

## **EFFECTS OF CHILDREN'S TEMPERAMENT ON THE AMOUNT OF ANALGESICS ADMINISTERED BY PARENTS AFTER SURGERY**

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Temperament, defined as behavioral style, can influence children's response to adverse events, and may affect both their perception of and response to pain. Previous studies have explored the influences temperament has on pain management, documenting that children with more active, outgoing temperaments report higher levels of pain and receive more analgesics. However, the relationship between children's temperament and parental administration of pain medication in the home setting has been largely neglected. Accordingly, the purpose of this study was to expand upon previous findings by focusing on analgesic administration by parents after outpatient surgery. A total of 273 parents of children ages 0-12 undergoing surgery participated in this study. Parents answered questions regarding their children's temperament preceding their child's surgery, and reported their child's pain intensity and amount of analgesics administered (non-opioid and opioid) on days 1, 3 and 7 after surgery. All analgesic doses were converted to mg/kg. Bivariate correlations revealed no significant associations between medication dosages and children's activity or sociability. Emotionality and shyness showed significant relationships ( $p < 0.05$ ) with acetaminophen, ibuprofen and hydrocodone and acetaminophen and hydrocodone, respectively. Hierarchical linear regression models controlling for pain severity indicated that emotionality was a significant independent predictor of acetaminophen ( $p = 0.02$ ), ibuprofen ( $p = 0.03$ ) and hydrocodone ( $p = 0.05$ ) administered. Similar regression models also indicated that shyness was a significant independent predictor of acetaminophen ( $p = 0.04$ ) and hydrocodone ( $p = 0.05$ ). Children's temperament, specifically emotionality and shyness, may influence postoperative pain management by parents, suggesting that parents are responding to children's behavioral style in addition to pain severity when deciding to administer analgesics at home.

Children's post-operative pain management has been largely placed in the hands of parents due to the high number of outpatient surgeries, which continues to grow. Unfortunately, parents inadequately administer analgesics to their children primarily due to lack of knowledge and misleading perceptions of children's analgesics (Zisk et al. 2007; Helgadóttir and Wilson 2004;

Zisk et al. 2010). Specifically, parents tend to not fully follow instructions they are given by physicians, related to fears of the long-term effects that are associated with analgesics (Zisk et al. 2007, 2010). Even when parents recognize their children are in pain and believe administration of analgesics is necessary, they still do not provide their children with acetaminophen in the correct dosage or within the appropriate time intervals (Helgadóttir and Wilson 2004; Zisk et al. 2010).

Several studies have addressed the issue of pain management and parents' perception of analgesics, but only a few have focused on the influence children's temperament has on pain management. Temperament, defined as behavioral style or the "how" of behavior, has nine dimensions including activity, approach/withdrawal, adaptability, rhythmicity, mood, intensity, distractibility, persistence and threshold (Helgadóttir and Wilson 2004). Helgadóttir and Wilson (2004) proposed that children's temperament might predict response to adverse events, and that it may affect both children's perception of pain as well as their observable behavior. This is essential considering parents administer analgesics when they perceive their children are in pain, which is evaluated by observing their children's behavior.

Children are more likely to be given analgesics when they voice their pain (Helgadóttir and Wilson 2004). Temperament also plays a significant role in whether or not a child will say-so when afflicted with pain. Previous findings concluded that temperament was indeed related to children's self-report of pain intensity (Zisk et al. 2007; Helgadóttir and Wilson 2004). Children with quiet, inactive behaviors may refrain from informing their parents of their pain, which may contribute to increased distress if it leads to inadequate pain management (Zisk et al. 2007; Helgadóttir and Wilson 2004).

Although previous studies explored the effects children's temperament has on certain aspects of pain management, the construct of temperament is largely neglected when health care professionals provide parents with instructions on proper administration of pain medications following surgery. The purpose of our study is to identify the relationship between children's temperament and the amount of postoperative analgesics administered by parents.

