INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.
The effect of a maternal voice audiotape on parasympathetic tone and behavior of hospitalized preschool children

Schaffner, Barbara Hoyer, Ph.D.

The Ohio State University, 1992

Copyright ©1992 by Schaffner, Barbara Hoyer. All rights reserved.
THE EFFECT OF A MATERNAL VOICE AUDIOTAPE ON
PARASYMPATHETIC TONE AND BEHAVIOR OF
HOSPITALIZED PRESCHOOL CHILDREN

DISSERTATION
Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

by

Barbara Hoyer Schaffner, B.S., M.S.

* * * * *

The Ohio State University
1992

Dissertation Committee:
Edna Menke
Bonnie Garvin
Barbara Smith

Approved by:
Edna Menke
Advisor
College of Nursing
DEDICATION

I dedicate this work to my family. First to my husband, Scott, whose loving support made all this possible. Also to my sons, Kevin and Christopher, who had to give up many hours allowing mom to study and whose question "have you graduated yet?" kept me moving toward that day.

This work is also dedicated to my mentor, Dr. Edna Menke, who has encouraged (pushed and pulled at times) me throughout my studies. Her confidence and support were unfaltering.
ACKNOWLEDGEMENTS

I would first like to acknowledge my dissertation committee: Edna Menke, Ph.D., R.N., Bonnie Garvin, Ph.D., R.N., and Barbara Smith, Ph.D., R.N. I also would like to acknowledge the following individuals whose select areas of expertise made this project possible: Richard Cartabuke, M.D. (Anesthesiologist), Thomas Knapp, Ed.D. (statistics), Deborah Campbell, R.N., B.S. (Head Nurse, Post-Anesthesia Care Unit), and the Post-Anesthesia Care Unit nursing staff. Special thanks goes to Otterbein College’s Faculty Summer Research Grants for providing financial support to conduct this project.

To the mothers who participated in the study, I express my sincerest appreciation. Their willingness to cooperate in my efforts to create audiotapes and interest in enhancing their child’s hospital experience made this study possible. Finally, to the children who participated in this study, your genuineness and totally honest responses to life’s experiences allowed this project to be and has enhanced the understanding of young children’s responses to hospitalization.

iii
VITA

January 30, 1956  Born - Barbara Ann Hoyer
Grosse Pointe, Michigan

1977  B.S.N., Nursing
University of Cincinnati
Cincinnati, Ohio

1977-1978  Staff Nurse, ICU Step down
Reid Memorial Hospital
Richmond, Indiana

1978-1979  Assistant Head Nurse, Pediatrics
Reid Memorial Hospital
Richmond, Indiana

1979-1981  Staff Nurse, Adult Medical
University Hospital
Indianapolis, Indiana

1981  M.S., Nursing
Indiana University
Indianapolis, Indiana

1981-1985  Instructor
College of Nursing
The Ohio State University
Columbus, Ohio

1981-1990  Staff Nurse, Float Pool
Children's Hospital
Columbus, Ohio

1985-present  Assistant Professor
Department of Nursing
Otterbein College
Westerville, Ohio
PUBLICATIONS


FIELDS OF STUDY

MAJOR FIELD: Nursing
   Advisors: Dr. Edna Menke
             Dr. Mary MacVicar
             Dr. Nancy Ryan-Wenger

MINOR FIELD: Family Relations
   Advisors: Dr. Geoffrey Leigh
TABLE OF CONTENTS

Dedication ................................................ii
Acknowledgements ....................................... iii
Vita ...................................................... iv
List of Tables ..........................................viii

CHAPTER

I. INTRODUCTION .........................................1
   Research question .................................. 6
   Hypotheses ........................................... 6
   Definition of Terms ................................ 6

II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK ...... 8
   Introduction ...................................... 8
   Psychological upset ................................ 8
   Age and psychological upset ...................... 16
   Separation .......................................... 17
   Physiologic measures ................................ 25
   Theoretical framework .............................. 29

III. METHOD ..............................................35
   Research design .................................... 35
   Population and subject selection .................. 36
   Procedure ........................................... 40
   Instruments ......................................... 42
   Data Analysis Plans ................................ 46

IV. DATA ANALYSIS AND RESULTS ...........................48
   Description of the sample ......................... 48
   Data analysis for the research questions ........... 58
   Discussion of the findings ......................... 68

V. SUMMARY .............................................74
   Limitations of the study ......................... 75
   Implications for research .......................... 76
APPENDICES ............................................... 81
A. Human Subjects’ Committee Approvals .............. 81
B. Telephone Recruitment Script .................... 84
C. Consent Form ........................................ 87
D. Background Information Form ...................... 92
E. Post-Anesthesia Care Unit Record .................. 94
F. Data Sheet ........................................... 96
G. Sleep Onset Latency Behavior Catalogue ........... 98
H. Sleep Onset Latency Behavior Catalogue and
   Definitions - Phase III ............................ 100
I. Regression Coefficients for Heart Rate Variability
   and Differences in Slope by Subjects ............ 102

BIBLIOGRAPHY .............................................. 106
LIST OF TABLES

Table | Page
---|---
1. Demographic Characteristics of the Sample | 50
2. Mean and Standard Deviations for Age, Height and Weight of the Sample | 51
3. One-way ANOVA for Age by Group | 51
4. One-way ANOVA for Height by Group | 52
5. One-way ANOVA for Weight by Group | 52
6. Mean Vital Signs on Admission and 15 Minutes Post Admission by Group | 54
7. One-way ANOVA for Admission Systolic Blood Pressure by Group | 54
8. One-way ANOVA for 15 Minute Post Admission Systolic Blood Pressure by Group | 55
9. One-way ANOVA for Admission Diastolic Blood Pressure by Group | 56
10. One-way ANOVA for 15 Minute Post Admission Diastolic Blood Pressure by Group | 56
11. One-way ANOVA for Admission Apical Pulse by Group | 57
12. One-way ANOVA for 15 Minute Post Admission Apical Pulse by Group | 57
13. One-way ANOVA for Admission Respiratory Rate by Group | 58
14. One-way ANOVA for 15 Minute Post Admission Respiratory Rate by Group | 58
15. Frequency of Distress Scores by Group | 60
16. Frequency for Specific Distress Scores Between Group | 63
17. Frequency of Distress Scores for the Most Distressed Children by Group | 63
18. Demographic Characteristics of Children Displaying
the Most Distressed Behavior ......................64

19. One-way ANOVA for Baseline 5 Minutes Heart Rate
Variability by Group ..................................66

20. One-way ANOVA for 10 Minute Heart Rate Variability
by Group ............................................67

21. One-way ANOVA for Differences in Slopes for Heart
Rate Variability from First 5 Minutes to Second 10
Minutes by Group ....................................67

22. One-way ANOVA for Differences in Slopes for Heart
Rate Variability from First 5 Minutes to Second 10
Minutes for Subjects with the Most Distressed
Behaviors .............................................68

23. Regression Coefficients for Heart Rate Variability
and Difference in Slope by Subjects ...............102
Chapter I

INTRODUCTION

Life situations that are labelled "difficult" occur to almost all children and adults. Even though such situations may be impossible to circumvent, these difficult times may be looked upon as opportunities for growth. The challenge is to provide an environment that encourages individuals to transcend the crisis period with recovery, growth and further differentiation (Erikson, 1968). One example of a difficult life situation for children is hospitalization.

It is generally accepted that hospitalization is a stressful time for children (Robertson, 1970; Klinzing & Klinzing, 1977; Thompson, 1985; McClowry, 1988).

When a child is hospitalized, he is removed from his home, family and friends and placed in an unfamiliar environment populated by strangers. . . Limitations are placed on his movement, and he is afforded very few choices. His privacy is invaded. . . His sleeping and waking times are probably not the same. . . He must sleep in a strange bed. . . His diet is different. . . Familiar toys and play things are probably not available to him. (Klinzing & Klinzing, 1977, p.3)

It has been noted that younger children frequently respond to hospitalization by becoming fearful, clinging, whiny and
overly dependent. Older children can react to hospitalization and hospital procedures by sobbing, crying, screaming, throwing temper tantrums, struggling against treatment, refusing to take medications and becoming violent and disruptive (Gellert, 1958; Chapman, Loeb & Gibbons, 1956; Thompson, 1985). Frequently children's behavior is seen to regress back to previously completed developmental stages (Stacey, 1979; Klinzing & Klinzing, 1977; Thompson, 1985; Whaley & Wong, 1991).

For nearly half a century a number of disciplines, including psychology, child development, medicine, sociology, and nursing, have studied children's psychosocial responses to hospitalization. While the behaviors that children may exhibit while hospitalized are well documented, how and why children's psychosocial responses differ is not well known. How the hospital environment influences children's behavior is even less well understood (McClowry, 1988). It has been suggested that future studies about hospitalization need to address the aspects of the hospital experience that are disruptive to children and caregiving that can promote recovery and growth of hospitalized children (Barnard, 1983).

The domain of nursing has been defined by the American Nurses' Association (1980, p.9) as "the diagnosis and treatment of human responses to actual and potential health problems". Human responses that have been identified as the focus for nursing interventions include emotional problems
related to illness and treatment and strains related to life processes such as growth and development (American Nurses' Association, 1980). Nurses need to identify individual responses to health problems and to provide care that will promote the well being of the people served. The effects of hospitalization and the treatment of a health problem are responses within the domain of professional nursing. Children provide a unique situation for nursing as children are rapidly developing and are experiencing the strains related to such ongoing life processes. When a child is hospitalized an additional stress is added to the child’s daily experiences. Nurses must work with the child towards dealing effectively with both the strains of normal growth and development and the problems that arise related to the illness and hospitalization.

In caring for a child who is hospitalized nurses address concerns that are relevant to that individual child. Age of the child has been found to influence the way the child adapts to all life experiences, including hospitalization as well as particular therapeutic nursing interventions. Therefore, when caring for a child, nurses must use interventions that are age appropriate to facilitate the highest level of wellness for the child (Stacey, 1979; Klinzing & Klinzing, 1977; Thompson, 1985; Whaley & Wong, 1989).

The literature identifies that children from late infancy through the preschool years are particularly influenced by
separation from their attachment figure, usually a parent, as this is the period of development when they are learning whom they can depend on to meet their needs (Flethcher, 1981; Barnard, 1983; Thompson, 1985). Separation from the attachment figure, in this age group, results in a phenomenon identified by Robertson (1958) as "settling-in", more commonly known as separation anxiety. The children predictably experience three stages of reaction to the attachment figures' absence: protest, despair and denial. Nursing textbooks have commonly included the stages of separation anxiety as essential knowledge for pediatric nurses so that nurses can understand the child's behavior. All such textbooks implore the nurse to intervene to assist the child during periods of separation but little advice is given on what such interventions might be (Whaley & Wong, 1991; Foster, Hunsberger & Anderson, 1989).

Nursing of children textbooks identify interventions such as staying with the child as much as possible and assigning consistent staff members to care for the child as appropriate Foster, et al, 1989; Whaley & Wong, 1991). The use of primary nursing on many pediatric units has helped to maintain some consistency of caretakers for children hospitalized over a period of time. But more and more children are being treated on an outpatient basis or are involved with same day procedures and/or surgery. It is not possible to establish a consistent caretaker that would provide an alternate
attachment figure in a such short period of time (Barnard, 1983; Whaley & Wong, 1991).

Regardless of the limitations placed on nurses, due to shortages of personnel or a short period of time for interaction with the children, interventions to help the young child deal with responses to hospitalization are necessary. During most hospitalizations there are times when the child’s attachment figure may or can not be with the child. An intervention that could be used in the absence of the child’s attachment figure would be beneficial to the child in dealing with the hospitalization and to the nurse in effectively caring for the child.

