Preoperative Preparation Programs in Children: A Comparative Examination

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We sought to determine whether an extensive behavioral preparation program for children undergoing surgery is more effective than a limited behavioral program. The primary end point was child and parent anxiety during the preoperative period. Secondary end points included behavior of the child during the induction of anesthesia and the postoperative recovery period. Several days before surgery, children (n = 75) aged 2–12 yr randomly received either an information-based program (OR tour), an information + modeling-based program (OR tour + videotape), or an information + modeling + coping-based program (OR tour + videotape + child-life preparation). Using behavioral and physiological measures of anxiety, we found that children who received the extensive program exhibited less anxiety immediately after the intervention, in the holding area on the day of surgery, and on separation to the operating room. These findings, however, achieved statistical significance only in the holding area on the day of surgery (44[10–72] vs 32[8–50] vs 9[6–33]; P = 0.02). Similarly, parents in the extensive program were significantly less anxious on the day of surgery in the preoperative holding area, as assessed by behavioral (P = 0.015) and physiological measures (P = 0.01). In contrast, no differences were found among the groups during the induction of anesthesia, recovery room period, or 2 wk postoperatively. We conclude that children and parents who received the extensive preoperative preparation program exhibited lower levels of anxiety during the preoperative period, but not during the intraoperative or postoperative periods. Implications: The extensive behavioral preoperative program that we undertook had limited anxiolytic effects. These effects were localized to the preoperative period and did not extend to the induction of anesthesia or the postoperative recovery period.

Behavioral preoperative preparation has been advocated in the psychological and medical literature, and an estimated 78% of all major children’s hospitals offer such programs to children and their parents (1). Indeed, most studies suggest that behavioral preparation for children undergoing anesthesia and surgery reduces anxiety and enhances coping (2–4). These preparation programs may provide narrative information, an orientation tour, role rehearsal using dolls, a puppet show, child-life preparation or, the teaching of coping and relaxation skills to children and their parents (4–6).

Although there is a general agreement about the desirability of these programs, recommendations regarding the content of preoperative preparation for children differ widely. In the 1960s, preparation programs were recommended to primarily provide information, encourage emotional expression, and establish trust between the medical staff and the child (7). In the mid-1970s, however, there was a shift toward modeling preparation programs (8). With modeling, the child indirectly experiences anesthesia and surgery by viewing a video or a puppet show. By the late 1980s, the literature indicated that effective preparation should include not only modeling but also child-life preparation, teaching of coping skills, and involvement of parents (4). In a recent article, a panel of experts rated the teaching of coping skills as the most effective intervention, followed by modeling, and then an operating room (OR) tour (1).

Although many previous investigations have compared groups undergoing the above behavioral preparation programs with control groups (2,9), there are few
studies contrasting these preoperative programs with each other. Furthermore, because highly rated techniques (e.g., coping) are associated with increased operational costs compared with lower rated techniques (e.g., tour), a comparative efficacy study is indicated. In this study, we sought to determine which type of behavioral preoperative preparation program is most effective: a tour of the OR (information-based), a tour + a commercially available videotape (information + modeling-based), or a tour + a videotape + child-life preparation (information + modeling + coping-based).

**Methods**

The primary clinical end point of this randomized, controlled trial was anxiety of the child and parent in the preoperative period, as defined by behavioral and physiological instruments. Secondary end points included the behavior of the child during the induction of anesthesia and the recovery period. Consecutive outpatients aged 2-12 yr, ASA physical status I or II, scheduled to undergo general anesthesia and elective outpatient surgery, such as herniorrhaphy and tonsillectomy, were considered for enrollment. Patients were excluded from the study if they had a history of previous surgery, hospitalization, prematurity, chronic illness, or developmental delay. After the parents gave written, informed consent, randomization was decided with a random number table. The use of sedative premedication and parental presence during induction of anesthesia (PPIA) was prohibited during this study. PPIA was used, however, as rescue therapy as detailed in the protocol below. The study was approved by the institutional review board, and written, informed consent was obtained from the parents.

