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Children's Immediate Postoperative Distress and Mothers' and Fathers' Touch Behaviors

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Abstract

Objective This study examined mothers' and fathers' use of child-directed touch in the postanesthesia care unit. **Methods** In all, 142 mothers and 112 fathers of 143 children aged 2–11 years undergoing outpatient surgery participated. Parent touch (instrumental, empathic) and child distress were coded. Mothers' and fathers' rates of touch were compared, and interrelations between touch and child distress were examined (overall and sequentially). **Results** The proportion of mothers and fathers who used touch did not differ, but mothers' rates of touch were higher than fathers'. Parental instrumental touch and mothers embracing touch were positively correlated with children's distress. Mothers were more likely to use embracing touch in response to children's distress than at any other time. **Conclusions** Results point to potential differences in mothers' and fathers' roles in the postoperative setting, and potentially different functions of touch. Results suggest that mothers may provide embracing touch to soothe or prevent children's distress.

Key words: adjustment; children; fatherhood; motherhood; parenting; parents.

The call for family-centered care has drawn attention to the role of parents in children's adjustment in medical contexts (Piira, Sugiura, Champion, Donnelly, & Cole, 2005). Although research on the influence of discrete parent behavior on children's distress and coping during medical procedures has led to a number of clinically relevant findings (Chorney et al., 2009; Martin, Chorney, Cohen, & Kain, 2013), the vast majority of this research focuses on parents' verbalizations (e.g., Blount, Devine, Cheng, Simons, & Hayutin, 2008; Chorney et al., 2009; Martin et al., 2013; McMurtry, Chambers, McGrath, & Asp, 2010). Surprisingly little research has extended the study of parental influences to the domain of nonverbal behaviors.

Touch is a particularly relevant nonverbal behavior because of its frequent use in close relationships, such

as that of a parent and child. The differential functions of touch are numerous (Gallace & Spence, 2010). In parent-child interactions, touch often includes an instrumental intent in the performance of certain tasks (e.g., dressing a child), but can also hold a strong communicative intent (e.g., empathic touch to soothe or support a child; Hertenstein, Verkamp, Kerestes, & Holmes, 2006). In some cases, it appears that touch can convey emotion as reliably as facial expressions and verbalizations (Elfenbein & Nalini, 2002; Hertenstein, Keltner, App, Bulleit, & Jaskolka, 2006). Moreover, empathic touch has been found to meaningfully influence physiological and emotional reactions in daily life (Gallace & Spence, 2010). For example, touch from a romantic partner contributes to reductions in heart rate and cortisol in anticipation of stress, above and beyond the effects of verbal

support alone (Ditzen et al., 2007; Grewen, Anderson, Girdler, & Light, 2003). In infants and children, research from diverse fields has demonstrated that parent touch establishes infant's feelings of security, elicits positive emotions (e.g., smiling), and modulates children's emotions and distress behaviors (e.g., crying; Beider & Moyer, 2007; Field, 2010; Hertenstein, Verkamp, et al., 2006).

Despite accumulating evidence pointing to the relevance of touch behaviors in modulating children's state emotions and behaviors, little research to date has parsed out the influence of parent touch from the broader range of parent behaviors on children's distress and coping with medical procedures, where anxiety and distress are common. In medical settings, health care personnel commonly use instrumental touch in providing patient care (e.g., changing dressings). However, few studies have independently examined the ways in which parents use instrumental touch, and how this touch relates to children's distress. While well-known observational coding schemes of adult-child interaction during medical procedures code for the use of nonverbal behaviors such as touch, the majority of these studies have examined touch as part of composite codes rather than individually (e.g., child distress includes restraint, adult empathy includes verbal and nonverbal empathic behavior) (e.g., Blount et al., 1997; Chorney et al., 2009).

Studies that have examined empathic touch in medical settings have had inconsistent findings. Whereas numerous studies have demonstrated positive associations between parental empathic touch and infant distress in response to medical procedures (Cohen, Bernard, McLelland, & MacLaren, 2005; Johnston et al., 2014; Lisi, Campbell, Pillai-Riddell, Garfield, & Greenberg, 2013), results of studies in older children have been less conclusive (Peterson et al., 2007; Vannorsdall, Dahlquist, Pendley, & Power, 2004). For example, Vannorsdall and colleagues (2004) demonstrated that soothing touch by nurses, but not parents, was associated with less child distress during lumbar punctures. Peterson and colleagues (2007) found that while parents engaged in significantly more empathic than instrumental touch during children's painful oncology procedures, empathic touch was not related to children's distress during the procedure. Interestingly, parents' empathic touch *after* the procedure was positively related to children's distress, suggesting that parents may have used empathic touch in response to children's distress. Of note, most of the research to date on empathic touch in medical contexts has examined relations between overall rates of touch and distress, but this research has been unable to identify whether children's distress is more likely to elicit parental empathic touch or to occur in response to empathic touch. Investigating the temporality of this association is an important first step in understanding

how parental nonverbal support behaviors function in their relation to children's distress in medical contexts.

