DALHOUSIE UNIVERSITY

Children's Fear during Procedural Pain: Preliminary Investigation of the Children's Fear Scale

C. Meghan McMurtry

Melanie Noel

Christine T. Chambers

Patrick J. McGrath

Author Note:

C. Meghan McMurtry, Department of Psychology, University of Guelph, Guelph, Ontario; Melanie Noel, Centre for Pediatric Pain Research and Department of Psychology, Dalhousie University and IWK Health Centre, Halifax, Nova Scotia; Christine T. Chambers, Centre for Pediatric Pain Research and Departments of Psychology and Pediatrics, Dalhousie University and IWK Health Centre, Halifax, Nova Scotia; Patrick J. McGrath, Centre for Pediatric Pain Research and Departments of Psychology, Pediatrics, and Psychiatry, Dalhousie University and IWK Health Centre, Halifax, Nova Scotia. The authors have no conflicts of interest to disclose.

This research was conducted at the IWK Health Centre during McMurtry's PhD training.

At the time of the research, McMurtry was supported by a CIHR CGS Doctoral Research Award. The project was supported by an IWK Health Centre Category A Research Grant awarded to McMurtry and colleagues and a CIHR operating grant awarded to CT Chambers. Noel was supported by a CIHR CGS Doctoral Research Award, a Nova Scotia Health Research Foundation Doctoral Student Research Award, an honorary Killam Predoctoral Scholarship, and a Pain in Child Health (PICH) stipend. CT Chambers and McGrath are supported by Canada Research Chairs. Portions of this manuscript were presented at the International Symposium on Pediatric Pain, Acapulco, Mexico, March 2010. As described in the Method section, the manuscript contains data that was collected as part of a larger study. Portions of this manuscript were presented at the International Symposium on Pediatric Pain, Acapulco, Mexico, March 2010. The authors would like to thank Sharon McKinley and colleagues who graciously provided the images of the Faces Anxiety Scale for our use in this research. Thank you to Dr. Carl von Baeyer for his thoughtful and engaging discussions on self-report of fear in children earlier in this project. We are also grateful to the families who participated in this research and the Core Lab staff.

Correspondence concerning this article should be addressed to C. Meghan McMurtry, Department of Psychology, MacKinnon Extension, 87 Trent Lane, University of Guelph, Guelph, Ontario, N1G 2W1. Email: mcmurtry@psy.uoguelph.ca

Abstract

Many children consider getting a needle to be one of their most feared and painful experiences. Differentiating between a child's experience of fear and pain is critical to appropriate intervention. There is no gold standard one-item self-report measure of fear for use with children. **Objective:** To conduct an initial investigation of the psychometric properties of the Children's Fear Scale (CFS; based on the adult Faces Anxiety Scale) with young school-aged children. **Methods:** Children and their parents were filmed during venipuncture and completed pain and fear ratings immediately after the procedure (n = 100) and 2 weeks later (n = 48). Behavioral coding of the procedures was conducted. **Results:** Support was found for inter-rater reliability (time 1: r_s = .51, p < .001) and test-retest reliability (r_s = .76, p < .001) of the CFS for measuring children's fear during venipuncture. Assessment of construct validity revealed high concurrent convergent validity with another self-report measure of fear (time 1: r_s = .73, p < .001) and moderate discriminant validity (e.g., time 1: r_s = -.30, p < .005 with child coping behavior; r_s = .41, p < .001 with child distress behavior). **Conclusions:** The CFS holds promise for measuring pain-related fear in children. In addition to further investigation into the psychometric properties of the CFS during acute pain with a wider age range, future research could validate this measure in other contexts. The utility of a one-item measure of fear extends beyond the field of pediatric pain to other contexts including intervention for anxiety disorders and children in hospital.

Keywords: fear, anxiety, children, measurement, pain

Children's Fear during Procedural Pain: Preliminary Investigation of the Children's Fear Scale

Fear is a negative emotion that is thought to arise as an alarm to a dangerous and/or life threatening situation (Albano, Causey, & Carter, 2000)[1]. Fear in children is common, can represent normative developmental processes, and may be induced by experiences such as separation from parents, a growling dog, or going to school (e.g., see: Gullone, 2000). Medical fears have been identified as a common subcategory of fear in children (e.g., Ollendick, 1983) and, unlike other types of fear, may increase with age (Gullone, 2000). Needle fears appear to be particularly prevalent: many children consider getting a needle to be one of their most feared and painful experiences (Broome & Hellier, 1987; Hart & Bossert, 1994). Fear can increase pain perception (Rhudy & Meagher, 2003). The bidirectional relationships between children's fear prior to needles and their fear and pain during needles are difficult to disentangle. However, differentiating between a child's experience of fear and pain is critical to appropriate intervention (Chambers, Hardial, Craig, Court, & Montgomery, 2005). A recent consensus document recommended the measurement of children's emotional responses to pain as a core outcome in pediatric pain clinical trials but there was insufficient evidence to recommend a single-item measure (McGrath et al., 2008).

Appropriate assessment of children should incorporate a developmental perspective considering their skills in a variety of domains such as emotional understanding, expressive and receptive language, as well as overall cognitive status (Sattler, 2002). The measurement of children's fear can be achieved through observation of behavior, physiological measurement,

[1] Anxiety is also a negative emotion but differs in that it is apprehensively directed toward a future negative event. A full theoretical discussion of the differences between anxiety and fear is beyond the scope of this paper (see: Albano et al., 2000).

and/or through self-report. Although self-report can be biased (Gullone, 2000), given the subjective, latent nature of fear, it is important to obtain self-report when possible. Several multi-item self-report measures of fear/anxiety are available (e.g., Fear Survey Schedule for Children – Revised; Ollendick, 1983) but are not specific to a given stimulus, lack feasibility in a busy clinical environment, and also require a certain level of literacy. Unlike the numerous one-item self-report measures of pain intensity (Stinson, Kavanagh, Yamada, Gill, & Stevens, 2006) and multiple item measures of fear/anxiety, there are limited one-item self-report tools for fear. The existing self-report fear measures have used a number of formats including various types of visual analogue scales, numerical rating scales, and pictorial "faces" scales (e.g., Bringuier et al., 2009; Crandall et al., 2007; LeBaron & Zeltzer, 1984; Tsao et al., 2004; Windich-Biermeier et al., 2007). Unfortunately, these tools often lack thorough validation, are not widely available, and details pertaining to their development are often unclear.

