Correlates of Pediatric Behavior and Distress during Intramuscular Injections for Invasive Dental Procedures

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Relations between general behavior, temperament, and procedure-related behavior and distress were examined in children receiving intramuscular injections before undergoing restorative dental procedures. Younger children are likely to benefit the most from interventions prior to and during dental procedures. Children's anxiety before dental procedures could help identify those at risk of displaying problematic behaviors. General behavior and temperament seem useful at identifying children who may experience greater levels of pain.

Key words: *temperament, procedure-related distress, dental procedures*
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INTRODUCTION

Children's behavior during dental procedures can be problematic for dental providers. Incidences of problematic dental behavior in children have been estimated as high as 40%.[1] This behavior may impact immediate dental care (e.g., sedation choice)[2] and can increase the difficulty of completing dental procedures. Difficult procedures can, in turn, lead to dental fear[3] and can have potential negative impacts on future dental health behaviors (e.g., avoidance of dental care).[4]

Several techniques have been developed to manage children's dental procedure-related distress. Many of these treatments are behavioral in nature and many have received empirical support. For example, Filcheck and others[5] evaluated the use of distraction during restorative dental procedures in 5 to 12-year-old children. Results of the study indicated that significantly fewer children who received distraction were rated as "uncooperative" than were children who received standard care. In another study, Folayan and colleages[6] evaluated psychological techniques during dental management. Results of this study indicated that those children who received psychological intervention reported decreased anxiety following the procedure whereas those who did not receive such intervention reported no change in anxiety.

Although psychological interventions appear to be effective in reducing dental procedure-related anxiety in children, the use of such interventions is not widespread as it requires a commitment of providers' time and other resources. Identifying children that are most at risk of suffering procedure-related distress and anxiety is important as it allows providers to target those children most in need of intervention. Providing specialized intervention to these high-risk children would result in the maximization of both provider resources and patient care.

Little research has been devoted identifying those children who are most at risk of suffering procedure-related distress and anxiety. Most of the literature has focused on specific dental fears and previous dental experience.[3] Only a few studies have examined relations between children's general behavior and their dental procedure-related behavior. For example, Klingberg and Broberg[7] examined the relation between temperament characteristics (negative emotionality, shyness, sociability, and activity) and dental fear. Results of this study indicated that children with high dental fear scored significantly higher on measures of shyness and negative emotionality than children without high fear. Although this study demonstrated relations between children's temperament and reports of dental fear, it did not examine children's fear and behavior during dental procedures.

Additional studies have evaluated children's temperament as a predictor of behavior throughout various stages and types of dental procedures, such as during an initial dental examination[8], before general anesthesia for dental surgery[9], and during conscious sedation.[10] Results of these various studies revealed temperaments that predict specific behaviors, such as an approach temperament predicting quiet behavior[8] and shyness[9] and approach/withdrawal temperament[10] predicting disruptive behaviors. In these studies, children's behavior during a specific painful stimulus (e.g., intramuscular injection) was not examined.

The current study was designed to further explore relations between children's general behavior and their behavior and distress during intramuscular injections prior to dental procedures. Specifically, measures of children's temperament and general behavior were collected from parents and relations between these measures and children's procedure-related behavior, pain, and anxiety were examined.

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METHOD

Participants were 44 children undergoing restorative dental procedures at a pediatric dental office in north-central West Virginia. Children ranged in age from 3 to 7 years (M = 4.75; SD = 1.15) and gender distribution was approximately equal (48% female). Children were predominantly Caucasian (96%) and 19 children had previous experience with this procedure (43.2%). Most children (96%) were accompanied to the dental procedure by their mother; the remaining children were accompanied by their father or another caregiver (4%). Parents ranged in age from 21 to 44 years (M = 28.0, SD = 4.72) and all were Caucasian.

Parents who accompanied participants to the dental procedure completed a background history form. Questions on this form included the dates of birth, races, genders of parent and child, family income and how many previous dental procedures the child had received.

