

A comparison of three self-report pain scales in Sri Lankan children

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Abstract

Background: Many self-report pain scales are available to assess the intensity of pain reported by children. There is hardly any research to compare their validity in Sri Lankan children.

Objective: To compare 3 self-report pain scales viz. FACES Pain Scale (FPS), Numeric Pain Rating Scale (NRS) and Verbal Pain Rating Scale (VRS).

Method: The study population comprised children 4-12 years old who presented to the paediatric ward and clinic of Ampara General Hospital with a complaint of pain from July 2012 to June 2013. Each child graded the pain intensity on the three pain scales introduced in random order by a trained investigator and rated the most easily understood scale. The investigator was asked to rate the most easily explainable scale in the individual case. The scales were ranked according to internal consistency, child preference and investigator preference.

Results: There were 152 children aged between 4-12 years who presented to the paediatric ward and clinic of Ampara General Hospital with a complaint of pain during the study period. The correlations between FPS/NRS, FPS/VRS and NRS/VRS were 0.82, 0.73 and 0.73 respectively, all with $p < 0.001$, indicating moderate to high correlation and measuring the same construct. The Cronbach alpha was 0.9021 indicating that the internal consistency of these three scales was very high. The Bland-Altman analysis showed limits of agreement of FPS/ NRS, FPS/VRS and NRS/VRS to be -3.2 to +3.1, -3.3 to +4.4 and -3.3 to +4.4 respectively. There was no significant difference between young (4-7) and old (8-12) age group children rating their pain within and between the

three pain scales. The FPS ranked best followed by the VRS and NRS.

Conclusions: The reliability of all three pain scales in terms of correlation and internal consistency is moderate to high in Sri Lankan children. The FPS is recommended since it is easily understood by children and because of its easy administration and favourable internal consistency.

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Introduction

Acute pain is one of the most common adverse stimuli experienced by children, occurring as a result of injury, illness, and medical procedures. It is associated with increased anxiety, avoidance, somatic symptoms, and increased parental distress¹. Numerous pain scales are currently available to measure pain in children. Pain can be measured by self-report (what children say), biological markers (how their bodies react), and behaviour (what children do). Because pain is a subjective event, self-report is best if it is available². Most children aged five years and older can provide meaningful self-reports of pain intensity if they are provided with age-appropriate tools and training. Self-reports of pain intensity are an oversimplification of the complexity of the experience of pain, but one that is necessary to evaluate and titrate pain-relieving treatments³. Scales to assess pain in children have been extensively studied, but there are few paediatric studies to establish the validity of these tools in non-Western cultures⁴. In Sri Lanka the standard pain assessment tools are not widely used though pain assessment is an integral part of the total pain management in children. Pain management is improved when pain is regularly and reliably measured³. There is a need to assess how the children perceive pain by using various type of pain scales in the Sri Lankan clinical setting. It will be useful to know which pain assessment scale is appropriate for Sri Lankan children. The Wong Baker FACES Pain Rating Scale (FPS), Numeric Pain Rating Scale (NRS)⁶ and Verbal Pain Rating Scale (VRS) are three commonly used pain scales^{5,6} (Figures 1-3).

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Figure 1: Wong Baker FACES Pain Rating Scale⁵