During the visit, children in all groups underwent a nursing evaluation of functional health status and a preoperative evaluation by an anesthesiologist. In addition, children and their parents were randomly assigned to receive one of the following three types of behavioral programs: information-based program (OR tour); information + modeling-based program (OR tour + videotape), information + modeling + coping-based program (OR tour + videotape + child life).

For the information-based program, participants received a short (10 min) tour of the OR. The tour included a brief explanation about the sequence of events and was modified based on the age of the child. For the information + modeling-based program, participants received a tour of the OR and a commercially available animated videotape (A Hospital Trip with Dr. Bip, KiDz-Med Inc., 1994) that shows a child undergoing surgery. The children and their parents watched the model experience all perioperative steps from admission to discharge.

For the information + modeling + coping-based program, participants received a tour of the OR and a videotape and child-life preparation. The child-life program lasted 30 min and provided information about the perioperative experience, as well as role rehearsal. This component was tailored to the specific surgery and age of the child. The session began with a story illustrated by photos taken in the OR of a doll going through each step experienced on the day of surgery. The medical play was modeled after classic role-playing. Children were offered the opportunity to participate in perioperative activities, such as listening to the doll’s heart, attaching electrocardiographic leads, and putting the doll “to sleep.”

Timing of behavioral preparation relative to the day of surgery has been identified as a significant variable affecting the response of the child to the intervention (3,9). Furthermore, the ideal timing varies based on the age of the child (3,9). In this study, therefore, children aged 2-4 yr were scheduled to receive the behavioral intervention 1-2 days before surgery, whereas children aged 5-12 yr were scheduled to receive the behavioral intervention 5-10 days before surgery.

Data regarding the following behavioral assessment tools are reported in Appendix 1. Two psychologists (blind to group assignment) served as assessors and administered the various instruments: EASI Instrument of child temperament (10), State-Trait Anxiety Inventory (STAI) (11), Visual Analog Anxiety Scale (VAS) (12), Venham Picture Test (VPT) (13), Yale Preoperative Anxiety Scale (YAS) (14), Monitor Blunter Style Scale (MBSS) (15), Coping Cards (CC) (16), and Post Hospitalization Behavior Questionnaire (PHBQ) (17,18).

For cortisol analysis, samples was transferred immediately into a tube containing heparin. After mixing, the blood was centrifuged at 4000 rpm for 2 min, and the plasma was stored at -70°C. Plasma cortisol was determined in duplicate using radioimmunoassay kits from Diagnostic System Laboratories (Webster, TX). Samples were analyzed in a single large batch, duplicates agreed within 15%, and quality assessment samples were well within the manufacturer’s defined range.

Two to ten days before surgery, subjects identified from the OR schedule were contacted by telephone, and a preoperative visit was scheduled.

Once written consent was obtained, subjects were randomized to one of the three groups. Baseline measures, such as temperament of child (EASI), trait anxiety of parent (STAI-T), and coping style of child (CC) and parent (MBSS), were obtained. Anxiety of the child (VPT, observational VAS) and of the parent (STAI, DBP/SBP, HR) was evaluated before (T1) and after the intervention (T2).

On the day of surgery, the anxiety of the child (VPT, observational VAS) and of the parent (STAI, DBP/SBP, HR) was assessed in the holding area (T3) and on separation to the OR (T4). If a subject exhibited unacceptable distress and anxiety on separation to the OR, PPIA was
allowed (rescue therapy). The decision for rescue therapy was made solely by the anesthesiologist managing the case (who was blinded to group assignment). Anesthesia was induced in all subjects using an O₂/N₂O/halothane technique. The behavior of the child during induction was evaluated by an independent, blind assessor (YPAS). Rating was performed at two time points: entering the OR (T₆) and during the introduction of the anesthesia mask (T₇). After induction, blood was obtained for serum cortisol analysis. Anesthesia was maintained with O₂/N₂O and isoflurane; IV fentanyl (1–3 μg/kg) was administered based on the decision of the attending anesthesiologist.