Although a small number of studies have highlighted the seemingly important role that parental touch plays in children's distress in medical procedures, little research has studied these associations distinctly in mothers and fathers. The broader parenting literature points to gender differences in the ways that parents use touch with their young children (Feldman, Gordon, Schneiderman, Weisman, & Zagoory-Sharon, 2010). For example, mothers appear to engage more in affectionate contact with their infant children than fathers, whereas fathers are more likely to use proprioceptive (e.g., moving, orienting) or stimulatory forms of touch (e.g., quick touches; Feldman et al., 2010). These gender differences are important because they may influence children's emotional and behavioral reactions in different ways. For example, stroking, a common affectionate touch (i.e., more commonly displayed by mothers), plays a stronger role in eliciting infant children's positive emotions and modulating negative emotions than other types of touch, such as poking or tickling (Peláez-Nogueras et al., 1997). Thus, if parents differ in the ways they touch their children, it is possible that this could influence children's emotional and behavioral responses in the face of distressing situations, such as medical procedures.

Specific to pain and medical settings, several studies have shown that mothers and fathers may respond differently to their children in both experimental and applied studies (Goubert, Vervoort, De Ruddere, & Crombez, 2012; Martin et al., 2013; Tourigny, Ward, & Lepage, 2004). For example, mothers have been found to use more verbal reassurance, helping, and empathic behaviors than fathers after their children's surgery (Martin et al., 2013; Tourigny et al., 2004). Yet, despite apparent differences in mothers' and fathers' caretaking roles in both medical and nonmedical contexts (Moon & Hoffman, 2008; Tourigny et al., 2004), it is not clear whether or how these differences translate into parents' differential use of touch with their children in a medical setting, and what impact these gender differences may have on children's distress behaviors.

This study examines mothers' and fathers' use of touch, and the relation between touch and children's immediate recovery after outpatient surgery in the postanesthesia care unit (PACU) where children experience high levels of pain, nausea, and other discomfort (Fortier, MacLaren, Martin, Perret-Karimi, & Kain, 2009). The PACU setting is unique from other procedural contexts in that children typically experience longer-term pain, are under the influence of multiple medications, and remain in the setting for prolonged periods. While some research has demonstrated that parental presence appears to benefit children in the

PACU (e.g., Fiorentini, 1993), little is known about the specific patterns of parent-child interaction that surround children's postoperative distress (Chorney, Tan, & Kain, 2013; Martin et al., 2013).

The first objective is to describe parents' use of empathic and instrumental touch. It is hypothesized that mothers will use more empathic and instrumental touch than fathers. The second objective is to examine the associations between rates of parents' touch and children's distress. It is hypothesized that parents' empathic and instrumental touch will be positively correlated with children's distress. The third objective is to examine the temporal relations between parents' empathic touch and children's distress. Specifically, we will examine whether empathic touch appears to be responsive to, or triggering of, children's distress. Based on the existing literature, it is plausible that parent empathic touch is used most often in response to children's distress, perhaps in an attempt to calm them (e.g., Hertenstein, Verkamp, et al., 2006). Alternatively, it is possible that empathic touch may be used in an attempt to prevent the occurrence of distress (e.g., Martin et al., 2013).

Method

Participants

Parents and children in this report were participants in the Behavioral Interactions Perioperative Study (BIPS) study, a large project examining the influence of parent and care provider behaviors on children's distress and coping throughout the perioperative period (Chorney & Kain, 2009; Chorney et al., 2012, 2013; Martin et al., 2013). The current report is the first from this sample to examine the interaction between parents' nonverbal behaviors and children's distress, and to separately examine and compare mothers' and fathers' nonverbal behaviors in the PACU.

Parents of children who were scheduled for elective outpatient surgery were recruited from a pediatric, tertiary care academic medical center in the Northeastern United States. Eligible participants were healthy children between 2 and 11 years of age and were accompanied by one or both of their parents. Emergent surgeries or surgeries requiring hospitalization were excluded because of differences in experiences (i.e., time available to prepare) and length of stay in recovery (i.e., many children who are hospitalized following surgery stay in the PACU only briefly before being transferred to the ward). Families were excluded if children had a chronic illness or developmental delay, or the parents did not speak English. Of the 836 potential participants approached for the BIPS study, 485 declined. While the majority of potential participants did not provide a reason for nonparticipation, of those that gave a reason, most indicated that the study involved too much paperwork. Of the 351

children who participated in the BIPS study, coded videotaped data were available for the 143 children (M age = 4.74, SD = 2.30) and parents (142 mothers and 112 fathers) in this report. For the remaining participants, coded postoperative data were not available because of participant withdrawal (n = 10), equipment malfunctions (n = 30), children being placed in nonrecordable PACU beds or leaving the PACU too soon (n = 38), or an inability to code behavioral data from video collected (e.g., muffled or inaudible video; n = 137). For the majority of participants in this report, both parents were present with their child in the PACU (N = 111; 78%). For 31 children (22%), only mothers were present in the PACU, and for one child, only the father was present (<1%).