There is no clear consensus on the best approach to obtaining self-report from children (Chambers & Johnston, 2002). However, simplified wording/instructions, concrete response options, and an option for the rater to respond nonverbally are important developmental considerations (Sattler, 2002). Pairing a picture with a child’s inner state has been suggested as a useful assessment technique (Sattler, 2002). Pictorial faces scales can be developed with each of these considerations in mind and are thought to have a number of advantages over other formats of scales for children (Champion et al., 1998). Most notably, it is thought that faces scales are easier for children to interpret because they do not require raters to translate their inner experience to a number. In addition, research examining preferences for pain scales has revealed that children and parents tend to prefer faces scales over other forms of scales (Goodenough et al., 2005; Keck, Gerkensmeyer, Joyce, & Schade, 1996). As a result, faces scales are frequently

used as self-report measures of pediatric pain intensity (Champion et al., 1998; Kuttner & LePage, 1989), and may be particularly useful for measuring fear in children. Furthermore, a faces scale might be most appropriate for use in rating emotions given that facial displays have long been recognized as an important cue to an expresser's emotion (Darwin, 1872/1998).

The Children's Anxiety and Pain Scales (CAPS) is an innovative assessment measure capturing the dimensions of pain and fear which was developed for use with 4 to10-year-old children (Kuttner & LePage, 1989). The initial development and investigation of the CAPS is described in an unpublished manuscript by Kuttner and LePage (1983), with a short summary of the results in a later review article (Kuttner & LePage, 1989). Research with the CAPS has demonstrated interval properties as well as good validity and reliability. Although the CAPS has been used in previous research, there is no 'gold-standard' one-item self-report measure of anxiety/fear in children. Researchers in other areas of the literature have been encouraged to continue psychometric testing of existing measures rather than developing new ones (e.g., Kazdin, 2005). However, researchers and clinicians should also have more than one well-validated scale from which to choose. In fact, researchers have indicated that their use of the CAPS resulted in part from a lack of an available alternative (Goodenough, Champion, Laubreaux, Tabah, & Kampel, 1998). The use of a scale because there is no other scale available is problematic (Kazdin, 2003).

The CAPS-Anxiety shows a series of drawings of a young, sex-neutral child displaying increasing levels of fear. A scale with faces that are less age-specific may be preferable to capture self-reports of fear from a wider age range of children and adolescents. Use of a consistent, age-appropriate measure would facilitate comparison across age groups. Furthermore, some researchers have expressed concern that on the CAPS-Anxiety the "faces depicting high

levels of anxiety are somewhat frightening in and of themselves" (Wright, Eisner, Stewart, & Finley, 2010, p. 425). Therefore, validation of an alternative one-item self-report measure of fear that can be used with a wide age range, completed in a busy clinical setting, and is freely and widely available could prove beneficial. The Faces Anxiety Scale (McKinley, Coote, & Stein-Parbury, 2003) was developed to measure anxiety/fear in adult patients in the intensive care unit. The scale was first used with a pediatric sample in an examination of parental reassurance in the context of child venipuncture (reference blinded for review) and subsequently in an investigation of children's memory of anxiety following venipuncture (reference blinded for review). Despite its potential utility for measurement of child fear during painful medical procedures, to date it has not been validated for use with children.

The objective of the present study was to conduct an investigation of the psychometric properties of the Children's Fear Scale (CFS; based on the Faces Anxiety Scale), including the test-retest reliability, inter-rater reliability, and construct validity of the scale. To facilitate comparison between the CAPS (designed for 4 to 10-year-old children) and the CFS, young school-aged children (5-10 years) were selected as participants for this initial study. Age differences were examined because although fear tends to decrease with age in general, medical fears may be an exception (Gullone, 2000). Also, age-related differences in fear ratings have not been consistently found (e.g., Briguier et al., 2009; Hart & Bossert, 1994; LeBaron & Zeltzer, 1984). Sex differences were examined in light of research showing that girls tend to report higher levels of fear in general (Gullone, 2000) and higher levels of anticipatory fear of venipuncture (Fowler-Kerry & Lander, 1991) than boys. It was hypothesized that the CFS would show good evidence of reliability and validity among children, girls' fear ratings would be higher than boys' fear ratings, and that younger children would report higher levels of fear than older children.

Method

Participants

A convenience sample of 100 5 to10-year-old children and their parents participated. In order to participate, children had to be between 5 and 10-years-old, accompanied by a parent, and able to stay for 1 hour following the venipuncture to complete the larger study tasks. Data from these participants was collected during a larger research program investigating children's perceptions of adults' emotions during reassurance and distraction during venipuncture (unpublished doctoral dissertation; second reference blinded for review). Specifically, following the venipuncture and the pain and fear ratings, children answered questions about adult emotions in response to videoclips of their own parents' procedural behavior as well as to video vignettes systematically varying aspects of adult behavior. Fear ratings were also collected as part of a smaller follow-up study 2 weeks later (reference blinded for review). The purpose of the present work was to document the psychometric properties of the CFS with 5 to 10-year-old children. Although the means and standard deviations of the time two fear ratings were reported in XXXX et al. (reference blinded for review), all analyses included in the present study are new (i.e., have not been previously published).

There were 40 boys and 60 girls with a mean age of 8.02 years (*SD* = 1.69 years). Parents were asked to indicate whether their child had a chronic illness (60% including asthma, cancer, peanut allergy) and the children's previous experience with bloodwork (52% had bloodwork completed ≥ 5 times). Per parent report, children were predominantly Euro-Canadian (*n* = 69) followed by African Canadian (*n* = 3), Asian Canadian (*n* = 2) and Other (e.g., "Canadian", multiple racial backgrounds; *n* = 23). On average, the participating families were of middle social class (*M* = 38.52; *SD* = 17.16; Class 3; Hollingshead Index; Miller, 1983). Eighty-five

mothers, 14 fathers, and one long-term female guardian participated (M_{age} = 37.41 years; *SD* = 6.68 years). Parents' self-identified ethnicity was as follows: Euro-Canadian (*n* = 69); African Canadian (*n* = 3); First Nations (*n* = 2); and Other (*n* = 25).

Measures

Demographic and Pediatric Bloodwork History Questionnaire: In addition to demographic information, parents indicated the number of times their children had bloodwork completed as well as their typical reaction to these procedures (format: Likert-type scale ranging from 1 = *negative* to 7 = *positive reaction*).