This study contributes to the body of knowledge about the effect of interventions aimed at reducing the negative impact of hospitalization on young children. Specifically, the research is designed to identify the effects of one intervention, a maternal voice audiotape, on preschool children during times of separation from the mother. Identifying the effects of one such intervention can provide data to nurses who work with children who must be separated from their attachment figure, even if only for short periods of time. The ability to identify beneficial effects from such an intervention would benefit the child, the family and the nurse.
RESEARCH QUESTION

What are the effects of a maternal voice audiotape on a three to five year old children experiencing short stay surgery?

HYPOTHESES

1. There will be a decrease in distress behaviors of 3-5 year old children hearing an audiotape recorded by the mother when compared with children hearing an audiotape recorded by an unknown adult female or not hearing an audiotape during recovery from short stay surgery.

2. There will be an increase in parasympathetic tone of 3-5 year old children, during recovery from short stay surgery, hearing an audiotape recorded by their mother when compared to children hearing an audiotape recorded by an unknown female or not hearing an audiotape.

DEFINITION OF TERMS

Short stay surgery -- surgery that is scheduled to be completed in one 24 hour period. This includes admission, the surgical procedure of having tubes inserted in the child’s ears, recovery and discharge to the child’s home.
Recovery from short stay surgery -- the time the child spends in the Post Anesthesia Care Unit (PACU) after the surgical procedure, a minimum of thirty minutes.

Distress behaviors -- behaviors observed of the child as categorized by the Sleep Onset Latency Behavior Catalogue (SOL) (White, Wear, & Stephenson, 1983).

Parasympathetic tone -- the presence of respiratory sinus arrhythmia, measured by changes in the R to R interval during monitoring of the cardiac rhythm and the respiratory pattern (Fouad, Taraze, Ferrario, Gighaly, & Aricandri, 1984).

Mother -- the biological mother who currently resides in the same household as the child.

Child -- a preschool child (3.0 - 5.11 years of age).

Mother voice audiotape -- a 15 minute audiotape, recorded by the mother, thought to be soothing to the child by the mother.

Audiotape recorded by an unknown female -- a 15 minute recorded children's story, Little Lost Kitten (Lovett, 1962), recorded by a female who is unknown to the child.
Chapter II

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Introduction

During the last five decades research has been done regarding the effects of hospitalization on children. The primary focus of the research has been describing the upset, including emotional, behavioral and physiologic distress, experienced by the child (Thompson, 1985). A more recent emphasis has been placed on investigating the effectiveness of interventions aimed at tempering the psychological upset of children who are hospitalized. The literature review focuses on the effect of hospitalization and interventions aimed at helping children deal with hospitalization. In addition, the theoretical framework for the study is presented.

Psychological upset

Psychological upset is the term frequently used in the literature to describe the constellation of negative behaviors that children exhibit when hospitalized. The term psychological upset has been defined as a multidimensional phenomenon including behavioral, subjective and physiological components (Vernon, Foley, Sipowicz and Schulman, 1965).
Other constructs such as emotional distress, fear, anxiety have become subsumed under the general concept of psychological upset (Thompson, 1985). Even though the term psychological upset was first used by Vernon et al. (1965), the original idea that hospitalization may be detrimental to a child's development was set forth by classic studies completed in the 1940's and 1950's (McClowry, 1988).

Early studies found that hospitalization and separation were disruptive to the development of children and the detrimental effects lasted over a period of months. Spitz (1945) studied 130 infants living in two institutions with thirty-four children raised at home by their parents. The two institutions included one called the "nursery" and one the "fondling home". Both institutions had a full time staff that helped care for the infants but in the nursery group the staff took more of a teaching and supervising role as the primary responsibility for caring for the infant remained with the mother. Maternal care in the fondling home was limited to breast-feeding the infants for the first two to three months. The nursery also provided the infants with more sensory stimulation in the form of visual stimuli and after six months of age other babies with whom to play.

Spitz found developmental differences between the two institutionalized groups as early as seven months with the Nursery infants more developmentally advanced. By the age of one year the nursery population averaged a development
quotient of 105 where as the foundling home quotient was 72, even though the fondling home infants had a higher beginning average. Comparisons of the infants at age two and three years revealed that the nursery children were healthier and more developed than the children from the fondling home. When compared with infants raised by parents at home both the fondling home and nursery infants had lower developmental quotients, but the nursery children had only slightly lower developmental scores.

Spitz attributed the differences to the amount of maternal care and involvement raised by parent children and Nursery children experienced compared to the lack of mothering experienced by the Fondling Home children. Although Spitz’s study was with children living in long-term institutions, the study led to the premise that if institutionalization is detrimental to the emotional health of children shorter disruptions of the mother-child bond might also be damaging.

Another early study examined the effects of hospitalization after discharge (Prugh, Staub, Sands, Kirschbaum and Lenehan 1953). The sample consisted of 50 children, aged 2 to 12 years, who were hospitalized for a variety of illnesses, were followed for three months after discharge. Matched groups were assigned to a traditional group and to an experimental group. The experimental group had frequent parental visits, earlier ambulation, and psychological preparation for hospitalization. A large
majority of the children, 92 percent of the control group and 68 percent of the experimental group, experienced persistent difficulties, such as enuresis, nightmares and behavioral regressions, at the time of discharge. A majority of the children (58 percent of the control group and 44 percent of the experimental group) still experienced these difficulties three months after discharge.

In the 1960's and 1970's researchers began exploring again the effects of hospitalization on children. O'Donnell (1976) compared thirty 5 to 11 year old pediatric patients' score on the Missouri Children's Picture Series administered on the day of admission and two days later while the child was still hospitalized. There was no significant difference in the overall scores but in eleven of the thirty subjects the test profiles demonstrated a change in a negative direction, while five of the thirty showed an improvement.

Astin (1977) compared the self-reported fears of twenty five hospitalized children with twenty five non-hospitalized children. The 10 to 12 year old subjects were asked to identify fears using a checklist of seventy one items. Even though the total number of fears did not differ between the groups, the hospitalized children expressed more fears about home. The fears expressed by the hospitalized children were also reported as being more intense than the non-hospitalized group.
Thirty children, aged 6 to 12 years, admitted for orthopedic surgery were compared with thirty subjects never hospitalized (Irwin & Kovacs, 1979). Projective techniques were used to assess the children's responses prior to and three to five days after surgery. Initially there were few differences between the groups, however, following surgery the hospitalized children were found to have lower self-esteem, higher dependency, and greater castration concerns than the non-hospitalized group.

Rieveschl (1979) examined the possible effects of short-term hospitalization on the cognitive development of forty 5 to 9 year old children. The children were assessed for spatial and affective perspective-taking skills before hospitalization, during the hospitalization, and after hospitalization. The hospitalized children (N=20) demonstrated a greater regression and disorganization of spatial perspective-taking skills while hospitalized and after their hospitalization than did their non-hospitalized counterparts.

Sipowicz & Vernon (1965) compared twenty four sets of preschool twins after one had been hospitalized. After one week at home the researchers found no significant differences in the behavioral changes that had occurred in the twins; however, the hospitalized twin was rated as the more upset of the two. The authors acknowledged that they had not
considered the stress the twin at home might have experienced during the absence of the sibling and the mother.

In a longitudinal study, thirty-six 4 year old children admitted for tonsillectomy and their mothers were observed and interviewed (Dearden 1970). Two weeks following surgery four/fifths of the children demonstrated an increase in disturbance. At the final interaction, six months after discharge, ten children were more upset than at the initial interview. Nineteen of the children showed a transitory disturbance after discharge but their behavior had returned to pre-hospital levels within six months.

Riffee (1981) used a self-report measure to compare post-hospital responses of hospitalized children with non-hospitalized children. Twenty-six surgical patients completed a self-esteem inventory on admission and thirty days later. Twenty-five non-surgical patients completed the inventory on admission and thirty days later. Twenty-eight non-hospitalized children completed the inventory twice, with a thirty day intervening period. The surgical group exhibited the greatest decline in self-esteem, the non-surgical group differed only on the school subscale of the self-esteem inventory when compared with the non-hospitalized group.

Vernon, Schulman and Foley (1966) developed the Posthospital Behavioral Questionnaire, (PHBQ), to measure the degree of psychological upset caused by hospitalization. The PHBQ consists of twenty-seven questions completed by the
parents who are asked to compare their child's pre and post hospital behaviors. Surveying 387 parents of children, 1 month to 16 years who had experienced hospitalization for a variety of conditions, Vernon et al. concluded that "the combination of illness and hospitalization is a psychologically upsetting experience for children in general, resulting in increased separation anxiety, increased sleep anxiety, and increased aggression toward authority" (p.593). Even though the majority of the children did demonstrate upset, 25 percent of the children were found to have improved in the post-hospital period.

Several other researchers found that the children's behavior improved in the post-hospital period. Sides (1977) had the parents of 190 children, 5 weeks to 16 years old hospitalized for various conditions, complete the PHBQ. Sixty-three percent were found to have a behavioral upset apparent up to two weeks after discharge. Twelve percent of the children demonstrated behavior improvement during the post-hospital time.

Douglas (1975) found similar results as 68 percent of the hospitalized preschoolers in his study had no reported negative behavioral changes. Douglas hypothesized that the recent changes made in hospital environments, especially increased parental participation may account for such a high percentage of children not demonstrating upset.
In conclusion, the research literature shows that hospitalization results in at least a brief change in a child's behavior. Data indicate that hospitalization may alter a child's behavior, perception of fear, self-esteem, level of dependency and cognitive abilities (O'Donnell, 1976; Astin, 1977; Irwin & Kovacs, 1979; Rieveschl, 1979; Sipowicz & Vernon, 1965; Riffee, 1981). However, there are conflicting data that psychological upset occurs in hospitalized children when compared with non-hospitalized children (Rieveschl, 1979; Sipowicz & Vernon, 1965; Astin, 1977; Irwin & Kovacs, 1979). One reason for the differences in the findings may be the inability to examine hospitalized and nonhospitalized children under comparable circumstances, as there is no naturally occurring event during which the non-hospitalized children can be observed (Thompson, 1985). Limitations of the research include that many different variables were measured as outcomes of hospitalization. The lack of consistency in dependent variables makes comparisons between studies difficult. All measurements were mother's self-reports of behavior retrospectively. Data of the children's actual behavior while hospitalized were not collected.

The literature also shows that some children actually benefitted psychologically from hospitalization (Vernon & Schulmen, 1965; Douglas, 1975). A methodological problem in determining psychological benefit may be that the most commonly used tool to identify post-hospital upset, the PHBQ,
does not include questions that would indicate psychological maturation (McClowry, 1988). Thompson (1985) reported that twenty-four studies since 1965 used the PHBQ exclusively to identify the child’s behavioral reaction to hospitalization.

An alternative explanation, offered by Anna Freud (1952), is that some children are matured by hospitalization. She viewed the symptoms of psychological upset not as signals of trouble but as positive signs that the child was using adaptive ways of responding to potentially stressful situations. Viewed from this perspective, psychological upset is not an outcome but a means of working through the stressful experience incurred by hospitalization (McClowry, 1988). The common acknowledgement remains that hospitalization is a stressful time for children and that they should be assisted to successfully cope with the experience.

