

# **THE EFFECT OF CHILDREN'S TEMPERAMENT ON THE RELATIONSHIP BETWEEN PARENTAL ANXIETY AND POSTOPERATIVE PAIN**

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The intent of this study was to determine the role of temperament in the context of the established relationship between parent preoperative anxiety and postoperative pain in pediatric surgical patients. There is currently a large body of literature that indicates preoperative anxiety as a predictor for postoperative pain. There are also some studies that focus on temperament and its association with pain and pain management. The purpose of this study is to examine these constructs in one model. A total of 240 pediatric surgical patients, ages 0-18, participated in this study. Before surgery, willing parents completed surveys, which measured their own anxiety and their children's baseline temperament. Both parents and children completed postoperative pain reports on postoperative days 1, 3, and 7. Bivariate correlations revealed that child emotionality and shyness affected parent-report of pain differently than it did child self-report of pain. However, the data failed to support our hypothesized model of temperament as a mediator of the relationship between parent preoperative anxiety and children's postoperative pain. Our other predicted model, which had temperament as a moderator of the relationship between parent preoperative anxiety and postoperative pain, was also not significant.

In the United States, more than 5 million children undergo surgery annually; these children are often subject to experiencing stress and pain perioperatively (Kain et al 1996). In the hospital setting, the administration of pain medication is controlled by health care providers and medical staff. However, when the child continues to recover at home, the responsibility of administering pain medication falls into the hands of the child's parents. It has been found there is a tendency for parents to not strictly follow the recommendations of health care providers in terms of administration of analgesics. For example, children receive fewer than the recommended doses of pain medication and parents also tend to increase the time period between

administration of doses (Hamers and Abu-Saad 2002; Kankkunen et al 2003; Warnock and Lander 1998).

A recent study conducted by our group showed that a child's temperament—more specifically, shyness and emotionality—affects the amount of analgesics administered by parents postsurgery (Zolghadr et al 2012). Temperament is defined as behavioral style and includes nine dimensions (activity, approach/withdrawal, adaptability, rhythmicity, mood, intensity, distractibility, persistence, and threshold) (Thomas and Chess 1977). Activity, emotionality, reactivity and sociability are modulated by temperament (Goldsmith et al 1987). Studies have shown that child temperament plays a role in how children express pain (Zisk et al 2007). This may result in under-medication because many parents tend to believe that pain medication should only be administered when the child shows severe pain rather than before the onset of pain as recommended (Zisk et al 2007).

Child temperament has also been shown to be a predictor of preoperative anxiety in children (Fortier et al 2010). Children's preoperative anxiety is important to study because it is associated with increased pain and analgesic consumption in the postoperative setting (Kain et al 2006). Moreover, parent anxiety has also been shown to be related to children's anxiety before surgery (Kain et al 1996). That is, higher levels of parental anxiety are associated with increased anxiety in the child.

Although previous studies have examined temperament and parent preoperative anxiety in relation to children's preoperative anxiety and postoperative analgesic consumption, only a few have studied temperament as it relates to postoperative pain itself. Zisk and colleagues determined temperament was related to postoperative pain—children who are more quiet and/or inactive might not voice their pain adequately to parents (Zisk et al 2007). The purpose of this

study is to clarify the complex relationship between child temperament, parental anxiety, and both parent and child report of children's postoperative pain.

In this study we hope to expand our knowledge of how temperament influences pain in the postoperative setting. Previous studies have determined that temperament influences the child's preoperative anxiety and the amount of analgesics consumed. Other studies have identified parent anxiety as a risk factor for increased postoperative pain. We predict that child temperament may in fact impact the relationship between parent anxiety and postoperative pain. Therefore, the purpose of this study is to determine whether child temperament acts as a mediator or a moderator in the relationship between parent anxiety and postoperative pain. More specifically, is temperament the variable through which parent anxiety has its effect on postoperative pain or does it change the nature of this relationship?

## **MATERIALS AND METHODS**

*All experiments were carried out in accordance with the Institutional Review Board at the University of California, Irvine, and were consistent with Federal guidelines.*

### **Participants**

In total, 240 Spanish and English speaking families with children (ages 0-18) undergoing outpatient elective surgery participated in this study. Children were classified under American Society of Anesthesiologists Physical Status 1 and 2, which meant that the children were of good health or only had mild systemic disease. Children undergoing any procedure associated with cancer (i.e. biopsy), with developmental delays or special needs, or born prematurely (before 32 weeks) were not recruited.