In this study, we expand on previous findings of children's temperament influencing pain management by focusing on analgesic administration. Research suggests that parents often under-medicate children or wait to administer analgesia until children are in a considerable amount of pain. Pain management can be indirectly or directly affected depending on whether children voice their pain or not, since children's temperament does have an effect on factors including their observable behavior. With temperament being an influential element, we predict that children's temperament will ultimately affect analgesic administration after surgery. In particular, we predict children with shy, inactive temperaments will receive less pain medication than children with loud, active temperaments. In addition, parents of children with inactive temperaments will report low pain scores compared to parents of children with active temperaments.

## 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

A total of 273 Spanish- and English-speaking families with children (age 0 – 12) undergoing outpatient elective surgery and admitted via the St Joseph's Outpatient Pavilion Surgery Center participated in this study. Children were Classification I and II of the American Society of

Anesthesiology (ASA) Physical Status classification system, which entails the patient is in good health (Class I) or has a well controlled disease of one body system (Class II). This does not include children whose daily activities are limited due to moderate or severe systemic diseases.

## **Measures**

*The Emotionality Activity Sociability Temperament Survey (EAS-TS).* The EAS-TS is a valid and reliable assessment reported by parents of baseline temperament in early childhood through adolescence. It consists of 20 items in four categories: emotionality, activity, sociability and impulsivity. A five-point scale is used to score the items, ranging from 1 = *not at all true* to 5 = *very much true* (Buss and Plomin 1984). The parent completed the EAS-TS on the day of the child's surgery, prior to recovery.

*Parent's Postoperative Pain Measure (PPPM).* The PPPM is an appropriate behavioral measure developed for parents to reliably assess their child's postoperative pain. Parents indicate whether or not their child exhibits each of the 15 behavioral indicants of pain. The measure has shown to be strongly related to child-rated pain and contains a cutoff score of 6, which identifies children experiencing clinically significant pain (Chambers et al. 1996). PPPM was included in the follow-up packet and completed at home by parents on post-operative days 1, 3 and 7.

*Faces Pain Scale- Revised (FPS-R).* This pain scale measures the intensity of children's pain, and contains six faces ranging from an expression indicating "no pain" to an expression characterizing the "most pain possible" (Hicks et al. 2001). FPS-R is a self-report scale scored from 0 to 10, and is a valid tool used for children (Hicks et al. 2001). It is used in this study to see how much pain the child is in when and if they are provided with analgesics by comparing it to the Analgesics Follow-up. FPS-R is also related to EAS-TS and the PPPM to see if

temperament correlates to self-report and parental report of pain. Children completed the FPS-R at home on postoperative days 1, 3 and 7.

*Numeric Rating Scale (NRS).* This observational numeric rating of pain ranges from 0 (indicating no pain) to 10 (severe pain). Observations are assessed by parents of children ages 8-12 (Varni et al. 1987; Gragg et al. 1996).

*Analgesics Follow-up.* Completed by parents on days 1, 3 and 7 after the child's surgery. Parents reported the amount and type of analgesics administered, along with the time of administration. This provides real-time assessment of pain management (Zisk et al. 2010).

### **Study Procedures (recruitment)**

Potential participants were identified through review of the St. Joseph Outpatient Pavilion surgery schedule and eligibility was assessed by review of the electronic medical record. Parents of potential subjects were mailed an introduction letter and study information sheet when time permitted, and were contacted by a research associate via telephone to answer questions as well as invite participation. When time did not permit, the research assistant notified potential families of the study the day of surgery in the preoperative holding room. A request for a waiver of written informed consent was made since this study did not involve more than minimal risk to the subjects.