**Age and psychological upset**

Age has been consistently reported as an individual attribute that influences a child’s response to hospitalization. Vernon et al. (1965) and Thompson (1985), in their reviews of the literature concerning responses of children to hospitalization, contend that a curvilinear pattern exists. Children seem to be least affected during the school-age years and most affected from six months of age through the preschool years.
Vernon et al. (1966) found that children 6 months to 4 years exhibited more behavioral disturbances one week after hospitalization. Vernon and Schulman (1965) examined the PHBQ scores of 295 hospitalized children, ages newborn to 9 years. The results showed that preschool children had a strong reaction, both positively and negatively, to hospitalization. When compared with older children, preschool children became more upset and had a higher incidence of psychological benefit in response to hospitalization. Similarly, Simon, Bradshaw and Silva (1980), found that deteriorated behavior was most common between the ages of 13 and 36 months whereas improved behavior was most common in the 37 - 60 month age range.

**Separation**

Separation from parents is a major contributing factor to the immediate and post-hospital upset of preschool children (Vernon et al, 1965; Thompson, 1985). Robertson (1952), one of the most influential persons in making change in the psychosocial care of hospitalized children, has stated that children who are separated from their maternal figure suffer from "separation anxiety". Separation of the child from the mother caused emotional harm to the child and probably also to the mother. If separation does represent a threat to children in the hospital then efforts to minimize separation should reduce hospitalized children's psychological upset (Thompson, 1985).
Many studies have shown that the presence of the mother during hospitalization has a positive effect on the behavior of children. Brain and Maclay (1968) selected 197 mothers, whose preschool children were scheduled for tonsillectomy and/or adenoidectomy surgery, who had expressed willingness to accompany their children to the hospital. Mothers were randomly assigned to the rooming-in (N=101) or not-rooming-in (N=96) group. The children's behaviors were observed and rated by the unit's personnel and by an anesthiologist. Significantly more of the children in the rooming-in group demonstrated a more favorable adjustment with 76 percent considered to have "satisfactory" adjusted versus 43 percent of the children in the non-rooming-in group. Interviews with mothers two weeks to four months after discharge demonstrated that significantly fewer children whose mother had roomed-in were classified as disturbed (with a new behavioral disorder/trait observed) and the duration of a disturbance was significantly shorter. Post-hospital physical recovery was also affected with complications such as hemorrhage or infection at the wound site significantly more common in the non-rooming-in group (23 percent) than the rooming-in group (11 percent).

Courture (1976) examined hospitalized children's behaviors in relation to the visitation patterns of the parents. The visitation patterns of thirty-one parents of three to six year old children were labelled as rooming-in
(stayed overnight), unlimited visitation (greater than eight hours per day) and limited visitation (less than eight hours per day). No differences were found in the behavior of the children in the three groups while hospitalized; however, one month after discharge the rooming-in group had an improvement in adjustment scores above prehospital rating levels.

Fagin (1966, 1969) interviewed 60 mothers about their children's behavioral patterns on admission to the hospital and two times after discharge. The children of non-rooming-in mothers demonstrated more posthospital disturbances in eating, sleep patterns, and bladder control. In addition, the children of rooming-in mothers showed significant increases in their maturity levels from the time of admission to after discharge.

McGillicuddy (1976) studied sixty mother-child dyads, hospitalized from two to ten days. The PHBQ was completed by the mothers two times, at the time of admission and one month after discharge. Results of the study demonstrate that the rooming-in children exhibited positive changes in behavior one month after discharge whereas the non-rooming-in children exhibited increased behavioral disturbances.

Other researchers have investigated the effects of substitute caregivers as a way of modifying the effects of separation. Branstetter (1969) observed thirty children aged 14 to 36 months. Each child was hospitalized in either the mother-present group, substitute-mother group (with a
caretaker assigned to the child who was present during the waking hours) or the mother-absent group. The behaviors demonstrated by the mother-present group were quite similar to the behaviors demonstrated by the substitute-mother group. The mother-absent group demonstrated more crying, aggression, and withdrawal. The children in the substitute-other group were observed to accept the surrogate rapidly, however, the substitute relationship did not supersede that with one's own parent.

In a similar study, Ziegler and King (1982) used a substitute visitation program with a foster grandparent visiting two hours per day. Sixty-eight children, aged 7 months to 6 years, were divided into an under visited group (less than 5 hours per week), parent-visitation group (at least 10 hours per week), and an experimental group (similar visitation of the under visited group plus the foster grandparent). The under visited group had lower scores on all five behavioral variables, vocalization, motor behavior, play, fear and environmental responsiveness, but the only significant difference between the under visited group and the parent visitation group was for the variable of play.

In contrast, Lehman (1975) examined the behavior of forty-eight subjects (3-5 years of age) half of the subjects were children whose mothers chose to room-in. The behavior of the child was assessed by both the nurse and the mother while in the hospital and by the mother again two weeks after
discharge. Lehman found that the children whose mother roomed-in displayed more aggressive behaviors while in the hospital. He concluded that this increase in aggression was a reflection of the child's increased sense of security due to the mother's presence. After discharge, using the PHBQ, he found a tendency toward fewer behavioral disturbances in the rooming-in children; however, there were no statistically significant differences between the groups.

Lee and Cereene (1969) found similar results. One hundred and forty-four children, ages one to eight years, hospitalized for elective surgery, were included in a study to examine behavior during anesthesia induction in relation to the type of parental contact prior to surgery. Results indicated that the child's emotional state, asleep, calm, or crying, was unrelated to the type of contact with parents the night before. It should be noted that parents were considered to have roomed-in if they spent the night or if they left the hospital at bedtime and returned the next morning, a deviation from the accepted definition of "rooming-in". Crying behavior was noted to be more in the children from the rooming-in group and in the younger children. But more parents roomed-in with the younger children, so the increased crying may be a reflection of age and not necessarily type of parental contact.

One other intervention that has been tested as having a mediating effect on separation during hospitalization is
parent voice recordings. Hennessey (1976) investigated the response of ten children, 17-30 months, to brief separation from the mother. Audio recordings of the mother’s voice reading a story were played for each child daily for four days, for a total of twenty-eight sessions. Observations were made by the nurse during the tape recordings. All children indicated they recognized their mother’s voice and most remained attentive. At completion of fifteen of the twenty-eight tape recording sessions the child fell asleep or showed signs of drowsiness. Behaviors of pleasure occurred twice as often as behaviors of displeasure.

Dart (1980) studied children, 3 to 4 years of age, hospitalized for tonsillectomy and/or adenoidectomy surgery. The children were randomly assigned to one of three groups, a mother group, a stranger group or a control group. The children in the mother group saw a picture of their mother on a television screen and heard their mother’s voice. The stranger group saw a picture of an unfamiliar female and heard recordings of favorite children’s stories and rhymes by a strange female voice. The control group saw a picture of a landscape and heard classical music.

More positive behaviors such as play, curiosity, and positive affect were demonstrated by the mother group. Posthospital behavior ratings, using the PHBQ, showed the mother group with less regressive behaviors. No difference
between groups was found on the separation anxiety factor of the PHBQ.

McCain (1982) had the parents of fifteen, 4 to 8 year old, hospitalized children produce voice recordings to be played for the children twice per day when the parents were not present. Informal observations of the children indicated that all children listened intently to the recordings and most asked to hear the tape again. No child appeared visibly upset by the tapes. All parents were supportive of the idea and willingly produced the requested audiotapes. A majority of the parents reported that the children "enjoyed" listening to the tapes.

White, Wear, and Stephenson (1983) compared hospitalized children hearing a taped recording of their mother reading a bedtime story with children who did not receive a story (N=18). The children, 3 to 8 years old, were observed while falling asleep and their behavior recorded using the Sleep Onset Latency Behavior Catalog (SOL). Even though the no-story group tended to take longer to fall asleep and demonstrated more distress behaviors there were no statistically significant differences between groups.

In a similar study with a larger sample (N = 94), White, Williams, Alexander, Powell-Cope, and Conlon (1990) investigated the sleep onset latency and distress behaviors in 3 to 8 year old children hospitalized for at least two consecutive nights. The children were divided into four
groups. The parents were not present with three of the groups, those who listened to a parent-recorded story, a stranger-recorded story and those who did not listen to a story. Group four had the parents present at bedtime. The parent-recorded story group had a significantly longer sleep onset latency and had higher incidence of distress behaviors. It was also noted that the parent present group had a significantly longer sleep onset latency than the no-story group. These results contrast with results of the White et al. (1983) study and may be attributable to the larger sample size. White et al (1990) hypothesized that the increased distress in the parent-recorded story group may have "resulted from psychological discomfort generated by remembrances of home" (p.138).

The recent literature on separation does indicate that having the parent present during hospitalization does decrease psychological upset, especially upset that is demonstrated in behavior one week to four months after discharge (Brain & Maclay, 1968; Courtture, 1976; Fagin, 1966, 1969; McGillicuddy, 1976). The research regarding the effect of parental presence on the inpatient behavior of the child is more mixed, however, none of the researchers indicated that parental presence had a negative effect. Most authors have agreed with Freud (1952) in hypothesizing that the demonstration of behaviors labelled as distressful in the presence of the
parent might actually indicate an increased level of comfort by the child in expressing himself.

Considering the consistent evidence that parental presence does ease the effects of separation from hospitalization interventions to enhance parent/child contact are needed. As McClowry (1988) stated, efforts need to be made to "reduce the disparity between the child's regular life at home and treatment in the hospital" (p.308). A few studies have examined interventions such as substitute caregivers and parental tape recordings but the findings have been contradicting. Research is needed to determine what interventions may be effective in assisting a child to deal with separation related to hospitalization.

Physiologic measures

The research on the psychological upset of hospitalization and effects of separation during hospitalization have predominantly recorded behavioral observations of the child or subjective reporting measures completed by parents or trained staff. Considerably fewer studies have used measures of physiologic response. The most frequently used physiologic measure has been the child's heart rate, presumably affected by one's emotional state (Thompson, 1985).

Wolfer and Visintainer (1975) examined the effect of multiple interventions prior to hospitalization and hospital
procedures (N=80). The researchers included the measure of heart rate as an indication of physiologic arousal that would accompany fear, anxiety or emotional distress. The authors theorized that an increase in fear, anxiety or emotional distress would be positively associated with an increase in heart rate. In analyzing the effect of an intramuscular injection on the heart rate of both the experimental and control groups, they concluded that the experimental group had significantly lower heart rates before and after the injection. The experimental group also had lower posthospital adjustment scores, lower mean upset ratings and higher mean cooperation ratings. The use of the physiologic measure of heart rate correlated well with other signs of decreased distress and anxiety in the experimental group.

Burling and Collipp (1969) also used heart rates to determine the effect of treatment received by children who are hospitalized. Their results indicated that the greatest elevations in pulse occurred during injection, otoscopy and rhinoscopy. The increased heart rate indicated increased psychological upset at those times.

In measuring heart rate the researchers are presuming that the subject's emotional state is dictating the observed change. Changes in heart rate can also be observed in response to hypoxia, elevated body temperature, electrolyte imbalance and/or endocrine factors such as hyperthyroidism (Jensen, 1980). A dilemma is to delineate the factors that
are actually influencing the heart rate. A physiologic measure more specific to psychological upset or stress would be helpful in determining the physiologic effects of hospitalization and the effectiveness of interventions aimed at helping children adapt to hospitalization.

The autonomic nervous system is divided into the sympathetic and parasympathetic nervous system and functions spontaneously, usually below the conscious level, to maintain homeostasis. The sympathetic and parasympathetic systems work in an exquisite balance in the normal body in response to the external and internal environment to maintain homeostasis. The generalized action of the sympathetic system is to prepare the body for the so-called "fight or flight" reaction. On the other hand, the parasympathetic system is primarily concerned with mechanisms responsible for maintaining resting bodily functions (Jensen, 1980). In identifying stress in hospitalized children or the adaptation of the child to hospitalization a measure of sympathetic tone, parasympathetic tone or both would be informative.

