Painometer App as an Assessment Tool for Pain Intensity Measurement in Nonspecific Low Back Pain of Young Patients

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Abstract

Purpose: This study aimed to examine the practicality and dependability of the painometer application's Numeric Rating Scale (NRS) for evaluating pain intensity, in comparison to the conventional NRS method. **Objective:** This study aimed to assess the effectiveness of an Android application as a tool for measuring pain intensity in patients with low back pain**. Methodology:** This study employs a descriptive research approach, with a sample size consisting of 59 patients. **Analysis:** Interclass correlation coefficients were employed to assess the Painometer application's efficacy on an Android phone for detecting pain intensity. Additionally, the Bald Altman plot was utilized to evaluate the agreement between the two scales. **Conclusion:** The Painometer application demonstrates strong reliability and agreement among both individual testers and different testers. Therefore, it can effectively quantify the level of pain.
Keywords: NRS –Numerical rating scale, Painometer app, LBP- Low back pain

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Introduction

Adolescents often experience pain as a common issue [1]. An extensive assessment conducted in the early 20th century found that the median prevalence of chronic pain ranged from 11 to 38 percent [2]. Pain is a complex psychosocial reaction that arises from multiple sources in the context of musculoskeletal disorders [3]. In young adults, prolonged sitting or activities involving excessive forward bending can trigger back pain as a symptom. [4]. Low back pain is the second most prevalent type of pain experienced by young adults, with significant negative impacts on health and work/education attendance.[5] Pain is a subjective and individualized sensation, and the patient is the most reliable source of information regarding their own experience [6].

To establish an efficient strategy for managing chronic low back pain in an individual, it is essential to conduct a thorough and accurate assessment of the pain experienced [7].The American Pain Society recognized pain to be the fifth important sign of medical evaluation in the 1990s.[8] Several assessment measures have been created to measure the severity and impact of pain. Some of these instruments include the visual analogue scale (VAS), verbal rating scales (VRS), and numerical rating scales (NRS) [9]. Over the past few decades, researchers have demonstrated the effectiveness of information and communication technologies (ICTs) in managing pain in young adults. ([10.] Internet-based evaluation tools are easily accessible on smartphones used by young individuals, hence increasing the use of ICTs for assessing and treating people. These tools allow for real-time data capture with just a click of a button.

This study aims to evaluate the efficacy of an application called Painometer as a tool for assessing pain. The Painometer includes several validated pain intensity scales, such as the Faces Pain Scale–Revised (FPS-R), the numerical rating scale–11 (NRS-11), the Colored Analogue Scale (CAS), and the visual analogue scale (VAS), for

measuring pain intensity in patients with nonspecific low back pain. The study will compare the Painometer app scales i.e. NRS with its traditional/conventional scale only.

Methodology

The study employed a descriptive design, specifically utilizing a correlational approach.   The inclusion criteria for the test will include individuals who have had severe pain in the lower back for a minimum of 3 months. The age range considered will be between 16 to 25 years.   It was ensured that the patient had no previous history of cardiovascular problems. The patients were selected based on the aforementioned criteria.   The Oswestry Disability Index (ODI), Numerical Rating Scale (NRS), and an Android phone with the Painometer application (an electronic NRS) were utilized for the examination.   Patients presenting with disorders such as IVDP, spinal cord dysfunction, infectious diseases, osteoarthritis, and traumatic injuries were excluded from the study.

Procedure

This study received approval from the Department of Physiotherapy at Tantia University, Sri Ganganagar. Additionally, it was carried out at the Institute of Health Sciences, Department of Physiotherapy, Chandaka, Bhubaneswar. Initially, patients were chosen according to the established criteria. The selected patients were given a consent form to indicate their willingness to participate in the research. Both the standard Numeric Rating Scale (NRS) and the Painometer app NRS were utilized for evaluating the patient's pain assessment. The therapist provided the patient with a detailed explanation of the scale and its practical implementation. Following a practice session, the data was documented using both the conventional approach known as the Numeric Rating Scale (NRS) and the electronic NRS through the Painometer app. The objective of the demonstration and practice was to acquaint patients with the methodology of applying the scale, whether it be through traditional pen and paper or via a digital application.

