



OPTIMIZATION AND PERSONALIZATION OF SELF-REPORT PAIN INTENSITY ASSESSMENT TOOLS IN PEDIATRIC AND ADOLESCENT POPULATIONS



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INTRODUCTION

Accurate pain assessment in pediatric populations is indispensable due to the potential adverse consequences associated with untreated pain. Despite the common utilization of self-report tools, children may face difficulties in effectively communicating their pain due to age, cognitive ability, or developmental status. This work evaluated and compared correlation and concordance of commonly used pediatric pain scales such as the Color Analog Scale, Faces Pain Scale-Revised, Numeric Rating Scale, Visual Analog Scale, and Wong-Baker FACES Pain Rating Scale. Furthermore, the level of agreement and utility of electronic delivery of these pain scales was assessed. Overall, this review may enable more personalized pain management in pediatric populations.

METHODS

Objective: Provide an updated literature review comparing pediatric pain assessment tools and assessing the viability of electronic delivery of such tools.

Databases: PubMed/Medline, EMBASE, and Google Scholar.

Inclusion Criteria: Explicit comparisons of 2+ self-report pain scales, English language, human participants between the ages of 3 and 18, published between June 2004 and January 2022.

- Case reports, editorials, letters, commentaries, overviews, conference abstracts, and reviews or meta-analyses were excluded.
- References of selected articles from database search were also screened via the “Cited by” and “Related Articles” functions offered by Google Scholar.

RESULTS

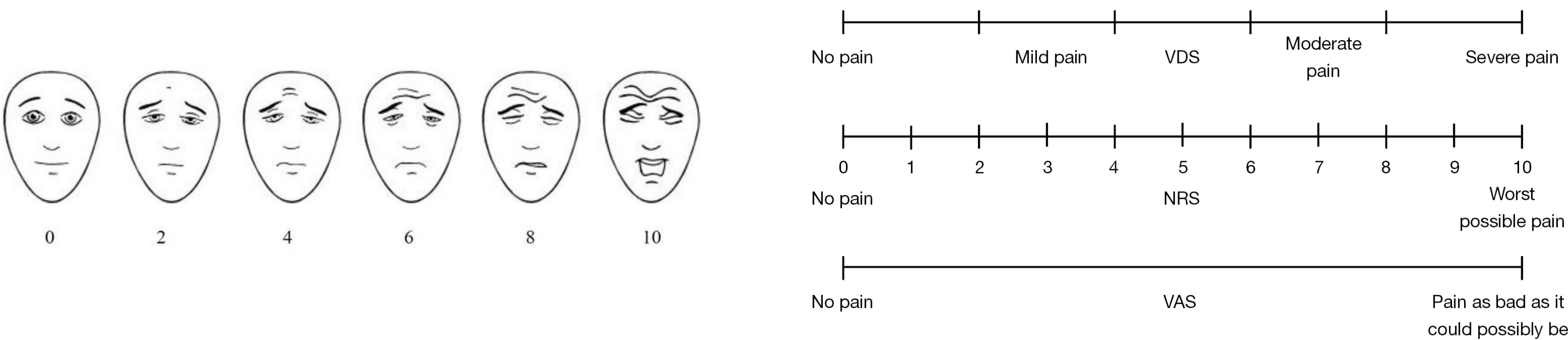
TABLE 1. Reported Correlations Between Pain Rating Scales in Children

Pain Scales	Reference	Statistics	Age															
			4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
CAS & VAS	Sanchez-Rodriguez et al., 2012	r = 0.89			•	•	•											
	Le May et al., 2018	r = 0.92			•	•	•	•	•	•	•	•	•	•	•	•	•	
	Bailey et al., 2007	95% CI Agreement						•	•	•	•	•	•	•	•	•	•	
CAS & FPS	Perrott et al., 2004	r = > 0.84		•	•	•	•	•										
	Perrott et al., 2004	r = 0.91								•	•	•	•	•	•			
	Subhashini et al. 2008	r = > 0.80			•	•	•	•	•	•	•							
	Goodenough et al., 2005	r = 0.75	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
CAS & FPS-R	Sanchez-Rodriguez et al., 2012	r = 0.71			•	•	•											
	Tsze et al., 2013	r = 0.85	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
CAS & NRS-11	Sanchez-Rodriguez et al., 2012	r = 0.79			•	•	•											
FPS-R & NRS-11	Sanchez-Rodriguez et al., 2012	r = 0.75			•	•	•											
	Tsze et al., 2018	r = 0.92						•	•	•	•	•	•	•	•	•	•	
FPS-R & VAS	Newman et al., 2005	r = 0.67	•	•	•	•	•	•	•	•	•	•	•	•	•			
	Sanchez-Rodriguez et al., 2012	r = 0.73			•	•	•											
FPS-R & FACES	Newman et al., 2005	r = 0.79	•	•	•	•	•	•	•	•	•	•	•	•	•			
VAS & NRS-11	Sanchez-Rodriguez et al., 2012	r = 0.74			•	•	•											
	Myrvik et al., 2016	r = 0.88						•	•	•	•	•	•	•	•	•	•	
VAS & FACES	Newman et al., 2005	r = 0.70	•	•	•	•	•	•	•	•	•	•	•	•	•			
	Garra et al., 2009	ρ > 0.9								•	•	•	•	•	•			

r – Pearson correlations, ρ – Spearman correlations, CI – Confidence Interval

CAS – Color Analog Scale, FPS – Faces Pain Scale, FPS-R – Faces Pain Scale-Revised, NRS-11 – Numeric Rating Scale, VAS – Visual Analog Scale, FACES – Wong-Baker FACES Pain Rating Scale

FIGURE 1. Examples of Commonly Used Pediatric Pain Assessment Tools



Left – Example of the Faces Pain Scales-Revised (FPS-R). Right – Combined examples of the Numeric Rating Scale (NRS-11)(middle) and Visual Analog Scale (VAS). These assessment tools are often displayed together. The Verbal Descriptor Scale (VDS) is also commonly displayed with the NRS-11 and VAS but was outside the scope of this review.

RESULTS

- Many common pediatric pain scales demonstrated strong correlations with each other.
- Scales that include facial features and/or colors possessed strongest correlations in pediatric populations.
- Concordance of scales may depend on the patient age group and individual scale characteristics, limiting interchangeability.
- Electronic versions of pain scales have been found to be valid and have shown agreement with traditional versions in some studies.
- Pediatric populations prefer electronic delivery of pain assessment tools when compared to traditional delivery modalities.

CONCLUSIONS

- Visual aids such as faces and colors in pain rating scales show strong correlations with other pain scales; further research is needed to explore the influence of fine facial features and the number of faces in these tools.
- Consistently using the same pain assessment tool with individual patients can enhance clinicians' understanding of their pain.
- Electronic delivery of visual pain scales can improve accuracy and ease of assessment for diverse pediatric populations.
- **Development of a universal, emoji-based, electronic pain scale with familiar faces and fine features could be a cost-effective, customizable, and inclusive solution for the future of pain assessment in children.**