



Pain Assessment Scales in Children: A Comparative Narrative Review of Existing Tools

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ABSTRACT

Aims: The aim of this study was to examine six different assessment tools for pain in children. The study sought to determine whether there were differences clinical usage among the various scales. Additionally, the study aimed to identify if any of the scales demonstrated superior sensitivity compared to the others.

Method and Materials: A narrative review of currently published studies was performed following standard guidelines. Online databases PUBMED and Google Scholar were searched for systematic reviews published before January 2024. The search terms initially included pain rating scales, pain measurement, pain intensity. Papers were examined for abstract relativity before being included. Ultimately, a total of 6 articles were selected for the final analysis.

Findings: The Wong-Baker Faces Pain Scale and Faces Pain Scale (FPS) were found to be the most frequently mentioned as sensitive, valid, and reliable tools in various clinical scenarios. In terms of clinical application, the Oucher Scale and Poker Chip Pain Scale have not been utilized for chronic pain assessment, whereas the other four measures have been employed in different contexts including acute, chronic, and post-operative pain.

Conclusion: All six assessed instruments yielded noteworthy favorable outcomes when assessing acute pain in children aged three and above. However, their sensitivity, validity, and reliability varied.

Keywords: Pain Assessment, Pain Perception, Pain Scales, Pediatrics, Children

Introduction

Measuring pain in children is of paramount importance due to its impact on their well-being, but it also poses significant challenges. Untreated pain can have detrimental effects on children, including anxiety, difficulty sleeping, helplessness, and hopelessness^[1]. A study conducted in Norway found that physicians significantly underestimated pain in pediatric patients, and only 42.1% of children with severe pain received pain relief^[2]. The difficulty of pain measurement in children lies in accurately assessing and quantifying the subjective experience of pain in non-verbal or preverbal children, as it often relies on self-report, which may not be feasible in this population^[3]. While pain assessment can be done through observer report or behavioral observation, these methods have limitations and often differ from the child's self-report ^[4].

Observers, such as parents, tend to either overestimate or underestimate the pain experienced by children, and their judgments are greatly influenced by their own personal traits and the surrounding circumstances when assessing children's pain.^[5, 6, 7]. Another limitation of accurate pain measurement in children is the frequent non-specific sign of pain: crying. Behaviors linked to child discomfort are commonly witnessed in various emotional conditions, including crying as a sign of distress or sorrow.^[4] Additionally, different measurement techniques and tools for assessing pain in children have shown great variation, making standardization and consistency challenging ^[3, 4]. While the search results provide valuable insights into the use of pain assessment tools in children for specific medical conditions, a comprehensive review of different pain assessment tools across

various pediatric populations was conducted to introduce the most commonly used of these tools and compare their sensitivity and determine in which clinical settings each one is preferred to be used. The self-report provided by the patient stands as the utmost precise and dependable evidence of pain's presence and its level of intensity. This remains valid for patients across all age groups, irrespective of any communication or cognitive impairments^[8]. In the absence of objective criteria, the healthcare provider relies on the patient to provide crucial details regarding the location, nature, and intensity of the pain. While doctors often question the severity mentioned by the patient and rely on their own judgments, the significance of the patients' account regarding the specific location and characteristics of the discomfort has been validated both theoretically and through regular clinical practice.^[8]

Pain scores are widely acknowledged as a precise and dependable means of evaluating a patient's pain level and their response to pain management interventions ^[8]. As some of the most commonly used pain assessment scales in pediatrics are Wong-Baker FACES Pain Rating Scale, Faces Pain Scale-Revised (FPS-R), Numeric Rating Scale (NRS), Visual Analog Scale (VAS), Oucher Pain Scale, Poker Chip Pain Scale, the aim of this review study is to provide a comprehensive review of the characteristics of these scales.

Method and Materials

A comprehensive search was conducted on PubMed and Google Scholar to gather all relevant studies on pain assessment tools in children with more focus on those that have compared at least two modalities. Studies published electronically until the end of January 2024 were considered. The search utilized keywords such as 'pain assessment', 'pain perception', 'pain scales', 'pediatrics', 'children pain assessment'. Initially, a total of 246 articles were identified, including 23 systematic reviews. After removing duplicates and irrelevant studies, a more detailed analysis of the abstracts six systematic reviews were included in the study. The main perspective of which the studies were

compared was to assess the sensitivity and clinical usage of the scales.

