Assessing Temperament as a Predictor of Distress at Anesthesia Induction Using the Children's Behavior Questionnaire Short Form

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A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Science in Dentistry

University of Washington

2016

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Program Authorized to Offer Degree:

School of Dentistry

University of Washington

Abstract

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Purpose: To determine whether temperament as measured by the Children's Behavior Questionnaire Short Form (CBQ-SF) is associated with distress at mask induction of general anesthesia (GA) for dental rehabilitation.

Methods: Child-caregiver dyads were enrolled from physically healthy (ASA I-II) patients three to eight years old who received dental care under general anesthesia at an outpatient dental surgery center. Mask induction without any form of sedative premedication was utilized to induce GA in all patients. Inductions were video recorded, and scored for distress by two independent raters using a validated 10-point Induction Compliance Checklist (ICC). To assess child temperament, caregivers completed the CBQ-SF while waiting for the dental procedure to be completed. Chi-squared, Fisher's exact, and Wilcoxon rank-sum tests were used to determine the relationship between temperament domains, demographic variables, and distress at induction.

Results: Fifty-two child-caregiver dyads were enrolled in the study. Of these, 54% (n=28) of the children had perfect inductions (no disruptive behaviors). There was no statistically significant difference in perfect versus imperfect induction with respect to age, race, time of surgery, parent/guardian presence, insurance status, parental education level, employment or marital status, number of children in the household, pre-

existing dental pain, or household food security. Female gender was significantly associated with imperfect induction (p=0.01).

Conclusions: In this study there was no statistically significant relationship between temperament and patient compliance during general anesthesia induction. Parental presence did not improve induction compliance. Female patients were more likely to have disruptive behaviors at induction.

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I. INTRODUCTION

Appropriate use of behavior guidance techniques enables dental providers to deliver effective care and to impart a positive impression of dentistry on the developing child. Care strategies may include techniques ranging from basic communicative guidance to complex pharmacological management. Today, general anesthesia (GA) is used increasingly often to provide full mouth dental rehabilitation (FMDR) for children.[1] GA is often employed due to behavioral limitations, quantity of treatment, or special healthcare needs. FMDR with GA has been shown to improve the social, psychological, and physical health of children and is an increasingly well-accepted modality of treatment when children are unable to tolerate dental care while awake or sedated.[1,2]

While typically perceived as one of the least traumatic behavior guidance techniques, dental treatment under GA is not completely without adverse psychological effects. Studies have shown that both parents and children experience stress before and after treatment.[3] Even generally well-mannered children may show significant distress and resistance during the induction process[4] or post-operative psychological complications.[5-7]

A child's reaction to medical and dental treatment is dependent upon a number of factors. One factor that has received considerable attention is temperament, a measure of the innate aspects of personality and responses to new events and settings. Rothbart defined temperament as "individual differences in reactivity and self-regulation which are assumed to have a constitutional basis."[8] This internal, biological basis for reactions to new environments includes medical and dental offices,[9] where temperament has been shown to affect a child's ability to cope with treatment.[10-13] In particular, children exhibiting more effortful control (voluntary and willful control of attention and behavior) were more capable of tolerating aversive procedures.[14,15]

Knowing which specific temperament constellations are associated with negative outcomes at GA induction could help identify children at high risk for distress and allow clinicians to implement stress reduction strategies. In turn, incorporation of successful stress reduction protocols may improve patient outcomes and help establish parent and provider expectations for dental GA procedures. Baseline temperament data for children receiving dental rehabilitation under GA will also contribute to the body of dental behavior management literature. There has been little research regarding temperament as a predictor of distress at GA induction or post operatively, and the CBQ has not been used to evaluate temperament as a predictor of distress at GA induction.

This study aimed to determine if specific temperament characteristics were associated with child distress at anesthesia induction. Additional aims included determining if patient characteristics such as age, gender, family size, race, food insecurity, parental employment, and parental education were related to distress at induction.

II. METHODS

The research team consisted of a graduate pediatric dentistry resident (GH), one attending pediatric dentist (TN) who was also the graduate thesis committee chair, and four undergraduate research assistants. The team present in the operating suite typically consisted of one attending pediatric dentist, one resident dentist, the anesthesiologist, and two dental assistants. The study design was cross-sectional.

Study Population

Patients were recruited from the University of Washington-Department of Pediatric Dentistry's Center for Pediatric Dentistry (CPD) outpatient Dental Surgery Center (DSC). The patients were

planned for comprehensive dental care under GA. Reasons for care under GA included pre-cooperative age, behavioral limitations, extensive treatment needs, and history of unsuccessful treatment with local anesthesia.

