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Sequential analysis of child pain behaviors and maternal responses: an observational study

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INTRODUCTION

Chronic or recurrent abdominal pain is a prevalent pediatric pain problem [17]. Medical evaluations of common childhood abdominal pain symptoms typically yield no evidence of organic disease, leading to a diagnosis of functional abdominal pain disorder (FAPD). FAPD is associated with significant psychosocial dysfunction including anxiety, depression, missed school days, and high health care utilization among children [4, 7, 15, 28], and anxiety, depression, somatic symptoms, decreased quality of life, and increased health care utilization among *mothers* of children with FAPD [5]. Furthermore, children with FAPD are at risk for chronic pain and distress in adulthood [29, 34].

Cognitive-behavioral theory provides a framework for understanding psychosocial factors that may contribute to dysfunction associated with FAPD. Catastrophizing (CAT), defined as “an exaggerated negative ‘mental set’ brought to bear during painful experiences” [30] has been shown to be associated with increased pain experience, expressivity and pain-related dysfunction in adults [26] and children [6, 18, 23, 31]. More recently, attention has been paid to catastrophic cognitions on the part of *significant others* [9, 27]. Parents’ catastrophic cognitions about their child’s pain have been associated with parents’ emotional and behavioral responses to the child’s pain [3, 13] as well as adverse outcomes in the child [13, 24, 25]. Parental CAT may lead parents to interpret child pain behavior as indicating harm or threat to child wellbeing, and thus may increase the likelihood of solicitous parental responses that restrict child activity, school attendance or otherwise signal that pain is threatening or damaging [19]. Such solicitous responses could potentially reinforce and maintain pain and illness behaviors, disability and school absences [22, 33, 36].

The present study sought to examine associations between maternal CAT and both maternal and child behavior in a laboratory setting. The use of direct observation contrasts with the majority of studies on parental CAT which have employed questionnaire or vignette

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methodologies [2, 9, 13, 25] and provides an additional source of information independent of self-report. Children with FAPD were videotaped interacting with their mothers while undergoing a validated water ingestion procedure to induce abdominal discomfort [35]. Observers coded child pain behavior and maternal responses during the interaction, allowing sequential analysis of mother and child behaviors. The use of sequential analysis allows the identification of temporal patterns of child and parent behaviors, potentially illuminating factors that may elicit or maintain dysfunctional behaviors, and pointing towards avenues for intervention. For example, if child pain behavior significantly increases the likelihood of subsequent maternal solicitousness (which has been shown to be associated with negative outcomes [36]), interventions might address this pattern by helping parents respond to child pain behavior with more adaptive responses. We hypothesized that: (1) maternal CAT would be associated with greater child pain behavior and greater maternal solicitousness; (2) child pain behavior and maternal solicitous behaviors would be temporally associated in sequential analyses of interactional data; and (3) maternal CAT would moderate the association between child pain behavior and maternal solicitousness, such that mothers higher in CAT regarding their child's pain would be more likely to respond solicitously to their child's pain displays than would mothers lower in CAT.

METHODS

Participants

Eighty children with recurrent FAPD and their mothers served as participants, recruited from the gastroenterology outpatient clinic of Seattle Children's Hospital. Inclusion criteria for children were: age 8–12; at least 3 episodes of abdominal pain over a 3-month period interfering with the child's activities; a gastroenterologist-determined diagnosis of recurrent FAPD; and normal renal status (given the water ingestion procedure). Exclusion criteria for children were: positive physical or laboratory findings that indicated a disease process explaining symptoms of abdominal pain; chronic disease (e.g., Inflammatory Bowel Disease, pancreatitis, or diabetes); developmental disability requiring either full-time special education or impairing ability to respond to assessments; and inability to speak or comprehend English. All mothers needed to be at least 21 years of age and English speaking and comprehending. Mothers rather than fathers were identified as the participating parents given that (1) prior research has shown that mothers report higher levels of CAT compared to fathers [12] and (2) increased homogeneity of the sample would increase ability to detect hypothesized effects.