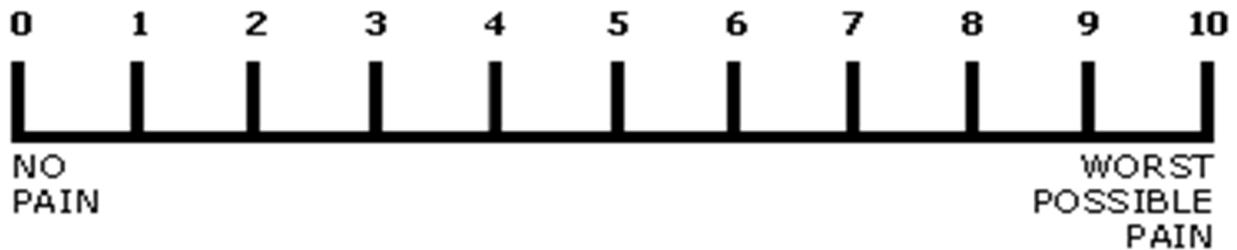


Figure 2: Numeric Pain Rating Scale⁶

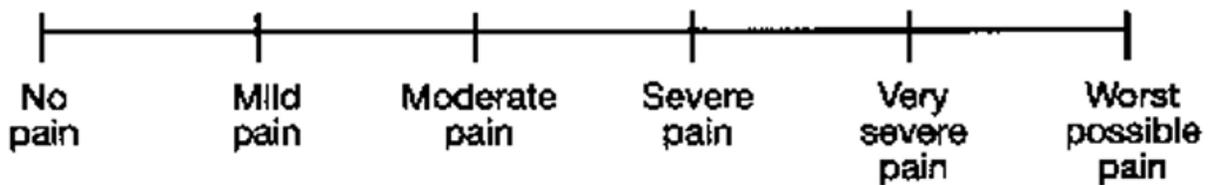


Figure 3: Verbal Pain Rating Scale⁶

Objectives

The aim of this study was to assess the ability of Sri Lankan children to use three commonly used pain scales viz. FPS, NRS and VRS. Further, this study compared the reliability of the three pain scales and internal consistency of each pain scale to identify the most suitable scale for Sri Lankan children.

Method

The study population comprised children aged between 4-12 years who presented to the paediatric ward and clinic of Ampara General Hospital, the only tertiary care centre in the Digamadulla district, with a complaint of pain, regardless of aetiology, from July 2012 to June 2013 and were able to speak Sinhala. Non-verbal children, children with cognitive or hearing impairment, children with physical disability, developmentally delayed children, children with altered level of consciousness and children who were unable to communicate easily in Sinhala were excluded. Ethical approval was obtained from the Ethics Review Committee of the Sri Lanka College of Paediatricians before starting the study. Informed verbal consent was taken from the parents or carers of the children.

Information on demographic data, type of pain and duration was collected by one of the trained investigators using the pretested structured questionnaires and subsequently the pain assessment was done using the 3 pain scales which were printed in A4 sheets separately with pretested Sinhala translations. Each child was asked to grade the pain intensity on FPS by choosing the face which best described his or her own face, on the NRS by rating the pain on a scale of 0–10 and on the VRS by reading the words and choosing the one that best described the pain he or she was experiencing, after giving adequate explanation on each pain scale. The 3 pain scales sheets were introduced to the children in a random order and also the anchor points (the extreme ends of the scales) were explained alternatively (either from left to right or vice versa) to avoid leading bias. (The exact pain score which the child gave on the 3 pain scales was also marked on the questionnaire by the investigator.) In addition, the child rated the most easily understood scale in the individual case and the investigator was asked to rate the most easily explainable scale in the individual case.

Data was analysed using appropriate statistical tests using SPSS-18 statistical software. The VRS was standardized to 0–10 metric for meaningful statistical comparison. The reliability and comparison statistics were calculated. The degree of correlation between the scales was compared by performing Spearman’s and Pearson’s correlation tests. The internal consistency of each scale was measured with Cronbach’s alpha. The level of agreement between scales was determined by Bland-Altman’s plots. The scales were ranked according to the internal consistency, child’s preference and investigator’s preference.

Results

There were 152 children between 4-12 years who presented to the paediatric ward and clinic of Ampara General Hospital with a complaint of pain during the study period and were able to communicate in

Sinhala. Out of the 152 children 82 were male and 70 were female, 98 (64.5%) had acute pain and 54 (35.5%) had chronic pain (>12weeks). The types of pain comprised headache in 72 (47.4%), abdominal pain in 52 (34%), chest pain in 8 (5.3%), joint pain in 8 (5.3%), back pain in 2 (1.3%), limb pain in 3 (2%), muscle pain in 2 (1.3%) and ear pain in 2 (1.3%). The mean age of children was 8.73 ± 2.21 years and the mean duration of pain was 125 ± 266 days. The mean pain score in each scale was: FPS -6.102 (n=146, SD 2.75), NRS -6.076 (n=130, SD 2.73), and VRS -5.288 (n=118, SD 2.72). The number of children who were unable to understand the pain scales were FPS-6, NRS-22 and VRS-34. As shown in table-1, the three pain scales FPS, NRS and VRS were very positively correlated among each other ($r > 0.7276$ in all cases). The Cronbach alpha of the three pain scales was 0.9021 indicating that the scales were measuring the same construct.