Eligible patients were aged 36 to 95 months, ASA Classification I or II, and with parental English language comprehension. Patients with exceptional dental circumstances such as severe pain or infection, those with ASA classification of III or greater, and patients or parents who without English proficiency were not included. Participants were pre-screened for age, health status, and English language comprehension prior to the day of surgery using the electronic health record (EHR; axiUm, Exan Group, Coquitlam, BC) and their screening data was stored in Microsoft Excel (2013). Children received a history and physical exam on the day of surgery. Prior to entering the operating suite parents consented to dental treatment, anesthesia care, and provided informed consent to participate in the study.

Video Recording, Questionnaires (CBQ-SF and demographic) and Video Scoring

The child's induction was video recorded by a member of the research team from the time the patient entered the operating suite until they were completely induced. All children received inhalational mask induction with oxygen, sevofluorane, and nitrous oxide without premedication.

While children were in the operating suite, parents or caregivers completed the CBQ-SF, a demographic survey, and a food insecurity questionnaire. The Children's Behavior Questionnaire Short Form (CBQ-SF), developed by Rothbart et al., is one of the most commonly used temperament instruments in contemporary research and provides a validated measure of temperament domain for children ages three to eight.[16] The CBQ-SF consists of 94 questions on a seven point Likert scale and evaluates temperament in fifteen dimensions as well as the categories of Negative Affectivity, Effortful Control, and Extraversion/Surgency[16]

(Figure 1). The demographic survey collected patient age, gender, parent-reported race, parent level of education, parent marital status, parent employment, number of children in household, pre-existing dental pain, and household food security. Insurance type, health status, and patient age were collected from the EHR.

The ICC (Figure 2) outlines ten negative behaviors that occur commonly during induction. During video review, negative behaviors were summed; a higher score indicated a more distressful induction. Initial behavioral scores were written down using paper forms and subsequently entered and managed using REDCap electronic data capture tools hosted at the University of Washington. Videos were reviewed by two independent observers (GH and TN) and were evaluated for inter-rater reliability.

Food Insecurity Scoring

Food security of the households was assessed using the Six-Item Short Form of the Food Security Survey Module developed by the U.S. Department of Agriculture Economic Research Service. The short form survey was developed by researchers at the National Center for Health Statistics.[17] According to the guide at usda.gov, "[The six item short form] has been shown to identify food-insecure households and households with very low food security with reasonably high specificity and sensitivity and minimal bias compared with the 18-item measure. It does not, however, directly ask about children's food security, and does not measure the most severe range of adult food insecurity, in which children's food intake is likely to be reduced."[17]

Data Analysis and Statistics

Age was collected as a continuous variable and categorized into 36-60 and 61-90 month sub-categories to facilitate reporting. Races reported were Non-Hispanic White, Asian, Hispanic/Latino, Black, Native Hawaiian/Pacific Islander, American Indian or Alaskan Native,

and Other. The time of day during which the induction occurred was grouped into two hour blocks. We estimated descriptive statistics for demographic information. (Table 1) We analyzed variables collected from the CBQ-SF according to the instructions provided with the instrument and compiled into individual temperament categories (Figure 1).

Induction compliance sum scores were grouped as “Perfect Compliance,” representing ICC total scores of zero, and “Imperfect Compliance” representing any total ICC score from one to ten.

Demographic variables were tested individually for associations with imperfect compliance (ICC score greater than zero) using Fisher’s Exact Test when expected cell counts were less than five and Chi-squared test when expected cell counts were greater than five. Individual temperament variables were analyzed individually for association with imperfect compliance using the Wilcoxon rank-sum test. All data analysis was performed using STATA 13, (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP) statistical. Statistical significance was set a priori as $p<0.05$.

This study was conducted after receiving approval from the University of Washington Institutional Review Board (#49517).