Measures

The Child Behavior Coding System, Postanesthesia Care Unit (CBCS-P; Chorney, Tan, Martin, Fortier, & Kain, 2012) is a validated observational coding system of parent, child, and care provider behaviors in the PACU. For each code category (e.g., "empathic touch"; "instrumental touch"), specific CBCS-P behavioral codes *within* the category are mutually exhaustive and exclusive (i.e., every behavior is coded, but behaviors can only be represented by a single code, such as no empathic touch, pat/rub touch, or embracing touch). Codes included in the CBCS-P have good-to-excellent interrater reliability, and good concurrent validity with commonly used measures of child distress, such as practitioner pain ratings and analgesic use (Chorney et al., 2012). Only the parental touch and child distress codes were used in this study.

Parental Touch

Five forms of parental touch are coded in the CBCS-P. Two forms of touch are empathic (i.e., touch that is meant to soothe or reassure), and three forms are instrumental (i.e., touch related to medical procedures or that serves a nonmedical instrumental function). Empathic touch codes included: (1) embracing touch (i.e., rocking, holding, or laying in bed with the child; longer episodes of touch that had meaningful durations), and (2) pat/rub touch (i.e., patting the hand or head, rubbing the back, holding hands, or giving hugs and kisses; short bouts of touch that were often time limited). When embracing and pat/rub touch behaviors co-occurred, embracing touch codes took precedence (e.g., holding a child and patting his or her hand would be coded as embracing touch). Instrumental touch codes included: (1) nonpainful medical or instrumental touch (i.e., touch involving medical devices that are not potentially painful, or moving and/or orienting the child for medical procedures or nonmedical activities); (2) painful medical touch (i.e., touch to an area that could cause the child pain); (3) restraint (i.e.,

physical restraint of a distressed child to complete a medical procedure or ensure his/her safety).

Child Distress

Based on theoretical and statistical associations between child distress behavioral codes, prior studies using the CBCS-P have derived nonverbal and verbal child distress composite codes (Chorney et al., 2012; Martin et al., 2013). Given significant, positive intercorrelations between these composites in a prior study using the CBCS-P (Martin et al., 2013) and conceptual overlap in verbal and nonverbal distress behaviors, a total child distress variable was derived for this study (i.e., coded as present during any time in which a distress behavior occurred). Thus, the child distress variable included behavioral codes for verbal pain, verbal and nonverbal resistance, verbal and nonverbal requests for support, verbal negative emotion, crying, screaming, and guarding (i.e., holding and/or covering a painful site).

Procedure

The research institution's Human Investigation Committee approved this study. Potential participants were identified from a scheduled list of patients and were contacted by phone and informed of the study 1–7 days before their scheduled surgery. Parents who were interested in participating provided informed consent and completed demographic measures either during a preadmission visit approximately 2 days before surgery or on the day of surgery. Parents provided written consent, and children >5 years of age provided assent, on the day of a preoperative appointment that occurred 2–7 days before the child's surgery. During this appointment, families completed demographic questionnaires and other self-report measures for the larger study. Following surgery, children and parents were transferred to the PACU and were videotaped from first entry until discharge using a set of cameras placed in the PACU. Parents and children did not receive compensation for participation.

Coding Process

Video footage of families' stay in the PACU was converted into computer files and imported into Observer XT Software for video coding. Two independent research assistants (both with bachelor's degrees in psychology) coded three 5-min segments from videotape (and thus had access to both nonverbal and verbal content). These segments included: (1) the first 5 min that the child was awake, (2) 5 min around the removal of the intravenous catheter, and (3) a randomly selected 5-min segment selected for child distress. Coders used continuous timed-event coding methods to record data, which allows for the coding of the onset and offset of multiple behaviors. Coders

overlapped on a randomly selected 20% of the data to allow for assessment of interrater reliability. Both event-based (interrater agreement on the number and order of coded events) and time-unit kappas (interrater agreement on duration and timing of codes (Bakeman, Quera, & Gnisci, 2009) are reported. Kappas for touch were in the good to excellent range (event-based: embracing = .73; pat/rub = .83; instrumental = .74; time-unit: embracing = 1.0; pat/rub = .94; instrumental = .73). Kappas for children's distress were in the moderate to excellent range (event-based = .65; time-unit = .92).

Data Analysis

Analyses were conducted using SPSS 21 (SPSS Inc., Chicago, IL) and Generalized Sequential Quierier 5.1 (Bakeman & Quera, 1995). To account for differences in the length of observation, all raw data were divided by the number of seconds in the observation to generate a rate. Data did not meet assumptions for parametric testing, and thus, nonparametric statistics were used. Median rates and the proportion of parents who used each form of touch (based on the overall sample of parents and only the parents using each form of touch) are reported. In line with prior studies of touch during painful medical procedures (Peterson et al., 2007), and given the small proportion of parents that used painful medical touch and restraint (see Table II), these codes were combined with nonpainful medical and instrumental touch to create an "instrumental touch" composite. Chi-square analyses were used to examine differences in the proportion of mothers and fathers using each form of touch, and Mann-Whitney tests were used to examine differences in mothers' and fathers' rates of each form of touch. Spearman rank-order correlations were used to examine associations among rates of child distress and parental touch.