### **Measures**

*The Emotionality Activity Sociability Temperament Survey (EAS-TS)*. The EAS-TS is a parent-report assessment of temperament in early childhood to adolescence. This measure evaluates baseline temperament of the child and is composed of 20 items in 4 categories: emotionality, activity, sociability and impulsivity. Parents score their child on each item on a five point scale—1=*not true at all* to 5=*very much true* (Buss and Plomin 1984).

*Parents' Postoperative Pain Measure (PPPM)*. The PPPM is a parent report of their child's pain following surgery. Parents record the presence or absence of each of 15 behavioral indicators of pain. The measure provides a systematic and reliable pain assessment and is the only validated measure of parent-report postoperative pediatric pain. The PPPM has a cutoff score of 6 which indicates that the child has significant pain (Chambers et al 1996).

*Faces Pain Scale- Revised (FPS-R)*. The FPS-R is a self-reported pain scale that is constructed of a series of six faces ranging from a neutral expression (“no pain”) to an expression representing the “most pain possible”. The scores range from 0-10 and is a well-validated scale recommended for use with children 4-18 years of age (Hicks et al 2001).

*State-Trait Anxiety Inventory (STAI)*. This is a widely used self-report anxiety assessment instrument for adults. It contains two separate 20-items questionnaires and is on a 4-point self-report rating scales for measuring trait and state anxiety. Total score for state and trait anxiety range from 20-80 each; with higher scores denoting higher levels of anxiety (Spielberger 1983).

## **Study Procedure**

Potential participants were identified through review of surgery schedules and assessed for eligibility by review of the electronic medical record. Eligible families were mailed an introduction letter and study information sheet. Participants were also recruited on the day of the surgery in the preoperative holding room. Prospective participants were provided with all

pertinent information such as purpose, procedures, risks, benefits, alternative to participation, and many opportunities to ask questions. Parents completed the EAS-TS and STAI in the preoperative waiting area and the PPPM and FPS-R at home on postoperative days 1, 3, and 7.

### Statistical Analysis

Analyses were performed using SPSS 21.0. Pearson product-moment correlations were used to measure the association between the children’s temperament (EAS-TS) and postoperative pain (PPPM and FPS-R). To analyze temperament as mediator and/or moderator of the relationship between parent trait anxiety and parent-report of pain, a series of linear regression analyses outlined by Baron and Kenny (1986) were used.

## RESULTS

### *Correlations between Temperament and Parent Report of Children’s Postoperative Pain*

Emotionality, shyness, and sociability showed significant bivariate correlations with parent report of pain on postoperative days (POD) 1, 3, and 7 as well as the average PPPM score across all 3 postoperative days (Table 1).

**Table 1. Correlations between parent report of postoperative pain and child temperament.**

	Emotionality		Shyness		Activity		Sociability	
	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>
PPPM-POD 1	.236**	(131)	.293**	(130)	-.220*	(130)	-.284**	(130)
PPPM-POD 3	.269**	(131)	.171	(130)	-.123	(130)	-.212*	(130)
PPPM-POD 7	.208*	(131)	.082	(130)	.012	(130)	-.115	(130)
Ave PPPM	.269**	(142)	.237**	(141)	-.142	(141)	-.242**	(141)

Note. POD= Postoperative day. PPPM = Parents Postoperative Pain Measure. Sample sizes (n) vary due to missing data.

\**p* < .05, \*\**p* < .01

### *Correlations between Temperament and Child Self-Report of Postoperative Pain*

Bivariate correlations were run between child-report of pain on postoperative days (POD) 1, 3, 7, the four EAS-TS subscales, and the total average of child-report pain scores (Table 2).

Emotionality showed significant relationships with POD 3 and total average self-report of pain.

Shyness showed significant relationships with POD 1, 3, and the total average child pain reports.

**Table 2. Correlations between child-report of postoperative pain and child temperament.**

	Emotionality		Shyness		Activity		Sociability	
	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>
FPS-POD 1	.189	(98)	.208*	(97)	-.111	(97)	-.072	(97)
FPS-POD 3	.235*	(101)	.234*	(100)	.030	(100)	-.083	(100)
FPS-POD 7	.011	(99)	.106	(98)	.001	(98)	-.017	(98)
Ave FPS	.190*	(108)	.223*	(107)	-.043	(107)	-.111	(107)

Note. FPS=Faces pain score (child self-report of pain); POD= Postoperative day. Sample sizes (n) vary due to missing data.