III. RESULTS

Demographic Variables

Fifty-two child-caregiver dyads participated between July 15, 2015 and December 30, 2015. Of the child patients, less than half (44%) were female. Patient age ranged from 36 to 95 months, with a mean age of 62 months (Standard Deviation [SD]=17). The mean age of males was 64 months (SD=17) and the mean age of females was 61 months (SD=17). The majority of patients reported their race as White, Non-Hispanic (53%). Seven (14%) reported Asian. The remaining

participants were Hispanic/Latino (6%), Black (8%), American Indian/Alaska Native (4%), and Other/Multiple (4%). Those representing less than ten percent were grouped as Other/Multiple for analysis. Greater than 50% (n=30) of the inductions occurred before 11:00 hrs, with only eight (13%) occurring after 13:00 hrs. Patients with state insurance (Washington State Apple Health) accounted for the majority of the study population (n=42, 82%). A parent or guardian was present in the operating suite at 22 of the inductions (42%). At the time of surgery, seven parents reported that their child was in pain (14%).

Of the parents, six had less than high school education, and 30 had some college education or higher (62%). Twenty-seven parents reported being employed full time (56%), and 10 were unemployed (21%). With regard to marital status, 34 (70%) were married or in a committed relationship, and 15 had never been married or were divorced, widowed or separated (30%). The most common number of children in the household was two (n=19, 38%), with six respondents stating that they had four or more children (12%). Based on responses to the six-item food security survey, 10 of the households (19%) in our study population were food insecure (this definition includes households with low food security and very low food security). (Table 1).

Temperament and Behavior

There were no statistically significant associations between temperament and perfect or imperfect inductions. However, children with higher scores in inhibitory control and attention control experienced more perfect inductions. Also, children with higher median scores in fear and discomfort showed more imperfect inductions. (Table 2).

Induction Compliance

Greater than half of the patients experienced perfect inductions (zero negative behaviors scored on the Induction Compliance Checklist). Patients whose parents/guardians were not present at induction had a higher percentage of perfect inductions, but the result was not statistically significant (p=0.11). Children whose parents reported that the child was in pain on the day of surgery also had a higher percentage of perfect inductions, but this result was also not statistically significant (p=0.10). Age was not significantly associated with induction compliance (p=0.76).Gender was the only demographic variable that was significantly associated with induction compliance. Twenty (69%) male patients had perfect inductions, versus only eight (35%) female patients (p=0.01) (Table 1).

Food Insecurity

Ten participants (19%) reported that that their household was food insecure. Seven of these (70%) had perfect inductions, compared to 21 (50%) children from food secure households. There was no significant association between food security and induction compliance (p=0.31) (Table 1).

Quality Assurance

There was a 95% inter-rater reliability between raters' ICC scores.

IV. DISCUSSION

GA has become an increasingly popular method of providing FMDR for pediatric patients. In fact, in 2005 parents ranked GA third after only tell-show-do and nitrous oxide when asked to rank preferred means of behavior management.[1] Additionally, specific aspects of temperament have been associated with children's ability to tolerate dental and medical procedures,[11,14,15,18,19] and shyness and negativity may be related to a more difficult induction process.[20,21] The

relationship between temperament and behavior at general anesthesia induction is an important area of study. It may enable dental and anesthesia providers to identify and offer appropriate interventions for children with temperament characteristics indicative of a difficult induction.

Temperament

Others have shown that greater effortful control was predictive of children's coping behavior during difficult medical procedures.[14] However, our study showed no significant association between temperament and general anesthesia induction compliance. The temperament data generated from the CBQ-SF was analyzed for an association with perfect and imperfect inductions. While previous studies have shown high impulsivity, low effortful control, shyness and approach/withdrawal tendencies to be related to unsuccessful oral sedation, this study indicates that a favorable induction may be independent of these characteristics.[11,13,15,20] However, the lack of significant findings could also be due to our small sample size. While not statistically significant, children with higher scores in inhibitory control and attention control experienced more perfect inductions, correlating with the results of previous studies. Additionally, patients with higher fear and frustration scores experienced more imperfect inductions, a reasonable set of characteristics for patients having a more difficult induction and in general matching the results of previous studies.

Demographic Characteristics

Only female (versus male) gender was statistically significantly associated with experiencing an imperfect induction (*p=0.01)*. This is in contrast to previous studies of induction compliance, in which there was a nearly even percentage of males and females who experienced perfect inductions.[22] This may be due to small sample size or the fact that boys had a slightly greater mean age than females, as greater age is associated with improved induction compliance.[3,22,23] We did not detect any statistically significant associations between other demographic variables

measured, such as age, race, parental education status, pain on day of surgery, or time of surgery.

