Multimethod Assessment of Children’s Distress During Noninvasive Outpatient Medical Procedures: Child and Parent Attitudes and Factors

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The present study assessed behavioral distress during noninvasive outpatient procedures in children ages 4–10 years using a multimethod approach. Factors hypothesized to exacerbate children’s distress included parents’ and children’s attitudes toward healthcare, children’s knowledge of medical settings, and parental anxiety. A total of 53 parent–child dyads were recruited from outpatient clinics, with procedural distress assessed via child report, parent report, and direct observation. Some differences emerged depending on the method used to gauge distress. Children’s healthcare attitudes and knowledge were associated with observed and child-reported distress, but parent’s personal anxiety was associated only with their own perceptions of children’s procedural distress. Parents’ attitudes toward healthcare were associated with their anxiety but not with children’s behavioral distress or healthcare attitudes. Findings are discussed in terms of more consistent findings regarding children’s healthcare knowledge and attitudes versus the potential need for additional research on more divergent findings regarding parents’ anxiety and healthcare attitudes.

Key words attitudes toward healthcare; behavioral distress; children’s knowledge; multimethod; outpatient medical patients; parent–child relations.

Although medical procedures can be daunting for many, children are often more disturbed and threatened by medical situations because of the separation from caregivers and the novelty of the situation. Children’s adverse reactions to medical situations have long been recognized (Prugh, Staub, Sands, Kirschbaum, & Lenihan, 1953), although efforts have continued over the intervening decades to identify factors that mitigate or exacerbate children’s procedure-related distress (e.g., Mahoney, Ayers, & Seddon, 2010). Such reactions include short-term sequelae to hospitalization and surgery, such as depression, sleep disturbance, and aggression (Yap, 1988), but distress is also observed during outpatient procedures (Bachanas & Roberts, 1995). In operationalizing distress in this study, because of our multi-informant approach, behavioral manifestations of distress (e.g., crying, verbalized distress, solicitations for comfort) reportable across sources were emphasized rather than inferring children’s mood states.

Distress and anxiety in children undergoing invasive or painful medical procedures may be predictable (e.g., McMurtry, Chambers, McGrath, & Asp, 2010), but distress behavior and anxiety can actually amplify the perception of pain (McGrath, 1994). Moreover, the experience of pain can complicate our ability to disentangle the child’s reaction to a pediatric situation independent of their affective or behavioral response to the pain or invasiveness involved in a given medical procedure. Even without physically invasive or painful processes during medical procedures, children can become distressed because of misgivings about the equipment/setting or because of
memories of pain from earlier upsetting pediatric experiences (von Baeyer, Marche, Rocha, & Salmon, 2004). Yet compared to the volume of literature on distress during painful and/or invasive medical procedures, surprisingly little research has explored children’s distress during noninvasive procedures, which are common occurrences in the lives of most children.

Although research is limited, one study observed children demonstrated both behavioral and physiological distress even when the procedure was not invasive or painful, which can interfere with the smooth delivery of needed medical intervention (Tyc, Klosky, Kronenberg, & Armsendi, 2002). In noninvasive medical procedures without pain, like X-ray examinations, young children can still experience procedural distress that can interfere with diagnostic and treatment processes and outcomes (Bradford, 1990). Interventions have been developed that would be appropriate to children undergoing noninvasive pediatric procedures (Klosky et al., 2004; Stevenson et al., 1990). Nonetheless, despite the modest number of studies confirming that behavioral distress occurs during noninvasive pediatric contexts, research has not adequately identified factors that potentially exacerbate behavioral distress during procedures that do not induce pain. The current study thus explicitly investigated variables that may be associated with children’s behavioral distress during nonpainful outpatient medical procedures that would not be confounded by a reaction to pain that could arise from a physically invasive medical process.

Children possess a number of individual characteristics that may relate to their distress behavior but children’s behavior is also influenced by their parents. The classic notion of emotional contagion suggests that one’s emotional distress may be transmitted to another (Escalona, 1953; Hatfield, Cacioppo, & Rapson, 1994). Essentially, emotion contagion theory is congruent with basic social learning theory (Bandura, 1969), which proposes behavior can be learned through modeling. Parents can thus model behavior, including emotional distress and communicate beliefs to their children, which in the pediatric context would include parents modeling and/or conveying their distress and beliefs about the pediatric visit to their children.