Findings

A total of six systematic reviews were incorporated in the analysis, as shown in Table 1. These studies were conducted in various countries. The sample size of the review studies ranged from 6 to 127 articles and the most frequent tools studied were the Wong-Baker Faces Pain Scale and FPS. Among the tools studied Wong-Baker Faces Pain Scale and FPS were the most commonly reported as sensitive and valid and reliable in different clinical situations. It is worth noting that all six studies included the comparison of at least two measures of self-reported pain assessment tools. In regards of clinical usage, the Oucher Scale and Poker Chip Pain Scale have not been used to assess chronic pain, whilst other 4 measures have been used in different situations such as acute, chronic and post-operative pain. Data extracted from the review article mostly supports the usage of these tools in acute conditions such as Emergency Department and further evaluation is needed regarding their use in chronic and post-operative situations. The study provides limited information about the optimum age range in which any of the tools should be used, mostly because of the heterogeneity of the articles studied. Altogether very limited information is provided on the effective scales to be used under the age of three. In this study the following scales were reviews.

The Wong-Baker FACES Pain Rating Scale

The Wong-Baker FACES Pain Rating Scale is a self-reporting pain assessment tool that combines pictures and numbers to enable the user to rate pain. It can be used for children over the age of 3 and for adults ^[9]. The Wong-Baker FACES Pain Rating Scale represents a scale of 6 hand-drawn faces arranged horizontally depicting a spectrum of emotions ranging from a smiling face indicating no pain on the left to a crying face representing the worst level of pain on the right ^[10]. The scale is easy to understand and manipulate, making it one of the most commonly used pain

measurement scales in children. The FACES scale is frequently utilized for self-reporting acute pain as it has been documented in various studies [5,7,11,12]. Less commonly, it has been reported to have applications in postoperative pain^[13, 7] or chronic pain^[14,7].



Fig 1) The Wong-Baker FACES Pain Rating Scale.

The Faces Pain Scale-Revised (FPS-R)

The Faces Pain Scale-Revised (FPS-R) is commonly used in clinical settings, particularly in pediatric pain assessment and cross-cultural research.^[15,10] The FPS-R consists of six facial expressions ranging from "no pain" to "very much pain." Children are requested to indicate the face that accurately represents the level of discomfort they are experiencing. ^[15]. It can be used for children between the ages of 3 to 19^[7]. The FPS-R is frequently utilized for self-reporting acute pain as it has been documented in various studies^[7,16,17,18,19] Unlike the Wong-Baker Scale, it has been reported to have more applications in postoperative pain ^[7, 20, 21] and chronic pain ^[7, 16, 22].

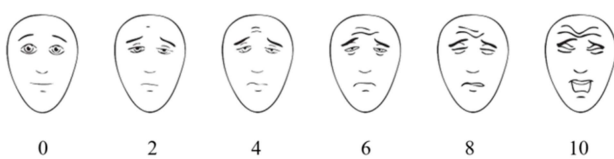


Fig 2) Faces Pain Scale-Revised.

Numeric Rating Scale (NRS)

The numeric rating scale (NRS) is a widely validated 11-point numeric scale that is applicable to a diverse range of patients. NRS data can be easily recorded, intuitively understood, and fulfill the necessary regulatory standards for pain evaluation and documentation. It requires the patient to rate their pain on a scale from 0 to 10, with 0 being no pain and 10 being the worst pain imaginable^[7-8,10,23-24]. It can be used for children between the ages of 3 to 20 ^[7, 23].

Unlike the 2 previous scales, The NRS is frequently utilized for self-reporting chronic pain ^[7, 25, 26] as it has been documented in various studies ^[7]. It has been reported to have some applications in postoperative pain ^[7, 27] and acute pain ^[7, 25].

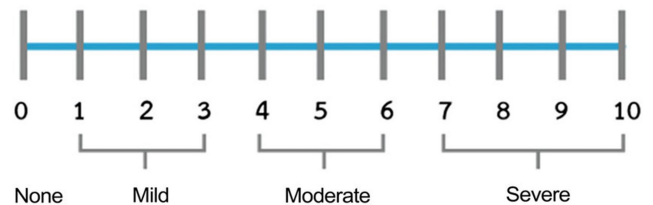


Fig 3) Numeric Rating Scale (NRS).

Visual Analog Scale (VAS)

A Visual Analog Scale (VAS) is a measurement instrument used in healthcare to quantify subjective experiences or attitudes, such as pain intensity, or patient satisfaction. It typically consists of a straight line with defined endpoints, and the individual being assessed marks a point on the line to indicate their level of the experience being measured. The position of the mark is then measured and scored. For example, in the context of pain, the VAS is a 10 cm line with "no pain" at one end and "worst possible pain" at the other, and the patient marks their level of pain on the line, which is then measured and recorded. The VAS is a simple and frequently used method to measure subjective experiences in healthcare settings ^[28, 29]. It can be used for children between the ages of 2 to 19. ^[7, 30]. The VAS is frequently utilized for self-reporting acute pain ^[7, 31, 32] as it has been documented in various studies ^[7]. It has been reported to have some applications in postoperative pain ^[7, 33] and chronic pain ^[7, 34].