Respiratory sinus arrhythmia (RSA) has been identified as a noninvasive measure of parasympathetic tone. "RSA is a component of heart rate variability that is manifested as fluctuations in the sinus rhythm at the respiratory frequency" (McCabe, Younque, Forges & Acles, 1984, p. 149). RSA has been identified in the heart rate by spectral analysis in multiple studies (Chess, Tam & Calaresu, 1975; Harper, Walter, Leake,
Hoffman, Sieck, Sterman, Happenbrouwers & Hodgman, 1978; Mulder & Mulder, 1981). The efferent pathway of RSA is mediated by the vagus nerve which is influenced by the parasympathetic system. It has been proposed that information regarding vagal control, and therefore parasympathetic tone, can be obtained from the amplitude of the heart rate fluctuation due to respiration.

Katona and Jih (1978), working with seven anesthetized dogs, reported an average correlation of .97 between RSA amplitude and heart rate change following cryogenic block of the vagus nerve. Approximately 90 percent of the variance in RSA amplitude could be explained by parasympathetic influences.

McCabe et al. (1984) studied nine anesthetized rabbits during stimulation of the aortic depressor nerve and administration of Propanolol (Inderol) to block sympathetic influences. Results indicated strong evidence that RSA is particularly sensitive to vagal influences on the heart. Donchin, Caton and Porges (1984) also documented the presence of RSA in sheep and concluded that RSA may serve as an indicator of the integrity of the central nervous system.

Fouad, Tarazi, Ferrario, Fighaly and Alicandri (1984) replicated the study with dogs by Katona and Jih (1975) with thirteen adult humans. Variations in heart periods correlated significantly with parasympathetic control (r=.90, p<.001)
indicating that variations in heart period (also known as RSA) is an accurate index of parasympathetic activity.

The use of RSA as a measure of parasympathetic activity, specifically vagal tone, has been documented in the literature in both animals and humans. In hospitalized children, the hospital experience will have a physiologic effect on the child as well as influencing behavior. If a child is adapting in a positive manner to the hospital experience or responding positively to a particular intervention the child should demonstrate an increase in parasympathetic activity which would be measurable through RSA.

THEORETICAL FRAMEWORK

The theoretical framework for the study was attachment theory (Bowlby, 1969) and separation anxiety theory (Robertson, 1970). Attachment theory has been one of the most influential theoretical contributions to understanding, in the nursing profession, the effects of hospitalization on the child (Brown, 1979). Separation anxiety has also been used extensively by the nursing profession to understand a young child's behavioral response to hospitalization and in planning appropriate interventions to care for the children.

Attachment theory derives its basic concepts from the biological sciences. The theory, developed by Bowlby (1969), is based on the idea that behavior progresses from simple to
more complex patterns as the child grows older. One of these patterns is attachment behavior. Attachment behavior is defined as "any one form of juvenile behavior that results in proximity" (Bowlby, 1969, p. 182). Caretaking behavior is defined as "the behavior of parents that is reciprocal to the attachment behaviors of the juvenile" (Bowlby, 1969, p. 182). The goal of attachment behavior is maintaining a certain set of relationships between the child and mother which maximizes the probability of survival by the child. The nature of this relationship is to maintain a close bond between mother and child. Only those children displaying attachment behaviors are capable of surviving in their environment.

The nature of attachment changes as a child develops. Both the behaviors exhibited by the child and the conditions that elicit such behaviors change. From infancy to childhood the intensity of overt attachment behaviors such as crying, calling for mother, acute distress lessen and the child appears, at least superficially, to display a greater tolerance of the separation. Bowlby (1969) has suggested that while a child can effectively negotiate brief and limited separations, more prolonged disruptions can be deleterious to the child.

Attachment behavior is thought to be elicited by two events: a disruption of the close proximity of the child and mother and the perception of threat. The termination of attachment behaviors can be eliminated by a return of
proximity between mother and child. Such events as seeing, hearing, or touching the mother should alleviate the child's need for overt attachment behaviors (Bowlby, 1969).

Admission to the hospital can be seen as a threat to the child and, if the mother cannot be with the child, the hospitalization can and will interrupt the mother child proximity necessary to the young child. Therefore, hospitalization does put the child at risk for deleterious effects on behavior and future development.

The observation that young children are acutely distressed by hospitalization cannot be disputed. For children between the ages of 6 months and 4 years, separation from parents is thought to be the most upsetting (Foster, Hunsberger & Anderson, 1989). At this stage of development, attachment is "fiercely possessive, selfish, and intolerant of frustration" (Robertson, 1970, p. 8). Children do not understand why they must be separated from parents, nor does their developmental level provide them with adequate coping mechanisms to withstand separation.

Preschool children seem to be the most affected, both positively and negatively, to hospitalization (Vernon & Schulman, 1965; Vernon et al., 1966; Simon et al., 1980). Developmentally the preschooler is in the stage of initiative versus guilt (Erikson, 1963). The central task, or crisis, is for the child to develop a sense of initiative that outweighs any sense of guilt. The child uses his world to begin and
learn new tasks, try new activities and experiences. On the other hand, guilt may develop when things go wrong, when they are not happy with what they have done.

Preschoolers are in Piaget's cognitive stage of preoperational thought (Piaget & Inhelder, 1969). Characteristics of preoperational thought include egocentricism and transductive reasoning. A preschooler cannot take into account another's point of view. Trying to understand why certain hospital procedures are necessary when all the preschooler knows is that he does not want it, can be all but impossible. Transductive reasoning proceeds from particular to particular and assume cause and effect where one does not exist. An example of transductive reasoning is "I wished my brother dead and now he is hurt; it is my fault".

Hospitalization limits the ability of a child to use the world as the child sees fit. The child must abide by the rules of the institution and most of the child's initiative is thwarted by the new and strange environment. A preschooler also might develop a sense of guilt about the reason for hospitalization with ideas such as "I was bad, now I am here". Hospitalization seen through the developmental level of a preschooler is difficult. Developmental tasks that the child is striving for are temporarily out of reach as the child's "normal" world is exchanged for a strange environment.

Coping behaviors are limited in the preschool years. Emotional expression and regression are commonly used (Foster
Regression for preschoolers is to the crisis of trust versus mistrust (Erikson, 1963) where the development of a bond with another is of utmost importance. However, during hospitalization there is separation from significant others such as the parents. Not only do preschoolers have limited coping abilities to begin with but previously successful coping skills can be taken away through separation that frequently comes with hospitalization.

The behavior of young children when separated even for short periods from parents has been described by Robertson (1970) as the stages of "settling in". The sequential stages of protest, despair, and denial (detachment) have also become known as separation anxiety.

The first stage is labelled "protest" and can last from a few hours to a week or more. The child cries, shakes the bedrails, throws oneself about in evident rage, and engages in repeated visual and verbose searches for mother. The child usually proves intractable to the comforting attempts by nurses or other adults. The next state, "despair" is characterized by a reduction in physical movement, monotonous crying and withdrawal from social contact. The features of this stage have been likened to a state of mourning. The third stage, "denial", is often interpreted in the hospital setting as a sign of acceptance of the separation. This stage is usually marked by a cessation of the despair stage and an acceptance of attention, food and toys from others. The child
frequently appears happy, smiling and interacting willingly with available adults.

Caregivers of hospitalized children, frequently nurses, are taught to recognize the signs of separation anxiety but not to be put off by the protesting child or fooled by the child demonstrating denial. The underlying knowledge base is that the children are experiencing separation anxiety and need to be comforted and cared for to alleviate the effects of the separation. During times of separation of the child from the primary caregiver, usually the mother, a connection or link between child and mother can be beneficial. The effects of separation on young children have been shown to be manifested both physiologically and in the behavior of the child. An intervention, such as having the child listen to the mother’s voice on audiotape, may decrease the effects of separation on preschool children and may be noted in the behavior and physiological responses of the child.
Chapter III

METHOD

Research Design

An experimental pre-test post-test control group design was used (Campbell & Stanley, 1963). Both observation and a physiologic measure were used to obtain data for understanding the effect of a mother's voice audiotape on 3 to 5 year old children experiencing short stay surgery.

The independent variable was the mother's voice audiotape. There were three levels of the independent variable: 1) children hearing their mother's voice audiotape, 2) children hearing an audiotape recorded by an unknown female, and 3) children who did not hear any audiotape.

The dependent variables measured were parasympathetic tone and behaviors of the 3 to 5 year old children. Parasympathetic tone was measured using respiratory sinus arrhythmia (RSA). The child's behavior was measured using the Sleep Onset Latency Behavior Catalogue (White et al., 1983).

Prior to data collection, approval of the research proposal was obtained from The Ohio State University Biomedical Human Subject Review Committee and the Columbus
Population and Subject Selection

The target (universal) population was defined as all preschool children who experience separation from their mother during hospitalization. The specific population for this study was preschool children hospitalized for minor surgery who would experience a time of separation from their mother. The accessible population were three to five year old healthy children pre-registered for same day surgery for myringotomy tube insertion. The accessible population is representative of the target population as the children did experience a separation from their mother while hospitalized. This population was chosen primarily for three reasons: 1) the subjects were accessible to the investigator, 2) the number of children scheduled for myringotomy tube insertion was adequate for recruitment, and 3) the children were without other health problems that may have interfered with their anestheology course and/or recovery period.

Three groups of three to five year old children experiencing short stay surgery for insertion of myringotomy tubes were recruited for this study. One group listened to the mother’s ten minute audiotape while in the Post Anesthesia Care Unit (PACU) following short stay surgery. One group listened to a 10 minute children’s story, with a separation
theme, while in the PACU following short stay surgery. The third group served as the control group and did not hear any audiotapes while in the PACU following short stay surgery.

Potential subjects were selected from children scheduled for surgery for insertion of myringotomy tubes. The criteria used for subject selection were:

1. the child was between the age of 3.0 and 5.11 years.
2. The child lived with the biological mother.
3. The child was free of any serious physical or emotional problems.
4. The child experienced, on the day of data collection, uncomplicated elective surgery for insertion of myringotomy tubes.
5. The child recovered in the PACU directly after the surgical procedure.
6. The mother was willing to have her child participate in the study.

A sample was recruited from the planned admission children for short stay surgery, insertion of myringotomy tubes, at Columbus Children’s Hospital. Children having insertion of myringotomy tubes were chosen because these children would experience similar pharmacologic agents during surgery and the length of surgery would be short, between 7 - 15 minutes, requiring only minimal anesthesia. The anesthetic agent for all subjects was an inhalation of Fluothane (Halothane) which is a rapid acting anesthetic recommended for
use in general anesthesia. The recovery from Fluothane is also rapid (Barnard, 1987).

The parents were contacted by phone and the study was described (Appendix B). The children of parents who were interested in participating in the study were randomly assigned to one of the three groups. For those children assigned to the experimental group, mother's voice audiotape, a time was scheduled for the investigator to meet with the mother prior to the surgery date to create the audiotape for her child. The mothers were instructed to create a ten minute audiotape that they felt would be soothing to their child. The audiotape could have been reading a story, a original narration, a song sung by the mother or any combination. The tapes were recorded in the child's home or in an empty office or conference room. The audiotapes were made using a GPX AM/FM Stereo Recorder Cassette Recorder with graphic equalizer, model C836. The audiotapes were recorded on Sony UX90 High Bias (type II/Cr02) uniaxial cassette tapes. The investigator kept possession of the audiotape until its use in the PACU. If the mother wished to create the audiotape at a different time, the mother was instructed to bring the tape with her on the day of surgery. The mother was asked not to play the tape for the child prior to use on the day of surgery. No problems in the procedures for subject recruitment of data collection were identified.
The audiotape by an unknown female consisted of a ten minute recording of the Little Kitten (Lovett, 1962) which has a separation theme with a happy ending and has been found appropriate for preschool and schoolage children (White et al., 1983). The audiotape story was recorded by an female unknown to the subjects and the same audiotape was played for all the children in the unknown female voice group.