Beginning with child-level background characteristics, several factors have been associated with increased distress behaviors. For example, younger children are generally more likely to demonstrate a wider variety and greater intensity of distress than older children during medical procedures (Bachanas & Roberts, 1995; Blount, Landolf-Fritsche, Powers, & Sturges, 1991; Jay, Ozolins, Elliott, & Caldwell, 1983; Tyc et al., 2002). In addition, girls may be more likely than boys to demonstrate distress. For example, females display higher levels of distress during painful procedures, such as bone marrow aspirations (Blount et al., 1991; Katz, Kellerman, & Siegel, 1980) and during hospitalization (Saylor, Pammeyer, Finch, & Eason, 1987), although such gender differences with girls are not systematically observed (e.g., Rodriguez & Bogg, 1994), particularly in younger children (Goodenough et al., 1999).

Apart from demographic characteristics, child-level factors pertaining to their pediatric history are also relevant to child distress. For example, one major intervention approach to minimize children’s pediatric distress involves providing information regarding the medical procedures (Jaaniste, Hayes, & von Baeyer, 2007), predicated on the belief that preparatory information reduces distress (Palermo, Drotar, & Tripi, 1999). Higher anxiety is often observed among children with the least familiarity with medical procedures and instruments (e.g., Claar, Walker, & Smith, 2002). A child’s prior experience with medical settings and procedures is also likely to influence their attitudes toward those same settings and procedures. But relatively little is known about children’s attitudes toward healthcare as it relates to their distress, even in the literature on invasive medical procedures. Children with more negative, unfavorable attitudes toward healthcare, as well as their mothers’ negative attitudes toward healthcare, evidenced greater distress during annual well-child outpatient visits that included a blood test (Bachanas & Roberts, 1995). Such unfavorable attitudes reflect a general dislike of healthcare entities and the belief that they are ineffective and should be avoided (e.g., Bush & Holmbeck, 1987).

Consistent with social learning theory, attitudes toward health reflect shared family-level cognitions about illness (Gochman, 1997), supported by studies showing children often adopt the health beliefs and habits of their parents (e.g., Bush & Iannotti, 1988). Children’s attitudes about healthcare are associated with their mothers’ attitudes, with modest effect sizes using variants of the same measure given to the child and parent (Bachanas & Roberts, 1995; Hackworth & McMahon, 1991). Thus, a parent may hold negative, unfavorable attitudes toward healthcare professionals and medical settings which can sway a child’s developing attitudes such that children mirror parents’ attitudes, which in turn could affect children’s behavioral distress.

Emotional contagion theory also suggests parents’ reactions to the medical situation can influence their children’s distress during a procedure. Parents can theoretically facilitate their children’s coping during painful procedures (Bustos, Jaaniste, Salmon, & Champion, 2008), but some parental attempts to help their child...
cope are actually associated with greater distress (Cohen, Bernard, Greco, & McClellan, 2002). Indeed, parents’ own distress behavior is associated with their children’s greater distress (Mahoney et al., 2010) perhaps because parents expect their child to become distressed, which is then reflected in children’s anticipatory distress even in noninvasive procedures (Tyc et al., 2002). Parents may experience anxiety before their child’s procedure that is communicated to the child (Prins, 1994). Thus, parent-level anxiety and attitudes are theoretically connected via social learning to children’s beliefs and distress.

A critical research design issue pertains to integrating various perspectives. Researchers advocate including a range of methods, highlighting the limits of single source and monomethod approaches (Holmbeck, Li, Schurman, Friedman, & Coakley, 2002). Assessment with children, parents, and observational measures is optimal (e.g., McClellan et al., 2009), wherein rating scales and direct observation are clearly useful (e.g., Blount & Loiselle, 2009). Parents are often relied upon because of their familiarity with the child’s distress behaviors. Yet distress also reflects a subjective experience, rendering children’s perspectives invaluable. Although child self-report may be complicated by doubts arising from the respondent’s age, researchers have meaningfully included the report of children as young as three (e.g., Blount et al., 1992).