Induction Compliance and Related Factors

The process of undergoing GA can be stressful for children and parents. Potential stressors may include the anticipation of general anesthesia and surgery, pre-operative waiting time, number of medical providers present, and expectation of post-operative pain.[24] These and other distressful events during surgery can contribute to postoperative maladaptive behaviors,[25] including anxiety, emergence delirium, temper tantrums, bad dreams, difficulty eating, and sleep disturbances.[5,22] We found that while more than half of children experienced a perfect induction, a significant portion of patients showed one or more negative behaviors at induction (Figure 3), and a small portion of patients demonstrated a number of these behaviors, which may relate to future maladaptive behaviors.

While there are many stressful factors associated with the GA visit, induction has been shown to be the most stressful phase of perioperative experience for children and families.[26] Fifty-four percent of the children in this study experienced a perfect induction, with zero negative behaviors scored on the ICC. These findings are similar to other studies using the ICC, which showed 57% perfect induction compliance.[22] The behaviors measured by the ICC are one measure of the stress that children experience during the process of receiving dental care under GA. Our results suggest that distress at induction is very common, with approximately half of the children in the study experiencing a stressful induction. Therefore, the induction process is a time during the GA procedure that deserves focus. The ability to identify patients who are at higher risk for poor induction compliance could reduce the burden of stress on patients and their

parents by planning for them to receive perioperative interventions that prevent distress and behavioral changes.

Parental Presence

In this study, parents were present in the room 42% of the time, at the anesthesiologist's discretion. We chose not to make parental presence a prerequisite for inclusion, as this could have introduced a bias for children with a certain parent-child dynamic and specific temperament. However, this may have led the anesthesiologist to allow parents into the operating suite in circumstances where clinical experience suggested that parents could positively impact the child's experience. Conversely, by separating parents likely to have a negative effect on children, we may have inadvertently altered the exposure and the subsequent behavioral response.

Our study confirmed the results of previous studies which showed that parental presence at induction generally did not improve induction compliance. In fact, based on this and previous studies, parents of most children should generally not be encouraged to be present at induction.[4] While it has been noted that older children may benefit from parental presence during induction,[27] in our study older children had only slightly more perfect inductions (14 of 27 in the 36-60 month age group, versus 14 of 25 in the 61-90 month age group), which was not a significant result.

Food Insecurity

In the United States, food insecurity is related to unemployment, lower household assets and socioeconomic status, and certain demographics.[28] Overall food insecurity is 14% in the U.S. but 19% of households with children are known to be food insecure. This matches the 19% households with children reporting food insecurity in the study population.[17] Additionally, 21% of parents in this study reported that they were

unemployed. This may be related to the fact that the study population was 82% state insurance, and 30% of households were single parent households - populations known to have higher food insecurity. There is a relationship between food insecurity, low socioeconomic status, and untreated dental caries.[29] However, the dynamic between sociodemographic characteristics of children who receive dental treatment under GA and their individual and family food security warrants further research. In particular, patients who present for FMDR under GA have some of the highest rates of untreated dental caries,[30] which could be related to quality and quantity of food available, among other factors.

Study Limitations

As mentioned previously, a primary limitation in this study was the number of subjects. This was due to logistical constraints and the exploratory nature of the study. Future studies with larger sample sizes would provide sufficient power to enable a more elaborate subgroup analysis to determine if any temperament characteristics are indeed significantly related to induction compliance behaviors or total scores. Allowing parental presence based on anesthesiologist preference may have been a confounder for associations between temperament and induction compliance, and with a larger study population this could be controlled. Reasons for this type of confounding were discussed above.

Additionally, there was a considerable age range of patients, from 36 to 95 months, spanning the sensorimotor and preoperational stages to the concrete operational stage of development. Previous literature has also shown that it is more difficult to determine preoperative behaviors in young children, particularly those who may appear more cooperative initially.[3] In this study, the range of development among patients may have affected induction compliance, although temperament likely remains relatively static for

an individual patient irrespective of age. Finally, the time of day may have been a confounding factor between age and induction compliance due to the fact that many of the younger patients were scheduled earlier in the morning.

Future Studies

Despite the increasing acceptance of FMDR under GA, it is a major undertaking for most families and can be a cause of significant parental stress. Interestingly, although convenient and well tolerated by children, GA may represent the most distressing behavior guidance modality for parents, even greater than other pharmacological management techniques such as oral sedation.[6] In such cases, a parent whose child has FMDR experiences anxiety which may be transferred to the child during the peri-operative period, resulting in poor behavioral compliance.[4] We suggest that when considering preoperative anxiety, parents and children should be managed as a unit.[25] For these reasons, an investigation of the stress, temperament, and fears of parents and caregivers would help inform practice and aid in clinical decision making.