Recruitment of study participants was conducted according to the following procedures. Our hospital-based clinical research coordinator conducted a weekly screening of all gastrointestinal patients aged 8–12 scheduled for an upcoming clinic appointment. She discussed each potentially eligible case with the patient's medical provider. If the provider deemed the child to have FAPD, s/he mentioned the study to the parent and child at the clinic visit, and inquired as to whether the family was interested in further information. If so, the clinical research coordinator approached the family either in the clinic or by phone, describing the study procedures, risks and benefits. One hundred and thirty-five families were deemed eligible and approached. Reasons for refusal ($n = 55$) were: time commitment

(n = 18); travel constraints (n = 3); mother didn't want the child to experience discomfort (n = 2); and unknown/ no specific reason given (n = 32). The final study sample consisted of 80 children (27 males and 53 females, age 9.6 on average) and their mothers (age 40.9 on average).

Design and procedure

Sessions took place in the Pediatric Clinical Research Center of Seattle Children's Hospital. All procedures were approved by the Institutional Review Board of this institution. Upon arrival to the center, mothers and children independently completed a battery of questionnaires. Mothers did so via pencil-and-paper; an experimenter orally administered questionnaires to children in a separate room. Measures are listed below.

Child-reported measures

Faces Pain Scale-Revised [14]—The Faces Pain Scale is a single-item, validated measure of pain intensity. Children are shown a row of 6 line-drawn faces. The left-most face depicts no pain, with the faces depicting increasing pain as they move from left to right. Children are instructed to choose the face that shows “how much their stomach hurts right now”. Options are scored as 0 (no pain) to 10 (very much pain). As a manipulation check, children completed this scale twice, at baseline (just prior to the water ingestion procedure) and again immediately following water ingestion.

Perceptions of study difficulty and acceptability—Two items assessed perceptions of the laboratory visit. Specifically, children were asked, “How hard was it for you to drink water until you felt full?” (perceived difficulty) and “How much would you recommend this study to another family?” (perceived acceptability) on a 0–4 (*not at all* to *a whole lot*) scale. These questions were posed at the end of study procedures but prior to debriefing.

Mother-reported measures

Pain Catastrophizing Scale-Parent [9]—The PCS-P assesses parents' CAT about their child's pain. Thirteen items such as, “I worry all the time whether my child's pain will end” are rated on a 0–4 scale. Summary scores can range from 0–52 with higher values indicative of greater CAT. The developers reported strong internal consistency ($\alpha = 0.93$) and validity as demonstrated by associations with parent distress and child disability [9]. Cronbach's coefficient alpha for the present sample was 0.91.

Perceptions of study difficulty and acceptability—As described under child-reported measures, mothers were asked, “How hard/difficult was it for your child to drink water until s/he felt full?” and “To what extent would you recommend this study to another family?” Ratings were made on a 0–4 scale and occurred at the end of study procedures but prior to debriefing.

Symptom provocation and mother/ child interaction

A water ingestion procedure was used to induce visceral discomfort among children, following a standardized protocol [35, 36]. This procedure was originally used in studies of gastric motility and requires children to drink water for up to 15 minutes until they feel

“completely full” as assessed by the Fullness Rating Scale [35]. In completing this scale, children view 5 line drawings of the human body in which each stomach is shaded to represent varying degrees of satiety (empty to completely full), selecting the drawing that best depicts their present state. We created a modified version of this scale, using pictures of 5 circles designed to represent stomachs and their degree of fullness. The circles ranged in black shading from no shading on the left (0% full) to complete shading on the right (100% full). The Fullness Rating Scale was administered immediately prior to the commencement of water ingestion and at 5-minute intervals during the procedure.