In the postanesthesia care unit (PACU), the incidence of adverse effects, time to discharge, and time to first fluid intake were recorded. Nurses were asked to rate the cooperation of the child with regard to the oxygen mask, pulse oximetry probe, and IV cannula (T₇). Two weeks after surgery, parents were contacted by telephone for a research nurse (blinded to group assignment), and the PHBQ was completed.

The primary end point of this study was the anxiety of the child and the parents in the preoperative holding area on the day of surgery, and data obtained in a previous investigation were used to calculate sample size (9). Based on an expected effect size of 10%, α of 0.05 (two-tail), and power of 0.80, 75 subjects were needed to complete this investigation.

Descriptive statistics provide an overview of the relations between the child and parent variables and the anxiety level of the child and parent. Normally distributed data are presented as mean ± SD, whereas skewed data are presented as medians and interquartile ranges (25%-75%). The differences among groups were examined by using one-way analysis of variance (ANOVA) and Kruskal-Wallis one-way ANOVA (for skewed data). Categorical data were examined by using χ² analysis. Repeated-measures ANOVAs were conducted to assess changes in behavioral and physiological measures of anxiety for the children and parents over the various time points (T₁–T₇).

Previous research has identified parental trait anxiety, the age of the child, and the child’s temperament to be important indicators of intervention outcome for children during the induction of anesthesia (19–21). Thus, these variables were used as covariates in analyses of the child’s anxiety during the induction of anesthesia. To localize the effects, we performed three two-factor ANOVAs with Tukey’s procedure for child’s anxiety during the induction of anesthesia. Effects of parental coping style on child’s and parent’s anxiety in the holding area were also examined. Statistical significance was accepted at P < 0.05. All analyses were performed on an intention to treat basis, and data were analyzed by using SPSS version 6.1.1 (SPSS Inc, Chicago, IL).

**Results**

Seventy-five subjects were recruited for this study. Two subjects, however, were excluded because of major protocol violations. Therefore, 73 subjects were included in the final analysis. Rescue therapy (PPIA) was necessary for one subject in Group 1, two subjects in Group 2, and one subject in Group 3. No significant differences were found across the three groups for any of the demographic variables (Table 1).

A repeated measures ANOVA for child’s anxiety failed to reveal significant effects of group on changes in anxiety over time (Figure 1). One-way ANOVA demonstrated that children who received the extensive program exhibited less anxiety immediately after the behavioral intervention, in the holding area on the day of surgery, and on separation to the OR. These findings, however, achieved statistical significance only in the holding area on the day of surgery (44 [10–72] vs 32 [8–50] vs 9 [6–33]; P = 0.02). Post hoc analysis localized the effects between Group 1 and Group 3 (Figure 1).

In contrast to the findings during the preoperative period, there were no differences among the groups during the induction of anesthesia, as assessed by behavioral (YPAS) and physiological (cortisol) measures (Table 2). This persisted after the child’s age,

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**Table 1. Characteristics of Study Subjects and Their Parents**

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (n = 24)</th>
<th>Group 2 (n = 25)</th>
<th>Group 3 (n = 24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s age (yr)</td>
<td>7 ± 3.1</td>
<td>5 ± 2.2</td>
<td>5 ± 2.8</td>
</tr>
<tr>
<td>Gender % (M/F)</td>
<td>43/57</td>
<td>48/57</td>
<td>42/58</td>
</tr>
<tr>
<td>Anxiety score for previous medical encounters</td>
<td>6 (0–81)</td>
<td>10 (0–80)</td>
<td>11 (0–100)</td>
</tr>
<tr>
<td>EASI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotionality</td>
<td>12 ± 3.6</td>
<td>12 ± 4.1</td>
<td>11 ± 4.4</td>
</tr>
<tr>
<td>Activity</td>
<td>15 ± 3.7</td>
<td>16 ± 3.5</td>
<td>18 ± 4.3</td>
</tr>
<tr>
<td>Sociability</td>
<td>19 ± 2.5</td>
<td>18 ± 3.3</td>
<td>18 ± 2.6</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>12 ± 3.6</td>
<td>13 ± 3.5</td>
<td>14 ± 3.5</td>
</tr>
<tr>
<td>STAI-T Parent</td>
<td>38 ± 7.9</td>
<td>41 ± 8.8</td>
<td>38 ± 8.8</td>
</tr>
<tr>
<td>VPT</td>
<td>8 (8-14)</td>
<td>9 (8-15)</td>
<td>9 (8-13)</td>
</tr>
</tbody>
</table>