Children's Fear Scale (CFS)[2]. The CFS is based on the Faces Anxiety Scale developed by McKinley and colleagues (2003) to measure anxiety or fear in adults in the intensive care unit. The one-item scale consists of a row of five sex-neutral faces ranging from a no fear (neutral) face on the far left to a face showing extreme fear on the far right. The rater responds by indicating which of the five faces matches his/her level of anxiety or fear. The scale faces were drawn by a graphic artist according to the facial muscle changes involved in a fearful expression (Ekman & Friesen, 1978) and based on photographs of faces showing increased fear. The Faces Anxiety Scale showed greater ease of use (feasibility) for adult intensive care patients than the short anxiety subscale (6 items) of the Brief Symptom Inventory (Derogatis & Melisaratos, 1983). Rank order, interval properties, criterion validity, and treatment responsivity have all been supported with adults (Cooke, Holzhauser, Jones, Davis, & Finucane, 2007; McKinley et al., 2003; McKinley & Madronio, 2008; McKinley, Stein-Parbury, Chehelnabi, & Lovas, 2004).

For the CFS, the overall size of the Faces Anxiety Scale was reduced to match the size of the CAPS (see further information below) but the drawings were not altered. The instructions

[2] Available from the first author upon request (note to Reviewers: following publication of the manuscript, our future plan is to post the CFS on the first author's website so that it will be easily and freely accessible).

from the Faces Anxiety Scale were changed on the CFS to be developmentally appropriate in light of differences in the acquisition of fear-related vocabulary in young children. Specifically, less than 80% of 5-year-old children were found to understand the terms “worried”, “nervous”, “concerned”, “fearful”, and “alarmed”; the term “afraid” was understood by 100% and used by 90% whereas “scared” was understood by 98.4% and used by 93.4% of 5-year-old children (Ridgeway, Waters, & Kuczaj, 1985). See Figure 1 for the scale and instructions. Scores on the CFS were converted to numerical scores ranging from 0 (*no fear*) through 4 (*extremely fearful*).

Children’s Anxiety and Pain Scale (CAPS). The CAPS is a set of two scales – one designed to measure pain and the other to measure anxiety or fear in 4 to 10-year-old children (Kuttner & LePage, 1983, 1989). The anxiety/fear scale of the CAPS has been used most frequently in the context of venipuncture, but also in outpatient surgery and medical examinations contexts (Fowler-Kerry & Lander, 1991; Goodenough et al., 2004; Goodenough et al., 1997; Marks, Lamb, & Tzioumi, 2009; Wright et al., 2010). In the present study, only the scale measuring fear was used. The fear scale consists of line drawings of five sex-neutral child faces ranging from no fear (*neutral*) on the far left to extreme fear on the far right. The child is asked to “point to the face that shows how scared you were”. The CAPS shows evidence of interval properties as well as content and convergent validity (Fowler-Kerry & Lander, 1991; Kuttner & LePage, unpublished manuscript; Kuttner & LePage, 1989; Goodenough et al., 1997; Goodenough et al., 2004). Moderate test-retest reliability has been supported in the perioperative environment but the sensitivity and feasibility of the measure when employing traditional scoring has been questioned in this context (Wright et al., 2010). Scores on the CAPS were converted to numerical scores ranging from 0 (*no fear*) through 4 (*extremely fearful*; Goodenough et al., 1997). The CAPS was used to test the construct (convergent) validity of the CFS.

For consistency, the CFS and the CAPS were presented in the same size and format as the CAPS is produced: each scale was printed on white paper (height: 2.25 in./5.7 cm; width: 9.5 in./24.1 cm) mounted on yellow paper (height: 4.5 in./11.4 cm; width: 11 in./27.9 cm) and laminated. For both scales, the width of each face measured approximately 1.25 in (3.2 cm). The front of the scales simply depicted the faces with no numbers or verbal descriptors. Instructions appeared on the back, were read aloud by the researcher, and were not visible to the rater.

Faces Pain Scale – Revised (FPS-R). The FPS-R is a one-item self-report pain intensity scale (Hicks, von Baeyer, Spafford, van Korlaar, & Goodenough, 2001). Scores on the FPS-R range from 0 to 10 (Hicks et al., 2001). The FPS-R has demonstrated convergent validity, discriminant validity, and test-retest reliability and has been recommended for use following procedure-related pain in clinical trials for children aged 4 to 12 years (McGrath et al., 2008; Stinson et al., 2006). The FPS-R was used to test the construct (discriminant) validity of the CFS.

Child-Adult Medical Procedure Interaction Scale – Revised (CAMPIS-R). The CAMPIS-R is an observational measure of child and adult behaviors during medical procedures. The 35 codes of the CAMPIS were combined into six broad categories in the CAMPIS-R (Blount et al., 1997). Research has supported the concurrent construct validity of the CAMPIS-R with observational and self-report measures (Blount et al., 1997). In this study, the CAMPIS-R was used to measure child coping and child distress behaviors calculated as proportions of total child behavior. Reliability coding of 20% of the participants indicated a kappa of .92 (*SE* = .01) for the child codes representing excellent agreement (Fleiss, Levin, & Paik, 2003). The CAMPIS-R was used to test the construct (convergent, discriminant) validity of the CFS.

Procedure

The study took place in an outpatient blood laboratory of a tertiary care pediatric health center. The researcher approached any family in the waiting room with a child who appeared to be between 5 and 10-years-old. Following provision of information about the study and inclusion/exclusion questions, informed consent from the parents and verbal assent from the children was collected as appropriate. The venipuncture was provided as usual with the following exceptions: a researcher was present in the room, the procedure was filmed, and the parents were asked to wear a clip-on microphone. After the procedure was complete, parents and children were asked to independently complete the rating scales with the researcher. Children provided ratings on the FPS-R, the CAPS, and the CFS. Parents provided a proxy rating of their child's fear using the CFS. Although parents always completed their scale first, the presentation order of the child scales was counterbalanced. The children were not allowed to see their parents' responses and it was also emphasized that they should provide their own responses. Parents then completed the demographic and pediatric bloodwork history questionnaire.

Approximately 2 weeks following venipuncture (M = 14.71 days, SD = 4.20 days), 48 of the children (24 boys, 24 girls; M_{age} = 7.50 years, SD = 1.41) and their parents completed the same fear and pain ratings that they completed during time one via telephone (full methodological detail reported in (reference blinded for review)[3]. Parent proxy ratings were collected for the purposes of the present investigation. Ethical approval was obtained from the health center's Research Ethics Board.