According to Walker et al. [35], the water ingestion procedure produces discomfort similar to but less intense than that experienced by children with FAPD. In her validation study, FAPD children reported increased gastrointestinal symptoms from pre- to post-ingestion (a large effect, $d = 1.28$, more so than healthy children, $d = .89$), but such symptoms were less intense than those reported weeks earlier with respect to a typical abdominal pain episode. In our study, children drank out of a filled 50.7 ounce bottle (with a straw if so desired) for up to 15 minutes. Time spent drinking ranged from 2.5 to 15 minutes ($M = 9.05$, $SD = 3.66$) and the amount of water ingested ranged from 5.70 to 41.20 ounces ($M = 19.62$, $SD = 8.56$). Children could elect to stop drinking at any point and no adverse events occurred.

Each child and his/her mother were seated opposite from one another at a small table during the procedure. Instructions stressed the importance of focusing on water ingestion (i.e., the task at hand) but did not constrain mother-child conversation. Discrete digital video-recorders captured separate close-up images of both mother and child. The two recordings were synchronized and viewed together in a side-by-side format during the coding process. Mothers and children were fully informed about the videotaping aspect of the study during the consent/assent process.

Behavioral coding

Video-recordings of the water ingestion procedure were divided into 30-second segments. Two trained undergraduate coders independently watched each segment and recorded whether each of the codes described in Table 1 occurred or did not occur in a given segment: child pain behavior, maternal solicitousness, maternal negativity, and non-task conversation. As indicated in the table, the coders used both verbal and nonverbal information to make their judgments. For example, a child holding, rubbing or massaging his/her stomach constituted pain behavior, and a mother holding the child's straw for him/her constituted solicitousness. Coders underwent an extensive training period supervised by the first author with consultation from the second and last authors. Discrepancies in practice ratings were discussed with the first author until consensus was reached. Thirty-five videos (44%) were coded by one rater; 29 videos (36%) were coded by the other rater; and 16 videos (20%) were double-coded to assess inter-rater reliability. Kappa values for inter-rater reliability are listed in Table 1 and ranged from 0.83 for maternal solicitousness to 0.95 for non-task conversation. Maternal negative behaviors occurred at a very low rate and thus were dropped from further analysis.

Analytic plan

Analyses were conducted using SPSS 21.0 and R 3.03. Descriptive statistics were used to characterize the sample with respect to: (a) baseline (pre-ingestion) demographic and psychosocial characteristics, (b) characteristics of the water ingestion process and base rates of coded behaviors, and (c) post-session ratings of acceptability. Paired t-tests were conducted to examine pre- to post-ingestion change in child-reported pain intensity (as a manipulation check), and correlational analyses afforded examination of associations among key study variables from both questionnaire and observational data.

To assess the sequential interactions between mothers and children during the water ingestion procedure, we used mixed modeling with a lagged criterion. In each analysis, a predictor at time T was used to predict a behavior at time T+1, after controlling for the behavior at time T. To illustrate, maternal solicitousness at time 1 was used to predict child pain behavior at time 2 (30 seconds later), after controlling for child pain behavior at time 1. By controlling for immediately preceding behavior within the same person, we examined whether behavior by one dyad member was able to predict the behavior of the other beyond the effects of autocorrelation. Two sets of analyses were run: one treating child pain behavior as the criterion and the other treating maternal solicitousness or non-task conversation as the criterion. For the set treating child pain behavior as the criterion, two analyses were conducted with the following terms: (1) maternal solicitousness, maternal CAT, and their interaction as predictors and (2) non-task conversation, maternal CAT, and their interaction as predictors. For the other set, two analyses were conducted, one to predict maternal solicitousness and one to predict non-task conversation. For each one, child pain behavior, maternal CAT, and their interaction were entered as predictors. To aid in the interpretation of findings, we centered our predictors around their respective means prior to entering them into the prediction equation. We also analyzed the data using a Generalized Mixed Model, specifying a binomial distribution with logit link. In all instances, the results were virtually identical to those reported here.

RESULTS

Sample characteristics

Table 2 displays demographic and psychosocial characteristics of the sample. Children were, on average, 10 years old. Two-thirds of children were female, and the majority was non-Hispanic (86%) and Caucasian (70%). Mothers were, on average, 41 years old. Forty-five percent were college-educated; 55% were employed full- or part-time; and 84% were married or cohabiting with a partner.

