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Sequential Analysis of Mothers' and Fathers' Reassurance and Children's Postoperative Distress

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Objective Children experience distress after surgery. Associations exist between parent reassurance (e.g., ''It's OK'') and child distress, but little is known about the causal direction of these interactions. This study examined sequential relations between mothers' and fathers' reassurance and children's distress. **Methods** 146 families with 2- to 11-year-olds undergoing elective surgery participated. Time-event coding and time-window sequential analysis examined whether reassurance preceded or followed child distress. Secondary analyses examined the relation of child sex and parent anxiety with the reassurance/distress contingency. **Results** Reassurance was positively correlated with distress; however, nonverbal distress was less likely to start following reassurance and was also more likely to continue following reassurance. Mothers were more likely to reassure following boys' verbal distress, and mothers with higher anxiety were more likely to reassure following nonverbal distress. **Conclusions** Whereas parental reassurance may prevent the start of child distress, it might maintain ongoing child distress.

Key words children; pain; parents.

Approximately 5 million children in the United States undergo surgery each year (Cullen, Hall, & Golosinskiy, 2009; DeFrances, Lucas, Buie, & Golosinskiy, 2008). The period immediately before surgery including anesthesia induction is stressful for parents and children (Chorney & Kain, 2009), but the majority of a family's time on the day of surgery is spent recovering in the postanesthesia care unit (PACU; Cullen, Hall, & Golosinskiy, 2009). The PACU experience is variable, but many children emerge from anesthesia disoriented, anxious, and in pain from surgery (Fortier, MacLaren, Martin, Perret-Karimi, & Kain, 2009; Kain, Mayes, Wang, & Hofstadter, 1999). Anxiety and distress can exacerbate pain (McGrath, 1993), which can in turn lead to increased fear and avoidance of subsequent procedures (Pate, Blount, Cohen, & Smith, 1996). Perioperative distress can also result in long-term maladaptive postoperative behavior changes, such as general anxiety, separation anxiety, and sleep impairments (Kain, Mayes, Caldwell-Andrews, Karas, & McClain, 2006). Taken together, postoperative distress can exacerbate the pain experience, which can result in short- and long-term negative outcomes.

Researchers have examined child distress in medical settings and have identified parents' behavior as a central predictor (for a review, see Schechter et al., 2007). In fact, parents' behavior is reported to account for 53–64% of the variability in children's distress during brief acute medical procedures (Cohen, Bernard, Greco, & McClellan, 2002; Frank, Blount, Smith, & Manimala, 1995; Mahoney, Ayers, & Seddon, 2010) and 50% of the variance in children's distress preoperatively (Chorney et al., 2009). Fine-grained analyses of brief medical procedures have identified that some adult behaviors (e.g., distraction, commands to cope) are associated with higher child coping, whereas other adult behaviors (e.g., reassurance, empathy, giving control, apologizing) have been consistently associated with higher distress in children (for a review, see Blount, Piira, & Cohen, 2003).

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Reassurance, defined as procedure-related comments (e.g., ''It is OK.'') directed at a child with the intent to suggest the environment is nonthreatening, is the most common parent behavior during children's brief medical procedures as well as during the preoperative period and has consistently been found to be correlated with higher distress in children (e.g., Chorney & Kain, 2009; Cohen, Manimala, & Blount, 2000; Sadhasivam et al., 2009). Thus, researchers have experimentally examined whether parent reassurance causes child distress. One study using laboratory-induced pain found higher distress in female children of parents who were trained to use multiple distress-related behaviors, which included reassurance (Chambers, Craig, & Bennett, 2002). Experimental studies in medical settings have produced conflicting results. In one study, children whose parents were trained to reassure during immunizations displayed higher verbal fear and need for restraint but not global distress (Manimala, Blount, & Cohen, 2000). In contrast, Gonzalez, Routh, and Armstrong (1993) did not find that parents' reassurance influenced children's distress using a similar experimental paradigm. Despite the inconsistent results, researchers have termed parent reassurance ''distress promoting'' (Blount et al., 1989, 1997) and argue that it may be harmful to the child during medical procedures (McMurtry, McGrath, & Chambers, 2006).

