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Commentary

Use of facial expressions for pain assessment in infants during acute painful procedures

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Facial expressions of pain are the most commonly used indicators in response to acute procedural pain in the clinical and research realm due to their objectivity, universality, accessibility, sensitivity, and specificity (Prkachin, 2009; Schechter et al., 2010; Chang et al., in press). The assessment of facial expressions in infants and young children occurring during episodes of crying was first systematically described by Charles Darwin (1872), then, over a century later, further evaluated and described in newborn infants in response to acute procedural pain (Grunau & Craig, 1987). Facial expressions are now included in the majority of multiple composite observational pain assessment scales in use, however, the descriptors used may be inconsistent with the indicators that are observed and frequently, there is a lack of explanation regarding the correct use of the scale (e.g. type of pain; Chang et al., in press). Indicators of pain that are frequently included in the facial component of pediatric pain assessments include brow bulge, eye squeeze, nasolabial furrow, and open mouth (McGrath et al., 1985; Grunau & Craig, 1987; Stevens et al., 1996; Schultz et al., 1999; Harrison et al., 2015; Chang et al., in press). According to Prkachin (2009), lowering of the brow, eye squeeze, deepened nasolabial furrow, and open mouth are facial descriptors that clearly distinguish between painful and nonpainful stimuli. In infants and young children, pain is indicated by facial expressions to communicate and to signal pain and danger to others and to gain attention to bring about assistance (Prkachin, 2009; Chang et al., in press). However, it has been recognized that further validation of some of the facial items is necessary as they are oversimplified, ambiguous, or inconsistent (e.g. the Face, Legs, Activity, Cry, and Consolability [FLACC] scale includes the subjective description of appears sad or worried as an indicator for pain; Chang et al., in press). In addition, in a recent study by Harrison et al. (2014), it was determined that the specific facial expressions that are consistent with the maximum score of 2 on the FLACC scale (e.g. clenched jaw and quivering chin) rarely occur. Further validation and refinement of the facial expression component of pain assessment scales is warranted to improve the accuracy and consistency of the assessment.

The FLACC scale is an example of an observational scale that evaluates facial expressions, is frequently used in clinical settings, and is one of the most commonly used assessment tools in research (Merkel et al., 1997; available at: http://wps.prenhall.com/wps/media/objects/3103/3178396/tools/flacc.pdf). The scale is considered a well-established measure of postoperative and procedural pain in children (von Baeyer & Spagrud, 2007; Chorney & McMurtry, 2014). The five categories are each scored on a 0 to 2 scale, totaling a maximum possible score of 10 (Merkel et al., 1997). For the Face component, a 0 represents *no particular expression or* smile, a 1 represents *occasional grimace or frown, withdrawn, disinterested,* and a 2 represents *frequent to constant quivering chin, clenched jaw* (Crellin et al., 2007). In a study conducted by Nilsson and

colleagues (2008), in younger children, raters experienced difficulty distinguishing between facial expressions indicating pain intensity and distress. The Leg component assesses the lower extremities for movement (e.g. ranging from a relaxed position to kicking), the Activity component assesses the full body for movement (e.g. ranging from lying quietly to rigid and jerking movements), the Cry component assesses the strength and amount of crying (e.g. ranging from no cry to a steady crying, screaming, or sobbing), and the Consolability component assesses the amount of comforting required to console the infant (e.g. ranging from relaxed to difficult to console or comfort; Gomez et al., 2013). The FLACC scale was originally developed for the assessment of postoperative pain (Merkel et al., 1997) and research has shown that the FLACC has acceptable interrater reliability and validity for pain assessment in infants and children up to 7 years old during the postoperative period (Nilsson et al., 2008). The FLACC scale has also been frequently used to evaluate acute procedural pain in young children (von Baeyer & Spagrud, 2007; Nilsson et al., 2008; Gomez et al., 2013; Chorney & McMurtry, 2014), despite limited formal psychometric evaluation of the FLACC for the measurement of such short lasting acute procedural pain episodes such as immunizations (Crellin et al., 2007; Nilsson et al., 2008; Gomez et al., 2013).