Results

[3] The larger study consisted of 102 participants; the smaller study began recruitment after 32 participants had already taken part. Once the smaller study began, every participant who had taken part in the larger study was approached. A total of 70 participants were approached and 63 indicated interest in participating in the smaller study. Of these, 15 children were excluded either because they did not meet inclusion criteria for the smaller study [i.e., they received an intervening needle prior to the second interview (n = 8)] or because they were not available at follow-up (n = 7).

Unless otherwise noted, the data reported in the following is based on information collected immediately after the procedure (time one).

Descriptives

The distributions of fear ratings by children and parents were examined with measures of central tendency and variability, as well as skew and kurtosis (Table 1). While child self-report ratings of fear spanned the entire range on both scales (Figure 2), the mean ratings were in the low range (just over 1 out of 4). Skewness measures the symmetry of a distribution and kurtosis measures whether the scores cluster in the middle or in the tails (i.e., how peaked the distribution is; Field, 2005). Child self-report ratings on both fear scales were significantly positively skewed. The values for skew and kurtosis were converted to z-scores demonstrating significant departures from normality for both scales in terms of skewness (CFS: $z = 4.04$, $p < .001$; CAPS: $z = 5.25$, $p < .001$) and for the CAPS ($z = 3.00$, $p < .01$; CFS: $z = 0.37$, *ns*) in terms of kurtosis. Given the non-normality of the child self-report distributions, non-parametric statistical tests (Spearman's rho, Mann-Whitney for between-subject, Wilcox Signed Rank for within-subject tests) were used in the data analysis with exceptions as noted.

Reliability and Validity

The difficulty in assessing traditional psychometric properties in pediatric pain has been reviewed elsewhere (e.g., Erikson, 1990). Beyer and Knapp (1986) argue that the concepts of test-retest reliability, internal consistency, and inter-rater reliability cannot be easily applied to one-item measurements of pain intensity; their contention can be extended to single-item measurements of fear. Beyer and Knapp (1986) propose instead that researchers focus on investigations into validity such that if high validity can be demonstrated, reliability is assumed.

Thus, while preliminary investigation of the inter-rater and test-retest reliability of the CFS will be outlined in the following, greater emphasis is placed on testing the validity of the measure.

Construct validity: Does the CFS measure children's fear? The high positive relationship of the CFS with the CAPS self-report measure of fear both immediately [$r_s(100) = .73$, $p < .001$] and 2 weeks following venipuncture [$r_s(48) = .87$, $p < .001$] provide evidence of convergent validity. The relationships between children's fear ratings and their overt distress behavior as measured by the CAMPIS-R also provides evidence of convergent validity. Specifically, a moderate positive relationship was found between children's distress behavior as measured by the CAMPIS-R and their self-report of fear on the CFS at time one, $r_s(100) = .41$, $p < .001$. The CFS fear ratings of children whose proportion of distress behavior fell in the bottom quartile (i.e., $\leq 25^{th}$ percentile) and in the top quartile (i.e., $\geq 75^{th}$ percentile) were compared: children who displayed increased distress behavior according to the CAMPIS-R gave significantly higher ratings of fear using the CFS (*Mdn* = 2; *M* = 1.96) following the procedure compared to children who displayed less distress behavior (*Mdn* = 1; *M* = 0.76), $U = 143.5$, $p < .001$, representing a medium-large effect ($r = -.48$; Field, 2005). Furthermore, discriminant validity of the CFS was supported through a negative relationship between children's ratings on the CFS and their coping behavior during the procedure, $r_s(100) = -.30$, $p < .005$. However, the relationship between pain self-report on the FPS-R and fear on the CFS was somewhat higher than the expected moderate relationship, $r_s(100) = .65$, $p < .001$. The difference between children's ratings on the FPS-R (transformed to 0-4) and CFS failed to reach significance, $T = 1135$, $p > .05$, a small effect ($r = -.15$). Parental rating of their children's usual reaction to having bloodwork done (1 = *negative* to 7 = *positive reaction*) was moderately related to children's rating of fear during the procedure at time one, $r_s(98) = -.40$, $p < .001$ and more strongly related

to parental rating of child fear, $r_s(98) = -.64$, $p < .001$. Thus, children who usually had negative reactions to bloodwork had higher self-reports of fear and were also rated by their parents as being more fearful. These relationships provide further evidence of the convergent validity of the CFS. There was no significant relationship between the number of times children had previously completed bloodwork and their rating on the CFS, $r_s(99) = -.17$, $p > .05$.

Inter-rater reliability: How closely did children's and parents' ratings match? Immediately after the procedure, a moderate correlation was found between parents and children's ratings of child fear on the CFS, $r_s(100) = .51$, $p < .001$. However, when exact agreement was examined using kappa, level of agreement was in the poor range ($k = .14$; Fleiss et al., 2003). A moderate correlation was found between parents' and children's ratings of fear on the CFS 2 weeks following venipuncture, $r_s(48) = .60$, $p < .001$.

Test-retest: How stable were the fear ratings over time? Traditional test-retest reliability is generally not applicable to fear as it is expected to fluctuate over time in response to different situations. However, Kuttner and LePage (1989, p. 200) indicate that "it may be possible to establish test-retest reliability using a retrospective reporting method" (and see Keck et al., 1996). As children were asked to rate fear during the same event but at a later date, the data does contain a measure of the stability of the ratings over time. Children's fear ratings immediately after and 2 weeks following venipuncture were highly correlated $r_s(48) = .76$, $p < .001$. Similarly, parents' ratings of their children's fear at these time points were also strongly related, $r_s(48) = .72$, $p < .001$.

Sex and Age Effects

To examine sex and age differences at time one, children were divided into a younger (5-7 years old; $n = 54$) and an older group (8-10 years old; $n = 46$); as noted previously, there were

40 boys and 60 girls. Mean differences between ratings on the scales by child age and sex were examined using two mixed ANOVAs (child ratings, parent ratings)[4]. A 2 (sex) x 2 (age) x 2 (fear scale) mixed ANOVA on children's self-report of fear showed that there were no significant main effects or interactions according to scale, all F's < 3, *ns*. There was a main effect of child sex showing that girls endorsed significantly higher fear ratings than boys across scales, $F(1) = 8.3$, $p < .01$[5], representing a small-medium effect ($r = .28$; Field, 2005). No effect of age was found, $F(1) = .82$, *ns*. A 2 (sex) x 2 (age) ANOVA on parents' ratings of children's fear using the CFS showed no significant differences based on child age or sex, all F's < 1, *ns*. Parallel analyses were run at time two showing no effects of age or sex on child or parent fear ratings.