V. CONCLUSIONS

1. There were no statistically significant associations between temperament and distress at general anesthesia induction.
2. Male patients had more perfect inductions than females (p=0.01).
3. In this study parental presence was not related to perfect or imperfect induction compliance.

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VII. APPENDIX/TABLES

Table 1. Population demographics and ICC Scores: Perfect vs Imperfect induction

Variable	Overall N (%)	Imperfect Compliance (ICC = 1-10) N (%)	Perfect Compliance (ICC = 0) N (%)	p-value
Age				0.76*
36-60 months	27 (52)	13 (48)	14 (52)	
61-96 months	25 (48)	11 (44)	14 (56)	
Gender				0.01*
Male	29 (56)	9 (31)	20 (69)	
Female	23 (44)	15 (65)	8 (35)	
Parent Reported Race				0.85**
White, Non-Hispanic	26 (53)	12 (46)	14 (56)	
Asian	7 (14)	4 (57)	3 (43)	
Other/Multiple	16 (33)	7 (44)	9 (56)	
Surgery Time of Day				0.29**
07:00-08:59	17 (33)	11 (65)	6 (35)	
09:00-10:59	13 (25)	4 (31)	9 (69)	
11:00-12:59	15 (29)	6 (40)	9 (60)	
13:00-14:59	8 (13)	3 (43)	4 (57)	
Parent/Guardian Presence				0.11*
Yes	22 (42)	13 (59)	9 (41)	
No	30 (58)	11 (37)	19 (63)	
Is Child in Pain				0.10**
Yes	7 (14)	1 (14)	6 (86)	
No	43 (86)	23 (53)	20 (47)	
Insurance				0.72**
Private or Cash	9 (18)	5 (56)	4 (44)	
WA State Apple Health	42 (82)	19 (45)	23 (55)	
Parental Education				0.52**
Less than High School	6 (13)	4 (67)	2 (33)	
High School	12 (25)	4 (33)	8 (67)	
Some College	15 (31)	9 (60)	6 (40)	

College Graduate or Higher	15 (31)	7 (47)	8 (53)	
Parent Marital Status				0.41**
Married/Committed Relationship	34 (70)	16 (47)	18 (53)	
Never Been Married	9 (18)	6 (67)	3 (33)	
Divorced/Widowed/Separated	6 (12)	2 (33)	4 (67)	
Parental Employment				0.61**
Employed	27 (56)	14 (52)	13 (48)	
Unemployed	10 (21)	6 (60)	4 (40)	
Homemaker	5 (10)	1 (20)	4 (80)	
Other	6 (13)	3 (50)	3 (50)	
Number of Children in Household				0.51**
One	13 (24)	8 (67)	4 (33)	
Two	19 (38)	8 (42)	11 (58)	
Three	13 (26)	5 (38)	8 (62)	
Four or More	6 (12)	3 (50)	3 (50)	
Is Household Food Secure				0.31**
Yes	42 (81)	21 (50)	21 (50)	
No	10 (19)	3 (30)	7 (70)	
Overall				
Total	24 52	25 (46)	28 (54)	

*Chi-square test

** Fisher's Exact Test

Table 2. Temperament Domains and Distress at Induction: Perfect vs Imperfect Induction