In addition to experimental studies, some researchers have used observational methods to better explicate the relation between reassurance and distress over time. These methods allow for the examination of which parent and child behaviors are likely to precede or follow one another. Blount et al. (1989) used event sequential coding and lag sequential analyses and found that adults' reassuring comments were the most common antecedent and consequence for children's distress during bone marrow aspirations/lumbar punctures. Using similar methodology, Taylor, Sellick, and Greenwood (2011) also found that parents' reassurance was likely to precede and follow children's distress; but, they also found parents' reassurance was likely to precede and follow children's coping.

Although previous sequential studies add to our understanding of how children and parents may respond to one another over time, the type of data coding—event sequential coding—used by Blount et al. (1989) and Taylor, Sellick, and Greenwood (2011) have several limitations. Specifically, event sequential coding allows for only one code by one subject to be recorded at a time, which does not capture co-occurring behaviors (e.g., simultaneous occurrence of parents' reassurance and children's distress) or accurate information about the duration of the behavior or the start and stop points of behaviors (Chorney, Garcia, Berlin, Bakeman, & Kain, 2010). Thus, it is difficult to determine if, in fact, reassurance prompts children to become distressed, follows distress, or whether it is associated with ongoing distress.

Although numerous studies have emphasized the influence of parents' behavior on children's distress, little is known about how demographics (e.g., child sex, parent sex, and child age) impact the relations. For example, studies consistently refer to ''parent'' behavior; however, studies almost exclusively examine mothers' behaviors. Indeed, a review of father involvement in pediatric psychology research reported that approximately 91% of data reported in pediatric and health journals included mothers only or collapsed ''parent'' findings and did not examine mothers and fathers separately (Phares, Lopez, Fields, Kamboukos, & Duhig, 2005). In terms of the reassurance–distress relation, the developmental literature suggests that mothers might be more responsive than fathers to children's distress (Lamb, 2004); however, one study comparing the quantity of mothers' and fathers' ''attending behavior,'' which included reassurance among other procedure-focused behaviors, found no differences (Moon, Chambers, & McGrath, 2011).

The current study used an alternative type of data coding (time-event sequential coding) and sequential analyses (time-window sequential analyses) to examine mothers' and fathers' reassurance and children's postoperative distress. Time-event sequential coding differs from previously used event sequential coding, in that it allows for multiple behaviors to be coded at a time and collects data on the onset and offset of behaviors (thus differentiating between the start and continuance of a behavior), which allows for the examination of co-occurring behaviors (Bakeman & Gottman, 1997). The current study also used time-window sequential analyses, which, unlike lag sequential analyses, allows for more flexibility in interactions and assumes that a behavior is not necessarily caused by the behavior that immediately precedes or follows it, but instead assesses the likelihood that a behavior (e.g., distress) will start, stop, or occur within a specified time frame following another behavior (e.g., reassurance).

The primary aim of our study was to examine the sequential association of parent's reassurance preceding and following the start of children's distress. It was hypothesized that both mothers' and fathers' reassurance would precede and follow the *start* of children's distress in the PACU. A secondary aim was to examine the influence of parent type (mother or father), child sex, and parent baseline state anxiety on the reassurance–distress relation, and to assess if one parent's use of reassurance influenced the other parent's use of reassurance. Owing to limited

findings regarding the influence of these variables on the reassurance–distress relation, no a priori hypotheses were posited for these analyses.

Method

Participants

The current study is part of a larger single-site study, which examined child coping and distress and adult behavior across the perioperative period (Chorney et al., 2009; Chorney, Tan, & Kain, 2013; Chorney, Tan, Martin, Fortier, & Kain, 2011). The current study focuses on the reassurance–distress interaction with mothers and fathers as unique participants and considers baseline anxiety and child sex, which has not previously been examined in this sample. A sample of 119 parent–child dyads with alpha level of .05 and power of .95 should be adequate to detect a medium effect size (*g* value of .15). Participants in this study included 146 children aged 2–11 years ($M = 4.87$, $SD = 2.23$; 50% female) undergoing elective outpatient surgery and their parents. Mothers were present in 146 videos and fathers were present in 114 videos. Mothers' ages ranged from 25 to 70 years ($M = 37.23$, $SD = 5.89$) and fathers' ages ranged from 25 to 79 years ($M = 38.95$, $SD = 7.15$). All children were in good health (American Society of Anesthesiologists health status classification I or II). Child and parent demographic data are displayed in Table I.