Discussion

The valid measurement of fear is important to guiding effective and targeted interventions. The present objective was to provide a preliminary investigation into the use of a new one-item measure of fear with young school-aged children. Children and their parents were filmed during pediatric venipuncture. Immediately after the procedure, children and parents completed pain and fear ratings; extensive behavioral coding of the procedures was later conducted. A subset of the children and their parents completed fear ratings 2 weeks after the procedure. This multi-method approach allowed investigation of the psychometrics of the CFS. Support was found for construct validity (including concurrent convergent and some evidence of discriminant validity), inter-rater reliability, and test-retest reliability of the measure. Specifically, regarding construct validity, the CFS demonstrated high correlations with another one-item measure of fear (CAPS) and was negatively related to child coping behavior. The CFS

[4] ANOVA is considered robust against non-normality of distribution (Field, 2005).
[5] Given the main effect of sex, the relationships reported in the following sections on reliability and validity were also run as partial Pearson correlations controlling for sex. The pattern of results (and level of significance) was identical.

was also moderately related to child distress behavior and moderately to highly related to child pain. The magnitude of the relationship between the CFS and the Faces Pain Scale-Revised was higher than expected in the present investigation but is similar to previous research on pediatric venipuncture using the CAPS and a measure of pain intensity (Goodenough et al., 1997; Goodenough et al., 2004) and also between a VAS of fear and experimental pain (Tsao et al., 2004). Similarly, pain affect tends to be moderately to highly correlated with pain intensity [e.g., Miró, Castarlenas, & Huguet (2009); Goodenough, van Dongen, Brouwer, Abu-Saad, & Champion (1999)] and the constructs continue to change together over repeated measurements in a clinical sample (e.g., Connelly & Neville, 2010). There was no significant relationship between children's ratings on the CFS and the number of times they had undergone bloodwork, suggesting that novelty of the procedure does not affect children's ratings. However, supporting the measure's validity, children described by their parents as having a history of negative reactions to bloodwork had higher ratings of fear on the CFS (both self- and parent-report).

Regarding reliability, children's ratings of fear during venipuncture were relatively stable over a two-week period. A moderate correlation was found between child and parent report on the CFS; however, similar to other research when exact agreement is examined (e.g., Chambers, Reid, Craig, McGrath, & Finley, 1998), the kappa value for child versus parent report was in the poor range. The level of agreement between child and parent report of fear is consistent with studies examining concordance in the medical procedures literature (Zhou, Roberts, & Horgan, 2008) and in the literature on childhood psychopathology (De Los Reyes & Kazdin, 2005).

Research on fear as part of typical development has been inconsistent with respect to age-related differences (Gullone, 2000). Younger children may provide more extreme responses on descriptive-based scales when asked to rate emotions (Chambers & Johnston, 2002). Contrary to

our hypothesis, in the present research, no age differences were found in children's ratings (or their parents' ratings) of fear. Although investigation of potential sex effects was not the primary objective of this study, a small to medium effect was found showing girls provided higher ratings of fear than boys immediately after the procedure but not 2 weeks later. No differences were found in the parental ratings of child fear. Previous research has been inconsistent with respect to sex differences in children's ratings of pain and fear (e.g., Fowler-Kerry & Lander, 1991; Broome & Hellier, 1987). Continued investigation into whether there are reliable age and sex differences in procedural fear remains an area for future research.

A variety of self-report tools have been used to measure child fear but with little consistency. Information on the development and psychometric testing of the majority of these measures is also lacking. For younger children (e.g., 5 to 7-year-olds), a faces-type scale may hold particular promise. Both the CFS and the CAPS are one-item self-report tools which depict a continuum of fear via drawings of five faces. The present study used the CAPS as a comparison measure. The CAPS shows the head and face of a young child of indeterminant sex showing increased levels of distress. The CAPS has been used in prior research (e.g., Fowler-Kerry & Lander, 1991; Goodenough et al., 2004; Marks et al., 2009; Wright et al., 2010) and shows evidence of content and convergent validity as well as interval properties. However, a detailed account of the initial development and investigation of the CAPS is not easily available as the original manuscript is unpublished (Kuttner & LePage, 1983) although some of the relevant information is included in a later review article (Kuttner & LePage, 1989). The acceptability of the pain scale has also been found to be low (Chambers et al., 2005). Accordingly, low acceptability might also be a limitation of the anxiety/fear scale. Furthermore, its appearance seems slightly dated as the hairstyle is reminiscent of the 1980's.

In contrast to the CAPS, the CFS does not depict the full contours of an individual's head and face. It is both sex and age neutral. The Faces Anxiety Scale, and therefore the CFS, was drawn with specific reference to the facial actions involved in the emotion of fear and does not include any details that could allow it to become dated looking (e.g., hair). Previous research has supported the utility of the Faces Anxiety Scale to measure fear in adult patients in the Intensive Care Unit. The present investigation provides support for using a revised version of the tool, the CFS, with young school-age children. The CFS has low administration, response, and scoring burden. The assessor simply needs to read the instructions on the back of the scale during administration and match the face the child points to with the corresponding intensity number. No extra materials are needed; children do not have to use a writing utensil or a slider to respond (vs. for a VAS) or even touch the scale.

The current investigation was preliminary in nature and has limitations. Regarding generalizability, there may have been some self-selection bias inherent in recruitment. On one hand, it is possible that parents of children who are quite fearful may be more likely to participate in order to understand how best to help their children during painful procedures. More likely however, the most highly fearful parents and children would not agree to participate in a study involving videotaping the procedure and direct observation. Therefore, the ratings given by the present sample may underestimate the average level of fear in pediatric venipuncture. The children were also asked to rate their fear after the procedure; if they had been asked to provide anticipatory ratings, the mean ratings may have been higher (and the relationships with the comparison measures altered). That said, 22% of children rated their fear as at least 2 out of 4 on the CAPS and 29% children did so on the CFS. Furthermore, the mean fear ratings of just over 1 out of 4 in the present study are consistent with previous research measuring anticipatory fear of

venipuncture (e.g., Goodenough et al., 1997). Although a retrospective reporting method has been suggested as a way to establish test-retest reliability (Kuttner & LePage, 1989; Keck et al., 1996), children's anxiety ratings 2 weeks following venipuncture were memory-dependent. As such, their ratings could have been influenced by other factors experienced outside of the medical context (e.g., mood at the time of recall, parent-child discussions about the venipuncture which could have served to reframe the memory, and/or quality of previous medical experiences). Future research should examine this method of establishing test-retest reliability in different contexts and using different time frames.