The audiotape was recorded in a sound proof booth in the Voice Disorders Lab in the Department of Otolaryngology at the Ohio State University on a dual head Magnavox cassette recorder with graphic equalizer. The audiotape was recorded on a Sony UX90 High Bias (type II/Cr02) uniaxial cassette tape. The audiotape was recorded by an adult female with no known speech impairments. The total number of words recorded in the Little Kitten story (Lovett, 1962) was 1516 in 586.9 seconds for a rate of speech of 154.98 words per minute which is within the norm of 135.1 - 219 words per minute for a nonstuttering female (Darley & Spriestersbach, 1978). The mean voice pitch was 218 Hz with a standard deviation of 58 Hz, considered within normal limits by Baker (1987). The female voice was determined to be free of perceptible vocal pathology or dysphonia as judged by a certified and licensed speech-language pathologist experienced in the assessment of voice disorders (Trudeau, 1991).

Procedures for ensuring anonymity and confidentiality were employed, all subjects were given a subject number and
all data were recorded using the subject number. Prior to data collection the mother's voice audiotape was collected from those in the experimental group. A signed informed consent was obtained from the parents the morning of surgery in the room on the Short Stay Surgery unit at Children's Hospital. No assent was obtained from the child subjects as their age is too young.

Procedure

On the day of the scheduled surgery the researcher met with the parents of the children on the Short Stay Surgery unit at Children's Hospital. Written informed consent was obtained at that time. The mother's voice audiotape was collected from the parents of the children in the experimental group if the tape was made by the mother independently. Each mother was assured that the tape would be played only for her child. The mother was asked to complete a brief demographic form (Appendix C).

When the child arrived in the PACU, following the surgical procedure, the child was admitted to the unit by the unit's nursing staff in the usual manner. Once the child was assessed by the PACU nurse as having reached level "1" in "neuro" on the Post Anesthesia Recovery Score according to the Post-Anesthesia Care Unit Record (Appendix D), the child was attached to the Case 15 (Marquette Corporation) Monitor, in
lead 2, for recording of the cardiac rhythm. No new skin electrodes were placed on the child’s skin as skin electrodes were already in place from surgery. The monitor was turned on and the cardiac rhythm was recorded for fifteen minutes on a IEC type II/High CrO2 cassette tape using a TEAC R-60 cassette data recorder. The Teac R-60 cassette data recorded does interface with the ECG monitor. At the same time, observation of the child by a nonparticipant observer began.

Observations of the child’s behavior were recorded according to the Sleep Onset Latency Behavior Catalogue (SOL) every thirty seconds. The nonparticipant observer sat unobtrusively at the foot of the child’s bed. The monitoring of heart rhythm along with the observations continued for fifteen minutes. The children in the mother’s voice audiotape group and the unknown female voice audiotape group had the appropriate audiotape turned on five minutes after the monitoring and observations began. The tape played for ten minutes. At all times during the audiotapes the child received routine PACU care from the assigned unit staff nurse. One child required additional nursing management, involving supplemental oxygen delivery. The audiotape was stopped and the staff nurse delivered care as needed. Data collection was not resumed on that subject and that subject’s data was not included in the study. The length of the intervention, a total of fifteen minutes, did not extend the length of recovery time in the PACU, as it is unit policy that all
children are recovered in the PACU a minimum of thirty minutes.

**Instruments**

Each parent completed a demographic information sheet created by the investigator (Appendix C). This form was used to collect background information on the children. The instrument consisted of seven fill in the blank questions. The responses were placed directly on the form by the parent. The instrument was designed to provide descriptive information about the sample including the child’s birthdate, gender, type of surgery, major health problems, family composition, previous hospitalization and previous experience of the child of hearing the mother’s voice on audiotape. Data obtained on the demographic form were transferred to a "Data Sheet" (Appendix E). Additional data regarding the child’s height, weight, PACU admission time, the time observations began, anesthetic agent received, other medications received, blood pressures, pulses and respiratory rates were also recorded on the "Data Sheet".

Observations of the child’s behavior were made by a nonparticipant observer and recorded according to the Sleep Onset Latency Behavior Catalogue (SOL) (White et al., 1983; White et al., 1990). Behavioral data were recorded on the "Sleep Onset Latency Behavior Catalogue" sheet (Appendix F).
The SOL has been divided into eight conceptual categories, distress, self-soothing, communication, pleasure, neutral, sleep, active, and inactive (Appendix G). The SOL was tested for content validity by experienced pediatric nurses based on their experiences with hospitalized children and their bedtime behaviors and found to be valid (White et al., 1983). The SOL is comprised of 54 behaviors expected by the child-subject when falling asleep and the interactive behaviors with the child-subject expected by hospital personnel, other adults in the patient environment and other child-patients. The 54 behaviors are mutually exclusive.

One behavior "ear rub" was added in the conceptual category of distress after consulting with two pediatric post-anesthesia care nurses concerning the typical behaviors seen post myringotomy tube insertion (Campbell, 1991). Ear rub was defined as ear rub with fingers, fist, or hand. The total number of behaviors observed using the SOL Catalogue was 55 behaviors, all mutually exclusive.

The observers, one a registered nurse and one a nursing student, were trained in the use of the behavior catalogue using the behavior description for the SOL (White et al., 1983) and training videotapes provided by Dr. M. White, University of Florida, primary author of the SOL. The training tapes consist of 5 to 45 minute simulations of a child falling asleep in the hospital. The training tapes were developed in a behavioral laboratory.
Interobserver agreement was established prior to actual data collection and intermittently during the data collection period (Topf, 1988). Observer agreement between the observers was determined after viewing the training tapes using Cohen's kappa (Fleiss, 1981). After the first training tape the kappa value was .42. A review and discussion of the descriptions for each behavior was conducted with both observers prior to viewing the second training tape. The kappa value was .82 after viewing the second training tape. A kappa value of greater than or equal to .75 is considered "excellent agreement beyond chance" (Fleiss, 1981, p.223).

Two subjects were recruited for the purpose of piloting the SOL measurement tool and the research procedures. Observations of the two pilot subjects demonstrated kappa values of .78 and .84 respectively. Interrater agreement was found to be low on three behaviors after the first subject: whimper (k = -.78), talk/help (k = .32), and talk/separation (k = .32). Further discussion of the behavior descriptions ensued prior to the second subject with positive results. Interrater agreement, after the second subject, demonstrated kappa values for whimper of .68, talk/help of .94 and talk/separation of .68. All other behaviors were found to fall above the .40 level, considered "fair agreement beyond chance" (Fleiss, 1981, p. 218).

Interrater agreement between the trained nonparticipant observers was tested on three occasions during the data...
collection period. Covert assessment was used to obtain the most accurate scores to analyze interrater agreement (Topf, 1988). Interrater agreement remained in the "excellent agreement" range, with kappa = .84, .92 and .94, throughout data collection. A review of the training tapes after the twenty fifth subject revealed continued excellent agreement between raters, kappa = .94. The lowest interrater agreement scores were found for the individual behaviors of "movement of extremities" (k = .66) and "eyes open" (k = .72). Both these values are acceptable and represent "fair to good agreement beyond chance" (Fleiss, 1981, p.218).

A measure of parasympathetic tone was evaluated noninvasively via computer analysis of heart rate variability (Fouad et al., 1984; Katona & Jih, 1975; Chess et al., 1975; Harper et al., 1978; Donchin et al., 1984). The child's cardiac rhythm, a single ECG lead with stable base line and well differentiated R wave was continuously recorded on a Case 15 (Marquette Corporation) Monitor in lead 2. The monitor was checked and approved by the maintenance department of the Children's Hospital before use.

The ECG rhythm was analyzed from the cassette tapes as described by Porges (1983) using patented computer routines (S.W. Porges, US Patent #4510,944). Artifacts in the ECG tracings were identified and mean heart period (R to R interval) calculated every thirty seconds by a Vagal Tone Monitor (VTM), version 1.15, Delta-Biometrics, Inc. The VTM
evaluated respiratory sinus arrhythmia in the frequency band of .24 to 1.04 Hz (approximately 15 to 60 cycles per minute) which has been successfully employed in the evaluation of respiratory sinus arrhythmia in young children (Delta-Biometrics, Inc., 1989). Thirty-second intervals of time were chosen for evaluation of heart rate variability to correspond with the thirty-second windows of data collection used with the SOL Catalogue.

Data Analysis

A codebook was developed for management of the data. Each behavior on the SOL Catalogue was specified within a data definition guide including the name of the behavior, the behavior label, the thirty-second interval of time represented and the number of columns needed for each observation. Parasympathetic tone data was specified for each thirty-second interval of heart rate variability and the number of columns needed for each observation. Demographic information was also specified within a data definition guide including the number of columns needed for the variable, the variable name, and the variable label. All data was entered into Word Perfect 5.1 data files on an IBM PC. Data analysis was conducted in SASS and Student Minitab.

Demographic data including gender, family type, previous hospitalization, and previous experience hearing their mother's voice on audiotape were analyzed by frequencies and
percentages for groups. Age, height, weight, and vital signs on admission and fifteen minutes after admission are numerical values and were analyzed using means, standard deviations and one-way analysis of variance (ANOVA). An alpha level of .05 was used as the criteria to ascertain if there were statistically significant group differences.

The three groups were compared on number of distress scores for the five minute baseline period and the ten minute baseline period. A chi-square analysis was used because of the categorical nature of the tool used to measure behavior.

A regression coefficient was calculated for each subject to identify a slope for heart rate variability by subject for the five minute baseline period and the ten minute intervention period. Slopes are most appropriately applied to randomized controlled trials when more than two observations per subject are collected to enhance the power of the analysis (Suter, Wilson, & Naqvi, 1991). The differences between the slopes were calculated for each subject. The change in slope from the five minute baseline period to the ten minute intervention period were analyzed using one-way ANOVA to determine differences by group.
Chapter IV

DATA ANALYSIS AND RESULTS

This chapter presents the data analysis and discussion in three sections. The first section describes the sample, the second addresses the research questions and the third section is a discussion of the findings.

DESCRIPTION OF THE SAMPLE

The sample consisted of 60 preschool children recovering in the PACU after myringotomy tube placement surgery. The 60 children were randomly assigned to three groups. Group 1 heard an audiotape recorded by their mother (N = 19), group 2 heard an audiotape recorded by an unknown female (N = 21), and group 3 heard no audiotape and served as the control group (N = 20).

To be considered as a subject, the child had to meet the following criteria:

1. was between the age of 3.0 years and 5.11 years,
2. lived with the biologic mother,
3. was free of any serious physical or emotional problems,
4. experienced uncomplicated elective surgery for insertion of myringotomy tubes, and
5. recovered in the PACU directly after surgery.

Data were collected over a nine month period, from June, 1991 to February, 1992.