Measures

Demographics

Demographic data were collected using a demographic measure previously used in the larger study assessing caregiver type (i.e., mother or father), child sex, race and ethnicity, type of surgery, and caregiver income and education.

Parent Anxiety

The State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970) is a 20-item self-report rating scale used to measure state (STAI-S) and trait (STAI-T) anxiety. The STAI is a reliable and widely used measure to assess state anxiety in a variety of settings (Metzger, 1976; Spielberger, Gorsuch, & Lushene, 1970) and has been used in prior studies examining parents' anxiety during children's surgery (Kain, Mayes, Caldwell-Andrews, Karas, & McClain, 2006). The internal consistency (Cronbach's alpha) in the current sample was .92 and .85 for state and trait anxiety, respectively.

Parent Reassurance and Child Distress Behavior

The Child Behavior Coding System-Postanesthesia Care Unit (CBCS-P; Chorney, Tan, Martin, Fortier, & Kain, 2011) is an observational coding system of adult and child behaviors during the postoperative period, which was found to have good to excellent interrater reliability and criterion validity (Chorney, Tan, Martin, Fortier, & Kain, 2011). Behavioral codes in CBCS-P are mutually exhaustive within a participant (i.e., every child/parent behavior exhibited is captured by a code) and exclusive (i.e., a specific child/parent behavior can only be associated with one code). For the purposes of this study, only the parent reassurance and child distress codes were used for analyses. Reassurance was defined as a procedure-related comment to child with the intent of neutralizing the situation or suggesting that the environment is nonthreatening (e.g., ''Don't worry'' ''It's OK''). In line with the intercorrelations among different distress behaviors reported in the development of the CBCS-P (Chorney, Tan, Martin, Fortier, & Kain, 2011) and to decrease the number of analyses, theoretically derived child distress codes were combined to create verbal and nonverbal child distress composites. The verbal distress composite included verbal pain (e.g., ''Ouch''), verbal resistance (e.g., ''Stop it''), verbal request for support (e.g., ''Mommy!''), and verbal negative emotion (e.g., ''I'm scared''). The nonverbal distress composite included cry, scream, nonverbal request for support (e.g., reaching for parent), guarding (e.g., covering or holding a pain site), and nonverbal resistance (e.g., pushing parent away).

Procedure

Institutional Review Boards approved the current study. Parents were recruited up to 7 days before surgery and completed written informed consent. Parents completed demographics and STAI-T during a preoperative hospital visit 2–7 days before surgery. Parents completed the STAI-S on the day of surgery. All children and up to two caregivers were taken to the PACU immediately following surgery. The children and parents enrolled in this study were videotaped from the moment they entered the PACU until they were discharged. More information on the sample and recruitment process can be found in (Chorney, Tan, & Kain, 2013).

Coding Process

Video data were captured using digital video cameras installed over the PACU beds. Considering that children can spend an average of 2 hr in the PACU following outpatient surgery (Kain, Mayes, Caldwell-Andrews, Karas, & McClain, 2006), three 5-min time segments (i.e., the first

Table I. *Demographic Data*

Demographics	N (%)
Child ethnicity	
Latino	11 (15)
Non Latino	62 (85)
Child race	
African American	6 (5)
Multiracial	5 (4)
Native American/ Pacific Islander	1 (.9)
White	100 (85)
Parent income	
Less than $10,000	4 (3)
$11–20,000	2 (1)
$21–30,000	3 (3)
$31–50,000	8 (7)
$51–80,000	25 (22)
$81–100,000	20 (17)
More than $100,000	54 (47)
Parent education	
≤12 years	21 (18.6)
13–16 years	54 (47.8)
≥17 years	38 (33.6)
Type of surgery	
Ear, nose and throat	56 (40)
Endoscopy	27 (19)
General	20 (14)
Urological	16 (11)
Plastic	10 (7)
Orthopedic	8 (6)
Other	3 (2)

5 min the child was awake, 5 min surrounding intravenous catheter removal, and 5 min surrounding distress within a randomly selected time interval) were selected from the PACU video to maximize coding efficiency and ensure that a range of behaviors were obtained during probable periods of distress. The coding of behaviors using CBCS-P was facilitated by Observer XT Software (Noldus Inc, Netherlands).