Values are mean ± SD or median (range).
EASI = Emotionality, Activity, Sociability and Impulsivity Instrument; STAI-T = State-Trait Anxiety Inventory, Trait Anxiety Score; VPT = Venham Picture Test.
temperament, and parental trait anxiety were used as covariates. Finally, there were no differences among the three groups with regard to PACU outcome variables, such as incidence of vomiting, time to first oral fluid intake, and all of the nurses ratings. There were also no differences in the incidence of negative behavioral changes 2 wk after surgery.

Next, children’s coping strategy ratings were correlated with observed anxiety in the preoperative holding area (controlling for preintervention observed anxiety). For logistical reasons, coping data were obtained only in a subsample of children (n = 22). Neither the child’s gender nor age related significantly to children’s ratings of the coping strategies. Because of sample size restrictions, it was not possible to directly test whether the relation between intervention group and observed anxiety was moderated by children’s perceptions of the value of different coping strategies. Significant associations were found, however, between anxiety in the preoperative holding area and children’s ratings of “asking for information” (r = 0.43, P = 0.03) and “talking with my mom” (r = 0.42, P = 0.04) as ways of dealing with fear. These associations indicate that children who rated these strategies positively also had lower levels of observed anxiety (conversely, children who rated these strategies less positively had higher levels of anxiety). Thus, children who preferred “information seeking” and “parental support” coping strategies may have been more receptive to the types of interventions offered in this investigation, all of which were oriented toward the provision of information.

Parents who received the extensive preparation reported that they were significantly less anxious (STAI) in the preoperative holding area on the day of surgery compared with parents in the two other groups (P = 0.047) (Table 3). When parental coping style (MBSS) was controlled for in a factorial ANOVA, there were significant main effects of group (F = 4.67, P = 0.015) and coping style (F = 4.09, P = 0.025).

A repeated-measures ANOVA that examined parental diastolic blood pressure (T1) demonstrated a main effect of time (F[2,17] = 9.7; P = 0.002) and a group × time interaction (F[4] = 3.9; P = 0.01). Post hoc analysis revealed that parents in the extensive preparation group had lower diastolic blood pressure immediately after the intervention (P = 0.01) and in the preoperative holding area on the day of surgery, compared with the minimal preparation group (P = 0.003) (Table 3). Furthermore, parents of children who received the extensive preparation also had significantly lower systolic blood pressure (P = 0.01) in the holding area compared with the two other study groups (Table 3).

**Discussion**

Under the conditions of this study, children and parents who received an extensive behavioral program manifested less anxiety during the preoperative period. It is important to emphasize, however, that this extensive intervention was not more effective with regard to a child’s behavior during the induction of anesthesia, in the PACU, or 2 wk postoperatively. Thus, one must decide whether the additional cost associated with child-life specialists is justified by reduction of anxiety only preoperatively.

The results of this study are consistent with an earlier study conducted with hospitalized children (22). Peterson and Shigetomi (22) contrasted information preparation to filmed modeling and to coping plus filmed modeling. Results indicated that children who received coping plus modeling techniques experienced less distress during their hospital experience (22). To the best of our knowledge, there are no reports in the literature contrasting child-life preparation to a tour or to videotape preparation. Child-life programs have become the standard in most major children’s hospitals, and their number has doubled since 1965.
(6). Child-life specialists facilitate coping and the adjustment of children and parents by providing play experiences, presenting information about the events and procedures, and establishing supportive relationships with children and parents. In making information accessible to children, child-life specialists incorporate descriptions of the sensations that children will experience, provide opportunities for children to examine and manipulate equipment to be used in their care, and encourage rehearsal with dolls.

