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Title: Comparison of the clinical utility of recently described tools for pain assessment in children with cognitive impairment

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Introduction: Several pain assessment tools have been shown to have good reliability and reasonable validity in assessing pain in children with cognitive impairment (CI).[1-3] While these psychometric properties are necessary to ensure accurate pain assessment, the ability to implement routine use of such tools into clinical practice may depend largely on their pragmatic qualities.[4] Previous investigators have identified several attributes necessary for easy implementation. These include the tool's relative advantage compared to others, its compatibility, and complexity. Furthermore, the ability to use one tool across populations may improve its clinical utility. Most observational pain scales lack these qualities. The purpose of this study was to compare the clinical utility of three tools (i.e., the Face, Legs, Activity, Cry, Consolability [FLACC] [1]; the Nursing Assessment of Pain Intensity [NAPI] [2], and the Non-Communicating Children's Pain Checklist-Postoperative Version [NCCPC-PV] [3]) that have been used to assess pain in children with CI.

Methods: Fifteen videotaped observations of children with CI were recorded during their first three postoperative days. With IRB approval and written consent, 6-7 healthcare professionals from each of 3 major national institutions viewed and scored the observed pain behaviors using the FLACC, the NCCPC-PV, and the NAPI in 5 segments each. The order in which these tools were used was randomly assigned to minimize bias. Following their review of video observations, observers completed a brief questionnaire scoring characteristics of the complexity, compatibility and relative advantage of each assessment tool using 5 point scales. Scores for each attribute were summed with higher scores reflecting a positive attribute. Scores were compared using Mann Whitney-U tests. $P<0.05$ was accepted as significant.

Results: Five physicians and 15 nurses from a variety of hospital settings participated. Respondents scored all attributes higher for the FLACC and NAPI compared to the NCCPC-PV (see table). The FLACC had similar scores for complexity, but higher scores for compatibility and relative advantage compared to the NAPI. Additionally, the time taken to score the FLACC and NAPI was significantly shorter than that to score the NCCPC-PV (2.9 ± 1.7 and 2.8 ± 1.5 vs 5.1 ± 2.2 minutes respectively; $p< 0.001$).

Discussion: This study demonstrated that simple tools such as the FLACC or NAPI possess the pragmatic qualities necessary for easy implementation in the hospital setting. This will in turn facilitate routine pain assessment in children with CI.

Table. Scores* for Clinical Utility Attributes of the Pain Assessment Tools

	Low Complexity	High Compatibility	Relative Advantage
FLACC	18.3 ± 1.7	18.4 ± 2.0	13.1 ± 2.1
NAPI	17.0 ± 2.1	15.9 ± 2.6**	11.3 ± 2.6**
NCCPC-PV	9.1 ± 3.1***	9.7 ± 4.3***	6.7 ± 2.7***

*Scores range from 5-20 for Complexity or Compatibility, 3-15 for Relative Advantage; with higher scores reflecting positive attribute.
**$p \leq 0.02$ compared to FLACC
***$p \leq 0.001$compared to NAPI and FLACC

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