Time-window sequential analysis was used to follow-up significant correlations between parental empathic touch and children's distress (i.e., whether the presence of one behavior increases the probability that another behavior will occur within a given time window; Chorney, Garcia, Berlin, Bakeman, & Kain, 2010; Yoder & Tapp, 2004). In this study, two sets of sequential analyses were conducted: One examining the likelihood of parental empathic touch occurring within a 10-s window following any instance of child distress (onset or maintenance), and the other examining the likelihood of child distress starting within a 10-s window following the onset of parental empathic touch. In this way, we examine both child distress triggering empathic touch, and empathic touch triggering child distress. A Yule's Q statistic was used to compare the likelihood of the target behavior (either touch or distress) occurring within the window to outside this window. Yule's Q values range from -1 to +1, with values closer to +1 representing greater

sequential probabilities (e.g., parental empathic touch being more likely to occur in the window after child distress than at any other time), and values closer to -1 representing lesser sequential probabilities (e.g., parental empathic touch being less likely to occur in the window after child distress than at any other time). Yule's Q values were computed for each parent-child dyad that displayed both touch and distress behaviors, and medians and interquartile ranges (IQRs) of the Yule's Q contingencies are reported. A binomial test evaluated whether the proportion of positive and negative Yule's Q values differed significantly from what would be expected by chance (i.e., 50%; Gottman, 1990).¹

Results

Descriptive and Correlational Analyses

Demographic information for children and parents is presented in Table I. Table II presents the proportion and median rates of mothers' and fathers' touch, including the individual touch behaviors as well as the instrumental touch composite. Significantly more mothers than fathers used embracing touch ($\chi^2 = 3.90$; $p = .05$), but the proportion of mothers and fathers using pat/rub and instrumental touch did not significantly differ (pat/rub touch: $\chi^2 = 0.52$; $p = .47$; instrumental touch: $\chi^2 = 2.74$; $p = .10$). Fathers' rates of touch were significantly lower than mothers' across all three touch categories (embracing touch: $Z = -2.64$, $p = .008$; pat/rub touch: $Z = -3.50$, $p < .001$; instrumental touch: $Z = -4.50$, $p < .001$).

Intercorrelations examined associations between child distress and parental touch. Rates of child distress were significantly positively correlated with rates of mothers' embracing touch ($r_s = .42$, $p < .01$), mothers' instrumental touch ($r_s = .22$, $p < .01$), and fathers' instrumental touch ($r_s = .66$, $p < .01$). Associations between child distress and fathers embracing touch ($r_s = .13$), mothers pat/rub touch ($r_s = .06$), and fathers pat/rub touch ($r_s = .17$) were nonsignificant.

Time-Window Sequential Analyses

The significant correlation between mothers' embracing touch and children's distress was followed-up using sequential analysis. The contingency examining mothers' embracing touch occurring during or after child distress had a large positive effect size ($n = 71$, median $Q = .78$, $IQR = 1.67$), indicating that mothers were more likely to use embracing touch during or

Table I. Summary of Demographics of Study Sample

Demographics	N (%)
Child sex	
Female	57 (40)
Male	56 (39)
Child ethnicity	
Latino	11 (8)
Not Latino	62 (43)
Child race	
White	99 (69)
Black	6 (4)
Native Hawaiian/Pacific Islander	1 (1)
More than one race	5 (3.5)
Parent education (years)	
≤ 12	21 (15)
13–16	53 (37)
≥ 17	38 (27)
Parent income	
$\leq \$20,000$	6 (4)
$\$21–50,000$	11 (8)
$\$51–80,000$	25 (17)
$\$80–100,000$	20 (14)
$> \$100,000$	53 (37)
Type of surgery	
Tonsillectomy and adenoidectomy	27 (19)
Myringotomy/ear tubes	3 (2)
Other	106 (74)

after children's distress than at any other time. Results of the binomial test supported this assertion: The proportion of dyads with positive contingencies (i.e., touch was more likely during or after child's distress; 65%) was greater than would be expected by chance ($Z = 2.49$, $p = .017$).

The contingency of child distress occurring following mothers' embracing touch had a large negative effect ($n = 49$, median $Q = -1.00$, $IQR = 1.80$), indicating that children were less likely to start exhibiting distress in response to mothers' embracing touch than at any other time. However, contrary to the descriptive analyses, results of the binomial test revealed that the proportion of dyads with negative contingencies (i.e., child distress was less likely to follow embracing touch; 57%) was not different than would be expected by chance ($Z = 1.00$, $p = .39$).

Discussion

This study examined mothers' and fathers' use of child-directed empathic and instrumental touch in the PACU, as well as overall and temporal associations between parental touch and children's postoperative distress. In line with our primary hypotheses, there were differences in mothers' and fathers' touch behaviors in the PACU. While mothers and fathers were equally as likely to use brief pat/rub touch and instrumental touch, proportionately more mothers than fathers used embracing touch. Additionally, mothers demonstrated significantly higher rates of touch than

1 Of note, all analyses were conducted on the full sample ($N = 143$ families) and the subset of families where both parents were present in the PACU ($N = 111$). The patterns and significance of the results were consistent for both sets of analyses; thus, for parsimony, the results reported here are based on analyses conducted on the full sample.

