta ZY, et al. How should we assess pain: do patients prefer a quantitative or qualitative scale? A study of patient preferences. *Am J Hosp Palliat Med.* 2021;38(4):383–390.
- Nimmaanrat S, Thepsuwan A, Tipchatyotin S, Jensen MP. Measuring pain intensity in older patients: a comparison of five scales. *BMC Geriatr.* 2024;24(1):556. <https://doi.org/10.1186/s12877-024-05127-6>.
- Bhatia A. Assessing and measuring pain in special populations: children, nonverbal, and cognitively impaired adults. *Monit Anesth Crit Car.* 2018:383.
- Kapstad H, Rokne B, Stavem K. Psychometric properties of the Brief Pain Inventory among patients with osteoarthritis undergoing total hip replacement surgery. *Health Qual Life Outcomes.* 2010;8:148. <https://doi.org/10.1186/1477-7525-8-148>.
- Abebe AB, Ayele TA, Miller J. Evaluating the validity of the Amharic Brief Pain Inventory among people with chronic primary musculoskeletal pain in Ethiopia. *BMC Musculoskelet Disord.* 2022;23(1):875.
- Zhang C, Qin L, Yin F, et al. Global, regional, and national burden and trends of low back pain in middle-aged adults: analysis of GBD 1990–2021 with projections to 2050. *BMC Musculoskelet Disord.* 2024;25:886. <https://doi.org/10.1186/s12891-024-08002-y>.
- GBD 2019: Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. <https://vizhub.healthdata.org/gbd-results/>.
- Hjermstad MJ, Fayers PM, Haugen DF, et al. Studies comparing numerical rating scales, verbal rating scales, and visual analogue scales for assessment of pain intensity in adults: a systematic literature review. *J Pain Symptom Manage.* 2011;41(6):1073–1093.
- Shafshak TS, Elnemr R. The visual analogue scale versus numerical rating scale in measuring pain severity and predicting disability in low back pain. *J Clin Rheumatol.* 2021;27(7):282–285.
- Begum MR, Hossain MA. Validity and reliability of visual analogue scale (VAS) for pain measurement. *J Med Case Rep Rev.* 2019;2(11).
- Kim EJ, Buschmann MT. Reliability and validity of the faces pain scale with older adults. *Int J Nurs Stud.* 2006;43(4):447–456.
- Thong IS, Jensen MP, Miró J, Tan G. The validity of pain intensity measures: what do the NRS, VAS, VRS, and FPS-R measure? *Scand J Pain.* 2018;18(1):99–107.
- Ferreira-Valente MA, Pais-Ribeiro JL, Jensen MP. Validity of four pain intensity rating scales. *Pain.* 2011;152(10):2399–2404.
- Miró J, Huguet A, Nieto R, Paredes S, Baos J. Evaluation of reliability, validity, and preference for a pain intensity scale for use with the elderly. *J Pain.* 2005;6(11):727–735.

24. Song CY, Lin SF, Huang CY, Wu HC, Chen CH, Hsieh CL. Validation of the brief pain inventory in patients with low back pain. *Spine*. 2016;41(15):E937–E942.
25. Hassett AL, Whibley D, Kratz A, Williams DA. Measures for the assessment of pain in adults. *Arthritis Care Res*. 2020.
26. Williams VS, Smith MY, Fehnel SE. The validity and utility of the BPI interference measures for evaluating the impact of osteoarthritic pain. *J Pain Symptom Manage*. 2006;31(1):48–57.
27. Jensen MP, Castarlenas E, Roy R, et al. The utility and construct validity of four measures of pain intensity: results from a university-based study in Spain. *Pain Med*. 2019;20(12):2411–2420.
28. Atisook R, Euasobhon P, Saengsanon A, Jensen MP. Validity and utility of four pain intensity measures for use in international research. *J Pain Res*. 2021;14:1129–1139. <https://doi.org/10.2147/JPR.S303305>.
29. Pathak A, Sharma S, Jensen MP. The utility and validity of pain intensity rating scales for use in developing countries. *Pain Rep*. 2018;3(5):e672. <https://doi.org/10.1097/PR9.0000000000000672>.
30. Safikhani S, Gries KS, Trudeau JJ, et al. Response scale selection in adult pain measures: results from a literature review. *J Patient Rep Outcomes*. 2018;2:1–9.
31. Terwee CB, Prinsen CA, Chiarotto A, et al. COSMIN methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. *Qual Life Res*. 2018;27:1159–1170.
32. Ojeda B, Salazar A, Dueñas M, Torres LM, Mico JA, Failde I. Assessing the construct validity and internal reliability of the screening tool test your memory in patients with chronic pain. *PLoS One*. 2016;11(4):e0154240.
33. Chiarotto A, Maxwell LJ, Ostelo RW, Boers M, Tugwell P, Terwee CB. Measurement properties of visual analogue scale, numeric rating scale, and pain severity subscale of the brief pain inventory in patients with low back pain: a systematic review. *J Pain*. 2019;20(3):245–263.
34. Dworkin RH, Burke LB, Gewandter JS, Smith SM. Reliability is necessary but far from sufficient: how might the validity of pain ratings be improved? *Clin J Pain*. 2015;31(7):599–602.
35. Leung JL, Twohig H, Muller S, et al. Test-retest reliability of pain VAS/NRS, stiffness VAS/NRS, HAQ-DI and mHAQ in polymyalgia rheumatica: an OMERACT study. *Semin Arthritis Rheum*. 2023;62:152239. <https://doi.org/10.1016/j.semarthrit.2023.152239>.
36. Kamper SJ, Apeldoorn AT, Chiarotto A, et al. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: cochrane systematic review and meta-analysis. *BMJ*. 2015;350.
37. Baamer RM, Iqbal A, Lobo DN, Knaggs RD, Levy NA, Toh LS. Utility of unidimensional and functional pain assessment tools in adult postoperative patients: a systematic review. *Br J Anaesth*. 2022;128(5):874–888.
38. Matteson EL, Maradit-Kremers H, Cimmino MA, et al. Patient-reported outcomes in polymyalgia rheumatica. *J Rheumatol*. 2012;39(4):795–803. <https://doi.org/10.3899/jrheum.110977>.
39. Karcioglu O, Topacoglu H, Dikme O, Dikme O. A systematic review of the pain scales in adults: which to use? *Am J Emerg Med*. 2018;36(4):707–714.
40. Copay AG, Eyberg B, Chung AS, Zurcher KS, Chutkan N, Spangehl MJ. Minimum clinically important difference: current trends in the orthopaedic literature, part II: lower extremity: a systematic review. *JBS Rev*. 2018;6(9):e2.
41. Froud R, Fawkes C, Foss J, Underwood M, Carnes D. Responsiveness, reliability, and minimally important and minimal detectable changes of 3 electronic patient-reported outcome measures for low back pain: validation study. *J Med Internet Res*. 2018;20(10):e272.
42. Chung AS, Copay AG, Olmscheid N, Campbell D, Walker JB, Chutkan N. Minimum clinically important difference: current trends in the spine literature. *Spine (Phila Pa 1976)*. 2017;42(14):1096–1105.