In the preoperative room, willing parents completed the EAS-TS, a measure of child temperament. Prior to discharge from the Post Anesthesia Care Unit (PACU), parents were given a take home packet to complete on postoperative day 1, 3 and 7. The packet included the Analgesic Follow-up, Numeric Rating Scale (NRS) and Postoperative Pain Measure for Parents (PPPM). Parents of children 4-7 were asked to administer the FPS-R of their child's pain over the previous 24 hours. Parents who had access to the internet were given the option of

completing the follow-up surveys online, which was made available through SurveyMonkey. SurveyMonkey is a licensee of the TRUSTe Privacy Program and abides by the EU Safe Harbor Framework as outlined by the U.S. Department of Commerce and the European Union.

### **Stat Analysis**

All analyses were conducted using SPSS 20.0. Throughout the whole sample, Pearson product-moment correlations were used to measure the associations between children's temperament (shyness, activity, sociability and shyness) and total dose of analgesics (hydrocodone, ibuprofen, acetaminophen and codeine) administered to children after surgery, including postoperative days 1, 3 and 7. To analyze the relationship of EAS-TS in regards to analgesics administered, hierarchical linear regressions controlling for pain severity were performed. Analysis of variance (ANOVA) tests were executed to analyze the significance of temperament as a predictor of the total amount of analgesics.

## **RESULTS**

Bivariate correlations between total analgesics and mean of EAS, shown in Table 1, indicated a significant relation between emotionality and acetaminophen ( $p = 0.02$ ), hydrocodone ( $p = 0.02$ ) and ibuprofen ( $p = 0.03$ ). In addition, shyness was significantly related to acetaminophen ( $p = 0.03$ ) and hydrocodone ( $p = 0.002$ ). There were no significant relationships between the activity and sociability subscales and analgesics given ( $p > 0.05$ ). Furthermore, there were no significant relationships between temperament and total doses of codeine given on postoperative days 1, 3 and 7 ( $p > 0.05$ ).

**Table 1. Correlations between total analgesics given to child in mg per kg on postoperative days 1, 3, 7 and mean of temperament.**

	EAS-TS emotionality	EAS-TS shyness	EAS-TS activity	EAS-TS sociability
Acetaminophen	.185*	.171*	-.017	.060
Codeine	-.030	-.059	.121	-.054
Ibuprofen	.164*	.090	-.014	.131
Hydrocodone	.197*	.255**	-.098	-.066

\* Correlation is significant at the  $p < 0.05$  level

\*\* Correlation is significant at the  $p < 0.01$  level

Hierarchical linear regression models controlling for pain severity indicated a significant relationship between the emotionality subscale and total acetaminophen ( $p = 0.02$ ), ibuprofen ( $p = 0.03$ ) and hydrocodone ( $p = 0.05$ ) administered to the child (Table 2). Similar hierarchical linear regression models revealed a significant relationship between shyness and total acetaminophen ( $p = 0.04$ ) and hydrocodone ( $p = 0.05$ ) given (Table 3).

**Table 2. Hierarchical linear regression model examining the mean of the emotionality subscale as predictor for total acetaminophen, ibuprofen and hydrocodone.**

	Acetaminophen			Ibuprofen			Hydrocodone		
	b	SE	p	b	SE	p	b	SE	p
Pain	0.34	3.41	0.00**	0.04	2.01	0.68	0.44	0.04	0.00**
Emotionality	0.22	7.33	0.02*	0.21	4.32	0.03*	0.19	0.08	0.05*
F (df,df)	12.13 (2, 103)			2.69 (2, 104)			14.71 (2, 86)		
Adjusted R <sup>2</sup> (p-value)	0.17 (0.02)*			0.03 (0.03)*			0.24 (0.05)*		

\*  $p < 0.05$ ; \*\*  $p < .001$

**Table 3. Hierarchical linear regression model examining the mean of the shyness subscale as a predictor for total acetaminophen and hydrocodone.**

	Acetaminophen			Hydrocodone		
	b	SE	p	b	SE	p

Pain	0.34	3.49	0.00 **	0.41	0.04	0.00 **
Shyness	0.19	8.72	0.04 *	0.27	0.09	0.05 *
<i>F (df, df)</i>	2.69 (2, 104)			14.71 (2,86)		
<i>Adjusted R</i> <sup>2</sup> ( <i>p</i> -value)	0.16 (0.04) *			0.24 (0.05) *		