Table II. Proportions and Median Rates of Mothers' and Fathers' Child-Directed Touch Behaviors Calculated Based on the Overall Sample and Only on the Sample That Used the Touch

Parent gender	Total N	Embracing touch			Pat/rub touch			Nonpainful medical touch			Painful medical touch			Restraint			Functional touch composite		
		Overall sample touch			Overall sample touch			Overall sample touch			Overall sample touch			Overall sample touch			Overall sample touch		
		M rate (IQR)	N (%)	M rate (IQR)	M rate (IQR)	N (%)	M rate (IQR)	M rate (IQR)	N (%)	M rate (IQR)	M rate (IQR)	N (%)	M rate (IQR)	M rate (IQR)	N (%)	M rate (IQR)	M rate (IQR)	N (%)	M rate (IQR)
Mothers	142	0.00 (0.33)	47 (33.10)	0.65 (0.56)	0.06 (0.19)	117 (82.39)	0.08 (0.20)	120 (84.51)	0.05 (0.08)	28 (19.71)	0.06 (0.11)	0.00 (0.00)	0.00 (0.00)	9 (6.34)	0.02 (0.02)	0.05 (0.11)	120 (84.51)	0.06 (0.11)	
Fathers	112	0.00 (0.00)	26 (23.21)	0.29 (0.41)	0.01 (0.08)	78 (69.64)	0.03 (0.13)	69 (61.61)	0.02 (0.03)	18 (16.07)	0.04 (0.09)	0.00 (0.00)	0.00 (0.00)	4 (3.57)	0.04 (—)*	0.02 (0.05)	72 (64.29)	0.04 (0.05)	

fathers for all forms of touch. These findings are in line with previous research, which has demonstrated that while fathers tend to be present and engaged in children's postoperative care in the hospital (e.g., support behaviors), they engage in these behaviors at lower rates and lower frequencies than mothers (Martin et al., 2013; Tourigny et al., 2004).

The reason for the differences observed between mothers' and fathers' use of parenting behaviors, such as instrumental and empathic touch, is unclear. One possible explanation is that fathers, although present and active, may serve as secondary caregivers in hospital settings (Higham & Davies, 2013). This notion bears further exploration given the growth of family-centered care models in pediatric medical care. It remains unclear whether the gender differences observed in this study and other studies (Martin et al., 2013; Tourigny et al., 2004) represent a natural transition from everyday parenting roles (Moon & Hoffman, 2008) into a medical context, or whether they are in some way imposed by a culture in hospitals that is geared more toward mothers as primary caregivers (Higham & Davies, 2013).

In line with Peterson and colleagues (2007), child distress was positively associated with both mothers' and fathers' rates of instrumental touch, suggesting that parents instrumentally assist in the PACU alongside medical staff, and that this touch appears to be associated with children's distress. Unfortunately, owing to the low proportion of parents using painful medical touch and restraint in this study, we were unable to parse out the contexts surrounding this association (e.g., medical procedures, pain, or other functions, such as dressing changes).

Contrary to our expectations with regards to empathic touch, only rates of mothers' embracing touch, and not pat/rub touch, demonstrated a positive association with children's distress. Time-window sequential analyses revealed that mothers' embracing touch was more likely to occur in response to children's distress than at any other time, and that children were less likely to exhibit distress in response to mothers' embracing touch than at any other time. This finding is similar to previous literature examining the sequential associations between parental verbal empathy and child distress in the PACU (Chorney et al., 2013; Martin et al., 2013). However, the results of this study extend this research to the domain of nonverbal empathy, suggesting that mothers' embracing touch may also play a role in preventing children from becoming distressed. Further, when children are already exhibiting distress behaviors, mothers appear to use embracing touch in response to this distress, likely in an attempt to soothe them. Indeed, a growing body of literature has highlighted the distress-reducing, anxiety-reducing, and soothing properties of touch (e.g., Gallace & Spence, 2010), and in particular maternal

touch in response to procedures that induce pain or fear (e.g., Johnston et al., 2014).

Unlike parents' verbal empathic behaviors, where children are less likely to become distressed in response to *both* mothers' and fathers' reassurance (Martin et al., 2013), the results of this study suggest that there may be a property of embracing touch that is unique to mothers, as evidenced by the greater number of mothers than fathers that used embracing touch, the higher rates of embracing touch among mothers than fathers, and the lack of an association between fathers embracing touch and children's distress. It is worth emphasizing that the unequal number of mothers and fathers in this study cannot explain these findings, as the pattern of results remained consistent when "mother-only" and "father-only" families were excluded from the analyses. It is possible that these findings relate to fathers' gender-established role as the "secondary" caregiver when the mother is present, although because only one "father-only" family participated, we were unable to explore this hypothesis.

In line with the accumulating evidence on the soothing and regulatory properties of touch, the results of this study provide temporal evidence that is suggestive of the distress-modulating properties of mothers' embracing touch. While there is ever-growing recognition of the role for parent–infant touch practices in postnatal care (e.g., skin-to-skin or "Kangaroo care"; Johnston et al., 2014), embracing touch has much less frequently been emphasized as an important parenting behavior in medical contexts for children beyond infancy. The results of this study provide evidence that parents' nonverbal empathic behaviors may continue to benefit older children in medical settings. In particular, there is cause for further clinical study, as these findings indicate that mothers' use of embracing touch, such as holding their children, may be a natural means of preventing or alleviating children's distress behaviors in the postoperative setting.