Two full-time nonstudent research assistants, a primary and secondary coder, coded the video data for this study and were considered ''trained'' once they met a kappa criterion of .80 agreement with the lead trainer. The primary coder coded all video data and the secondary coder overlapped with the primary coder on 10% of the videos, which were used for reliability analyses. Once training was complete, coders had weekly reliability meetings with the study coordinator to discuss discrepancies. The study coordinator and lead trainer, a psychologist who developed the coding manual and had supervised other video coding projects, made the final decision regarding discrepancies and the primary coder's data were edited accordingly and used for analyses. Time-unit and event-based kappas were calculated as the true kappa is likely to fall within those two kappas (Bakeman, Quera, & Gnisci, 2009). Time-unit kappas examine interrater agreement between successive pairs of time-units tallied. A 2-s time tolerance was used to assess agreement (i.e., agreement occurred if a code was assigned by one rater 2 s before or after the same code was assigned by another rater). Event-based kappas examine the order of events and focus on when behavior changes, which allows for the examination of agreements, omission errors, and commission errors. In this analysis, an agreement was tallied if there was an event alignment of .60 or better, which indicated that observers are at least 90% in agreement (Quera, Bakeman, & Gnisci, 2007). Reliability analyses for fathers' and mothers' reassurance indicated overall good to excellent agreement with an event alignment of .71–.75 and time-unit kappas falling between .87 and .95. Children's nonverbal and verbal distress revealed good to excellent agreement with an event alignment of .62–.81 and time-unit kappas between .90 and .96.

Data Analysis

Analyses were conducted using Generalized Sequential Querier 5.1.11 Software (Bakeman & Quera, 1995) and SPSS 18.1 (SPSS Inc., Chicago, IL). Preliminary analyses included descriptive analyses to assess the frequency or proportion of reassurance and child distress, chi-square analyses to examine differences in proportions of distress, correlational analyses (Spearman or Spearman Rank) to examine the associations among variables, analyses of variance to examine differences in sex, race, and type of surgery on outcome data (i.e., reassurance and distress), and Mann–Whitney tests determine if differences existed among mothers' and fathers' rate of reassurance.

Primary analyses examined if parent reassurance prompts child distress to start and if the start of child distress prompts parent reassurance, time-window sequential analysis was used to examine these temporal relations. Consistent with a prior study of sequential analyses (Chorney, Garcia, Berlin, Bakeman, & Kain, 2010), a 4-s time-window was used for each research question. Eight different child–parent contingencies in which either the start of children's verbal or nonverbal distress occurred within four seconds before or after mothers' or fathers' reassurance were examined. For each parent–child dyad contingency (e.g., child verbal distress starting following mother reassurance), a measure of sequential association

(Yule's *Q*) was calculated to determine an index of effect (Chorney, Garcia, Berlin, Bakeman, & Kain, 2010). Similar to a correlation coefficient, values of Yule's *Q* range from −1 to +1 with positive values indicate an increased sequential probability (i.e., it is more likely for one behavior to follow another), while negative values indicate a decreased sequential probability (Bakeman, 2000). Yule's *Q* values of 0.2, 0.43, and 0.6 are considered small, moderate, and large, respectively (Rosenthal, 1996). Data from children or parents who did not exhibit reassurance or distress behaviors resulted in an undefined Yule's *Q* value and were not included in analyses. As such, post hoc power analyses were conducted.

Distributions of Yule's *Q* values for all contingencies in this sample were positively skewed and resistant to transformation (i.e., following transformations the data did not pass normality tests). As such, nonparametric analyses were conducted to examine the primary aims. Descriptive statistics (Median and Interquartile Range) are reported to characterize sample. Although descriptive statistics provide information about the sample, they do not test whether the distribution of these scores is different from what would be expected by chance. To determine if it was significantly more likely for a contingency to have a positive of negative effect, or if was significantly more or less likely for one behavior to follow another, nonparametric binomial tests were used to determine if the proportion of negative and positive Yule's *Q* values for each contingency were significantly different than 50%, or what would be expected by chance (Gottman & Roy, 1990).