Manipulation check

Children completed the Faces Pain Scale-Revised twice: just prior to and immediately following water ingestion. As to be expected given the manipulation, child-reported current pain intensity increased from pre- to post-ingestion, $M (SD) = 2.10 (2.11)$ and $5.09 (2.61)$, $t = -10.06$, $p < .001$, providing support that the procedure was effective in increasing discomfort from a low to moderate level on average.

Perceived difficulty and acceptability

Mean perceived difficulty ratings fell below the 0–4 scale midpoint, indicating relatively low perceived difficulty: $M (SD) = 1.97 (1.21)$ for children and $1.11 (1.20)$ for mothers. Similarly, mean “willingness to recommend” ratings fell above the scale midpoint, $M (SD) = 2.78 (1.21)$ for children and $3.41 (0.72)$ for mothers, indicating relative acceptability of the procedure.

Base rates of coded behaviors

Table 3 lists descriptive characteristics of coded behaviors as a function of time across the water ingestion procedure. The left side of the table displays sums of behaviors endorsed per 30-second time segment. The right side of the table displays means. To illustrate, 22 of the 75 children (29%) who drank water for at least 5 minutes were rated by coders as exhibiting pain behavior in that segment. Fifteen of the 40 children (38%) who drank water for at least 10 minutes were rated by coders as exhibiting pain behavior in that segment. At this same time point, 4 of the 40 mothers (10%) exhibited solicitousness. The average proportion of children exhibiting pain behavior ranged from a low of 6% during the first 30 seconds of the procedure to a high of 38% at minutes 8 and 10 as mentioned previously. Rates of solicitousness ranged from 0–23%, and rates of non-task conversation ranged from 9% during the first 30 seconds of the procedure to 33% during the final 30 seconds of the procedure.

Associations among key study variables

Table 4 displays a correlation matrix of key study variables. Maternal CAT was positively associated with coded maternal solicitousness ($r = 0.32, p < .01$) and with coded child pain behavior ($r = 0.23, p < .05$). It was inversely associated with time spent drinking ($r = -0.39, p < .01$) and with coded non-task conversation ($r = -0.27, p < .05$). Other statistically significant correlations include those between coded child pain behavior and: time spent drinking ($r = -0.30, p < .01$), maternal solicitousness ($r = 0.33, p < .01$), and non-task conversation ($r = -0.34, p < .01$). Non-task conversation was also positively associated with time spent drinking ($r = 0.24, p < .05$).

Predicting coded child pain behavior

Table 5 presents the findings from each lagged regression analysis. Turning first to the prediction of child pain behavior (top half of Table 5), it is apparent that child pain behavior at time T was a consistent predictor of child pain behavior at time T+1. Maternal CAT also predicted child pain behavior. Children of mothers who scored higher in CAT exhibited more pain behavior during water ingestion than did children of mothers who scored lower in CAT.

The analysis involving solicitousness yielded a significant solicitousness $\times$ maternal CAT interaction. Figure 1 shows predicted values for each cross-product term at one standard deviation below and above their mean. Simple effects tests showed that observer-coded maternal solicitousness predicted subsequent observer-coded child pain behavior among mothers who scored lower in CAT ($b = 0.138, t = 2.66, p = .01$) but not among mothers who scored higher in CAT ($b = 0.078, t = -1.62, p = .11$). Thus, whereas the pain behavior of

children of high CAT mothers did not vary as a function of their mother's solicitousness, the pain behavior of children of low CAT mothers increased as their mother's solicitousness increased.

Predicting coded maternal solicitousness and non-task conversation

The values in the lower half of Table 5 show results of lagged regression analyses treating maternal solicitousness and non-task conversation as the criterion. As seen in the table, two main effects achieved significance. Mothers higher in CAT were more likely to exhibit solicitousness and less likely to engage in non-task conversation at T+1 than were mothers lower in CAT.