Consequently, the purpose of the present study was to conduct a multi-informant, multimethod assessment of young children’s behavioral distress (parent reported, child reported, and direct observation), targeting nonpainful, noninvasive medical procedures, a relatively under-studied segment of the pediatric psychology literature. Among the factors of primary interest were parents’ and children’s health-related attitudes, which have also not been well studied, particularly as they relate to distress during noninvasive procedures. Based on social learning theory, negative parental attitudes toward healthcare were hypothesized to be mirrored by children’s negative attitudes that would be associated with their procedure-related behavioral distress. Parental anxiety was similarly anticipated to relate to children’s procedural distress.

The study targeted children as young as four; thus we incorporated self-report strategies appropriate for young children. For example, existing self-reports of children’s healthcare attitudes pose questions assuming children are familiar with the medical aspects (or ask a child to estimate what they believe their attitude could be when unfamiliar; Bush & Holmbeck, 1987), which would be more complicated and abstract for young children. We were also interested in the role of children’s knowledge of pediatric equipment and settings as it relates to their healthcare attitudes and distress. Thus, we designed a measure to obtain attitudes for aspects of healthcare with which they were familiar. We hypothesized children with less knowledge of and poorer attitudes toward healthcare would display elevated distress behavior. Since parental factors were theorized to affect children’s distress, we examined whether children’s knowledge of and attitudes toward healthcare would predict parent reported, child reported, and observer reported behavioral distress beyond what might be attributed to parental anxiety and healthcare attitudes.

**Method**

**Participants**

Participants were 53 children between 4 and 10 years old (M = 7.08 years, SD = 1.95 years) who presented at outpatient medical clinics at Dunedin Public Hospital, located in Dunedin, New Zealand with a catchment area of the wider Otago region. Of these children, 32 were male and 21 were female. Parents (81% mothers) reported on their child’s race/ethnicity, with 85% indicating European descent. The majority (88.7%) of children were living in two-parent homes with a modal annual family income between NZ$30–45,000 (average national family income was NZ$46,100). Children were being seen for outpatient services for one of four noninvasive medical procedures: electroencephalogram (EEG, n = 13); electrocardiogram (ECG, n = 7); chest X-ray (X-ray, n = 3), or ear/nose/throat examination (ENT, n = 22). According to parent report, the majority of the children (54.7%) had previous outpatient hospital visits, nearly half had experienced an overnight stay (45.3%), and only a third (34%) had never experienced that day’s procedure before, suggesting this was a relatively medically ‘experienced’ sample of children.

**Measures**

**Parent Report**

The Behavioral Upset in Medical Patients-Revised Hospital scale (BUMP Hospital; Rodriguez & Boggs, 1994; Saylor et al., 1987) assesses a child’s behavioral distress in a hospital setting. Caretakers report on 28 items using a 5-point Likert scale, where higher scores are indicative of greater distress. For example, parents indicated their extent of agreement with the item, “Clinging, needs lots of reassurance”. The reliability and concurrent validity of the BUMP Hospital have been investigated with an inpatient sample, with internal consistency at .87 (Rodriguez & Boggs, 1994). For the current study, two items were removed as not applicable to a nonhospitalized sample (items inquiring about sleep). In the current study, this 26-item version...
of the BUMP-R Hospital maintained high reliability, with Cronbach’s $\alpha$ at .90.

The Attitudes towards Doctors and Medicine Questionnaire (ADMQ; Marteau, 1990) is a 19-item measure of an adult’s attitudes toward the medical profession, including opinions regarding the effectiveness of medicine and doctors to promote health versus their reluctance or skepticism. Parents responded on a 6-point Likert scale, with high scores reflecting more positive attitudes. Internal consistency has been previously reported as ranging from .61 to .76 as well as retest reliabilities ranging from .61 to .81 with support for concurrent validity (Marteau, 1990). In the current sample, parental ADMQ scores evidenced adequate internal consistency ($\alpha = .79$).

The State-Trait Anxiety Inventory (STAI; Spielberger, 1983) State anxiety scale is a widely used measure of self-reported anxiety in adults. Parents completed the STAI State anxiety scale to determine their situationally specific anxiety immediately prior to the child’s procedure. These 20 items are rated on a 4-point Likert scale, wherein higher scores suggest greater anxiety. Scores are scaled to $T$-scores with a mean of 50. Considerable psychometric evidence supports the reliability and validity of the STAI, with a high median $\alpha$ of .92 (Spielberger, 1983).