To examine the secondary aims, Spearman rank correlations, additional nonparametric difference tests (i.e., Wilcoxon signed-rank test and Mann–Whitney test), and additional time-window sequential analyses were conducted. Specifically, correlations and difference tests were used to examine relations between demographic variables/parent anxiety and Yule's *Q* scores, and whether there were differences between Yule's *Q* values of mothers and fathers. To assess whether parents influenced each others' likelihood of reassuring, two mother–father contingencies in which fathers' reassurance followed or preceded mothers' reassurance were examined using time-window sequential analyses.

Results

Preliminary Analyses

Of the entire sample, 91% of children displayed at least one instance of either verbal or nonverbal distress (88% showed verbal distress, 57% showed nonverbal distress). Reassurance was observed in 82% of the overall parent sample with 78% of mothers and 52% fathers using at least one reassuring comment. The proportion of mothers who reassured was not significantly different than that of fathers ($X^2 = 3.08$, $p = .09$); however, fathers' mean rate of reassurance was significantly lower than that of mothers', $Z = -5.86$, $p \leq .001$. Children's verbal and nonverbal distress was positively correlated and both distress composites were significantly positively correlated with mothers' and fathers' reassurance. Mothers' and fathers' rates of reassurance were not significantly related (Table II). Analyses revealed no other significant relations or differences among demographic variables and outcome variables.

Primary Analyses

Time-Window Sequential Analyses

Descriptive Analyses. Median Yule's *Q*s across dyads are reported in Table III. Contingencies in which distress followed reassurance consistently had large negative effects (i.e., $Q \geq .60$), indicating it was *less* likely for distress to start following reassurance than at any other time. With the exception of fathers' reassurance following children's nonverbal distress, contingencies in which reassurance followed distress had small to moderate positive effects (i.e., $Q = 0.2$–0.43), indicating an increased likelihood that reassurance follows the start of distress.

In light of the above conflicting correlational and sequential findings, subsequent analyses were conducted to determine whether reassurance decreased the likelihood that distress would stop, thus conceptualized as maintaining distress. Analyses with verbal distress were not applicable as verbal distress does not have a start or stop point. Median Yule's *Q*s for mothers and fathers indicated large negative effects ($Q = -1.00$), indicating that distress was less likely to stop following parents' reassurance than at any other time.

Binomial Analyses. Results of Binomial tests for each contingency are shown in Table IV, and are generally consistent with descriptive results. A significant proportion of children were *less* likely to start to display nonverbal distress following both mothers' ($Z = 3.28$, $p = .001$) and fathers' reassurance ($Z = 2.69$, $p = .006$). A significant proportion of children were also less likely to display verbal distress following fathers' reassurance ($Z = 1.96$, $p = .049$). There was no difference between the proportions of dyads in which verbal distress was more or less likely to follow mothers' reassurance ($Z = 1.35$, $p = .39$). Although contingencies in which parents' reassurance followed children's verbal and nonverbal distress produced small to moderate median positive effects, it was not significantly more likely for reassurance to follow distress. In terms of distress continuing following reassurance, a significant proportion of children

Table II. *Correlations Among Parents' Reassurance and Children's Distress*

Behavior	N	1	2	3	4
1. Fathers' reassurance	114	1.00	.18	.34**	.28**
2. Mothers' reassurance	144		1.00	.31**	.58**
3. Verbal distress	145			1.00	.56**
4. Nonverbal distress	145				1.00

Note: Spearman rank order correlations among parents' overall rate of reassurance and the rate and proportion of children's overall verbal and nonverbal distress, respectively; $^{**}p \leq .01$