Previous studies have found, through behavioral and physiological responses, that the induction of anesthesia is the most stressful event the child experiences during the perioperative period (20,21). Thus, it seems that the more extensive intervention was effective for low-stress periods, such as preoperative holding, but not for high-stress periods, such as the induction of anesthesia. The level of anxiety at particularly high-stress times may inhibit children's productively remembering or thinking about what they had learned during the preoperative program. If so, reminding the child of strategies or techniques during times of high-stress may help to reduce anxiety. An interesting future study may be to promote productive remembering in the children during perioperative high-stress events.

In this study, children who were involved in active engagement of the situation did better with the behavioral interventions offered. That is, children who preferred information seeking coping strategies benefited as a group from the various interventions used in this trial. This finding is not surprising considering that all the interventions that were offered in this trial contained significant amounts of perioperative information. In contrast, children who preferred avoidance coping strategies found the interventions used in this trial less effective. For this group of children, we recommend that other types of interventions (including less information and direct engagement in the situation, and more assistance in the use of distraction techniques) might be effective.

The findings of this study should be viewed in light of several methodological issues. First, several variables were controlled to increase the internal validity of the investigation. Because the timing of behavioral preparation relative to the day of surgery has been identified as affecting the response of the child to the intervention (3,9), we controlled for this variable. Similarly, the effectiveness of preoperative interventions is dependent on previous experience with surgical interventions. That is, for the child with a history of surgery, behavioral preparation may result in sensitization, producing an exaggerated emotional response (3,9). Thus, only children with no history of surgery were enrolled.

Second, this study did not use a no-intervention comparison group. This selection can be considered a methodological flaw, but we considered it a necessity. Angell (23) suggested that only when there is no known effective treatment is it ethical to compare a new treatment with a placebo. When effective treatment exists, the control group of a study must receive the best known treatment (23). Although there is a disagreement with regard to the best type of preoperative preparation, there is consensus that some type of preoperative preparation should be offered to children undergoing surgery.

Third, because measuring anxiety is complex, we used both behavioral and physiological instruments to assess the child's and parent's behavior. Indeed, our results were replicated with four different types of measures: observation of a child's behavior, a child's cortisol response, parental self-report of anxiety, and

### Table 3. Selected Behavioral and Physiological Anxiety Scores Among the Parents of Study Subjects

<table>
<thead>
<tr>
<th>Type of Assessment</th>
<th>Preintervention</th>
<th>Postintervention</th>
<th>Holding area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-Report</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAIS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>47 ± 10.3</td>
<td>44 ± 14.2</td>
<td>52 ± 11.0</td>
</tr>
<tr>
<td>Group 2</td>
<td>43 ± 11.8</td>
<td>39 ± 10.0</td>
<td>49 ± 13.0</td>
</tr>
<tr>
<td>Group 3</td>
<td>42 ± 15.2</td>
<td>38 ± 11.3</td>
<td>44 ± 12.2*</td>
</tr>
<tr>
<td><strong>Physiological</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>134 (110-149)</td>
<td>143 (105-149)</td>
<td>140 (123-145)</td>
</tr>
<tr>
<td>Group 2</td>
<td>120 (95-147)</td>
<td>115 (109-129)</td>
<td>114 (109-123)</td>
</tr>
<tr>
<td>Group 3</td>
<td>113 (106-140)</td>
<td>123 (106-135)</td>
<td>119 (110-145)</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>83 (61-98)</td>
<td>81 (70-102)</td>
<td>90 (83-100)</td>
</tr>
<tr>
<td>Group 2</td>
<td>69 (51-89)</td>
<td>74 (68-82)</td>
<td>73 (70-80)</td>
</tr>
<tr>
<td>Group 3</td>
<td>76 (65-88)</td>
<td>72 (54-81)†</td>
<td>72 (68-81)†</td>
</tr>
</tbody>
</table>

Values are mean ± SD or median (range).