\* $p < .05$ , \*\* $p < .01$

*Shyness and Emotionality as Moderators of the Relationship between Parental Anxiety and Parental Report of Pain.*

Parent report of pain was chosen over child report of pain for these analyses because it showed more significant correlations with temperament. Because both the emotionality and shyness components of temperament were related to parent report of children’s postoperative pain, both were examined as potential moderators. To test these hypotheses, regression techniques outlined by Baron and Kenny were used. Specifically, the predictor variable (parent trait anxiety) and the proposed moderator (emotionality) were entered into a regression equation with parent report of pain as the dependent variable. Then parent report of pain was entered into a regression equation with the interaction of emotionality and parent trait anxiety. Because these methods require variables with normal distributions, both the predictor and moderator were centered before examining the interaction term. Results of the overall reaction were significant ( $F(3, 103)=3.12, p=.03$ ). Emotionality and parent trait anxiety each emerged as significant

predictors for parent report of pain ( $t=2.05, p=.04$ ; and  $t=2.02, p=.05$ , respectively). However, the interaction of emotionality and parent trait anxiety was not a significant predictor in this equation, indicating emotionality was not a moderator of the parental trait anxiety-parent report of pain relationship.

The same method described above was also used to test shyness as moderator between the parent trait anxiety and parent report of pain relationship. The overall regression was significant ( $F(3, 103)=4.11, p=.01$ ). In this equation, shyness emerged as a significant predictor of parent report of pain ( $t=2.44, p=.02$ ) as well as trait anxiety ( $t=2.10, p=.04$ ). However, the interaction between shyness and parent trait anxiety was not a significant predictor in this equation. Thus, the predicted model in which shyness is a moderator of the relationship between parent trait anxiety and parent report of pain was not supported by the results.

*Shyness and Emotionality as Mediators of the Relationship between Parental Anxiety and Parental Report of Pain.*

To test these hypotheses, multiple regression techniques were conducted as presented by Baron and Kenny (1986). In the first step, the mediator is regressed upon the independent variable. Next, the dependent variable is regressed upon the independent variable. Last, the dependent variable is regressed upon both the mediator and the independent variable. In a sample in which the proposed mediator is indeed the mediator, the first and second regressions should emerge as significant. The last step assesses the relationship between the dependent variable and the mediator while controlling for the independent variable. Therefore, only the mediator should remain a significant predictor while the effect of the independent variable is reduced or eliminated.

The predicted model in which emotionality mediates the relationship between parental trait anxiety and parental report of pain resulted was not supported in this sample. The first two regression equations were overall significant ( $F(1, 220)=14.87, p<.01$ ; and  $F(1, 104)=5.10, p=.03$ , respectively) and showed that trait anxiety was a significant predictor of both child emotionality and parent report of pain (Table 3). Although the third analysis was significant overall ( $F(2, 103)=4.82, p=.01$ ), it did not uphold the requirements of a mediator. Emotionality was found to be a significant predictor of parent report of pain ( $t=2.06, p=.04$ ), but the effect of parent trait anxiety did not diminish ( $t=2.03, p=.05$ ). Therefore, the proposed mediational model in which emotionality accounts for the relationship between parent trait anxiety and postoperative pain is not supported.

**Table 3. Regression Analyses of Mediational Model for Parental Trait Anxiety, Child Emotionality, and Parental Report of pain**

	Predictors	Standardized Coefficient	t-value	p
1. Regression with EAS <sub>emo</sub> (Mediator) Regressed upon STAI <sub>Trait</sub> (IV)	1. STAI <sub>Trait</sub>	.252	3.86	.00
2. Regression with PPPM (DV) Regressed upon STAI <sub>Trait</sub> (IV)	1. STAI <sub>Trait</sub>	.217	2.26	.03
3. Regression with PPPM (DV) Regressed upon EAS <sub>emo</sub> (Mediator) and STAI <sub>Trait</sub> (IV)	1. STAI <sub>Trait</sub>	.194	2.03	.05
	2. EAS <sub>emo</sub>	.198	2.06	.04

*note:* EAS<sub>emo</sub>= child baseline emotionality; STAI<sub>trait</sub>=parent trait anxiety; PPPM= Parents Postoperative Pain Measure

The regression techniques described above were also used to test shyness as a mediator between parent trait anxiety and parent report of pain (Table 4). The results of the first analysis in which the child's shyness was regressed upon parent trait anxiety was significant ( $F(1, 220)=7.81, p<.01$ ). Identical to the analysis done for emotionality, the second regression equation for shyness indicated that the parent report of pain was significantly associated with parent trait anxiety ( $F(1, 104)=5.10, p=.03$ ). The third regression equation in which parent report of pain was



regressed upon the proposed mediator (shyness) and parent trait anxiety also produced overall significant results ( $F(2, 103)=6.22, p<.01$ ). However, in this final regression, both trait anxiety and shyness emerged as significant predictors for parent report of pain ( $t=2.11, p=.04$ ; and  $t=2.63, p=.01$ , respectively). Thus, our mediational model in which the effects of trait anxiety on parent report of pain are accounted for by shyness is not supported.