It is of note that pat/rub touch was the most highly used form of empathic touch for both mothers and fathers, but was not correlated with children's distress. The lack of an association between pat/rub touch and distress may speak to differential functions for empathic forms of touch. Embracing touch, which involves behaviors such as stroking and holding a child, is typically of a longer duration and may have a more nurturing quality than pat/rub touch, which is typically characterized by brief, time-limited bouts of touch, such as patting the hand or giving a kiss. The nurturing aspect of maternal touch may play a role in establishing secure attachment styles between mothers and infants (Weiss, Wilson, Hertenstein, & Campos, 2000), which is well-known to influence children's feelings of safety and security (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1973). Thus, in a medical context, it may be that the nurturing

properties of embracing touch serve the intent of calming children and helping them feel secure. Time-window sequential analyses support the view of maternal embracing touch as serving a soothing function and intent (i.e., in advance of, or in response to, distress), yet the function of pat/rub touch remains unclear. These findings on the differences in types of empathic touch may be useful in guiding parents in their use of empathic touch in the PACU. Furthermore, clinicians are urged to consider how medical settings may introduce barriers to parents' capacity to provide their children with embracing versus brief forms of touch. That is, it is not clear to what extent situational factors, such as medical equipment or frequency of routine visits from medical staff, may interfere with parents' comfort or ability to provide embracing touch.

Several limitations should be noted. Whereas this study sought to examine the function of parental touch behaviors in the PACU, it was beyond our scope to parse out touch from the broader context of parent–child interactions. Indeed, coders had access to verbal content from parents, children, and medical staff while coding touch, and it is possible that they used this additional verbal context to judge the intention of touch. Touch does not occur in isolation, but rather in the context of a number of other parental behaviors (e.g., distraction, reassurance, and others). Undoubtedly, the interaction among verbal and nonverbal behaviors likely influences children's behavior in a way that is not fully captured in this study. That said, most studies using micro-coding to date generally consider only verbal content, and thus considering only nonverbal content is still an addition to the literature. Second, characteristics of this sample may have implications for the generalizability of these findings. The larger study had a relatively high proportion of potential families decline participation (with limited data on reasons for nonparticipation), which may indicate participation bias in our sample. This sample was also relatively homogeneous in terms of socioeconomic status and race. Given these limitations, and cultural differences in touch behaviors (see Gallace & Spence, 2010), future research should extend the study of parental touch to include more diverse populations. Third, while time-window sequential analysis is able to clarify the order of behaviors in sequence, causation cannot be concluded from the results of this study. Future experimental studies will be required to confirm causality. Fourth, median rates of parental touch were relatively low. This is not uncommon in observational studies of parent behavior during children's medical procedures (e.g., Dahlquist, Power, & Carlson, 1995), but the clinical implications of these findings should be considered. Some of the low frequencies of the use of pat/rub touch could be attributable to the mutually exclusive coding used (i.e., when it co-occurred with embracing touch, it was not coded). Low rates of behaviors may also reflect that parents

may be hesitant to use particular parenting behaviors with their children in unfamiliar medical settings. However, although absolute frequencies were low, parent touch was still related to child outcomes in this study, thus demonstrating its potential importance.

Despite these limitations, this study also had numerous strengths. Touch is an important and common component of parent–child relationships; yet, it is understudied in medical contexts, particularly beyond the postnatal period. This study provides greater depth to our understanding of the ways that parents can interact proactively with children, by extending the study of parent–child interactions to the domain of nonverbal behavior. To this aim, the use of time-window sequential analysis in this study was of particular value, as it identified temporal sequences between mothers' embracing touch and children's distress. Including both fathers and mothers was another strength given models of family-centered care, as it contributes to the literature demonstrating important differences in mothers' and fathers' caregiving roles in perioperative care, a series of findings that may have clinical implications for how health care professionals encourage parental involvement in children's medical care.

In conclusion, this study examined mothers' and fathers' use of child-directed touch after children's surgery, the relations between parent touch and child distress, and the temporal associations between mothers' embracing touch and children's distress. Mothers and fathers demonstrated numerous differences in their use of both empathic and instrumental touch, which may be suggestive of primary and secondary parental roles in children's postoperative care. Sequential analyses demonstrated that mothers use embracing touch as a means of responding to their child's distress, and that mothers' touch may prevent children from becoming distressed. However, these same findings did not extend to fathers, as there was no association between fathers' empathic touch and children's distress.

In the context of the broader BIPS study, the current study adds to our understanding of best practices around parental involvement in children's perioperative care by extending it to nonverbal parenting behaviors, and improving our understanding of differences in parental roles. Alongside mothers, fathers are active empathic and instrumental participants in children's care. As models of family-centered care are further integrated into medical systems, health care providers should consider the important role that both caregivers play. This study also contributes to our understanding of parental behaviors, such as mothers embracing touch, which may aid in the management of children's postoperative distress. This is of clinical importance given the detrimental effects of children's distress and anxiety on their postoperative pain and recovery (LaMontagne, Hepworth, & Salisbury, 2001), and represents an additional opportunity to

guide interventions that will help optimize children's experiences with ambulatory surgery.