Table III. *Sequential Analyses: Descriptive Analyses*

Contingency	N	Median	Interquartile Range
Nonverbal distress following reassurance			
Mothers' reassurance	66	−1.00	1.61
Fathers' reassurance	27	−1.00	0.00
Verbal distress following reassurance			
Mothers' reassurance	66	−1.00	1.61
Fathers' reassurance	44	−1.00	1.54
Reassurance following nonverbal distress			
Mothers' reassurance	58	0.64	1.84
Fathers' reassurance	21	0.00	1.00
Reassurance following verbal distress			
Mothers' reassurance	59	0.20	1.70
Fathers' reassurance	21	0.44	1.81

Table IV. *Binomial Analyses*

Contingency	*N*	Less likely (%)	More likely (%)	*p* value	Power
Nonverbal distress following reassurance					
Mothers' reassurance	45	76	24	.001	
Fathers' reassurance	27	78	22	<.006	
Verbal distress following reassurance					
Mothers' reassurance	66	56	44	.39	.55
Fathers' reassurance	44	66	34	.05	
Reassurance following nonverbal distress					
Mothers' reassurance	57	39	61	.11	.95
Fathers' reassurance	21	62	38	.38	.60
Reassurance following verbal distress					
Mothers' reassurance	59	44	56	.44	.56
Fathers' reassurance	21	29	71	.08	.98

were less likely to stop nonverbal distress following both mothers' and fathers' reassurance ($Z = 2.60$, $p = 01$; $Z = 3.10$, $p = .002$, respectively).

Secondary Analyses

Demographic Analyses. Results of a Mann–Whitney test revealed that mothers were more likely to reassure following boys' verbal distress than they were following girls' verbal distress ($Z = -1.96$, $p = .04$). No significant relations were found among other mother contingencies, father contingencies, and child demographics. A Wilcoxon signed-rank test revealed no significant differences between the effects of mother and father contingencies.

Parental Anxiety Analyses. Mothers' trait ($N = 73$) and state ($N = 92$) anxiety scores ranged from 21 to 56, and 20 to 70 ($M = 35.10$, $SD = 7.12$; $M = 40.18$, $SD = 10.53$), respectively, and fathers' trait ($N = 20$) and state ($N = 19$) anxiety ranged from 22 to 47 and 20 to 70 ($M = 34.70$, $SD = 7.46$; $M = 34.58$, $SD = 6.12$), respectively. Analyses revealed a significant positive relation among mothers' state anxiety and the likelihood of mothers' reassurance following the start of nonverbal distress ($r_s = .37$, $p = .03$). No significant relations were found among father anxiety and father contingencies. Post hoc power analyses conducted on the secondary analyses showed that the power for the nonsignificant results ranged from .05 to .62.

Sequential Analyses of Mothers' and Fathers' Reassurance. Descriptive analyses revealed a moderate median positive effect ($Q = .58$) for fathers' reassurance occurring within 4 s of mothers' reassurance and a small negative median effect ($Q = -.26$) for mothers' reassurance following fathers' reassurance. Binomial tests indicated that the proportions of contingencies with a positive and negative effect did not significantly differ for fathers' reassurance following mothers' reassurance ($Z = .24$, $p = .79$) or for mothers' reassurance following fathers' ($Z = -.76$, $p = .52$); however, the binomial tests were under-powered owing to small subsamples.

Discussion

Consistent with previous literature, we found that both mothers' and fathers' reassurance was positively correlated with children's verbal and nonverbal distress in the PACU. However, contrary to arguments that parents' reassurance is distress-promoting, time-window sequential analyses demonstrated that children's nonverbal distress was significantly *less* likely to start following mothers' or fathers' reassurance. In other words, children were less likely to become distressed (e.g., start crying) after reassurance than they were at any other time. Similarly, children's verbal distress was less likely to begin after fathers' or mothers' reassurance; however, this contingency was only significant in father-child interactions. Mothers and fathers were also not significantly more likely to use

reassurance after the start of children's distress. Our finding that parents' reassurance might prevent children's distress in the PACU together with Taylor, Sellick, and Greenwood's (2011) results that parents' reassurance preceded and followed children's coping suggest that parents' reassurance might be beneficial to children in some domains.