### Child Report

The Behavioral Upset in Medical Patients-Child Self-Report Version (Child-BUMP; Rodriguez & Boggs, 1998) is a 27-item pictorial scale of items adapted from the BUMP Hospital scale above. All items are phrased in language understandable for children ages 4 and above. Modeled after the format of the Harter self-competence scales (Harter & Pike, 1983), the Child-BUMP presents items in a two-step process. Children are asked to select one of two line drawings depicting the child’s behavior that best describes them; for example, “This girl cried a little” versus “This girl cried a lot”. Each item is followed by two choices regarding the frequency (e.g., “always” versus “sometimes”). Thus, each item yields a score from 1 to 4, with higher scores suggesting greater behavioral distress. The picture in each item of most distress is counterbalanced, presented alternately either left or right on the page. Male and female versions are identical except for the sex of the child depicted in the drawing, with half of the items shaded to represent a non-White population. Since the Child-BUMP was initially designed for a hospitalized sample (Rodriguez & Boggs, 1998), two items were dropped (equivalent to the two sleep items dropped from the BUMP Hospital noted above). Internal consistency was reported for the 27 items of the Child-BUMP at .76, with modest correlations supporting concurrent validity with parent report of distress (Rodriguez & Boggs, 1998). In the current sample, the 25 remaining Child-BUMP items demonstrated modest internal consistency ($\alpha = .69$). An examination of the item characteristics indicated two of the items (“this girl says she’s sad” and “this girl doesn’t talk about things that bug her”) did not contribute well to the total score. Dropping these two items considerably improved the reliability, bringing Cronbach’s $\alpha$ to .80. Thus, given the enhanced reliability of this abbreviated 23-item version, this Child-BUMP total score is used in our analysis. To examine whether the Child-BUMP evidences stability, we also orally administered the Child-BUMP to a separate sample of 40 comparison children between ages 4 and 10 years (recruited from a preschool and elementary school) on two occasions (1 month apart, $M = 30.5$ days, $SD = 3.1$) regarding their perception of their distress when they are sick. For the 23-item Child-BUMP used in this analysis, the retest correlation was high, at .80.

The Children’s Medical Opinions Survey (C-MOS) was designed for this study to assess children’s attitudes toward healthcare. Children are presented nine photos in three categories: health professionals (doctor, nurse); health setting (hospital, examination room); instruments/procedures (stethoscope, medicine, injection, blood pressure cuff, and the instrument/procedure they just had). Photos were of the actual items in the hospital units in this study, chosen by the participating medical clinics as the most frequently used that would be familiar to children in the age range. While looking at the photo, the child is asked if they recognize the item (Yes/No); this preliminary step established if the child had knowledge of the item, with total scores from 0 to 9 on C-MOS Knowledge across photos. Only if the child reported recognition of the item were they then asked two attitude questions in the two-step model described above for the Child-BUMP. For example, for a stethoscope, in the first attitude question in the first step, children are asked if they would help them feel good or bad, followed by a second step about the intensity of that attitude (e.g., “a lot” vs. “a little” good/bad). This question was designed to assess their perception of effectiveness (comparable to the ADMQ concept). The second attitude question asked if they liked the item, again in two steps; the second step indicated intensity, evaluating whether they felt positively/negatively toward the object/medical professional. Two independent developmental psychologists specializing in children’s language development were consulted and items were modified until both experts considered the language appropriate for children ages 4 years and above. Summary scores were then generated summing across items for a C-MOS Judgment score for “good/bad” attitudes, averaged to be
proportional to the total number of items with which they were familiar (i.e., they would not be asked their opinion regarding an item if they reported no recognition of the item). Similarly, C-MOS Favorable scores are the average of all “like” ratings, proportional to recognized items. Ultimately, each attitude item yields a 4-point score ranging from 1 to 4, with an equivalent range for the summary scores given that they are based on averages, with higher scores indicating more favorable attitudes.

In our sample, C-MOS Knowledge internal consistency was modest, at .64; although not optimal, knowledge is not likely to reflect high consistency in this age group because familiarity with one item would not ensure familiarity with another. Attitude scores demonstrated high reliability, with C-MOS Judgment scores at $\alpha = .86$ and C-MOS Favorable scores at $\alpha = .87$. Based on the independent sample of 40 schoolchildren described above in the Child-BUMP, the C-MOS was also administered twice, 1 month apart. Stability for C-MOS Knowledge was .50, which is acceptable given that knowledge would likely increase over time, particularly as children likely inquired about items they were unfamiliar with after the first session. For attitude scores, C-MOS Judgment scores demonstrated good stability at .64 and C-MOS Favorable at .88.