Although the present study offers preliminary support for the reliability and validity of the CFS with a young sample, future research should replicate and further investigate its psychometric properties. To reach the goal of a measure appropriate for use with young children through adolescents, the scale should be tested with an older sample. Although the rank order of the faces has been established with adults, it has not been confirmed with children. Similarly, the responsivity of the tool to intervention with pediatric populations is unknown. The scale preferences of children and parents should also be assessed. Given the construct of interest was fear specific to the venipuncture, a multidimensional/global anxiety questionnaire was not used as a comparison. However, future research should examine the relationship between present/state levels of fear using the CFS and stable trait measures of anxiety and anxiety sensitivity as a small to moderate positive relationship has been found in previous research (Hart & Bossert, 1994). It is unclear whether the relatively high positive correlation between children's ratings of fear and pain is a function of the complexity of the relationship between fear and pain or an issue with the CFS. Further investigation into this issue remains an important area for future research.

Specifically, in order to further investigate the discriminant validity of the CFS, it should be assessed in the absence of pain as well as in the context of pain of varying intensities.

The utility of a well-validated one-item measure of fear extends beyond the field of pediatric pain to many other contexts. For example, in behaviorally-based treatments of anxiety disorders, children and adolescents are asked to progress through a graduated series of exposures to the feared stimulus/situation (i.e., create and follow a fear hierarchy; Albano et al., 2000). In order to create such hierarchies, a rating of the fear or anxiety provoked is needed. Such an ipsative measure could also be important to the recognition and self-monitoring of anxiety or fear (e.g., keeping a diary of reactions to situations). A tool like the CFS may be useful in these contexts with children as a concrete, easily completed, and accessible measure. In addition, with further validation, the CFS may be appropriate for use with hospitalized children who are not in pain, as fear/anxiety is associated with physical changes that can interfere with interventions and recovery (De Jong et al., 2005). Whether other applications of this tool are suitable remains a question for future research.

Standardizing instruments used in the assessment of important constructs such as fear and pain allows comparison of treatment outcomes across studies, which is imperative to designing effective interventions and clinical guidelines (Goodenough et al., 2005). Integral steps toward standardization include the development of a feasible scale and appropriate psychometric testing. Furthermore, both the tool and information on its psychometric testing should be widely available for effective standardization and evidence-based assessment across settings. The present investigation provided an important first step to reaching these goals with the CFS with young school-aged children.

References

Albano, A. M., Causey, D., & Carter, B. D. (2000). Fear and anxiety in children. In C. E. Walker, & M. C. Roberts (Eds.), *Handbook of Clinical Child Psychology,* (3rd ed., pp. 291-316). New York: John Wiley & Sons.

Beyer, J. E. & Knapp, T. R. (1986). Methodological issues in the measurement of children's pain. *Children's Health Care, 14,* 233-241.

Blount, R. L., Cohen, L. L., Frank, N. C., Bachanas, P. J., Smith, A. J., Manimala, M. R., et al. (1997). The Child-Adult Medical Procedure Interaction Scale-Revised: An assessment of validity. *Journal of Pediatric Psychology, 22,* 73-88.

Bringuier, S., Dadure, C., Raux, O., Dubois, A., Picot, M-C., & Capdevila, X. (2009). The perioperative validity of the visual analogue anxiety scale in children. *Anesthesia & Analgesia, 109,* 737-744. doi: 10.1213/ane.0b013e3181af00e4

Broome, M. E., & Hellier, A. P. (1987). School-age children's fears of medical experiences. *Issues in Comprehensive Pediatric Nursing, 10,* 77-86.

Chambers, C. T., Hardial, J., Craig, K. D., Court, C., & Montgomery, C. (2005). Faces scales for the measurement of postoperative pain intensity in children following minor surgery. *Clinical Journal of Pain, 21,* 277-285.

Chambers, C. T. & Johnston, C. (2002). Developmental differences in children's use of rating scales. *Journal of Pediatric Psychology, 27,* 27-36.

Chambers, C. T., Reid, G. J., Craig, K. D., McGrath, P. J., & Finley, G. A. (1998). Agreement between child and parent reports of pain. *The Clinical Journal of Pain, 14,* 336-342.

Champion, G. D., Goodenough, B., von Baeyer, C. L., & Thomas, W. (1998). Measurement of

pain by self-report. In: G. A. Finley & P. J. McGrath, (Eds.), *Measurement of pain in infants and children,* (pp. 123-160). Seattle: IASP Press.

Connelly, M., & Neville, K. (2010). Comparative prospective evaluation of the responsiveness of single-item pediatric pain-intensity self-report scales and their uniqueness from negative affect in a hospital setting. *The Journal of Pain, 11,* 1451-1460.

Cooke, M., Holzhauser, K., Jones, M., Davis, C., & Finucane, J. (2007). The effect of aromatherapy massage with music on the stress and anxiety levels of emergency nurses: Comparison between summer and winter. *Journal of Clinical Nursing, 16,* 1695-1703.

Crandall, M., Lammers, C., Senders, C., Savedra, M., & Braun, J. V. (2007). Initial validation of a numeric zero to ten scale to measure children's state anxiety. *Anesthesia and Analgesia, 105, 1250-1253.* doi: 10.1213/01.ane.0000284700.59088.8b

Darwin, C. (1998). *The expression of the emotions in man and animals* (3rd ed.) London: Harper Collins. (Original work published 1872)

De Jong, M. J., Burns, S. M., Campbell, M. L., Chulay, M., Grap, M. J., Pierce, L. N. B., & Simpson, T. (2005). Development of the American Association of Critical-Care Nurses' Sedation Assessment Scale for critically ill patients. *American Journal of Critical Care, 14,* 531-544.

De Los Reyes, A., & Kazdin, A. E. (2005). Informant discrepancies in the assessment of childhood psychopathology: A critical review, theoretical framework, and recommendations for further study. *Psychological Bulletin, 131,* 483-509.