The interaction between child pain behavior and maternal solicitousness is of special interest. Figure 2 shows predicted values for each cross-product term at one standard deviation below and above their mean. Simple effects tests showed that child pain behavior predicted subsequent solicitousness among mothers lower in CAT ($b = 0.069$, $t = 2.40$, $p < .05$): The more pain the child displayed at time T, the more solicitousness the mother displayed at time T+1. This responsiveness did not, however, characterize the solicitousness of mothers higher in CAT. As can be seen in Figure 2, the solicitousness they displayed at T+1 was independent of their child's pain behavior at T ($b = -0.015$, $t < 1$, $p = .60$).

DISCUSSION

Findings from this study provide support for some but not all study hypotheses. First, we predicted that maternal CAT would be independently associated with greater maternal solicitousness and greater child pain behavior. These main effects of maternal CAT were indeed borne out and are in line with questionnaire-based investigations of parental CAT and parental solicitousness [13, 19], and parental CAT and child pain behavior [19, 24]. Our results thus extend the literature on correlates of maternal CAT but in the context of an experimental pain induction paradigm and using objective indicators of behavior. We also found a positive correlation between coded child pain behavior and coded maternal solicitousness, consistent with behavioral models and prior research [11, 32, 36]. Although not hypothesized, we further found that maternal CAT and child pain behavior were inversely correlated with time spent drinking and non-task conversation.

We had hypothesized that child pain behavior and maternal solicitous behaviors would be temporally associated in lagged analyses, and that maternal CAT would moderate the association between child pain behavior and maternal solicitousness. We had anticipated that mothers higher in CAT would be more likely to respond solicitously to their child's pain displays than would mothers lower in CAT. While antecedent child pain behavior did not independently predict subsequent maternal solicitousness, and antecedent maternal solicitousness did not independently predict subsequent child pain behavior, these associations were indeed moderated by maternal CAT, but not in the predicted direction. For mothers lower in CAT, their solicitousness was predictable from their child's prior pain behavior. They were more likely to be solicitous toward their child if s/he had exhibited pain behavior in the preceding 30 seconds than if s/he hadn't. Interestingly, mothers higher in CAT made no such discriminations. Their solicitousness was unrelated to their child's prior

behavior, and in fact they were on average more solicitous toward their child irrespective of his/ her behavior.¹ These findings suggest that mothers higher in CAT may be less flexible in their responses to their children in pain and may have adopted a more non-discriminating pattern of solicitous responding. Compared to mothers lower in CAT, they may utilize solicitous responses more frequently and not only in response to child pain behavior. Mothers higher in CAT could thus have more difficulty reducing solicitous responses even when child pain behaviors are not evident. This may have implications for the design of psychosocial interventions for pediatric pain. Interventions aimed at identifying and changing maladaptive cognitions and responses might require different strategies when targeted to mothers identified as high in CAT.

As mentioned, maternal CAT also moderated the association between maternal solicitousness at T and child pain behavior at T+1. This association was positive for children of mothers lower in CAT. They were responsive to their mother's behavior in a predictable manner. If she was solicitous, the child exhibited more pain behavior. If she wasn't solicitous, the child exhibited less pain behavior. Perhaps the children of these mothers increased their pain behavior in response to their mother's solicitousness because it was more infrequent and salient, and thus more of a discriminative stimulus. The pain behavior of children of mothers higher in CAT, in contrast, was on average higher than that of children of mothers lower in CAT and also was not responsive to their mother's preceding level of solicitous behavior. Given that these high CAT mothers appear to be typically more solicitous, their children may display higher levels of pain behavior both inside and outside the laboratory in a cycle of mutual dysfunctional behavioral responses. Both high CAT mothers and their children may have developed a more habitual and stereotypical set of interactions in relationship to pain, and may not as easily adopt alternative responses even when pain or solicitous behaviors have not recently occurred. Findings regarding the more consistent maladaptive behaviors of the higher CAT mothers and their children suggest that interventions with these parents and children may need to focus on developing a wider repertoire of coping behaviors, and increased flexibility in responding to pain displays.