The NRS, an 11-point numerical rating scale, measures the highest level of pain intensity on a range ranging from 0 (no pain) to 10 (extreme pain). Prior research has shown that the conventional version (vNRS-11) has exhibited favorable psychometric characteristics when employed with children aged 6 years or above [19–24].   The eNRS, a modified version of the NRS, was administered on an android phone. The phone displayed a body diagram with dots representing areas of pain. Participants could select the area of pain and then choose the number that best represented their pain intensity by tapping on the corresponding number at the top of the screen.
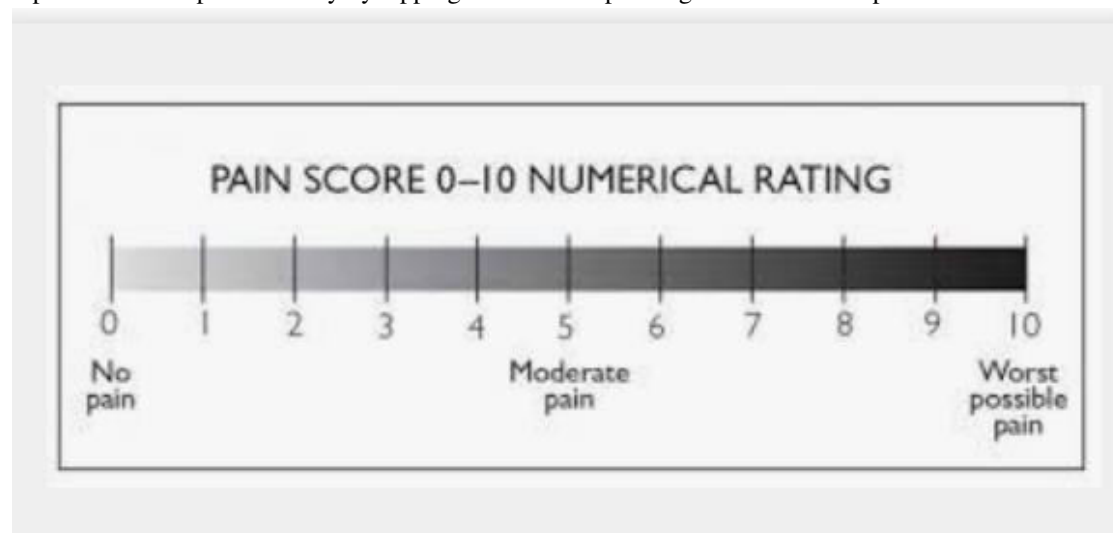

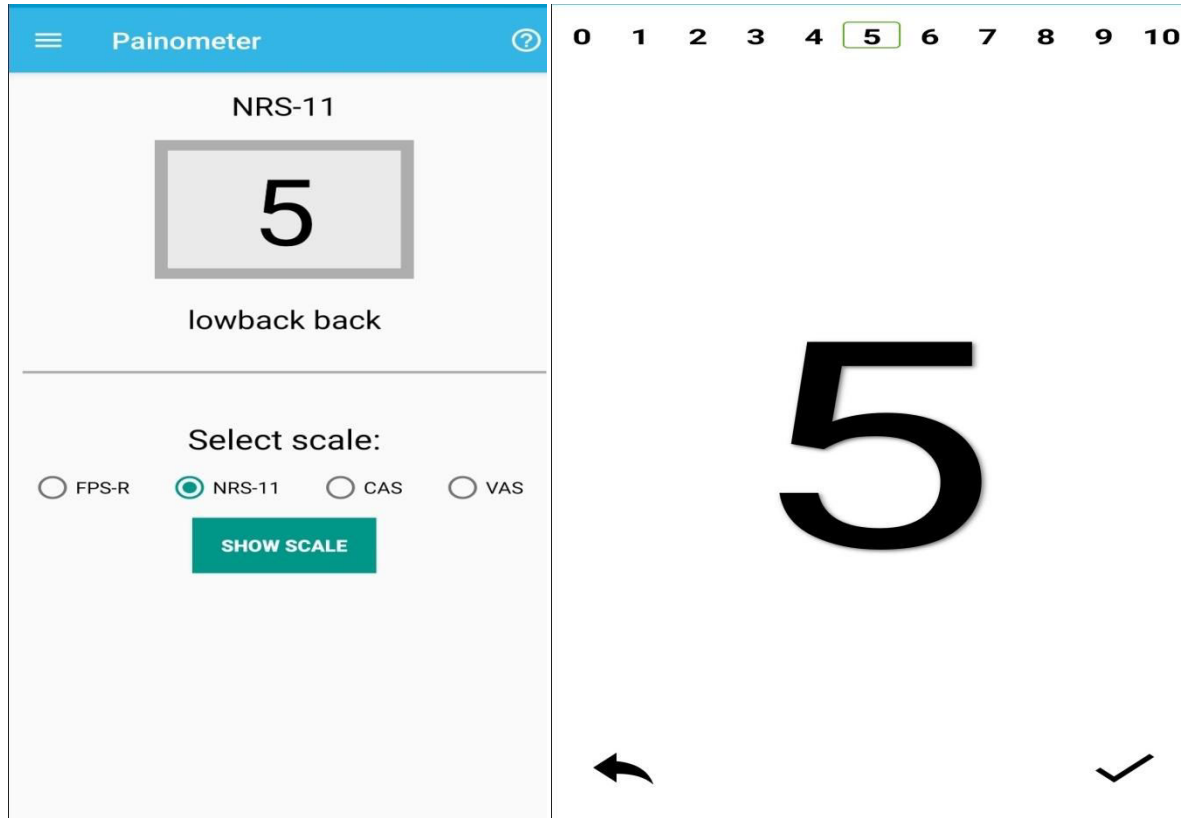**Figure 1. Conventional/traditional NRS-11 scale for measuring Pain Intensity**