Table 1 depicts demographic data of the sample. The majority of the sample was male; 74% of group 1, 76% of group 2 and 65% of group 3. Family type was predominantly children living with their biologic mother and biologic father (group 1 = 89%, group 2 = 81%, group 3 = 90%). Of the children in the mother's voice tape group 10% lived with their mother and extended family members. In group 2, the unknown female voice tape group, 5% lived with a single mother, 5% with their mother and stepdad, and 10% with their mother and extended family members. Of the children in group 3, the control group, 10% lived with a single mother.

Seventy-nine percent of group 1 had been previously hospitalized, having spent at least one night in the hospital. Previous hospitalizations included 57% of the children in group 2 and 74% of the children in group 3. A majority of the children had heard their mother's voice on audiotape, 79% of group 1, 57% of group 2, and 58% of group 3.

Table 2 summarizes the mean and standard deviation for age, height, and weight of the sample. The children in group 1 ranged in age from 33 to 72 months with a mean of 52 (SD = 13.67) months. Group 2 ranged in age from 30 to 74 months,
with a mean of 51 (SD = 13.75) months. The range in age for group 3 was 30 to 60 months, with a mean age of 47 (SD = 8.6) months. There was no statistical significant difference in age by group (F = 1.07, p = .348) as depicted in Table 3.

Table 1
Demographic Characteristics of the Sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1* (N=19)</th>
<th>Group 2** (N=21)</th>
<th>Group 3*** (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14</td>
<td>74</td>
<td>16</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>Family type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mom &amp; Dad</td>
<td>17</td>
<td>89</td>
<td>17</td>
</tr>
<tr>
<td>Single Mom</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mom &amp; Stepdad</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Hospitalized before</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>79</td>
<td>12</td>
</tr>
<tr>
<td>Heard mother's voice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
<td>79</td>
<td>12</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>21</td>
<td>9</td>
</tr>
</tbody>
</table>

* Heard mother's voice audiotape  
** Heard unknown female voice audiotape  
*** Heard no audiotape, control group
Table 2

Mean and Standard Deviation for Age, Height, and Weight of the Sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (N=19)</th>
<th>Group 2 (N=21)</th>
<th>Group 3 (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Age (months)</td>
<td>52</td>
<td>13.67</td>
<td>51</td>
</tr>
<tr>
<td>Height (inches)</td>
<td>42</td>
<td>4.09</td>
<td>42</td>
</tr>
<tr>
<td>Weight (lbs.)</td>
<td>20</td>
<td>28.3</td>
<td>18</td>
</tr>
</tbody>
</table>

Table 3

One-way ANOVA for Age by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>322.49</td>
<td>2</td>
<td>161.25</td>
<td>1.07</td>
<td>.348</td>
</tr>
<tr>
<td>Within group</td>
<td>8566.76</td>
<td>57</td>
<td>150.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8889.25</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 13.67
   group 2 = 13.75
   group 3 = 8.6

There was no differences in height between the three groups (F = 1.1, p = .339) as shown in Table 4. The mean height for group 1 was 42 (SD = 4.09) inches. Group 2 had a mean height of 42 (SD = 4.47) inches and group 3 had a mean height of 40 (SD = 4.5) inches.
Table 4

One-way ANOVA for Height by Group

<table>
<thead>
<tr>
<th>Source of variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>41.71</td>
<td>2</td>
<td>20.85</td>
<td>1.1</td>
<td>.339</td>
</tr>
<tr>
<td>Within group</td>
<td>1080.23</td>
<td>57</td>
<td>18.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1121.93</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 4.09
group 2 = 4.47
group 3 = 4.5

There was also no statistically significant difference in weight ($F = 1.18$, $p = .314$) by group as shown in Table 5. The mean weights for groups 1, 2 and 3 were 21 (SD = 5.9), 18 (SD = 5.4) and 17 (SD = 5.5) pounds respectively.

Table 5

One-way ANOVA for Weight by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>71.09</td>
<td>2</td>
<td>35.55</td>
<td>1.18</td>
<td>.314</td>
</tr>
<tr>
<td>Within group</td>
<td>1715.06</td>
<td>57</td>
<td>30.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1786.16</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 5.9
group 2 = 5.4
group 3 = 5.5

All of the subjects received the same anesthetic agent, Fluothane (Halothane) and none of the subjects received any medications preoperatively. One child in group 3, received
Sodium Pentathal for excessive agitation during the induction of anesthesia. No other medications were given to any of the subjects during the surgical procedure. None of the subjects were given additional medication in the PACU during the recovery period.

Table 6 summarizes the means and standard deviations for vital signs taken on each child in the PACU. An indirect blood pressure, taken either on a Dinamap monitor or palpated, apical pulse rate and respiratory rate were taken by the RN assigned to care for the child on admission to the PACU and fifteen minutes post admission. No child in the sample had a systolic blood pressure, diastolic blood pressure, apical heart rate, or respiratory rate recorded that was outside the norms for age (Whaley & Wong, 1991)

There was not a statistically significant difference by group in systolic blood pressure on admission ($F = .15$, $p = .859$) or fifteen minutes after admission ($F = 1.79$, $p = .178$) as depicted in Tables 7 and 8 respectively. Tables 9 and 10 demonstrate no statistically significant differences in the admission diastolic blood pressure ($F = 1.67$, $p = .20$) or diastolic blood pressure taken fifteen minutes later ($F = .04$, $p = .962$).
Table 6

Mean Vital Signs on Admission and 15 Minutes Post Admission by Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (N=19)</th>
<th>Group 2 (N=21)</th>
<th>Group 3 (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Admission systolic BP</td>
<td>94</td>
<td>12.3</td>
<td>96</td>
</tr>
<tr>
<td>Admission diastolic BP</td>
<td>40</td>
<td>14.7</td>
<td>45</td>
</tr>
<tr>
<td>15 minute systolic BP</td>
<td>107</td>
<td>16.9</td>
<td>105</td>
</tr>
<tr>
<td>15 minute diastolic BP</td>
<td>57</td>
<td>15.8</td>
<td>64</td>
</tr>
<tr>
<td>Admission apical pulse</td>
<td>106</td>
<td>21.4</td>
<td>108</td>
</tr>
<tr>
<td>15 minute apical pulse</td>
<td>108</td>
<td>24.3</td>
<td>111</td>
</tr>
<tr>
<td>Admission respirations</td>
<td>33</td>
<td>6.9</td>
<td>34</td>
</tr>
<tr>
<td>15 minute respirations</td>
<td>29</td>
<td>5.1</td>
<td>28</td>
</tr>
</tbody>
</table>

Table 7

One-way ANOVA for Admission Systolic Blood Pressure by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>50.11</td>
<td>2</td>
<td>25.06</td>
<td>.15</td>
<td>.859</td>
</tr>
<tr>
<td>Within group</td>
<td>9349.54</td>
<td>57</td>
<td>164.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9399.65</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD:  
group 1 = 12.3  
group 2 = 13.8  
group 3 = 12.1
Table 8
One-way ANOVA for 15 Minute Post Admission Systolic Blood Pressure by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>1344.49</td>
<td>2</td>
<td>672.25</td>
<td>1.79</td>
<td>.178</td>
</tr>
<tr>
<td>Within group</td>
<td>18057.86</td>
<td>57</td>
<td>376.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19402.35</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 16.9
group 2 = 11.2
group 3 = 14.8

The apical pulse rate showed no statistically significant difference between groups on admission ($F = .9, p = .413$) or fifteen minutes after admission ($F = 1.57, p = .217$) (Tables 11 and 12). Tables 13 and 14 present the one-way ANOVA results by group for admission and fifteen minute after admission respiratory rates. For admission respiratory rate the $F$ value = .05 ($p = .95$) and for fifteen minutes after admission, $F = .42 (p = .659)$, demonstrating no statistically significant differences by group.
## Table 9

One-way ANOVA for Admission Diastolic Blood Pressure by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>688.14</td>
<td>2</td>
<td>344.07</td>
<td>1.67</td>
<td>.20</td>
</tr>
<tr>
<td>Within group</td>
<td>6387.39</td>
<td>57</td>
<td>206.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7075.53</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 14.67  
group 2 = 14.6  
group 3 = 15.9

## Table 10

One-way ANOVA for 15 Minute Post Admission Diastolic Blood Pressure by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>32.31</td>
<td>2</td>
<td>16.15</td>
<td>.04</td>
<td>.961</td>
</tr>
<tr>
<td>Within group</td>
<td>12373.76</td>
<td>57</td>
<td>412.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12406.06</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 15.8  
group 2 = 17.9  
group 3 = 19.2
Table 11
One-way ANOVA for Admission Apical Pulse Rate by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>1107.03</td>
<td>2</td>
<td>553.51</td>
<td>.9</td>
<td>.413</td>
</tr>
<tr>
<td>Within group</td>
<td>34960.63</td>
<td>57</td>
<td>613.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>36067.65</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 21.4  
       group 2 = 23.5  
       group 3 = 18.5

Table 12
One-way ANOVA for 15 Minute Post Admission Apical Pulse Rate by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>1896.89</td>
<td>2</td>
<td>948.45</td>
<td>1.57</td>
<td>.217</td>
</tr>
<tr>
<td>Within group</td>
<td>33211.19</td>
<td>57</td>
<td>603.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>35108.09</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 24.3  
       group 2 = 19.5  
       group 3 = 23.2
Table 13
One-way ANOVA for Admission Respiratory Rate by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>5.77</td>
<td>2</td>
<td>2.88</td>
<td>.05</td>
<td>.95</td>
</tr>
<tr>
<td>Within group</td>
<td>3265.97</td>
<td>57</td>
<td>57.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3271.73</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 6.9
        group 2 = 6.9
        group 3 = 5.4

Table 14
One-way ANOVA for 15 Minute Post Admission Respiratory Rate by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>27.91</td>
<td>2</td>
<td>13.96</td>
<td>.42</td>
<td>.659</td>
</tr>
<tr>
<td>Within group</td>
<td>1791.14</td>
<td>57</td>
<td>33.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1819.05</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 5.1
        group 2 = 5.7
        group 3 = 6.5

DATA ANALYSIS FOR RESEARCH QUESTIONS

The data analysis is organized in regard to the two hypotheses. Strategies for data analysis are discussed with each research question. An alpha level of .05 was used for all hypotheses testing.
HYPOTHESIS 1:

There will be an increase in self-soothing behaviors of 3 to 5 year old children hearing an audiotape recorded by the mother when compared with children hearing an audiotape recorded by an unknown adult female or not hearing an audiotape during recovery from short stay surgery.

Distress scores from the Sleep Onset Latency Catalogue (SOL) (White et al., 1983) were examined to address this hypothesis. Distress scores included frequencies of the behaviors ear rub, pout, whimper, and scream exhibited by the children in the three groups. A chi-square analysis was performed on the frequencies of behaviors exhibited. The measures taken on each subject were independent of each other. In no way were the subjects related to each other and they had no contact with one another. In the chi-square analyses the expected frequencies were greater than 5, unless otherwise noted, indicating adequate sample size with df = 2 for chi-square analysis (Munro, Visintainer, & Page, 1986). The basis for the categories of data were the conceptual category of distress behaviors from the SOL (White et al., 1983). The groups were considered significantly different from one another if the alpha value was less than or equal to .05.

Table 15 reports the frequency of distress behaviors by group for the five minute baseline period and the ten minute period when the audiotapes were played for the children in groups 1 and 2. For group 3, when no audiotape was played, the ten minute period of data collection directly followed the five minute baseline period. The frequencies of behaviors
reported indicate the number of times all the children in a group demonstrated a distress behavior of ear rub, pout, whimper or scream in the five or ten minute period of time. Each child had his/her behavior recorded every thirty seconds, therefore, for the five minute baseline period there were ten times each behavior was recorded as occurring or not occurring per child; there were twenty times each behavior was recorded as occurring or not occurring during the ten minute intervention period. The frequencies are cumulative over the five or ten minute periods for all children.