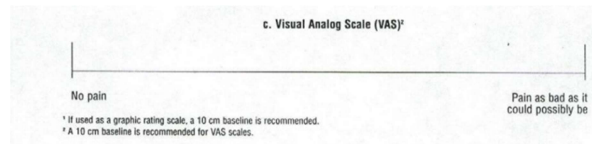


Fig 4) Visual Analog Scale (VAS).

The Oucher Pain Scale

The Oucher pain scale is a self-report pain assessment tool that can be administered in two ways: numerically or using photographs

of facial expressions of real children experiencing pain. The scale is used to measure the intensity of pain in children, and it has been validated for use in different ethnic groups and populations. The numerical scale consists of scores ranging from 0 (no pain) to 100 (the most severe pain) [35, 36, 37]. It can be used for children between the ages of 3 to 18 [7, 36]. Unlike all the previous scales, it has been not been reported to have applications in chronic pain [7] and it is mostly used to assess acute pain [7, 38, 39] and in some cases postoperative pain [7, 39, 40].

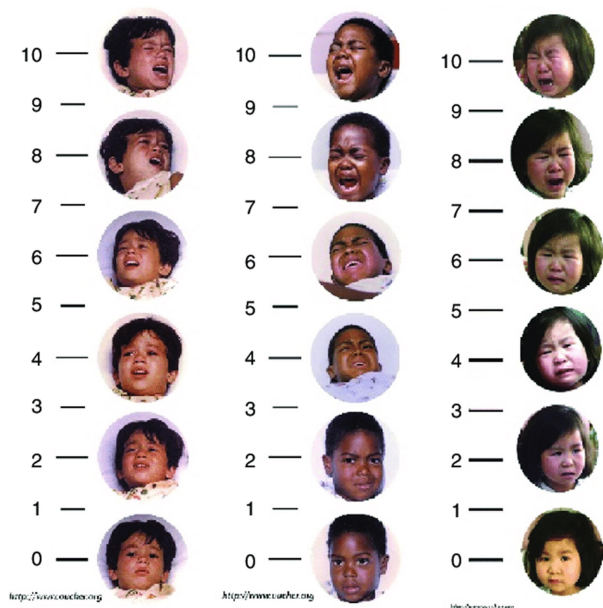


Fig 5) The Oucher Scale

The Poker Chip Pain Scale

The Poker Chip Pain Scale is a method used to assess and quantify pain, particularly in children. It involves the use of red poker chips to help children express the intensity of their pain. The scale typically uses 4 red poker chips, with each chip representing a different level of pain. For example, one chip may represent a little bit of hurt, while all four chips may represent the most hurt the child can have. The child is asked to select the number of chips that best represent the amount of pain they are experiencing. [41]. It can be used for children between the ages of 3 to 16 [7, 41]. Similar to the Oucher Scale, it has been not been reported to have applications in chronic pain [7] and it is mostly used to assess acute pain [7, 41, 42] and in some cases postoperative pain [7, 41, 42].

Discussion

The establishment of a reliable and valid pain assessment is crucial in order to deliver efficient clinical care to young individuals who are going through acute or chronic pain. Although the complex nature of pain experiences in children and adolescents is widely recognized, pain intensity continues to be the main determining factor in making decisions related to pain management [45, 46]. Accurate pain intensity measurement necessitates the use of valid and reliable tools. [30]. The aim of this study was to conduct a thorough comparison of six different scales employed for evaluating pain in children. The objective was to identify the tool that exhibits the highest level of sensitivity and determine the specific clinical situations in which each tool is most applicable. The information derived from this review article primarily confirms the effectiveness of these tools in acute situations. Nevertheless, further evaluation is necessary to assess and confirm their suitability in alternative clinical contexts, such as chronic or post-procedure pain. The research provides limited perspectives on the optimal age group for utilizing any of these scales. In general, there is a lack of data regarding the appropriate scales to use for children below the age of 3 [4]. There are some limitations to consider in this study. Firstly, the age range of children varied across the reviewed articles, which may have influenced the findings. Additionally, there was a discrepancy in the number of articles analyzed and reviewed for each tool. Only two of the selected studies compared all six tools, while the remaining studies only included some of them. It is important to note that although other pain assessment scales were reviewed in the chosen articles, they were not the focus of our study.

Conclusions

All 6 reviewed tools had significant positive results in evaluating acute pain in children above 3 years of age, but their sensitivity, validity, and reliability were different. There is still a need for more comprehensive studies to provide stronger evidence on the best way to assess pain in children.