The fact that maternal CAT was inversely associated with non-task conversation is worthy of consideration. One possible explanation for this finding is that non-task conversation could function as a potential distraction technique, and may be more likely to be used if the situation is viewed as non-threatening. For example, mothers might have said, "Let's talk about so-and-so's birthday party next weekend" or "Where should we go to eat after this?" While it is intriguing to think that mothers lower in CAT might be more likely to foster such conversation, we have no way of knowing if the intent of those conversations was in fact to distract from discomfort. In addition, non-task conversation coding was based on both parent and child speech, although our impression based on the videotapes and personal conduct of the sessions is that most was initiated by the mother. Another possibility is that families with a mother lower in CAT may simply be more likely to focus on other topics of interest rather than discomfort or the water ingestion procedure. Alternatively, families who focus on and

¹An anonymous reviewer wondered whether the interaction occurred because solicitousness was less variable among mothers higher versus lower in CAT. Although this concern is entirely reasonable, we did not find that variability in solicitousness differed by maternal CAT level, $p = 0.65$.

talk more about other topics rather than discomfort may be more likely to have a mother lower in CAT. Yet another possibility is that mothers higher in CAT may have directly or indirectly communicated worry about the water ingestion procedure to the child. We found an inverse correlation between maternal CAT and time spent drinking by the child, consistent with this hypothesis. This reduction in time spent drinking may have resulted in less time available for non-task conversation.

There are several limitations of this study that should be considered in interpreting its findings. The most obvious is that the parent sample was restricted to mothers. This was by design to optimize homogeneity but may have compromised external validity. Replication in a more heterogeneous sample is strongly advised. The limited research on pediatric pain involving fathers has shown that mothers' and fathers' beliefs and behaviors both matter and, in some cases, differ from one another [2, 10, 13]. For example, fathers may be more likely to discourage child illness behavior [2]. While these findings suggest possible gender differences in response patterns, both mothers' and fathers' responses may influence child pain behaviors and be important to enlist in intervention efforts.

This study used a well-validated measure of parental CAT, the parent-report version of the Pain Catastrophizing Scale [9]. This scale was designed to measure dispositional or "trait" CAT, the extent to which parents typically magnify and ruminate or feel helpless about their child's pain. To our view, this is a strength in that this variable can be easily measured and serve as a more global target for interventions designed to decrease parental reinforcement of child illness behaviors. However, state measures may be more strongly associated with in vivo measures of distress and other responses to pain. Durand and colleagues [8] recently pooled data from eight experimental pain studies that included both state and trait measures of CAT among children and/or parents. Trait and state measures of parental CAT were positively correlated, $r = .35$, $p < .001$, as were trait and state measures of child CAT, $r = .22$, $p < .001$, but the association between state-measured parental CAT and parental distress was stronger ($r = .41$) than the association between trait-measured parental CAT and parental distress ($r = .12$), though both correlations were statistically significant. These findings suggest that using both trait and state measures of parental CAT in future studies may be informative in examining both immediate and longer-term effects of parental responses to child pain behaviors.

While laboratory studies such as this allow standardized rigorous assessment procedures to be implemented, such assessment situations are admittedly somewhat artificial, and the extent to which the interactions captured in the laboratory generalize to those in the home is unclear. Similar observational research should ideally be conducted in more naturalistic (e.g., home) environments and in the absence of a pain induction paradigm. Because the nature of FAPD is episodic, however, repeated assessments would be required to capture parent-child interactions in the context of both pain-present and pain-absent scenarios. Ecological momentary assessment is also recommended. Such assessments could be captured in more naturalistic, day-to-day settings, perhaps via smartphone technology (or using ipod touches or similar devices for children). Work in adult chronic pain serves as a model for this sort of design and affords the ability to link sequences of patient and significant other responses to pain outcomes [1].