Derogatis, L. R., & Melisaratos, N. (1983). The brief symptom inventory: An introductory report. *Psychological Medicine, 13,* 595-605.

Ekman, P., & Friesen, W. V. (1978). *Facial action coding system: A technique for the measurement of facial movement*. Palo Alto, CA: Consulting Psychologists.

Erikson, C. J. (1990). Pain measurement in children: Problems and directions. *Developmental and Behavioral Pediatrics, 11,* 135-137.

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). London: Sage.

Fleiss, J. L., Levin, B., & Paik, M. C. (2003). *Statistical methods for rates and proportions* (3rd ed.). New York: Wiley.

Fowler-Kerry, S. & Lander, J. (1991). Assessment of sex differences in children's and adolescents' self-reported pain from venipuncture. *Journal of Pediatric Psychology, 16,* 783-793.

Goodenough, B., Champion, G. D., Laubreaux, L., Tabah, L., & Kampel, L. (1998). Needle pain severity in children: Does the relationship between self-report and observed behaviour vary as a function of age? *Australian Journal of Psychology, 50,* 1-9.

Goodenough, B., Kampel, L., Champion, G. D., Laubreaux, L., Nicholas, M. K., Ziegler, J. B., & McInerney, M. (1997). An investigation of the placebo effect and age-related factors in the report of needle pain from venipuncture in children. *Pain, 72,* 383-391.

Goodenough, B., Piira, T., von Baeyer, C. L., Chua, K., Wu, E., Trieu, J. D. H., & Champion, G.D. (2005). Comparing six self-report measures of pain intensity in children. *The Suffering Child, 8.* Available at: www.usask.ca/childpain/research/6scales/6scales.pdf

Goodenough, B., Roschar, F., Cole, A., Piira, T., & Kuttner, L. (2004). Self-report of pain-related distress before and after pediatric venipuncture: A validation study of the Children's Anxiety and Pain Scale. *Psychologica, 37,* 101-114.

Goodenough, B., van Dongen, K., Brouwer, N., Abu-Saad, H.H., & Champion, D.G. (1999). A

comparison of the Faces Pain Scale and the Facial Affective Scale for children's estimates of the intensity and unpleasantness of needle pain during blood sampling. European Journal of Pain, 3, 301-315.

Gullone, E. (2000). The development of normal fear: A century of research. *Clinical Psychology Review, 20,* 429-451. doi:10.1016/S0272-7358(99)00034-3

Hart, D. & Bossert, E. (1994). Self-reported fears of hospitalized school-age children. *Journal of Pediatric Nursing, 9,* 83-90.

Hicks, C. L., von Baeyer, C. L., Spafford, P. A., van Korlaar, I., & Goodenough, B. (2001). The Faces Pain Scale-Revised: Toward a common metric in pediatric pain. *Pain, 93,* 173-183. doi:10.1016/S0304-3959(01)00314-1

Kazdin, A. E. (2003). *Research design in clinical psychology* (4th ed.). Boston: Allyn & Bacon.

Kazdin, A. E. (2005). Evidence-based assessment for children and adolescents: Issues in measurement development and clinical application. *Journal of Clinical Child and Adolescent Psychology, 34,* 548-558. doi: 10.1207/s15374424jccp3403_10

Keck, J. F., Gerkensmeyer, J. E., Joyce, B. A., & Schade, J. G. (1996). Reliability and validity of the Faces and Word Descriptor scales to measure procedural pain. *Journal of Pediatric Nursing, 11,* 368-374.

Kuttner, L. & LePage, T. (1983). *The development of pictorial self-report scales of pain and anxiety management.* Unpublished manuscript.

Kuttner, L., & LePage, T. (1989). Faces scales for the assessment of pediatric pain: A critical review. *Canadian Journal of Behavioural Science, 21,* 198-209.

LeBaron, S. & Zeltzer, L. K. (1984). Assessment of acute pain and anxiety in children and

adolescents by self-reports, observer reports, and a behavior checklist. *Journal of Consulting and Clinical Psychology, 55,* 729-738.

Marks, S., Lamb, R., & Tzioumi, D. (2009). Do no more harm: The psychological stress of the medical examination for alleged child sexual abuse. *Journal of Paediatrics and Child Health, 45,* 125-132. doi: 10.1111/j.1440-1754.2008.01443.x

McGrath, P. J., Walco, G. A., Turk, D. C., Dworkin, R. H., Brown, M. T., Davidson, K., et al. (2008). Core outcome domains and measures for pediatric acute and chronic/recurrent pain clinical trials: PedIMMPACT recommendations. *Journal of Pain, 9,* 771-783. doi:10.1016/j.jpain.2008.04.007

McKinley, S., Coote, K., & Stein-Parbury, J. S. (2003). Development and testing of a faces scale for the assessment of anxiety in critically ill patients. *Journal of Advanced Nursing, 41,* 73-79. doi: 10.1046/j.1365-2648.2003.02508.x

McKinley, S., & Madronio, C. (2008). Validity of the Faces Anxiety Scale for the assessment of state anxiety in intensive care patients not receiving mechanical ventilation. *Journal of Psychosomatic Research, 64,* 503-507.

McKinley, S., Stein-Parbury, J., Chehelnabi, A., & Lovas, J. (2004). Assessment of anxiety in intensive care patients by using the Faces Anxiety Scale. *American Journal of Critical Care, 13,* 146-152.

Miller, D. C. (1983). *Handbook of research design and social measurement: A text and reference book for the social and behavioral sciences* (4th ed.). New York: Longman.

Miró, J., Castarlenas, E., & Huguet, A. (2009). Evidence for the use of a numerical rating scale to assess the intensity of pediatric pain. *European Journal of Pain, 13,* 1089-1095.

Ollendick, T. H. (1983). Reliability and validity of the Revised Fear Survey Schedule for

Children (FSSC-R). *Behaviour Research & Therapy, 21,* 685-692.

Rhudy, J.L. & Meagher, M.W. (2003). Negative affect: effects on an evaluative measure of human pain. *Pain, 104,* 617-626. doi:10.1016/S0304-3959(03)00119-2

Ridgeway, D., Waters, E., & Kuczaj, S. A. (1985). Acquisition of emotion-descriptive language: Receptive and productive vocabulary norms for ages 18 months to 6 years. *Developmental Psychology, 21,* 901-908. doi:10.1037/0012-1649.21.5.901

Sattler, J.M. (2002). *Assessment of children: Behavioral and clinical applications* (4th ed.). San Diego: Jerome M. Sattler.