\* *p*<0.05; \*\* *p*<.001

## DISCUSSION

The purpose of this study was to identify the relationship between children's temperament and total analgesics administered by parents on postoperative days 1, 3 and 7. Both emotionality and shyness showed significant relationships with acetaminophen, ibuprofen and hydrocodone and acetaminophen and hydrocodone, respectively. However, significant relationships failed to exist between the activity and sociability subscales and total analgesics given. There were no correlations between temperament and total codeine as well.

The mean of the activity and sociability subscales and total doses of analgesics given were not significantly positively correlated, which indicated that children's behavioral characteristics of level of activity and sociability did not have an effect on the amount of analgesics administered by parents. This was not as hypothesized, however, the resulted lack of a significant relationship between activity and sociability and amount of analgesics given does not automatically indicate children received sufficient amounts of analgesics. Buss and Plomin (1984) stated that matches between parents and children are greatest for activity and sociability. For example, parents similarly characterized with high levels of temperament as their child will intensify the child's temperament through their reactions; eventually resulting in neurotic behavior. Moreover, Zisk and colleagues (2007) revealed that parents with higher neuroticism scores believed children exaggerate pain and complain about pain to get attention. In turn, those

parents are less likely to provide analgesics even when their child expresses pain, resulting in unnecessary distress due to inadequate administration of analgesics to the child. Sociability is difficult to assess in young children, which is why the sociability scale in the EAS measure is better viewed as a mixture between sociability and shyness. That is, parents tend to interpret some of the questions in the EAS meant for sociability as shyness. This may lead to improper scoring of the two similar subscales and is the reason for many researchers to not distinguish the two (Buss and Plomin 1984). Pearson product-moment correlations did not reveal a significant positive correlation between the total amount of codeine and temperament ( $p > 0.05$ ). This may be due to the unfamiliarity parents have with codeine as it is not equally accessible as other analgesics such as acetaminophen or ibuprofen, thus why parents administer the medication strictly as directed by the health care professional (i.e. every 6 hours) opposed to when they sense their child experiences pain.

ANOVA and hierarchical regression models indicated emotionality and shyness were predictors of the amount of analgesics administered. As originally hypothesized, children with higher levels of emotionality were given particularly more acetaminophen, ibuprofen and hydrocodone. In addition, children with higher levels of temperament in terms of shyness were given more acetaminophen and hydrocodone. This was expected as emotionality directly influences whether children more readily voice their pain, thus determining administration of analgesics by parents. Furthermore, a previous study noted an association between shyness and high negative emotionality, which agrees with our findings in regards to the similar relationship between the emotionality and the shyness subscales and amount of analgesics given (Eisenberg et al. 1995). On one hand, this may imply children with low levels of emotionality and shyness are under-medicated and suffer improper pain management. On the other hand, children with

high levels of emotionality and shyness may have received an unnecessary amount of analgesics. However, this study solely examined children's temperament as a predictor for amount of analgesics given, therefore future studies should further investigate the relationship between temperament and adequate analgesic dosages received. Failure to consider temperament as an influential factor of pain management, yields continual administration of analgesics in improper doses, and eventually subjects children to both mental and physical negative effects.

In conclusion, the study has exposed that temperament, specifically emotionality and shyness, does in fact influence the amount of listed analgesics administered to children by parents after surgery. With that, a large-scale study should be conducted; ultimately seeking interventions tailored to parents based on temperamental differences in children. Health care providers should educate parents on proper analgesic administration in a manner specific to each child's temperament. For example, proper pain management instructions provided to parents of children with low levels of emotionality should include information such as children do not always verbally express when they are in pain (Zisk et al. 2007). This intervention could possibly diminish a large portion of children's distress, yielding an overall better recovery.

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