Although children's nonverbal distress is less likely to *start* following parents' reassurance, nonverbal distress is less likely to *stop* following both mothers' and fathers' reassurance. Thus, our data suggest that once a child is distressed, parents' use of reassurance is not beneficial and in fact may maintain children's distress. Taken together, parents' reassurance seems to function differently depending on the state of the child. Thus, reassurance may be both beneficial and harmful in that it may discourage distress from initiating but maintain it once it has begun.

Secondary analyses revealed significant associations among the sequential relation of reassurance and distress and demographic and anxiety variables. Specifically, the likelihood of mothers' reassurance to follow children's verbal distress was found to be significantly stronger for boys than girls. In other words, mothers were more likely to reassure after their boys verbalized distress than they were likely to reassure girls. Literature on gender differences in pain perception suggests that boys may learn to display stoicism when in pain (McGrath, 1993). As such, when boys do verbally express pain, mothers may be more inclined to react, which may explain the differences observed in the current study. In regard to parent anxiety, the positive relation among maternal state anxiety and the likelihood of reassurance following the start of nonverbal distress suggests that mothers who are more anxious on the day of surgery may be more responsive to the start of children's nonverbal distress, which is consistent with literature that suggests that parents who are more prone to focus on the threat of their child's pain, may use more pain attending behavior (e.g., reassurance) to relieve their own distress (Caes, Vervoort, Trost, & Goubert, 2012).

The current sample also allowed for a more thorough examination of mothers' and fathers' reassurance. Mothers' rate of reassurance was significantly higher than that of fathers', but the sequential relations among both parents' reassurance–distress contingencies were similar. This finding is consistent with another study, which found no differences in mothers' and fathers' distress-related behaviors during a cold pressor procedure (Moon, Chambers, & McGrath, 2011). Although previous studies have examined healthcare providers cuing parent behaviors (Cohen, Blount, & Panopoulos, 1997), little is known about how one parent's behavior may influence the other's in medical settings. Analyses in the current study showed a moderate *positive* effect for fathers' reassuring following mothers' reassuring and a small *negative* effect for mothers' reassuring following fathers' reassuring, but these sequential associations were not statistically significant. Taking into account that limited power may have influenced statistical tests, our findings suggest that mothers' reassurance might cue fathers to also reassure but fathers' reassurance discourages mothers from following suit.

The use of time-event sequential coding/analyses and the inclusion of fathers are strengths of the current study. The results emphasize the benefits of using this type of coding and analyses, which allow for the differentiation of the onset and maintenance of behaviors that have meaningful durations (e.g., nonverbal distress). The ability to analyze the associations among behavioral interactions over time also allowed for a more accurate examination of whether or not reassurance is in fact distress promoting. Limited data exist on fathers, and this study adds valuable information on father–child interactions and mother–father differences in behavior.

Limitations should also be noted. First, it was beyond the scope of this study to examine the influence of other parent behaviors (e.g., distraction); thus, it cannot be concluded that reassurance influences distress more or less than other parent behaviors. Second, the current study included a fairly homogenous sample in regard to socioeconomic status and race. Third, although a large sample was recruited, the subsamples for each contingency were small as a result of the Yule's *Q* calculations, which may have limited the power to detect significant associations. Future studies should seek to examine these associations in more diverse samples in different settings. Finally, although we were able to examine how interactions occurred over time, this study is still observational and future studies should use experimental methods including teaching parents when to reassure to confirm the causality of these interactions.

Despite limitations, the results of the current study have potentially important clinical implications and contribute novel information to the literature on parent–child interactions during medical procedures. This study highlights the complex nature of the relations among mothers' and fathers' reassurance and children's verbal and nonverbal distress. Further, the findings provide preliminary evidence that reassurance, a previously hypothesized distress promoting behavior, may, if used correctly, be beneficial. Children experience significant pain and distress on the day of surgery and these outcomes have been associated with negative short- and long-term postoperative consequences (Fortier, MacLaren, Martin, Perret-Karimi, &

Kain, 2009; Kain, Mayes, Caldwell-Andrews, Karas, & McClain, 2006). Considering that distress can exacerbate the experience of pain, strategies that help reduce distress may be especially beneficial to this population. The findings of this study can be used to better educate parents on when to provide reassurance to optimize the postoperative experience for their children.

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