Of these behavioral indicators of distress, facial cues may be the most difficult for observers to score reliably on measures such as the FLACC scale. A recent study that demonstrates the need for further validation and refinement of the facial component of the FLACC scale, by Harrison et al. (2014) utilized the scale as an outcome measure to assess immunization pain in infants. The study involved assessing pain in infants aged 0-12 months during an injection procedure based on 142 videos posted on YouTube. Two experienced pediatric research nurses, trained in the use of the FLACC scale by Harrison and her Be Sweet to Babies research team, and who were working in a pediatric hospital where all nurses are trained in the use of the FLACC scale and Premature Infant Pain Profile (PIPP; Stevens et al., 1996; which uses facial expressions from the Neonatal Facial Coding System [NFCS]; Grunau & Craig, 1987) viewed all 142 videos and completed pain assessments using the FLACC scale. Harrison's team had previously reported acceptable interrater and intrarater agreement of FLACC scores (Gomez et al., 2013; Harrison et al., 2014). As reported by Harrison et al. (2014) the two nurses assigned high FLACC scores during the injections (median score = 10, interquartile range = 3). Upon discussing the results with the raters, and crosschecking against the posted videos, it became evident that the maximum score of 2 for the facial parameter, although often designated, was not being scored according to the indicators described on the scale (frequent to constant quivering chin, clenched jaw; Merkel et al., 1997). A substudy was therefore planned to identify the decisions made about the facial expressions used by the raters that led to the designated maximum score of 2. A secondary analysis of the 142 videos included in the initial study (Harrison et al., 2014) was completed and pain was assessed at four time points: 15 seconds before the first injection (baseline), at the time of the first injection, at the time of the second injection, and 15 seconds after the last injection (Gomez et al., 2013). For each of the described time points, the viewers observed for approximately 10 seconds (i.e. 5 seconds prior to the time point and 5 seconds following the time point) to ensure that the assigned FLACC scores accurately reflected the time point. Each video was viewed and scored and the rationale for each score was documented.

At the baseline period (n = 111), the maximum facial score of 2 was allocated once and the facial expression description was not consistent with the FLACC scale. At the first injection point (n = 122), there were 75 (62%) videos with scores of 2, yet only one description was consistent with FLACC descriptors. In 68 videos, a second injection was given, and 61 were able to be scored. Of these, 55 (90%) were allocated scores of 2, yet only one description was consistent with the FLACC scale. Interestingly, this one video was of a neonate. Fifteen seconds after the injections (n = 101), there were 21 (21%) scores of 2 and none of the descriptions were consistent with the FLACC scale. The comments provided by the research nurse were rarely consistent with the FLACC scale descriptors

and in fact, were frequently described over the four time points as brow bulge (n = 129), eye squeeze (n = 143), and open lips (n = 100), consistent with the facial expressions described in the NFCS and included in the frequently used multidimensional pain scale, PIPP. This highlights that experienced pediatric nurses using the FLACC scale to score procedural pain, use their judgments and experience of observing the commonly occurring facial expressions to pain when allocating scores, rather than the specific listed descriptors.

There are several limitations to this study. It is unknown if the infants filmed for the YouTube videos used in our study are representative of infants' responses during immunizations. Our study was also limited by the small number of pain raters and, as they were experienced registered nurses, the possibility of influence from previous training and clinical experience with other pain scales. In addition, cross ratings with other pain scales were not performed as assessments were only done with the FLACC scale.

These findings suggest that despite its strong psychometric qualities, the FLACC scale may operationalize facial indicators of pain in ways that are not consistently well adhered to by raters. Analysis of facial expressions during the assessment of acute procedural pain in infants is an important component to quantify the amount of pain being experienced. The refinement of facial descriptors of pain and further psychometric evaluation and validation of the facial expressions component of behavioral pain assessment scales is warranted when using these tools for either clinical or research purposes in infants undergoing acute painful procedures.

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