Table 1) Summary of the review articles

Study	Sample Size	Objectives	Findings	Notes, Considerations
Adrienne YL Chan et al. [43]	34 reviews and assessing an overall of 22 pain assessment tools including FACES and FPS-R	To systematically identify pain assessment instruments presently utilized in pediatric palliative care, and evaluate their psychometric properties and feasibility, and make recommendations for clinical practice	Out of all the scales assessed including FACES and FPS-R, The FPS-R is suggested for self-assessment due to its ability to balance feasibility and psychometric properties	In terms of observational tools, the FLACC scale/FLACC Revised and PPP are recommended for their respective age groups.
Birnie KA et al. [7]	80 reviews and assessing 8 different pain assessment tools. (including the NRS-11, Color Analogue Scale (CAS), (FPS-R), Oucher, Photographic and Numeric scales, Visual Analogue Scale, and Wong-Baker FACES Pain Rating Scale (FACES), Poker Chip Pain Scale	To assess the validity and reliability of single-item self-report pain intensity measures in children aged 3 to 18 years. Additionally, the researchers aimed to provide evidence-based recommendations for measuring acute, postoperative, and chronic pain in children and adolescents.	According to the evidence at hand, the NRS-11, FPS-R, and CAS were highly recommended for individuals to self-report their acute pain. However, when it comes to self-report measures for postoperative and chronic pain, only limited recommendations could be made.	It is worth noting that no specific measures were recommended for children under the age of 6, indicating the necessity for further improvement in measurement techniques within this age group
Tomlinson D et al. [10]	127 reviews and assessing 4 pain assessment tools including Faces Pain Scale (FPS) (scored 0–6); Faces Pain Scale–Revised (FPS-R) (0–10); Oucher pain scale (0–10); and Wong-Baker Faces Pain Rating Scale (WBFPRS) (0–10)	to provide a concise and methodical analysis of pain intensity self-report scales for children, this study aims to summarize and systematically review the most frequently utilized scales. The primary objectives are to assess the reliability and validity of these scales and to compare their preference and utility.	All four pain scales, based on psychometric data, were determined to have sufficient support. Among the options, children showed a preference for the WBFPRS. However, a drawback of the WBFPRS is the potential confusion between pain intensity and affect due to the use of smiling and crying anchor faces.	There is no evidence to support switching from one faces scale to another for clinical purposes when one of the scales is already being used. However, for research purposes, the FPS-R has been suggested due to its usefulness and psychometric characteristics. Limited data is available for children under the age of 5.
Bai J et al. [35]	6 reviews and assessing 6 pain assessment tools including FACES and Oucher Scale	To systematically evaluate pain measurement scales used in Chinese children to assess the psychometric properties of available pain assessment tools.	The Asian Version of Oucher Scale and FACES demonstrated acceptable to good psychometric qualities.	The psychometric qualities of the FLACC, COMFORT-Behavior Scale, and PASPI were found to be highly satisfactory when used with Chinese children. However, the NFCS exhibited unsatisfactory psychometric qualities.
Nagarwal, P. et al. [44]	A narrative review and comprehensive explanation of three components of pain assessment in children are self-report (including The Wong-Baker FACES Pain Rating Scale, (FPS-R), (NRS), (VAS), The Oucher Pain Scale, The Poker Chip Pain Scale.) , behavioral observation and physiological measures.	To evaluate different approaches and instruments for assessing pain in children during dental procedures	Among the various scales examined, the Wong-Bakers facial pain rating scale (WB-FPS) is widely regarded as the most superior option due to its user-friendly nature for the operator and its ability to be effortlessly replicated. Furthermore, it is suitable for implementation in	FLACC is the most widely accepted tool for assessing behavioral pain in non-verbal and cognitively impaired patients. These assessments are particularly valuable in understanding the pain experienced by individuals who are unable to communicate verbally.

Castarlenas E. et al. [23]	16 reviews and assessing 2 pain assessment tools NRS and VAS	to review this research and summarize what is known regarding the reliability and validity of the NRS-11 as a self-report measure of pediatric pain intensity and compare it to VAS results as the reference	children as young as 3 years old. The NRS-11 has been found to be reliable and valid for use with children and adolescents, as supported by the findings of reviewed studies.	Further investigation is required to address certain unresolved inquiries and concerns. These include determining the minimum age at which children can provide accurate assessments of pain intensity and establishing a consensus on administration instructions, specifically regarding the descriptors used for the upper anchor.
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Authors' Contribution

ShB is the primary executor of this project. Recently, she completed her MD degree from Tehran University of Medical Science.

Conflict of Interests

The author states no conflicts of interest in this work.

Ethical Permission

This study protocol was approved by the Ethics Committee of Tehran University of Medical Sciences applying Helsinki Declarations.

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