	Overall Median (IQR)	**Perfect Compliance (ICC = 0) Median (IQR)**	**Imperfect Compliance (ICC = 1-10) Median (IQR)**	**p-value**
Temperament Scales				
Effortful Control	5.2 (4.5, 5.7)	5.2 (4.3, 5.8)	5.3 (4.8, 5.6)	0.99
Attention Control	4.6 (3.8, 5.3)	5.0 (3.9, 5.5)	4.3 (3.8, 4.9)	0.27
Inhibitory Control	4.8 (4.1, 5.3)	5.0 (4.2, 5.4)	4.6 (3.8, 5.0)	0.12
Perceptual Sensitivity	5.4 (4.6, 6.1)	5.3 (4.6, 6.2)	5.5 (4.5, 6.0)	0.81
Low-Intensity Pleasure	6.0 (5.4, 6.4)	5.8 (5.2, 6.3)	6.1 (5.6, 6.5)	0.18
Negative Affectivity	4.4 (3.8, 4.9)	4.4 (3.8, 4.9)	4.5 (3.9, 4.9)	0.47
Frustration	4.6 (3.9, 5.3)	4.5 (3.9, 5.0)	5.1 (3.8, 5.6)	0.22
Fear	3.8 (3.3, 4.7)	3.6 (3.0, 4.4)	4.2 (3.4, 4.9)	0.12
Discomfort	4.2 (3.3, 5.1)	4.0 (3.1, 4.8)	4.6 (3.8, 5.5)	0.05
Sadness	4.4 (4.1, 4.9)	4.4 (4.1, 4.9)	4.4 (3.7, 5.0)	0.64
Soothability	4.6 (3.7, 5.2)	4.6 (3.8, 5.2)	4.6 (3.7, 5.2)	0.69
Extraversion/Surgency	4.4 (4.2, 4.8)	4.3 (3.9, 4.8)	4.4 (4.2, 4.8)	0.29
Activity	5.1 (4.7, 5.7)	5.2 (4.5, 5.7)	5.1 (4.7, 5.9)	0.82
Shyness	3.9 (3.0, 4.8)	4.1 (2.7, 4.7)	3.8 (3.1, 4.8)	0.73
High-Intensity Pleasure	5.4 (4.4, 6.2)	5.3 (4.5, 6.0)	5.7 (4.7, 6.3)	0.21
Smiling and Laughter	5.8 (5.3, 6.3)	5.8 (5.3, 6.5)	5.8 (5.3, 6.3)	0.72
Impulsivity	4.5 (4.0, 5.1)	4.6 (4.0, 5.5)	4.5 (3.9, 5.0)	0.44
Positive Anticipation	5.3 (4.5, 6.0)	5.2 (4.6, 5.7)	5.3 (4.5, 6.2)	0.93

Figure 1. Temperament Domains and Categories

Effortful Control	Voluntary and willful control of attention and behavior.
Attention Control	Tendency to maintain attentional focus upon task-related channels.
Inhibitory Control	The capacity to plan and to suppress inappropriate approach responses under instructions or in novel or uncertain situations.
Perceptual Sensitivity	Detection of slight, low-intensity stimuli from the external environment.
Low Intensity Pleasure	Amount of pleasure or enjoyment related to situations involving low stimulus intensity, rate, complexity, novelty and incongruity.
Negative Affectivity	Inclination to experience and express negative emotions.
Frustration	Amount of negative affect related to interruption of ongoing tasks or goal blocking.
Fear	Amount of negative affect, including unease, worry or nervousness related to anticipated pain or distress and/or potentially threatening situations.
Discomfort	Amount of negative affect related to sensory qualities of stimulation, including intensity, rate or complexity of light, movement, sound, texture.
Sadness	Amount of negative affect and lowered mood and energy related to exposure to suffering, disappointment and object loss.
Soothability	Rate of recovery from peak distress, excitement, or general arousal.
Extraversion/Surgency	Amount of motor activity, such as pace, quantity and intensity of walking, talking, and thinking.
Activity level	Level of gross motor activity including rate and extent of locomotion.
Shyness	Slow or inhibited approach in situations involving novelty or uncertainty.
High Intensity Pleasure	Amount of pleasure or enjoyment related to situations involving high stimulus intensity, rate, complexity, novelty and incongruity.
Smiling and Laughter	Amount of positive affect in response to changes in stimulus intensity, rate, complexity, and incongruity.
Impulsivity	Speed of response initiation.
Positive Anticipation	Amount of excitement and positive anticipation for expected pleasurable activities.

Figure 2. Induction Compliance Checklist

INDUCTION COMPLIANCE CHECKLIST BEHAVIORS, SCORING

STUDY ID # _____ REVIEWER _____

- ☐ Crying, tears in eyes
- ☐ Turns head away from mask
- ☐ Verbal refusal, says "no"
- ☐ Verbalization indicating fear or worry, "where's mommy?" or "will it hurt?"
- ☐ Pushes mask away with hands, pushes nurse or anesthesiologist with hands/feet
- ☐ Covers mouth/nose with hands/arms or buries face
- ☐ Hysterical crying, may scream
- ☐ Kicks/flails legs/arms, arches back, and/or general struggling
- ☐ Requires physical restraint
- ☐ Complete passivity, either rigid or limp

_____ TOTAL SCORE

The ICC score represents the sum of behavioral groupings. High scores are correlated with poor behavioral compliance. Perfect induction scores zero, while the highest score of ten indicates the worst possible induction. In previous studies a score of less than four has been considered to be a poor induction.

Figure 3. Induction Compliance Scores by Percentage