CHILD BEHAVIOR AND TEMPERAMENT

Parent-reports were used to assess general behavior and temperament. The Behavioral Assessment System for Children (BASC)[11] measures the behavioral adjustment of children. The BASC yields three composite and 12 subscale scores. The Behavioral Symptom Index is an overall composite and encompasses all subscales. The externalizing problems composite consists of scales assessing hyperactivity, aggression, and conduct problems. The internalizing problems composite examines anxiety, depression, and somatization. Additional clinical scales assessed on the BASC-PRS include atypicality, withdrawal, and attention problems. The Adaptive Skills Composite measures adaptability, social skills, and leadership. T-scores of 70 or above on the clinical scales indicate functioning in the clinically significant range and T-scores of 30 or below on the adaptive scales indicate clinically significant difficulties in function. The BASC-PRS has internal consistency coefficients ranging from 0.74 to 0.80 and test-retest reliabilities ranging from 0.85 to 0.88.[12] The Temperament Assessment Battery for Children-Revised (TABC-R)[13] assesses 3 to 7-year-old children's temperament via parents' report. Parents completed this measure before the dental procedure. The measure yields an overall composite score (Difficult to Manage Composite). The TABC-R parent form demonstrates good internal consistency, with alpha coefficients ranging from 0.70 to 0.90.[13]

CHILD PAIN AND ANXIETY

Child pain and anxiety were assessed via children's self-report, parent report, and dental hygienist report. The Children's Anxiety and Pain Scale (CAPS)[14] was used to assess children's self-reported anxiety and pain associated with the dental procedure. The CAPS consists of two sets of five-face scales, one set displays increasing magnitudes of anxiety, and the other displays increasing magnitudes of pain. Prior to the dental procedure, children were asked to rate their current and anticipated anxiety and pain. After the dental procedure, children reported on their anxiety and pain during the procedure, as well as their current pain and anxiety. Scores on the CAPS range from 1 to 5, with higher scores indicating higher levels of pain and anxiety. The CAPS has demonstrated good discriminant validity between pain and anxiety, as well as good reliability and construct validity.[14] The CAPS has also been recognized as easy to use and it has been frequently used in pediatric pain research.[14]

Prior to and following the dental procedure, parents responded to questions about their own anxiety, and their child's pain and anxiety using 100mm horizontal line visual analog scales (VAS). Higher scores are indicative of higher pain or anxiety. VAS are widely used in pediatric pain studies, have good reliability and validity, and do not result in clustering of scores as is common with likert-type scales.[15,16] Pre-procedure questions assessed parent's current anxiety, ratings of their child's anxiety in the waiting room, prediction of their child's anxiety during the procedure, and prediction of the amount of pain that their child would experience during the procedure. After the procedure, parents responded to questions assessing their anxiety, their child's anxiety, and their child's pain during the procedure.

A dental hygienist also completed ratings of children's procedural behaviors. She rated children's anxiety during the intramuscular injection and children's problematic behavior during the injection and dental procedure using numerical rating scales ranging from 1 to 5. Higher scores indicated higher levels of anxiety and problematic behaviors. In addition, she reported the level of sedation during the procedure on a likert scale. Possible scores ranged from 1 (unconscious) to 4 (alert).

Children scheduled to undergo restorative dental procedures and their parents were informed of the study by a research assistant at the time the family was being checked into the pediatric dental office. If the family was interested in participating, the research assistant further explained the study and obtained informed consent. Parents and children completed their pre-procedure measures (i.e., Background Information, Parent Pre-Procedure VAS, BASC, TABC-R, and CAPS) while waiting for the dental procedure.

All children received intramuscular sedation injections of Vistaril (anxiolytic/sedative) or Nubain (analgesic) immediately prior to the dental procedure in one or both of their legs. Specifically, an injection in each leg typically occurred with larger children or if the child received higher doses of the medication. A single injection was used with smaller children or those receiving less medication. The dentist administered these injections and no numbing medication (e.g., EMLA) was used. The reason for the use of sedation was because many of the patients came from long distances for the appointment and multiple appointments would be difficult and also because many of these patients were specifically referred because traditional methods (e.g., nitrous oxide) was not sufficient to provide relaxation or behavior control.