Stinson, J.N., Kavanagh, T., Yamada, J., Gill, N., & Stevens, B. (2006). Systematic review of the psychometric properties, interpretability and feasibility of self-report pain intensity measures for use in clinical trials in children and adolescents. *Pain, 125,* 143-157.

Tsao, J. C. I., Myers, C.D., Craske, M. G., Bursch, B., Kim, S. C., & Zeltzer, L. K. (2004). Role of anticipatory anxiety and anxiety sensitivity in children's and adolescents' laboratory pain responses. *Journal of Pediatric Psychology, 29,* 379-388.

Windich-Biermeier, A., Sjoberg, I., Dale, J.C., Eshelman, D., Guzzetta, C.E. (2007). Effects of distraction on pain, fear, and distress during venous port access and venipuncture in children and adolescents with cancer. *Journal of Pediatric Oncology Nursing, 24,* 8-19.

Wright, K.D., Eisner, A., Stewart, S.H., & Finley, G.A. (2010). Measurement of preoperative anxiety in young children: Self-report versus observer-rated. *Journal of Psychopathology and Behavior Assessment, 32,* 416-427. doi: 10.1007/s10862-009-9158-9

Zhou, H., Roberts, P., & Horgan, L. (2008). Association between self-report pain ratings of child and parent, child and nurse and parent and nurse dyads: Meta-analysis. *Journal of Advanced Nursing, 63,* 334-342. doi: 10.1111/j.1365-2648.2008.04694.x

Table 1

Descriptives of child fear ratings during venipuncture by rater and scale

	Child		Parent
	CAPS (0-4)	CFS (0-4)	CFS (0-4)
M	1.01	1.08	1.77
SD	1.05	1.15	1.18
Mdn	1.00	1.00	2.00
Range	0-4	0-4	0-4
Skew (SE)	1.26 (0.24)	0.97 (0.24)	0.27 (0.24)
Kurtosis (SE)	1.43 (0.48)	0.18 (0.48)	-0.79 (0.48)
50th percentile	1.00	1.00	2.00
90th percentile	2.00	3.00	3.00
95th percentile	3.95	3.95	4.00

Note: CFS = Children's Fear Scale; CAPS = Children's Anxiety and Pain Scale – Anxiety Scale only; M = mean; SD = standard deviation; Mdn = median; SE = standard error.

Figure 1. The Children's Fear Scale (adapted from the Faces Anxiety Scale; McKinley et al., 2003). Instructions on the CFS are as follows: "These faces are showing different amounts of being scared. This face [point to the left-most face] is not scared at all, this face is a little bit more scared [point to the second face from left], a bit more scared [sweep finger along scale], right up to the most scared possible [point to the last face on the right]. Have a look at these faces and choose the one that shows how scared you were during the needle."

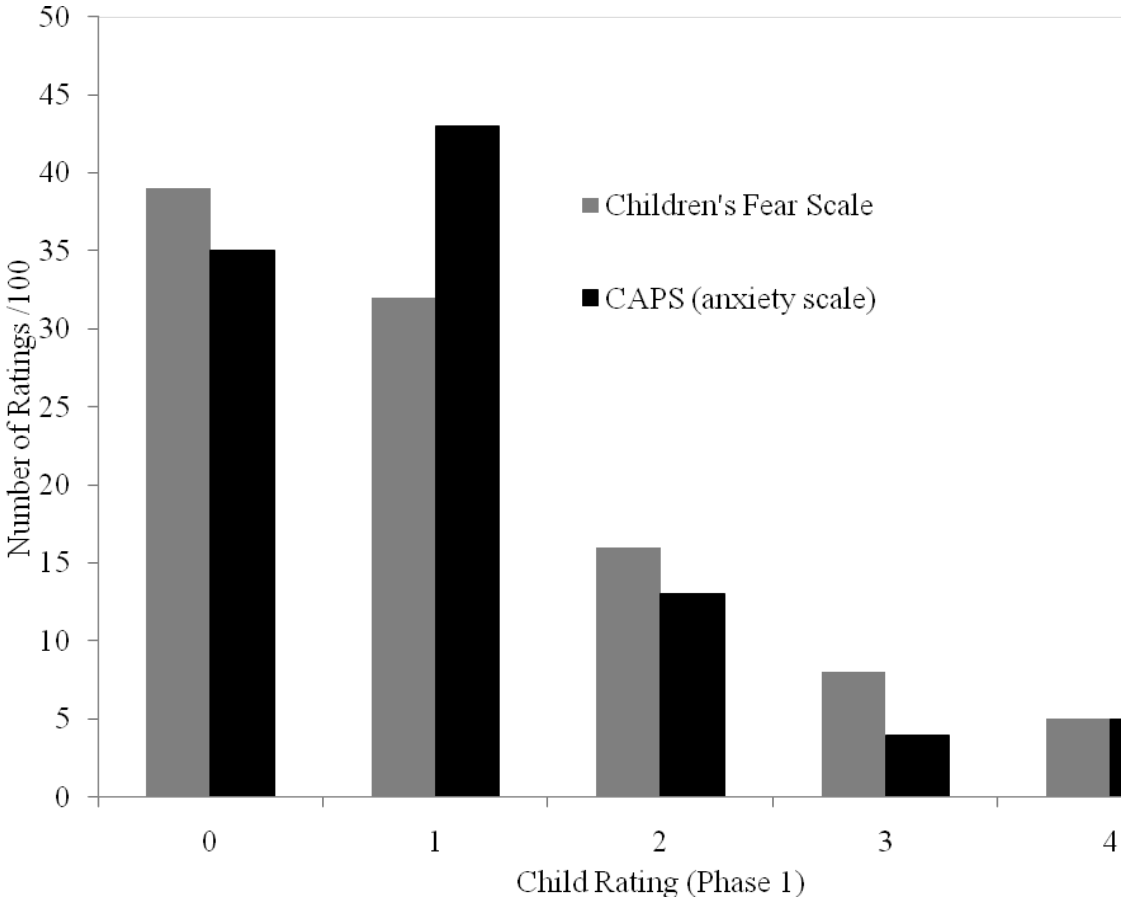

Figure 2. Frequency distribution of child self-report on the two measures of fear. Both scales showed positively skewed distributions.