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References

- Ainsworth, M. D. S., Blehar, M., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Erlbaum.
- Bakeman, R., & Quera, V. (1995). *Analyzing interaction: Sequential analysis with SDIS and GSEQ*. Cambridge, UK: Cambridge University Press.
- Bakeman, R., Quera, V., & Gnisci, A. (2009). Observer agreement for timed-event sequential data: A comparison of time-based and event-based algorithms. *Behavior Research Methods*, *41*, 137–147. doi: 10.3758/BRM.41.1.137
- Beider, S., & Moyer, C. A. (2007). Randomized controlled trials of pediatric massage: A review. *Evidence-Based Complementary and Alternative Medicine: eCAM*, *4*, 23–34. doi: 10.1093/ecam/nel068
- Blount, R. L., Cohen, L. L., Frank, N. C., Bachanas, P. J., Smith, A. J., Manimala, M. R., & Pate, J. T. (1997). The Child-Adult Medical Procedure Interaction Scale-Revised: An assessment of validity. *Journal of Pediatric Psychology*, *22*, 73–88.
- Blount, R. L., Devine, K. A., Cheng, P. S., Simons, L. E., & Hayutin, L. (2008). The impact of adult behaviors and vocalizations on infant distress during immunizations. *Journal of Pediatric Psychology*, *33*, 1163–1174. doi: 10.1093/jpepsy/jsn030
- Bowlby, J. (1973). *Attachment and Loss. Vol. 2: Separation: Anxiety And Anger*. New York, NY: Basic Books.
- Chorney, J. M., Garcia, A. M., Berlin, K. S., Bakeman, R., & Kain, Z. N. (2010). Time-window sequential analysis: An introduction for pediatric psychologists. *Journal of Pediatric Psychology*, *35*, 1061–1070. doi: 10.1093/jpepsy/jsq022
- Chorney, J. M., & Kain, Z. N. (2009). Behavioral analysis of children's response to induction of anesthesia. *Anesthesia and Analgesia*, *109*, 1434–1440. doi: 10.1213/ane.0b013e3181b412cf
- Chorney, J. M., Tan, E. T., & Kain, Z. N. (2013). Adult-child interactions in the postanesthesia care unit: Behavior matters. *Anesthesiology*, *118*, 834–841.
- Chorney, J. M., Tan, E. T., Martin, S. R., Fortier, M. A., & Kain, Z. N. (2012). Children's behavior in the postanesthesia care unit: The development of the Child Behavior Coding System-PACU (CBCS-P). *Journal of Pediatric Psychology*, *37*, 338–347. doi: 10.1093/jpepsy/jsr101
- Chorney, J. M., Torrey, C., Blount, R., McLaren, C. E., Chen, W. P., & Kain, Z. N. (2009). Healthcare provider and parent behavior and children's coping and distress at anesthesia induction. *Anesthesiology*, *111*, 1290–1296.
- Cohen, L. L., Bernard, R. S., McClelland, C. B., & MacLaren, J. E. (2005). Assessing medical room behavior during