This study provides direct observational and self-report data from children with FAPD and their mothers in a laboratory situation designed to elicit pain behaviors and maternal responses in relationship to maternal CAT. The results extend the literature on CAT among significant others of those with pain and highlight avenues for intervention in pediatric settings. Effective cognitive-behavioral approaches [16, 20, 21] could be tailored to parents identified as high in CAT about their child's pain to modify maladaptive cognitions, enhance flexibility of responses, and expand their repertoire of adaptive coping responses to child pain behavior.

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Figure 1.
Predicted coded child pain behavior at T+1 from coded maternal solicitousness at T and maternal catastrophizing

Figure 2.
Predicted coded maternal solicitousness at T+1 from coded child pain behavior at T and maternal catastrophizing

Table 1

Description of observer-coded maternal and child behaviors and kappa reliabilities

Code	Description	Examples	Kappa
Child pain behavior	Any child verbal or nonverbal behavior expressing the experience of pain or discomfort	Holding stomach; bending over due to pain or physical discomfort; whining; groaning; grimacing I don't feel well. My tummy hurts.	0.85
Maternal solicitousness	Any verbal or nonverbal behavior that focuses child's attention on symptoms; conveys concern regarding child's well-being; attempts to reduce demands on child; or questions child's ability, safety or advisability to complete task	Does your tummy hurt? How do you feel? Do you need to use the restroom? I can hear your stomach gurgling. I think you should stop now. Can you do this?	0.83
Maternal negativity	Expressing anger, disapproval, disdain or contempt towards child	I'm so sick of hearing you complain. You're not doing a very good job.	0.87
Non-task conversation	Any verbal or nonverbal behavior not having to do with the task at hand	Did you do your homework for tomorrow? Can we get something to eat after this?	0.95

Table 2

Demographic and psychosocial characteristics of the sample

	Child	Parent
N	80	80
Age, M (SD)	9.58 (1.64)	40.91 (8.11)
Gender, n (%) female	53 (66.3)	80 (100)
Ethnicity, n (%)		
Hispanic	10 (12.5)	8 (10.0)
Non-Hispanic	69 (86.3)	72 (90.0)
Unknown	1 (1.3)	0 (0.0)
Race		
Asian	4 (5.0)	4 (5.0)
African American	2 (2.5)	1 (1.2)
American Indian/ Alaska Native	1 (1.3)	2 (2.5)
Caucasian	56 (70.0)	65 (81.2)
More than one race	13 (16.2)	7 (8.8)
Unknown	4 (5.0)	1 (1.3)
Education, n (%)		
High school degree or GED	---	7 (8.7)
Some college or technical school	---	37 (46.2)
4-year college degree	---	19 (23.8)
Post-baccalaureate degree	---	17 (21.3)
Marital status, n (%)		
Married	---	62 (77.5)
Cohabiting with partner	---	5 (6.2)
Married but separated	---	2 (2.5)
Single/ divorced/ widowed	---	11 (13.8)
Employment status, n (%)		
Not employed	---	35 (43.7)
Employed part-time	---	24 (30.0)
Employed full-time	---	20 (25.0)
Unknown	---	1 (1.3)
Child CAT	20.15 (12.20)	---
Maternal CAT re child pain	---	18.06 (10.06)

Table 3
Descriptive characteristics of coded behaviors as a function of 30-second time segment; convo = conversation.