Table 15

Frequency of Distress Scores by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>5 minutes</th>
<th>10 minutes</th>
<th>$X^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53</td>
<td>124</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>95</td>
<td>212</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>71</td>
<td>209</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>219</td>
<td>545</td>
<td>2.42</td>
<td>.298</td>
</tr>
</tbody>
</table>

Overall, the children in all three groups demonstrated few distress behaviors (Table 15). There was no statistically significant difference in frequencies of distress scores by group for the five minute baseline period or the ten minute intervention period ($X^2 = 2.42$, $p = .298$).

Table 16 reports frequencies for the specific individual distress behaviors by group. There was no statistically significant difference in the frequency of the behavior pout
The frequency of the behavior ear rub was statistically significant \((X^2 = 12.15, p = .002)\) by group (Table 16). Group 2 had fewer observed ear rubs in the baseline period. The frequency of ear rubs increased in all three groups for the ten minute intervention period; however, subjects in group 1 demonstrated the smallest increase in the number of ear rubs.

Table 16 indicates that there was a statistical significant difference in the number of whimpers by group \((X^2 = 36.42, p = .000)\). The fewest whimpers in the five minute baseline period were children in group 1. The frequencies of whimper increased in the ten minute intervention period for groups 1 and 3 but decreased in group 2.

For the distress behavior scream, Table 16 depicts a statistically significant difference by group \((X^2 = 7.52, p = .023)\). Group 1 demonstrated a very small increase in the number of screams from the five minute baseline period to the ten minute intervention period when compared with groups 2 and 3.

Only a few of the subjects in each group demonstrated a majority of the distress behaviors for that group. For group 1, 6 of the 19 subjects exhibited 59% of the distress behaviors. Six of the 21 subjects demonstrated 61% of the distress behaviors in group 2 and 7 of the 20 subjects demonstrated 79% of the distress behaviors in group 3.
Table 17 depicts the differences between frequencies of distress behaviors by group for the 19 most distressed subjects. There was no statistically significant difference between the most distressed children in each group ($X^2 = 3.29, p = .193$). Group 1 demonstrated fewer distress behaviors in the five minute baseline period, the ten minute intervention period and the smallest increase in distress behaviors overtime.

The most distressed children in groups 1, 2 and 3 did not differ from the total groups in mean age, gender, or family type (Table 18). The children who were most distressed were different from the total group in that the distressed children had fewer previous hospitalizations (Table 18) and therefore, probably had fewer past experiences with hospital routines, procedures and personnel.
Table 16
Frequencies for Specific Distress Scores between Group

<table>
<thead>
<tr>
<th>Behavior</th>
<th>5 minutes</th>
<th>10 minutes</th>
<th>X²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear rub</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>group 1</td>
<td>21</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>group 2</td>
<td>6</td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>group 3</td>
<td>15</td>
<td>36</td>
<td>12.15</td>
<td>.002</td>
</tr>
<tr>
<td>Pout</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>1*</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td>14</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3</td>
<td>3</td>
<td>18</td>
<td>3.82</td>
<td>.148</td>
</tr>
</tbody>
</table>

*expected freq. < 5

| Whimper    |           |            |    |      |
| Group 1    | 14        | 71         |    |      |
| Group 2    | 44        | 32         |    |      |
| Group 3    | 38        | 112        | 36.42 | .000 |

| Scream     |           |            |    |      |
| group 1    | 17        | 19         |    |      |
| group 2    | 31        | 33         |    |      |
| group 3    | 15        | 43         | 7.52 | .023 |

Table 17
Frequency of Distress Scores for the Most Distressed Children by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>5 minutes</th>
<th>10 minutes</th>
<th>X²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (N=6)</td>
<td>43</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (N=7)</td>
<td>63</td>
<td>123</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 (N=6)</td>
<td>68</td>
<td>153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>174</td>
<td>238</td>
<td>3.29</td>
<td>.193</td>
</tr>
</tbody>
</table>

In summary, the children who heard an audiotape made by their mother did not differ significantly in the frequency of
distress behaviors than those children who heard an audiotape made by an unknown female or those children who did not hear an audiotape. Overall, the number of distress behaviors observed was low in all three groups. A small number of children in each group accounted for a majority of the distress behaviors. The most distressed children were more likely to have no previous experience with hospitalization.

Table 18
Demographic Characteristics of Children Displaying the Most Distress Behaviors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (N=6)</th>
<th>Group 2 (N=7)</th>
<th>Group 3 (N=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mos.)</td>
<td>52.3</td>
<td>45.3</td>
<td>43.4</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4 66%</td>
<td>6 86%</td>
<td>5 83%</td>
</tr>
<tr>
<td>Female</td>
<td>2 33%</td>
<td>1 14%</td>
<td>1 17%</td>
</tr>
<tr>
<td>In Hospital Before</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0 0%</td>
<td>2 29%</td>
<td>0 0%</td>
</tr>
<tr>
<td>No</td>
<td>6 100%</td>
<td>5 71%</td>
<td>6 100%</td>
</tr>
<tr>
<td>Family type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mom &amp; Dad</td>
<td>5 83%</td>
<td>7 100%</td>
<td>6 100%</td>
</tr>
<tr>
<td>Single Mom</td>
<td>0 0%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Mom &amp; Stepdad</td>
<td>0 0%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Other</td>
<td>1 17%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
</tbody>
</table>

HYPOTHESIS 2:

There will be an increase in parasympathetic tone of three to five year old children, during recovery from short stay surgery, hearing an audiotape recorded by their mother when compared to children hearing an audiotape recorded by an unknown female or not hearing an audiotape.
Parasympathetic tone, as measured by heart rate variability, according to Porgues (1983), was examined at thirty second intervals for fifteen minutes for each subject. To test the hypothesis, analysis of data entailed several steps. First regression coefficients (or slopes) were computed for all subjects for the five minute baseline period and the ten minute intervention period (Appendix E). Then the differences between the slopes were calculated for each subject subtracting the five minute baseline slopes from the ten minute intervention period slopes (Appendix E). An one-way ANOVA was conducted on the differences in slopes to determine if there were significant differences in the change of heart rate variability from the five minute baseline period to the ten minute intervention period by group. Continuous data for heart rate variability were used. The groups were mutually exclusive in that any one subject was only in one group. The standard deviation for each group are reported to demonstrate homogeneity of variance.

Table 19 depicts an analysis of variance for heart rate variability for the five minute baseline period by group. The mean heart rate variability for the five minute baseline period was 5.24 (SD = 1.94) for group 1, 4.63 (SD = 1.72) for group 2, and 4.41 (SD = 1.39) for group 3. There was no statistical significant difference for heart rate variability by group for the five minute baseline period (F = 1.21, p = .31).
For the ten minute intervention period, the mean heart rate variability was 5.02 (SD = 1.76) for group 1, 5.10 (SD = 1.31) for group 2, and 4.59 (SD = 1.48) for group 3. Table 20 shows that there was no statistical significant difference in heart rate variability by group during the ten minute intervention period (F = .66, p = .519).

Table 19

One-way ANOVA for Baseline 5 Minute Heart Rate Variability by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>6.94</td>
<td>2</td>
<td>3.47</td>
<td>1.21</td>
<td>.31</td>
</tr>
<tr>
<td>Within group</td>
<td>157.29</td>
<td>57</td>
<td>2.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>164.23</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 1.94  
group 2 = 1.72  
group 3 = 1.39

In analyzing change in slopes from the baseline five minute period to the ten minute intervention period an one-way ANOVA was conducted (Table 21). There was no statistical significant difference (F = .98, p = .381) in the change in slope for heart rate variability by group.
Table 20
One-way ANOVA for 10 Minute Heart Rate Variability by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>2.89</td>
<td>2</td>
<td>1.45</td>
<td>.66</td>
<td>.519</td>
</tr>
<tr>
<td>Within group</td>
<td>117.90</td>
<td>57</td>
<td>2.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>120.80</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 1.76
      group 2 = 1.31
      group 3 = 1.48

Table 21
One-way ANOVA for Differences in Slopes for Heart Rate Variability from First 5 Minutes to Second 10 Minutes by Group

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>7.57</td>
<td>2</td>
<td>3.78</td>
<td>.98</td>
<td>.381</td>
</tr>
<tr>
<td>Within group</td>
<td>208.22</td>
<td>54</td>
<td>3.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>215.79</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 2.282
      group 2 = 1.905
      group 3 = 1.68

Table 22 depicts an analysis of change in slopes from the five minute baseline period to the ten minute intervention period for the most distressed children in each group. The characteristics of the most distressed children, six children in group 1, seven children in group 2, and 6 children in group
3, were described earlier. There was no statistical significant difference in change in slope ($F = 2.59, p = 1.06$) by group for the children with the most distress behaviors.

Table 22

One-way ANOVA for Differences in Slopes for Heart Rate Variability from First 5 Minutes to Second 10 Minutes for the Subjects with the Most Distress Behaviors

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>18.92</td>
<td>2</td>
<td>9.46</td>
<td>2.59</td>
<td>1.06</td>
</tr>
<tr>
<td>Within group</td>
<td>58.34</td>
<td>57</td>
<td>3.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>77.26</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: group 1 = 1.563  
group 2 = 1.330  
group 3 = 2.493

DISCUSSION OF FINDINGS

Hospitalization has been identified as a stressful time for children (Robertson, 1970; Thompson, 1985f; McClowry, 1988). Research has demonstrated that children, especially younger children, respond to hospitalization with behaviors typically labelled as negative, including clinging, whiney, crying, screaming and disruptive behaviors (Gellert, 1958; Chapman et al, 1956; Thompson, 1985). Nurses are the primary health care professional dealing with the hospitalized child and all behaviors associated with the experience. Caregiving strategies to help young children deal with the effects of hospitalization are needed (Barnard, 1983). This study
examined the effect of one intervention, a mother's voice audiotape, on children after they had experienced short stay surgery.

The 60 children demonstrated a low number of distress behaviors overall as recorded on the SOL. The group of children that heard their mother's voice audiotape exhibited the fewest distress behaviors during the ten minute intervention periods. The mother's voice group also had the smallest increase in distress behaviors when comparing the five minute baseline period with the ten minute intervention period. There were no significant difference between the three groups in the five minute baseline period or the ten minute intervention period.

Previous research has suggested that hospitalized children do demonstrate upset both during and after surgery (Deardon, 1970; Vernon et al, 1966). In those studies the actual amount of upset was never quantified and the data were collected by recall from the mother. The existence of distress behaviors in hospitalized children is well documented but the extent or degree of distress remains relatively unknown.

The results of this study do not support the results reported by White, Wear and Stephenson (1983). They found that a group of children that did not hear their mother read an audiotaped story demonstrated more distress behaviors than a mother's story group. Similar positive results to a
mother's voice and/or picture are reported by McCain (1982) and Dart (1980). It remains unclear whether the effect of maternal presence, in the form of a voice tape, has a comforting effect on young children.

The distress behaviors that were observed were predominantly exhibited by 19 of the 60 subjects. A question that immediately arises is why there are so many more distress behaviors in these 19 children. What makes these children different than the other children in the sample? The 19 most distressed children were similar to the total sample in age, gender, family type, and number that had previously heard their mother's voice on audiotape.