- infants' painful procedures: The measure of adult and infant soothing and distress (MAISD). *Children's Health Care*, 34, 81–94. doi: 10.1207/s15326888chc3402_1
- Dahlquist, L. M., Power, T. G., & Carlson, L. (1995). Physician and parent behavior during invasive pediatric cancer procedures: Relationships to child behavioral distress. *Journal of Pediatric Psychology*, 20, 477–490. doi: 10.1093/jpepsy/20.4.477
- Ditzen, B., Neumann, I. D., Bodenmann, G., von Dawans, B., Turner, R. A., Ehlert, U., & Heinrichs, M. (2007). Effects of different kinds of couple interaction on cortisol and heart rate responses to stress in women. *Psychoneuroendocrinology*, 32, 565–574. doi: 10.1016/j.psyneuen.2007.03.011
- Elfenbein, H. A., & Nalini, A. (2002). On the universality and cultural specificity of emotion recognition: A meta-analysis. *Psychological Bulletin*, 128, 203–235.
- Feldman, R., Gordon, I., Schneiderman, I., Weisman, O., & Zagoory-Sharon, O. (2010). Natural variations in maternal and paternal care are associated with systematic changes in oxytocin following parent-infant contact. *Psychoneuroendocrinology*, 35, 1133–1141. doi: 10.1016/j.psyneuen.2010.01.013
- Field, T. (2010). Touch for socioemotional and physical well-being: A review. *Developmental Review*, 30, 367–383. doi: 10.1016/j.dr.2011.01.001
- Fiorentini, S. E. (1993). Evaluation of a new program: Pediatric parental visitation in the postanesthesia care unit. *Journal of Post Anesthesia Nursing*, 8, 249–256.
- Fortier, M. A., MacLaren, J. E., Martin, S. R., Perret-Karimi, D., & Kain, Z. N. (2009). Pediatric pain after ambulatory surgery: Where's the medication? *Pediatrics*, 124, e588–e595. doi: 10.1542/peds.2008-3529
- Gallace, A., & Spence, C. (2010). The science of interpersonal touch: An overview. *Neuroscience and Biobehavioral Reviews*, 34, 246–259. doi: 10.1016/j.neubiorev.2008.10.004
- Gottman, J. M. (1990). *Sequential Analysis: A Guide for Behavioral Researchers*. Cambridge: Cambridge University Press.
- Goubert, L., Vervoort, T., De Ruddere, L., & Crombez, G. (2012). The impact of parental gender, catastrophizing and situational threat upon parental behavior to child pain: A vignette study. *European Journal of Pain*, 16, 1176–1184. doi: 10.1002/j.1532-2149.2012.00116.x
- Grewen, K. M., Anderson, B. J., Girdler, S. S., & Light, K. C. (2003). Warm partner contact is related to lower cardiovascular reactivity. *Behavioral Medicine*, 29, 123–130. doi: 10.1080/08964280309596065
- Hertenstein, M. J., Keltner, D., App, B., Buleit, B. A., & Jaskolka, A. R. (2006). Touch communicates distinct emotions. *Emotion*, 6, 528–533. doi: 10.1037/1528-3542.6.3.528
- Hertenstein, M. J., Verkamp, J. M., Kerestes, A. M., & Holmes, R. M. (2006). The communicative functions of touch in humans, nonhuman primates, and rats: A review and synthesis of the empirical research. *Genetic, Social & General Psychology Monographs*, 132, 5–94.
- Higham, S., & Davies, R. (2013). Protecting, providing, and participating: Fathers' roles during their child's unplanned hospital stay, an ethnographic study. *Journal of Advanced Nursing*, 69, 1390–1399. doi: 10.1111/j.1365-2648.2012.06131.x
- Johnston, C., Campbell-Yeo, M., Fernandes, A., Inglis, D., Streiner, D., & Zee, R. (2014). Skin-to-skin care for procedural pain in neonates. *The Cochrane Database of Systematic Reviews*, 1, CD008435. doi: 10.1002/14651858.CD008435.pub2
- LaMontagne, L. L., Hepworth, J. T., & Salisbury, M. H. (2001). Anxiety and postoperative pain in children who undergo major orthopedic surgery. *Applied Nursing Research*, 14, 119–124. doi: 10.1053/apnr.2001.24410
- Lisi, D., Campbell, L., Pillai Riddell, R., Garfield, H., & Greenberg, S. (2013). Naturalistic parental pain management during immunizations during the first year of life: Observational norms from the OUCH cohort. *Pain*, 154, 1245–1253. doi: 10.1016/j.pain.2013.03.036
- Martin, S. R., Chorney, J. M., Cohen, L. L., & Kain, Z. N. (2013). Sequential analysis of mothers' and fathers' reassurance and children's postoperative distress. *Journal of Pediatric Psychology*, 38, 1121–1129. doi: 10.1093/jpepsy/jst061
- McMurtry, C. M., Chambers, C. T., McGrath, P. J., & Asp, E. (2010). When “don't worry” communicates fear: Children's perceptions of parental reassurance and distraction during a painful medical procedure. *Pain*, 150, 52–58. doi: 10.1016/j.pain.2010.02.021
- Moon, M., & Hoffman, C. D. (2008). Mothers' and fathers' differential expectancies and behaviors: Parent x child gender effects. *The Journal of Genetic Psychology*, 169, 261–279. doi: 10.3200/GNTP.169.3.261-280
- Peláez-Nogueras, M., Field, T., Gewirtz, J. L., Cigales, M., Gonzalez, A., Sanchez, A., & Richardson, S. C. (1997). The effects of systematic stroking versus tickling and poking on infant behavior. *Journal of Applied Developmental Psychology*, 18, 169–178.
- Peterson, A. M., Cline, R. J. W., Foster, T. S., Penner, L. A., Parrott, R. L., Keller, C. M., ... Albrecht, T. L. (2007). Parents' interpersonal distance and touch behavior and child pain and distress during painful pediatric oncology procedures. *Journal of Nonverbal Behavior*, 31, 79–97. doi: 10.1007/s10919-007-0023-9
- Piira, T., Sugiura, T., Champion, G. D., Donnelly, N., & Cole, A. S. J. (2005). The role of parental presence in the context of children's medical procedures: A systematic review. *Child: Care, Health and Development*, 31, 233–243. doi: 10.1111/j.1365-2214.2004.00466.x
- Tourigny, J., Ward, V., & Lepage, T. (2004). Fathers' behavior during their child's ambulatory surgery. *Issues Compr Pediatr Nurs*, 27, 69–81. doi: 10.1080/01460860490451804
- Vannorsdall, T., Dahlquist, L., Pendley, J. S., & Power, T. (2004). The relation between nonessential touch and children's distress during lumbar punctures. *Children's Health Care*, 4, 299–315.
- Weiss, S. J., Wilson, P., Hertenstein, M. J., & Campos, R. (2000). The tactile context of a mother's caregiving: Implications for attachment of low birth weight infants. *Infant Behavior and Development*, 23, 91–111. doi: 10.1016/S0163-6383(00)00030-8
- Yoder, P. J., & Tapp, J. (2004). Empirical guidance for time-window sequential analysis of single cases. *Journal of Behavioral Education*, 13, 227–246.