Observation

The Observation Scale of Behavioral Distress-Revised (OSBD; Jay & Elliot, 1986) is designed for direct observational ratings, originally for children undergoing bone marrow aspirations and lumbar punctures. The coding system has been applied to other procedures (e.g., Powers, Blount, Bachanas, Cotter, & Swan, 1993). Using eight operationally defined behavioral signs of anxiety/behavioral distress, coders track whether the child exhibits information seeking, crying, screaming, restraint by others, verbal resistance, eliciting emotional support, verbal pain, and flailing. Each category is weighted according to intensity of the behavior (e.g., screaming and flailing are weighted higher than verbal resistance). The OSBD was coded in continuous 15-s intervals, tallying occurrence of each behavior; interval codes included behavior exhibited during procedure preparation (first eight 15-s intervals), during the procedure (ten 15-s intervals), and completion of the procedure (first eight 15-s intervals). For all but the EEG, this allowed for the entire procedure to be recorded; for EEG, which was longer, three phases were targeted for three procedure-related events (lying on the bed to begin EEG for four intervals, blowing on a windmill for three intervals, flashing lights for three intervals). Weighted mean interval scores within each phase contributed to the Total OSBD Distress score across phases. Prior studies support the psychometrics of the OSBD, with concurrent validity with other ratings of distress and good inter-rater reliability, with a correlation coefficient of .99 (Jay et al., 1983). In this study, 19 tapes were coded independently by another rater (36% of tapes), resulting in an inter-rater correlation of .95 for the weighted scores, an overall rate of agreement of 98.5% and Cohen’s $k$ of .66 on unweighted tallies across phases. Nearly half the sample evidenced some behavioral distress, with ~1% of any tallies involving a pain code.

Procedures

Approval for this study was obtained by the university Institutional Review Board and informed consent acquired. Parents of a child in the age range scheduled for an outpatient clinic visit received letters describing the study with their appointment reminder or were approached during their visit if unscheduled. Those parents expressing interest in participating at the time of their appointment were enrolled in the study (approximately 34 parents declined primarily due to time constraints). The parent completed the STAI on their own anxiety immediately before the scheduled procedure, while the researcher set up the videocamera in the procedure room. The parent was always present during the child’s procedure. Immediately after the procedure, the videocamera was stopped and the parent and child were taken to a quiet area of the clinic, where the parent completed demographic information, the ADMQ on their own attitudes and the BUMP-R Hospital on how their child behaved during the procedure. Meanwhile, the researcher privately interviewed the child, orally administering the C-MOS and Child-BUMP.

Results

Potential Covariates

T-tests or correlations were initially performed to determine whether measures differed relative to background characteristics to evaluate the need for covariates. No significant differences in outcome variables were identified for parent age and education or child gender (all $p > .05$).

There were no clear differences across different medical procedures (all $F$-tests, $p > .05$) with the exception of those receiving an EEG demonstrating somewhat more knowledge than those receiving the other procedures [$F(3, 45) = 2.91, p < .05$]. Greater family income was associated only with favorable parental attitudes on the ADMQ ($r = .32, p < .05$). As can be seen in Table 1, child age was associated with several measures and, of the questions assessing prior pediatric experience, the number of prior hospital outpatient visits demonstrated some association with
measures. Given this pattern, age and number of prior outpatient visits were considered potential covariates predicting children’s distress in the multivariate analyses.

### Bivariate Associations

For parental reports of children’s distress, an examination of the correlations (Table I) indicated greater parental anxiety related to their report of child distress. Parent report of child distress was also correlated with child reported and observed distress. However, BUMP Hospital scores were unrelated to parents’ attitudes toward healthcare or children’s CMOS Knowledge scores, but significantly correlated with children’s judgment scores about doctors and medicine as good for them. Children’s self-reported distress was significantly associated with their attitude scores but unrelated to either observed distress or parents’ anxiety or attitudes toward healthcare. Finally, direct observation of distress was significantly correlated with children’s CMOS scores such that children with greater knowledge and more positive attitudes evidenced less distress. Observed distress was unrelated to parental anxiety or parental healthcare attitudes.