* P = 0.047.
† P = 0.003.
‡ P = 0.011

STAI = State-Trait Anxiety Scale, State Anxiety; SBP = systolic blood pressure; DBP = diastolic blood pressure.
Anxiety Modulation

The YPAS (14) is an observational measure of preoperative anxiety that was developed and validated in an investigation involving 58 children. The YPAS consists of 27 items in five categories of behavior indicating anxiety in young children (activity, emotional expressivity, state of arousal, vocalization, and use of parents). Using k statistics, all YPAS categories have been demonstrated to have good to excellent inter- and intraobserver reliability (0.73–0.91), and when validated against other global behavioral measures of anxiety, the YPAS had good validity (r = 0.64).

The STAI (11) is a widely used self-report anxiety assessment instrument. More than 1000 studies using the STAI have been published in peer-reviewed literature. The questionnaire contains two separate 20-item, self-report rating scales for measuring trait and state anxiety. Parents responded on a four-point scale, total scores for situational and baseline questions separately range from 20 to 80, with higher scores denoting higher levels of anxiety. Test-retest correlations for the STAI are high (0.73–0.86).

The VAS (12) is widely used as both a self-report and observational measure of anxiety. For the purpose of this study, the VAS was used as an observational measure to rate the children. The VAS rating system consists of a 100-mm line that pictorially represents two behavioral extremes at either end of the continuum, i.e., “not anxious” and “extremely anxious.” Test-retest reliability of the VAS ranges from 0.61 to 0.73 when measured on adjacent days. Also, when used to measure anxiety, the VAS has good validity against a depression scale (r = 0.64–0.67).

The VPT (13) is a children’s (age 2–6 yr) self-report measure of anxiety that is used extensively in the dental literature. The instrument consists of eight picture sets, each depicting an anxious and a nonanxious child. Subjects are presented with pairs of pictures and asked to choose the child who most reflects how they feel. Internal consistency (a Kuder-Richardson) of the test is 0.838 (13), and test-retest is reported to be 93% in a sample of 64 children undergoing dental treatment (13).

Coping Style

The MBSS (15) is a standardized tool developed for patients undergoing medical procedures and identifies information seeking (high monitor)/information avoiders (low monitors) and distracters (high blunters)/nondistracters (low blunters). The MBSS assesses coping style through four scenarios of stressful situations (i.e., you are on an airplane that is experiencing severe turbulence). A list of eight possible reactions to the situation is presented, and participants are asked to check each behavior in which they would engage in that situation.
(i.e., look for exits or watch the in-flight movie). This measure has excellent reliability and validity.

CC (16) is an instrument used to obtain children's ratings of the value of different strategies for coping with fear in a hypothetical situation. That is, children are told the story of John/Jill, who is anxious because he/she must have a tooth pulled at the dentist. The children are next given different behaviors (i.e., think about something else, run away, talk to mom) in which John/Jill engages and are asked to indicate whether the behavior is a good or bad thing to do in this situation. This measure has good reliability and validity.

**Postoperative Behavior**

The PHBQ (17,18) is a self-report questionnaire for parents that is widely used in the literature and is designed to evaluate maladaptive behavioral responses and developmental regression in children after surgery. The PHBQ consists of 27 items frequently cited in the literature as common behavioral responses of children after surgery. Six categories of anxiety are incorporated in this instrument, including general anxiety, separation anxiety, sleep anxiety, eating disturbances, aggression against authority, and apathy/withdrawal. For each item, parents rated the extent to which each behavior changed in frequency compared with before surgery. This instrument shows acceptable test-retest reliability, good agreement with psychiatric interviews with parents, and predicts changes as a function of preoperative interventions.

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**References**