Figure 2 Shows the NRS-11 scale of Painometer v2 application for measuring Pain Intensity

Data Analysis & Statistical methods

Descriptive data including mean pain intensity with standard deviations (SD) were calculated for both version of NRS scale (Traditional vs.Painometer).

Table 1

Participants Descriptive statistics	
Participants (N)	59
Mean age(SD)	19.9 ± 2.19
Gender N(%)	
Male	44.1
Female	55.9
Pain status	
Mean pain NRS (SD)	4.4 ± 1.8
Mean Pain Painometer NRS(SD)	4.4 ± 2

To determine whether report provided by Painometer version of the NRS scale is concordant with those provided by the traditional NRS we used the Bland–Altman method.

Many studies have used Bland–Altmanmethodto determine agreement between reports from differentpediatric pain intensity scales. [8,23]. The Bland–Altman method uses a scatter diagram torepresent the difference between the scores reported byeach subject with two different scales or methods andcompares it with the average of these two scores. Weconducted analyses to determine the agreementbetween the scores reported on vNRS-11 &Painometer NRS-11.

Thus the maximum limit of agreement for comparision between VNRS & painometer NRS was ± 4.
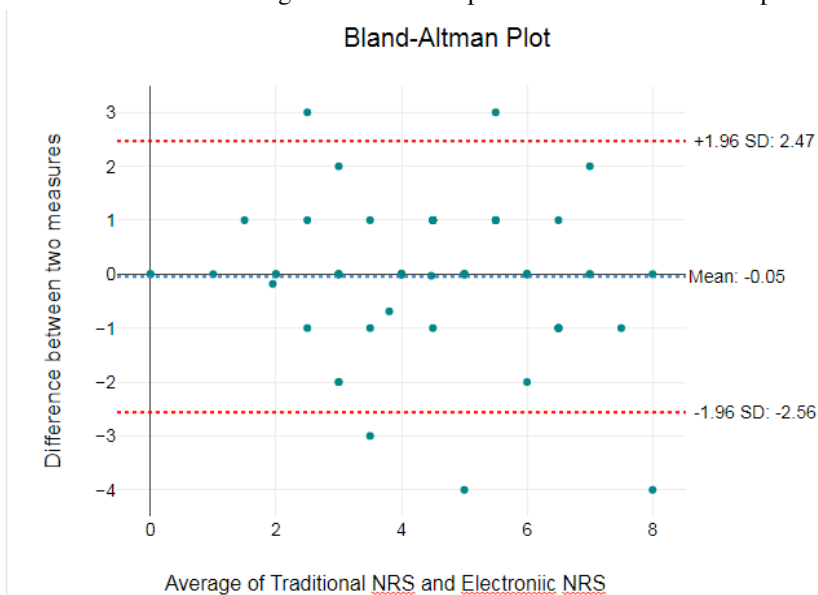
Graph 1 :Bland and Altman graphs showing Aggrement between traditional NRS vs Painometer NRS

Interclass correlation coefficient was done to find out the reliability of the scales.