**Table 4. Regression Analyses of Mediational Model for Parental Trait Anxiety, Child Shyness, and Parental Report of pain**

	Predictors	Standardized Coefficient	t-value	p
1. Regression with EAS <sub>shy</sub> (Mediator) Regressed upon STAI <sub>Trait</sub> (IV)	1. STAI <sub>Trait</sub>	.186	2.80	.01
2. Regression with PPPM (DV) Regressed upon STAI <sub>Trait</sub> (IV)	1. STAI <sub>Trait</sub>	.217	2.26	.03
3. Regression with PPPM (DV) Regressed upon EAS <sub>shy</sub> (Mediator) and STAI <sub>Trait</sub> (IV)	1. STAI <sub>Trait</sub>	.199	2.11	.04
	2. EAS <sub>shy</sub>	.248	2.63	.01

*note:* EAS<sub>shy</sub>= child baseline shyness ; STAI<sub>trait</sub>=parent trait anxiety; PPPM= Parents Postoperative Pain Measure

## DISCUSSION

The purpose of this study was to more closely examine the role of children’s temperament on pain in the postoperative setting. Initial correlational analyses between both child and parent report of postoperative pain severity and children's temperament revealed that correlations between temperament was more strongly associated with parent report of pain compared to child report of pain. Specifically, all four subscales of temperament were significantly correlated with parent report of pain on the first postoperative day. Contrastingly, only shyness was significantly associated with the child report of pain on POD 1. Self-report of pain is often referred to as the “gold standard” for pain report. Perhaps one reason why parent report of pain was more strongly associated with temperament than child report in the present study is because temperament may affect the ability of parents to perceive children's pain. That is, the more emotional and

expressive children are in their temperamental style, the more likely parents will be to endorse pain. Because parent report of pain was more strongly associated with temperament than child report of pain, parent pain report was used in the mediator and moderator analyses. It was expected that these two subscales affected pain more than sociability and activity based off findings by our group that showed shyness and emotionality as predictors of analgesic consumption (Zolghadr et al 2012).

However, our sample did not support our predicted model that had temperament—more specifically, shyness and emotionality—as a moderator of the relationship between parent trait anxiety and postoperative pain. Although the overall analyses were significant, our results did not show that temperament changes the nature of the relationship between parent trait anxiety and postoperative pain. Based on our study, temperament also did not appear to be a mediator between the parent trait anxiety and postoperative pain relationship. Emotionality and shyness do not appear to be the variable through which parent anxiety has its affect on postoperative pain. Our failure to find an association between temperament and this relationship may be due to our limited sample size.

Although the models that predicted mediator and moderator were not supported, our study did add support to existing studies that identify parent anxiety as a risk factor for increased pain. Our sample showed that parent anxiety is indeed a significant predictor of pain when controlled for shyness and emotionality. Our evaluation of temperament as a mediator also gave more evidence to a limited body of literature on how temperament is a significant predictor of postoperative pain. Previous studies have only stated that parents may not adequately perceive the pain of children with quiet and/or inactive characteristics since they are less likely to express

their pain (Zisk et al 2007). When controlled for parental trait anxiety, both emotionality and shyness emerged as significant predictors of postoperative pain.

In conclusion, temperament was not found to be a mediator between the parent anxiety and postoperative pain relationship. That is, it is not the variable through which parent anxiety has its effect on postoperative pain. Temperament was also not a moderator of this relationship; in that, it did not change the nature of how parent anxiety increases postoperative pain. Despite this, we were able to add support to the limited body of literature that indicates temperament as a predictor of postoperative pain. Future studies should focus on how temperament affects the relationship between child preoperative anxiety and postoperative pain. It would also be important to understand how parent report of pain compares to the gold standard (the child report of pain). Specifically, what variables affect this relationship? It is important to find the predictors of this relationship, as many times health care providers must rely on the parent pain report to provide appropriate pain management. The construct of temperament as it relates to pain and pain management is also important, but sometimes neglected when health care providers instruct parents on how to manage pain in the home setting. By adding to this body of literature, we hope to increase awareness to its affect and perhaps help push health care providers towards incorporating it to their postoperative home care instructions.

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