Table 1: Correlation between the pain scales

	Mean difference	Limits of agreement	Range
FPS vs NRS	0	-3.2 to +3.1	6.3
FPS vs VRS-10	0.5	-3.3 to +4.4	7.7
NRS vs VRS-10	0.5	-3.3 to +4.4	7.7

The Bland–Altman analysis (table 2) showed limits of agreement between FPS/NRS, FPS/VRS and NRS/VRS were -3.2 to +3.1, -3.3 to 4.4 and -3.3 to +4.4 respectively. The mean differences in all cases of comparison are not away from zero ($p < 0.05$).

Table 3 summarizes the means and standard deviations of three pain scales for young (4-7) and old (8-12) age groups.

Table 2: Bland-Altman analysis

	n	r	p	95% CI
FPS vs NRS	131	0.82	<0.0001	0.7555 to 0.8698
FPS vs VRS-10	118	0.7276	<0.0001	0.6296 to 0.8028
NRS vs VRS-10	114	0.7312	<0.0001	0.6323 to 0.8066

Table 3: Age group comparison (means and SD)

	Young (4-7)			Old (8-12)		
	n	mean	SD	n	mean	SD
FPS	106	5.783	2.5672	40	6.75	3.1276
NRS	102	5.8529	2.5617	26	6.5	3.228
VRS-10	101	5.2871	2.6621	18	5.2222	3.0785
GRAND	309	5.6440	2.6005	84	6.3452	3.1680

One sample t-test (table 4) was carried out to compare the means for each scale to grand mean of all three pain scores and no significant differences were observed for any of the scales. The young and old groups were compared in each scale to check any difference in age groups in individual pain scales and they were also not significant. The scales were

ranked according to three parameters: corrected item-total correlation, child's preference and investigator preference.

The results are summarized in table 5. Overall, the FPS ranked best followed by VRS and NRS.

Table 4: Age group comparison (one sample t - test)

Grand mean young vs	t	p
FPS-young	-0.668	0.5055
NRS-young	-0.1548	0.8288
VRS-10-young	1.123	0.1733
Grand mean old vs		
FPS-old	-0.139	0.6340
NRS-old	-0.2089	0.4806
VRS-10-old	1.190	0.2346

Table 5: Ranking of scales

	Corrected item-total correlation		Child's preference		Investigator preference		RANK
	value	Rank	value	Rank	value	Rank	
FPS	0.8447	2	0.7872 (111/141)	1	0.7816 (111/142)	1	1
NRS	0.8397	3	0.099 (14/141)	3	0.0563 (8/142)	3	3
VRS-10	0.8945	1	0.1134 (16/141)	2	0.0774 (11/142)	2	2

Discussion

The aim of the study was to compare three common pain scales in terms of reliability and internal consistency in order to identify which is the most suitable pain scale for Sri Lankan children. The three pain scales were highly correlated and the high Cronbach alpha suggests that the three pain scales were statistically highly reliable. Therefore all three pain scales could possibly be used to measure pain in children age 4-12 years. The inter-scale agreement was best between FPS and NRS.

The practical utility of the scales was assessed by child preference and administrator preference. Our results show that 34 children could not understand VRS and this figure for NRS and FPS were 22 and 6 respectively. The children (78%) and investigators (86%) preferred FPS over NRS and VRS. Therefore in terms of internal consistency, reliability and practical purposes of using the scales in the clinical settings, the FPS seems superior compared to NRS and VRS in the paediatric population. Belinda Goodenough et al in 2005 compared six types of pain scales which showed that younger and older children ranked facial expression measures as easier to use than other scale options⁷. Wong D, Baker C compared five types of pain scales including facial and numerical scales which indicated that children ages 3-18 years clearly prefer the faces scale over the other scales but none of the scales demonstrated superiority in validity or reliability in that study⁸.

We expected young children to over score their pain but the group comparison does not provide evidence for this and therefore both in young and old children, self-reporting of pain in all three scales were comparable. This study was restricted to one institution where majority of children speak Sinhala. We need to extend the study to many other centres to get more representation. Further the same could be

done among Tamil speaking children to check the reliability of the scales among Tamil speaking children. Further research is needed in the context of post-operative pain, trauma settings, pain relief after analgesic for example to test the temporal reliability. Visual analogue scale (VAS) is considered the gold standard among the pain assessment tools. But even in western cultures VAS proved to be difficult to understand by many children. So we did not include VAS scale in our study. We intend to do further research including the VAS scale for comparison.

Conclusions and recommendations

All three pain scales i.e. FPS, NRS and VRS are useful for the assessment of pain in children. In terms of reliability and practical utility the FPS is most preferred. Therefore FPS is recommended for assessment of pain paediatric patients in Sri Lanka.

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