Of potential interest, parents’ higher anxiety was associated with their more negative personal healthcare attitudes but not with children’s knowledge or attitudes. Parents with more negative personal attitudes had children who had less knowledge of pediatric settings. Children with greater knowledge on the CMOS did evidence more favorable attitudes toward healthcare.

### Multivariate Analyses

Three independent hierarchical multiple regression analyses were performed to predict children’s behavioral distress, with BUMP Hospital, OSBD, and Child-BUMP total scores as dependent variables. Hierarchical multiple regression techniques were performed wherein potential covariates were first entered (e.g., child age, number prior outpatient visits) followed by theorized parental factors in a second block (STAI and ADMQ scores), with a final block of child-level variables (CMOS Knowledge, Judgment, and Favorable scores) to determine if these explained variance beyond the parent factors.

Initially predicting OSBD scores, with covariates, parent, and child factors entered as described above, $R^2 = .37, F(7, 45) = 3.75, p \leq .01$. But examination of those variables contributing significant unique variance in observed distress scores ultimately retained only age as a covariate, with CMOS Knowledge and Judgment scores in the child block. In other words, parent factors in the second step did not contribute significant unique variance to OSBD scores, and when entering the two attitude scores simultaneously, the analyses favored retaining CMOS Judgment scores (i.e., the child’s evaluation of the effectiveness of healthcare over their opinions on favorability). Note that the CMOS Knowledge score was marginally significant but did appear to be accounting for variance and was thus retained in final model in the interests of completeness. Thus, the final, most parsimonious regression predicting OSBD scores resulted in an $R^2 = .33, F(3, 49) = 7.91, p \leq .001$ (see Table II for final regression results).
In the regression analyzing Child-BUMP scores as the outcome, with covariates, parent and child factors entered as described above, $R^2 = .34, F(7, 45) = 3.39, p < .01$. However, none of the covariates or parent factors contributed significant unique variance in child-reported distress. In the child block, both attitude scores contributed (CMOS Judgment marginally), thus appearing that negative attitudes on both dimensions were associated with child reported distress, with a final regression predicting Child-BUMP scores of $R^2 = .26, F(2, 50) = 8.87, p < .001$ (see Table II).

**Discussion**

The current study adopted a multi-informant approach to assess behavioral distress in children undergoing noninvasive outpatient medical procedures. Of primary interest was the relation between parents’ health-related attitudes and children’s health-related attitudes and knowledge as associated with children’s distress, assessed by child-report, parent-report, and direct observation. Guided by social learning theory, we hypothesized parental factors, such as anxiety and healthcare attitudes, would relate to children’s healthcare attitudes and knowledge that would in turn relate to their behavioral distress. Overall, findings suggest relatively modest consensus across reporters regarding children’s behavioral distress during the procedure. Thus, variables of interest were not uniformly related to children’s distress. For example, although children’s healthcare attitudes were associated with observed and child-reported distress, only parental anxiety predicted parent-reported distress. Consequently, factors that appear to impact children’s procedure-related distress may depend on who provides the evaluation of distress.

Based on child report and observation, greater knowledge about medical procedures was related to less child distress, consistent with earlier findings (Claar et al., 2002). Multivariate analyses predicting observed distress particularly suggested greater knowledge was associated with less behavioral distress. Such results support that familiarity and preparatory information surrounding the medical setting can significantly reduce a child’s experienced distress (Palermo et al., 1999). What is also interesting is that parents who held more favorable healthcare attitudes themselves also had children with greater knowledge of healthcare, suggesting that the parent’s attitudes may relate to their decision to provide better preparation for their children.

Somewhat consistently across source, children’s positive attitudes toward healthcare were generally related to children’s behavioral distress. Although the limited previous research has implied an association, we did not observe the previously reported overlap between parent and child healthcare attitudes (e.g., Bachanas & Roberts, 1995). In contrast to that study, the present study did not use a variation of the same measure across reporters, wherein the latter would magnify their findings and

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**Table II. Final Hierarchical Multiple Regression Equation Results for Child Distress**

<table>
<thead>
<tr>
<th>Observed Distress (OSBD Total) Results</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$\Delta r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Age</td>
<td>-0.31</td>
<td>-2.48*</td>
<td></td>
</tr>
<tr>
<td>No. of hospital outpatient visits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMOS knowledge</td>
<td>-0.23</td>
<td>-1.89*</td>
<td></td>
</tr>
<tr>
<td>CMOS judgment</td>
<td>-0.32</td>
<td>-2.66**</td>
<td></td>
</tr>
</tbody>
</table>