A dental hygienist rated level of sedation, with 80% of the sample reported as "lightly sedated". The sedation level for the other nine participants (20%) was not reported by the dental hygienist. Dental procedures included pulpotomies, crown placements, extractions, and pulpectomies. The average length of the dental procedure was 137 minutes, ranging from 40 to 240 minutes. At the completion of the procedure, children and their parents completed the post-procedure measures (i.e., Parent Post-Procedure VAS and CAPS). The dental hygienist assisting with the procedure completed ratings of child's behavior during the procedure. Since almost all children in the sample received similar sedation, the medication does not appear to differentially impact results.

Data from this study was analyzed in several stages. First, descriptive statistics were used to characterize the sample. Specifically, demographics characteristics (e.g., age, race) and study data (e.g., child pain and anxiety, child temperament) were examined.

Following demographic analyses, bivariate correlations were conducted to examine relations among children's behavioral adjustment and their pain and behavior during the medical procedure.

RESULTS

The means and standard deviations of children's self-reported and parent's reported child pain and anxiety are displayed in Table 1. Parents' mean self-reported anxiety prior to the dental procedure was 41.42 (SD = 34.16) and mean self-reported anxiety after the procedure was 48.80 (SD = 32.08). Dental hygienist's mean reports of children's anxiety during the intramuscular injection was 4.55 (SD = 0.59). Children's mean problematic behavior during the intramuscular injection was 4.07 (SD = 1.16) and was 2.95 (SD = 0.47) during the dental procedure. Preliminary correlational analyses revealed no significant relations between the length of the procedure and child report of procedural pain and anxiety, parent report of child procedural pain and anxiety, or dental hygienists reports of child's anxiety and behavior.

CORRELATES OF CHILDREN'S PROCEDURAL

TABLE 1: Means and Standard Deviations of Children's Dental Pain and Anxiety

	Child Report (Range: 1 – 5)		Parent Report (Range: 0 – 100)	
	M	*SD*	*M*	*SD*
Pre-Procedure Anxiety	1.87	1.40	29.02	31.70
Anticipated Procedural Pain	2.16	1.31	33.67	26.82
Anticipated Procedural Anxiety	2.38	1.52	53.93	35.70
Procedural Pain	3.14	1.50	26.05	26.76
Procedural Anxiety	2.57	1.50	34.00	30.76

BEHAVIOR

Child age was significantly negatively correlated with dental hygienist reports of problematic behavior during the muscular injection, $r (42) = -0.32$, $p < 0.05$, indicating that younger age was associated with more problematic behaviors. Child-report of pre-procedure anxiety was positively correlated with dental hygienist reports of problematic behavior during the intramuscular injection, $r (35) = 0.40$, $p < 0.05$, and during the dental procedure, $r (30) = 0.37$, $p < 0.05$. The BASC Adaptive Skills Composite also was related to dental hygienist ratings of child problematic behavior during the intramuscular injection, $r (42) = -0.31$, $p < 0.05$. Children who scored lower on this composite were rated as more problematic. Parent report of child pre-procedure anxiety was correlated with dental hygienist reports of child anxiety during the intramuscular injection, $r (42) = 0.36$, $p < 0.05$. Other child, parent, and dental hygienist reports were not significantly correlated with children's procedural behavior.

CORRELATES OF CHILDREN'S PROCEDURAL PAIN

Children's scores on the BASC-PRS overall composite, the Behavioral Symptoms Index, $r (39) = 0.37$, $p < 0.05$, Externalizing Problem Composite ($r (39) = 0.35$, $p < 0.05$), Internalizing Problem Composite ($r (39) = 0.32$, $p < 0.05$), Adaptive Skills Composite, $r (39) = -0.36$, $p < 0.05$, Adaptability scale, $r (39) = -0.34$, $p < 0.05$, Hyperactivity scale, $r (39) = 0.33$, $p < 0.05$, and Aggression, $r (39) = 0.33$, $p < 0.05$, were all related to parent-report of children's procedural pain. In addition, parent's scores on the TABC-R overall Difficult-to-Manage composite was significantly correlated with parent's report of children's pain during the dental procedure, $r (39) = 0.41$, $p = 0.01$. Other child, parent, and dental hygienist reports were not significantly correlated with children's procedural pain.