Results

59 LBA subjects were recruited for this study inwhich 24 male and 35 female. The table 1 summarizes the descriptive information of the Participants.The main aim of this study was to find out whether Painometer app can be use for pain assessment in low back pain patient by testing its reliability and feasibility with traditional version. The interclass correlation between the traditional NRS and Painometer NRS was 0.7789 which signifies good reliability and further found agreement between the reports provided by the traditional NRS and painometer NRS when taken into account keeping results at 95% confidence interval.

Discussion

The study was conducted to provide important informationregarding the Painometer app as an assessment tool for assessing pain intensity in young adults with low back pain. Earlier studies have been conducted in a Paediatric group of people checking the feasibility of electronic versions of four scales widely used to measurepediatric pain intensity: the Numerical Rating Scale(NRS-11), the Faces Pain Scale-Revised (FPS-R), themechanical visual analogue scale (mVAS), and the ColoredAnalogue Scale (CAS). Previous studies' results also provided evidenceof the agreement between the scores reportedby traditional and electronic versions of the scales thatare included in Painometer.[17]

The agreement between traditional and painometer NRS was found statistically significant stating into a 95% confidence interval as hypothesized, stating the scales can be interchangeably used. This study's results align with reports provided by Castarlenaset al. [10] who found an agreement between reportsprovided by the verbally administered NRS-11 and itselectronic version.

The limitation will be taken into accountby the broader scale population in future intended studies considering the assessment of pain intensity twice before assessment after recovery to estimate the proper validity of the scales. Further, a larger group of subjects should be recruited to prove the same as it may not be a representation of young adults suffering from low back pain as the sedentary lifestyle and more exposure to screen time is increasing leading to an increase in musculoskeletal issues.

The demo made the noting down of measurement easier so practice sessions should be given before using an electronic version of any assessment scale.The study advancesour knowledge by giving specific additional informationon the validity and the concordance of the reportsobtained with electronic versions of four of the mostwidely used scales to assess pain intensity.Furthermore, the results of our study demonstrate thatpain intensity reports provided by Painometer are validand that there is an agreement between the reports providedby traditional and electronic versions of the 0–10Numerical Rating Scale at 95% CI.

This study shows that digital application can save real time assessment for researcher, clinicians working with pain reports for low back pain.

Painometeris a mobile application that can help to assesspeople with pain. These results are in line with those of recent studies reporting on the agreement of the electronicversion of the NRS-11 [8] and the usability ofPainometer [17].The reliability of the scale was also found out basing Interclass coreelation coefficient for traditional and Painometer NRS.

Reference

1. Anna Huguet, Jordi Miró, The Severity of Chronic Pediatric Pain: An Epidemiological Study, The Journal of Pain,Volume 9, Issue 3,2008,Pages 226-236,ISSN 1526-5900,

2. King S, Chambers CT, Huguet A, MacNevin RC, McGrath PJ, Parker L, MacDonald AJ. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. Pain. 2011 Dec;152(12):2729-2738.

3. Mannion AF, Balagué F, Pellisé F, Cedraschi C. Pain measurement in patients with low back pain. Nat Clin Pract Rheumatol. 2007 Nov;3(11):610-8.