$R = .57, F(3, 49) = 7.91***
$ $R^2 = .33$ (Adj $R^2 = .29$)

<table>
<thead>
<tr>
<th>Child-reported Distress (Child BUMP results)</th>
<th>$\beta$</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMOS judgment</td>
<td>-0.26</td>
<td>-1.91#</td>
</tr>
<tr>
<td>CMOS favorable</td>
<td>-0.34</td>
<td>-2.47*</td>
</tr>
</tbody>
</table>

$R = .51, F(2, 50) = 8.87***
$ $R^2 = .26$ (Adj $R^2 = .23$)

<table>
<thead>
<tr>
<th>Parent-reported distress (BUMP Hospital results)</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$\Delta r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child age</td>
<td>-0.41</td>
<td>-3.53***</td>
<td></td>
</tr>
<tr>
<td>No. of hospital outpatient visits</td>
<td>0.30</td>
<td>2.50**</td>
<td></td>
</tr>
<tr>
<td>Block 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAI State Anxiety</td>
<td>0.33</td>
<td>2.88**</td>
<td></td>
</tr>
</tbody>
</table>

$R = .60, F(3, 49) = 9.16***
$ $R^2 = .36$ (Adj $R^2 = .32$)

Note: Tables include Beta weights, incremental or change in $r^2$ ($\Delta r^2$), multiple correlation coefficient ($R$), squared multiple correlation coefficient ($R^2$), and adjusted squared multiple correlation (adj $R^2$). BUMP = Behavioral Upset in Medical Patients-Revised Hospital; Child-BUMP = Child Self-Report of Behavioral Upset in Medical Patients; CMOS = Children’s Medical Opinions Survey; Knowledge, Favorable, and Good/Bad Judgment scales; OSBD = Observation Scale of Behavioral Distress-Revised.

*p = .06; *p ≤ .05; **p ≤ .01; ***p ≤ .001.
Although several important factors were included in this study, a few limitations should be noted. First, we conducted multivariate analyses with a small sample to enrich the findings; but for example, the sample was too small to factor analyze the CMOS (Costello & Osborne, 2005). Clearly, further psychometric evaluation of the new and modified measures used in this study is warranted. The participants were also recruited from clinics in New Zealand and were relatively medically experienced; thus, this knowledgeable sample may not generalize to the average child experiencing routine noninvasive medical procedures. Given the sample size, we could not clearly evaluate potential differences in reactions to the variety of protocols intrinsic to diverse noninvasive medical procedures. Future work could provide additional insights to our findings by targeting a larger, less medically knowledgeable, ethnically diverse sample of children from other healthcare systems, explicitly comparing different medical procedures.

One imperative avenue for future research is to further examine children’s attitudes about medical settings, which is infrequently studied, perhaps due to concerns surrounding children’s age and their ability to effectively report their own attitudes. The current study employed a new pictorial measure designed specifically to assess attitudes proportional to their knowledge. Our findings suggest that children’s attitudes regarding how effective and positive they view healthcare indeed may relate to their observed and self-reported distress. Further research on children’s healthcare attitudes using developmentally appropriate measures is thus needed. Moreover, the role of parental healthcare attitudes should be examined, specifically whether specific parental attitudes could positively sway children’s attitudes and thereby mitigate their distress.

Overall, the current findings underscore the need to obtain multiple reporters as distress appears to reflect the “eye of the beholder”. Relying solely on parent report of children’s distress, for example, may be affected by parents’ personal distress. These results demonstrate children’s knowledge and healthcare attitudes may play a role in their behavioral distress in noninvasive procedures. Parents who prepare their children in advance of medical procedures, not simply by providing knowledge but conveying broader healthcare attitudes, could potentially ease their children’s distress. The vast majority of pediatric research relies on assessing distress in children undergoing invasive, often painful, medical procedures, although children exhibit distress in noninvasive procedures (Tyc et al., 2002). Some have considered whether there is a distinction between distress and pain response during painful procedures (Blount & Loiselle, 2009). By researching distress in
noninvasive procedures, we can uncover more purely psychological aspects of distress elicited by the pediatric context independent of pain response.

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**Conflicts of interest** None declared.

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