DISCUSSION

The current study examined correlates of children's problematic behavior and distress during restorative dental procedures requiring intramuscular injections. Overall, reports from children and parents revealed that children experience moderate to high pain and anxiety during these procedures. Dental hygienists also noted that children exhibited high levels of anxiety and problematic behavior. In addition to problematic behavior during restorative procedures, the current study also indicates that children exhibit problematic behavior during preparation (i.e., intramuscular injections) for such procedures. These results are consistent with past research highlighting the prevalence of problematic behavior in children receiving dental procedures.[1] As such, interventions that target distress during injections and during dental procedures are important.

Interventions that have been found to be effective at reducing distress during pediatric painful procedures (e.g., immunizations, venipunctures) may be helpful at reducing children's pain, anxiety, and problematic behavior during dental procedures. Specifically, pediatric pain research has found that distracting children during a painful procedure by utilizing cartoon movies, guided imagery, books, bubbles, and party blowers is effective at reducing pain and distress.[17-19] Stark and colleagues[20] found that distraction was an effective intervention at reducing anxiety and disruptive behavior in four children receiving dental treatments. In addition, other cognitive-behavioral interventions, such as breathing exercises, relaxation, coping skills, modeling, rehearsal, and reinforcement have also been found to be effective at reducing children's procedural related distress in other medical settings.[21,22]

Implementing such interventions with every child consumes staff time and resources. As such, identifying those children who are at particular risk for difficulties with intramuscular injections and restorative dental procedures may be helpful. The current study examined correlates of children's distress and problematic behavior in an attempt to identify characteristics that may be helpful in screening children who may be in need of intervention. Procedural characteristics, such as the length of the dental procedure, were not associated with children's distress or problematic behavior. However, results indicate that younger children tended to exhibit more problematic behavior than older children, suggesting that targeting interventions to this age group is important. Additionally, it seems that asking children about their anxiety before the procedure may be informative. Children's reports of anxiety prior to the dental

procedure were associated with problematic behavior during the intramuscular injection and restorative procedures. Interestingly, children's general behavior and temperament were not associated with problematic behavior. Factors associated with children's procedural pain were different than those that were associated with problematic behavior. Measures of children's general behavior and temperament appear to be more useful at identifying children at risk for being in pain during restorative dental procedures than self-reported anxiety.

Several limitations of the current study should be noted. First, the small sample size decreased the power in this study, which limits the ability to detect significant relations between variables. In addition, the relative homogeneity of the sample (e.g., 96% Caucasian) limits the ability to generalize these findings to other populations, such as children from other racial and ethnic groups.

The lack of consistent relations between children's general and procedural behavior may be due to multiple issues. First, children in this study underwent procedural sedation, which likely influenced the amount of problematic behavior reported during the dental procedure. Further research should explore the potential moderating or mediating effects sedation may have on relations between children's behavior. In addition, though this study relied on the reports from multiple informants (e.g., children, parents, dental hygienists), there was no use of an observational measure of children's distress. The utilization of an observational measure has the potential of contributing additional information about children's distress during dental procedures, such as the frequency and duration of different distress behaviors (e.g., crying, flailing), which is not evident from reports utilized in the current study.

Additionally, there was a lack of associations between children's reports of pain and anxiety and parental reports of children's general behavior and temperament. Future research should examine whether children's reports of their general behavior and temperament may be more appropriate. These measures also have the potential of further specifying children in need of intervention in dental settings.

This study is an important first step in identifying predictors of children's dental distress. Future research should be conducted to further examine relations between children's dental distress and their general behavior and temperament. Continuing to identify predictors of children's dental distress and problematic behavior are in order so that dental providers can make the best use of their time and resources by targeting children who are in need of help coping with the distress associated with dental procedures.

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