Time	N	Sum within each time segment			Means per time segment		
		Child pain behavior (# kids)	Maternal solicitousness	Non-task convo	Child pain behavior (% kids)	Maternal solicitousness	Non-task convo
00:30	80	5	5	7	.0625	.0625	.0875
01:00	80	7	7	10	.0875	.0875	.1250
01:30	80	6	5	9	.0750	.0625	.1125
02:00	80	10	7	16	.1250	.0875	.2000
02:30	80	9	6	17	.1125	.0750	.2125
03:00	80	23	14	20	.2875	.1750	.2500
03:30	78	9	5	22	.1154	.0641	.2821
04:00	78	22	10	20	.2821	.1282	.2564
04:30	77	28	6	17	.3636	.0779	.2208
05:00	75	22	11	15	.2933	.1467	.2000
05:30	71	17	7	8	.2394	.0986	.1127
06:00	65	13	4	10	.2000	.0615	.1538
06:30	59	15	8	13	.2542	.1356	.2203
07:00	52	14	4	9	.2692	.0769	.1731
07:30	49	11	2	10	.2245	.0408	.2041
08:00	45	17	4	7	.3778	.0889	.1556
08:30	44	16	7	6	.3636	.1591	.1364
09:00	44	15	3	11	.3409	.0682	.2500
09:30	42	15	7	10	.3571	.1667	.2381
10:00	40	15	4	7	.3750	.1000	.1750
10:30	34	11	0	4	.3235	.0000	.1176
11:00	30	8	3	7	.2667	.1000	.2333
11:30	26	6	3	8	.2308	.1154	.3077
12:00	20	5	2	6	.2500	.1000	.3000
12:30	19	4	0	3	.2105	.0000	.1579

Time	N	Sum within each time segment			Means per time segment		
		Child pain behavior (# kids)	Maternal solicitousness	Non-task convo	Child pain behavior (% kids)	Maternal solicitousness	Non-task convo
13:00	16	5	2	3	.3125	.1250	.1875
13:30	16	3	2	4	.1875	.1250	.2500
14:00	16	3	0	3	.1875	.0000	.1875
14:30	13	3	3	4	.2308	.2308	.3077
15:00	12	2	1	4	.1667	.0833	.3333

Table 4

Correlation matrix of key study variables

	1	2	3	4	5	6	7	8
1. Child age	1.00							
2. Child gender	-.07	1.00						
3. Child weight in kg	.59**	-.05	1.00					
4. Time spent drinking in sec	.15	.05	-.07	1.00				
5. Maternal CAT re child pain	.14	.01	.16	-.39**	1.00			
6. Coder-derived child pain behavior	-.14	.00	.03	-.30**	.23*	1.00		
7. Coder-derived maternal solicitousness	.02	-.09	.14	-.17	.32**	.33**	1.00	
8. Coder-derived non-task conversation	.11	-.04	.13	.24*	-.27*	-.34**	-.15	1.00

* $p < .05$

** $p < .01$

Table 5

Results of lag sequential analyses using coder-derived indicators of behavior and maternal-reported catastrophizing (CAT)

Criterion: child pain behavior at T+1				
Predictors	b	SEb	t	p
Intercept	0.19803			
Child pain behavior at T	0.26629	0.02665	9.993	.0000
Maternal solicitousness	0.03000	0.03612	0.831	.4087
Maternal CAT	0.05890	0.02492	2.364	.0208
Solicitousness $\times$ maternal CAT	-0.14035	0.04498	-3.120**	.0026
Intercept	0.19554			
Child pain behavior at T	0.26104	0.02646	9.866	.0000
Non-task conversation	-0.04649	0.03165	-1.469	.1462
Maternal CAT	0.05192	0.02480	2.093	.0399
Non-task convo $\times$ maternal CAT	0.02234	0.04508	0.496	.6214
Criterion: maternal solicitousness at T+1				
Intercept	0.108497			
Maternal solicitousness at T	0.002164	0.027413	0.079	0.9373
Child pain behavior at T	0.027374	0.020170	1.357	0.1791
Maternal CAT	0.057954	0.017934	3.231	0.0019
Child pain behavior $\times$ maternal CAT	-0.054513	0.025944	-2.101	0.0392
Criterion: non-task conversation T+1				
Intercept	0.087941			
Non-task conversation at T	0.515023	0.022814	22.574	.0000
Child pain behavior at T	-0.036464	0.020903	-1.744	.0854
Maternal CAT	-0.042684	0.017597	-2.426	.0178
Child pain behavior $\times$ maternal CAT	0.002787	0.027057	0.103	.9182