4. Lipika Sahu, Bibhuti Sarkar, etal .Effect of Muscle Energy Technique along with Segmental Stabilization Exercise on Pain, Range of Motion and Function in subjects with Chronic Mechanical Low Back Pain A Randomized Clinical Trial.IJAR,Feb 2021,Issue 1, Vol 8

5. Priyadarshini Mishra, J Ayyapan. Reliability and Sensitivity of Shuttle Walk Test inChronic Mechanical Low Back Pain Patients.Indian Journal of Physiotherapy & Occupational Therapy. July-September 2015, Vol. 9, No. 3

6. Charette SL and Ferrell BA (2007) Rheumatic diseases in the elderly: assessing chronic pain. Rheum Dis Clin North Am 33: 109−122

7. Castarlenas E,Sanchez-Rodriguez E,de la vega R,Roset R.Miro J.Agreement between verbal and electronic version of the numerical rating scale (NRS-11) when used to assess pain intensity in adolescents.Clin J Pain 2015:31:229-34

8. Stinson JN,Jibb L ,New information and communication technologies for pain,In:McGrath PJ,Stevens BJ,Walker SM,Zempsky WT,eds.Oxford Textbook of Paediatric Pain.Oxford:University Press:2013:569-77

9. Waddell G, Somerville D, Henderson I, *et al. (1992)* Objective clinical evaluation of   physicalimpairment in chronic low back pain. *Spine*

10. Bombardier C (2000) Outcome assessments in the evaluation of treatment of spinal disorders: summary and general recommendations. Spine 25: 3100−3103

11. Mannion AF et al. (2005) Outcome assessment in low back pain: how low can you go? Eur Spine J 14: 1014−1026

12. Ferrer M et al. (2006) Validation of a minimum outcome core set in the evaluation of patients with back pain. Spine 31: 1372−1379; discussion 1380

13. Pengel LH et al. (2004) Responsiveness of pain, disability, and physical impairment outcomes in patients with low back pain. Spine 29: 879−883

14. Walsh TL et al. (2003) Is a condition-specific instrument for patients with low back pain/leg symptoms really necessary? The responsiveness of the Oswestry Disability Index, MODEMS, and the SF-36. Spine 28: 607−615

15. IASP Task Force on Taxonomy (1994) Classification of Chronic Pain: Descriptions of Chronic Pain Syndromes and Definitions of Pain Terms, edn 2. Seattle, WA: IASP Press

16. .Desbiens NA et al., for the SUPPORT Investigators. Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment (1996) Pain and satisfaction with pain control in seriously ill hospitalized adults: findings from the SUPPORT research investigations. Crit Care Med 24: 1953−1961

17. Harris IA et al. (2007) Factors associated with back pain after physical injury: a survey of consecutive major trauma patients. Spine 32: 1561−1565

18. Lund I et al. (2005) Gender differences in electrical pain threshold responses to transcutaneous electrical nerve stimulation (TENS). Neurosci Lett 375: 75−80

19. Herr KA et al. (2004) Pain intensity assessment in older adults: use of experimental pain to compare psychometric properties and usability of selected pain scales with younger adults. Clin J Pain 20: 207−219

20. Schierhout GH and Myers JE (1996) Is self-reported pain an appropriate outcome measure in ergonomicepidemiologic studies of work-related musculoskeletal disorders? Am J Ind Med 30: 93−98

21. Von Korff M et al. (2000) Assessing global pain severity by self-report in clinical and health services research. Spine 25: 3140−3151

22. Zanoli G et al. (2000) Lessons learned searching for a HRQoL instrument to assess the results of treatment in persons with lumbar disorders. Spine 25: 3178−3185

23. McGuire DB (1999) Measuring pain. In Instruments for Health-Care Research 528−561 (Eds Frank-Stromborg M and Olsen S) Boston: Jones and Bartlett

24. Ogon M et al. (1996) Chronic low back pain measurement with visual analogue scales in different settings. Pain 64: 425−428 27 Hägg O et al. (2003) The clinical importance of changes in outcome scores after treatment for chronic low back pain. Eur Spine J 12: 12−20

25. John Bedson* , Jonathon Hill, David White, Ying Chen,etal(2019) Development and validation of a pain monitoring app for patients with musculoskeletal conditions (The Keele pain recorder feasibility study)

26. Robert N Jamison1,2, Anna Mei (2016)Longitudinal trial of a smartphone pain application for chronic pain patients: Predictors of compliance and satisfaction

27. Elisabet S_anchez-Rodr_ıguez, MSc,Roc_ıo de la Vega, PhD etal (2015),An App for the Assessment of Pain Intensity:Validity Properties and Agreement of Pain Reports When Used with Young People

28. Roc_ıo de la Vega, Roman Roset etal(2014) Development and Testing of Painometer: A Smartphone App to Assess Pain Intensity