The most distressed children differed from the total sample in one way: their experience with previous hospitalization. Fewer of the most distressed children had experienced being in a hospital overnight compared with the rest of the sample. These results are in conflict with previous studies that found prior hospitalization does not affect children's responses to future health care (Gratz, 1977; Shrand, 1965; Vernon et al, 1966; Lockwood, 1970; Knight, 1978). In contrast, O'Donnell (1976) reported a positive behavioral response from children with previous inpatient hospital experience.

In this study there appears to exist some positive outcome related to experience even in children as young as 3 to 5 years. Having been in a hospital, exposed to hospital
routines and hospital personnel and successfully going home again seems to decrease the expressed distress of some children. What it is about the previous hospital experience that decreases distress has not been identified. Jean Johnson in her development of a theory of self-regulation has consistently found that sensory information in addition to procedural information reduces distress during noxious stimulation (Johnson, 1973; Leventhal & Johnson, 1983). Maybe the child's previous experience with hospitalization provides sensory information that the child can recall to help deal with the current experience.

The question arises as to what preparation should be given to children prior to their initial hospitalization that could decrease any distress they may experience. Another interesting question is what, if any, other characteristics or experiences of a child could contribute to decreased distress during hospitalization.

It would be interesting to study the same children after his/her hospital experience. Some research studies have shown that children are still distressed or at times more distressed long after discharge (Irwin & Kovacs, 1979; Rieveschel, 1979; Sipowicz & Vernon, 1965; Deardon, 1970; Riffee, 1981). Would the most distressed children have greater distress after discharge from short stay surgery? Would the least distressed children remain relatively unaffected or may they actually
have benefitted from the hospital experience consistent with the results by Sides (1977) and Douglas, (1975).

Another interpretation for the nonsignificant differences between the groups may be related to the SOL Catalogue (White et al, 1983). The SOL Catalogue was constructed for observing young children's behavior while falling asleep in the hospital. The distress behavioral category was used in this study to observe the behaviors of young children while waking up after surgery. While falling asleep and waking up are similar conceptually, the specific behaviors may be different. The SOL Catalogue may lack the sensitivity to capture behaviors indicating distress in children awakening after surgery. Behaviors related to physical activity, such as restlessness and thrashing, may be needed to be added to the SOL Catalogue.

The results of the study also indicated no significant difference in change in heart rate variability from the five minute baseline period to the ten minute intervention period. Listening to their mother's voice on audiotape did not cause a significant increase in the parasympathetic tone of the children. Decreased anxiety and increased comfort was not identified through the physiologic measure of parasympathetic tone.

There are no previous studies that used heart rate variability, as a measure of parasympathetic tone, in examining the effects of hospitalization or the effects of any
intervention on young children. In fact there are no studies that examine heart rate variability for children ages 3 to 5 years. Previous research has been conducted with multiple animal groups, infants and adults (Katona & Jih, 1978; McCabe et al, 1984; Fouad, et al, 1984; Chess et al, 1975; Harper et al, 1978; Mulder & Mulder, 1981). The lack of norms for heart rate variability for preschool children makes conclusions regarding the heart rate variability of the children in the current sample difficult. Further research is needed to identify the norms for heart rate variability of healthy preschool children.

This study did not support the conceptual framework originally proposed; listening to their mother's voice on audiotape did not decrease the distress behaviors of preschool children recovering from surgical insertion of myringotomy tubes. Even though the group who heard their mother's voice tape had fewer distress behaviors and a smaller increase in distress behaviors overtime, the difference between groups was not significant. The children who heard their mother's voice tape also did not demonstrate a significant difference in heart rate variability indicating no significant increase in parasympathetic tone in the children.
CHAPTER V

SUMMARY

Hospitalization is a stressful time for young children, involving at the least limited separation from parents. During these stressful times nurses are called upon to care for the children and assist them in dealing with their separation and all aspects of the prescribed treatment. An intervention that would assist the child to deal more positively with hospitalization and separation would benefit the child, the family, and the nurse.

A pre-test post-test control group experimental design was used to examine the effects of a mother’s voice tape on the behavior and parasympathetic tone of preschool children recovering from surgical insertion of myringotomy tubes. Sixty children, ages 3 to 5 years, were randomly assigned to three groups; a mother’s voice tape group, an unknown female voice tape group, and a no tape control group. The children’s behavior and parasympathetic tone, using heart rate variability, were measured in the PACU for fifteen minutes while the child was waking up from anesthesia.

Results showed no statistically significant difference in the frequency of distress behaviors of the children in the
three groups. Overall, few distress behaviors of ear rub, pout, whimper, or scream were observed. Nineteen of the 60 children demonstrated most of the distress behaviors. The most distressed children differed from the total sample in experience with previous hospitalizations. The most distressed children, from all three groups, had less experience with previous hospitalizations. Even in children as young as 3 to 5 years of age the experience of being in a hospital, acquaintance with hospital routines and hospital personnel seems to have a positive effect on future hospital experiences.

This study also demonstrated no significant differences in heart rate variability for the children in the three groups. The mother’s voice audiotape group and the audiotape made by an unknown female did not significantly impact the parasympathetic tone of the children when compared with the no audiotape control group.

LIMITATIONS OF THE STUDY

Several limitations warrant discussion. To begin with, the observers trained to complete the SOL Catalogue were to be blinded as to which audiotape group the child was assigned. It became apparent early on that the observer was going to hear the audiotape also and would be able to easily identify that many of the children heard the same story. The
hypotheses of the study were never shared with the observer and interrater agreement remained high.

The use of heart rate variability as a measure of parasympathetic tone, even though established as reliable and valid in the literature, has not been reported with preschool children. The lack of known norms for preschool children limited the conclusions that could be drawn from the study's results. A large study with healthy children in a familiar setting is needed.

Another limitation is the relatively small sample size. Even though the results indicate fewer distress behaviors in the children who heard their mother's voice audiotape, the difference was not significant. The sample size may have lacked the power to detect real differences. The window of analysis was also relatively small, consisting of a total of only fifteen minutes. Observing hospitalized children over a longer period of time might provide a more complete picture of their behavior allowing for the emergence of behavior patterns. Replication with a large sample with data collected for a longer period of time would better address these issues.

**IMPLICATIONS FOR RESEARCH**

This study demonstrates that the noninvasive measurement of heart rate variability is a tolerable and viable physiologic measure in preschool children. The parents were comfortable with the idea of monitoring the cardiac rhythm of
their child. The child and the nurse were very tolerant of the cardiac leads and wires which posed no visible interference with nursing care. Heart rate variability, as a measure of parasympathetic tone, could be a helpful and painless physiologic measure of anxiety and stress in young children. As nurses continue to investigate the effects of illness and the treatment of illness on children a physiologic measure indicating increase comfort and decrease distress will become invaluable. Care will need to be taken in long studies that the cardiac leads do not cause skin breakdown.

To assist in interpreting data regarding parasympathetic tone, norms need to be established for all ages of the population including preschool children. A study with a large number of healthy preschool children conducted in nonstressful familiar surroundings is needed to establish age norms.

A follow-up study on children after discharge is needed to determine any long term effects of short hospital stays with minimal separation. Pre-hospital educational materials could include effects of hospitalization and suggestions for enhancing the child's and family's experience.

Future studies should plan to examine the role the father plays in the effects of separation during hospitalization of young children. The effect of a father's voice audiotape could enlighten health care workers as to the impact of fathers in comforting their children.
Only a small number of children in the sample demonstrated a majority of the distress behaviors. Most of the children seemed to deal well with the separation after surgery. Their preparation appeared to be adequate to allow them to cope with their current experience.

Identification of children are most likely to become distressed would allow for further interventions prior to the hospitalization and separation to assist the child deal with their experience. Also, early identification of distress behavior will allow time to plan additional interventions during the hospital stay, especially times of separation, such as securing familiar objects from home, pictures and tapes from significant others. Nursing interventions could become more specific and individualized if accurate identification of children most likely to be distressed is completed prior to admission.

From a clinical standpoint, mother's voice audiotapes would be an appropriate strategy to use with young hospitalized children. No child was unduly upset by his/her mother's voice tape and overall, the mother's voice tape group exhibited fewer distress behaviors. Creating a mother's voice tape is relatively inexpensive, some pre-planning is needed to get the tape created and available. But the low cost and possible positive outcome make this strategy appropriate for nurses who provide health care to preschool children and their families.
Further study as to the type of information on the audiotape is needed. Is it soothing familiar content, such as a favorite story, that comforts young children? Or is it content that is concrete and objective or more emotional in focus that is helpful. Determining the content that is most comforting to the child would help give direction to mother’s and health care professionals who may create audiotapes for young children.

Future studies may also want to investigate the effect on an audiotape that is familiar to the child. Having an audiotape that the child has heard overtime before hospitalization may produce a more comforting response. Questions related to how familiar the child should be with the audiotape and how long before hospitalization should the audiotape be introduced need investigation.

From a more general perspective, future research in the area of child health needs to be intervention focused. Nurses need well researched substantiated information on how their actions affect the children they are caring for. The hospitalized child population is more acutely ill today than in previous years and have much more intense care needs. Nurses are the link between the child and the health care arena. How the nurse acts with the child and how the child responds is vital information to the bedside nurse. Helping the child deal with the illness and the treatment is the nurses’ domain,
understanding those interactions is vital to the future health of children.
APPENDIX A

Human Subjects' Committee Approval
MEMORANDUM

From: Vincent V. Hamparian, Ph.D.
Chairperson, Human Subjects Research Committee

To: Barbara H. Schaffner, RNC, MS & Sharon Stout-Shaffer

Date: April 11, 1991

Protocol #: 91HS011

Your protocol entitled: THE EFFECT OF A MATERNAL VOICE AUDIOTAPE ON PARASYMPATHETIC TONE AND BEHAVIOR OF HOSPITALIZED PRESCHOOL CHILDREN has been reviewed and approved by the Human Subjects Research Committee on April 11, 1991 - CONTINGENCIES SATISFIED

NOTE: It is the responsibility of the principal investigator to retain a copy of each signed consent form INDEFINITELY in a manner that maintains confidentiality. In the absence of the principle investigator, the appropriate director or chief must assume this responsibility.
ACTION OF THE REVIEW COMMITTEE

With regard to the employment of human subjects in the proposed research:

91H0096 THE EFFECT OF A MATERNAL VOICE AUDIOTAPE ON THE BEHAVIOR AND PARASYMPATHETIC TONE OF HOSPITALIZED PRESCHOOL CHILDREN,
Edna M. Menke, Barbara H. Schaffner, Family and Community Nursing

THE BIOMEDICAL SCIENCES REVIEW COMMITTEE HAS TAKEN THE FOLLOWING ACTION:

X APPROVED

*Stipulations stated by the Committee have been met by the investigator and, therefore, the protocol is APPROVED.

It is the responsibility of the principal investigator to retain a copy of each signed consent form for at least four (4) years beyond the termination of the subject's participation in the proposed activity. Should the principal investigator leave the University, signed consent forms are to be transferred to the Human Subjects Review Committee for the required retention period. This application has been approved for the period of one year. You are reminded that you must promptly report any problems to the Review Committee, and that no procedural changes may be made without prior review and approval. You are also reminded that the identity of the research participants must be kept confidential.

Date: March 18, 1991
Signed: [Signature]
Chairperson

HS-025H (Rev. 8/90)
APPENDIX B

Telephone Recruitment Script
TELEPHONE RECRUITMENT SCRIPT

I will ask to speak to the mother of child's name and will identify myself as a graduate student in nursing at the Ohio State University. I will explain that I received their names from Children's Hospital and am conducting a research project as part of my requirements for a doctoral degree in Nursing at The Ohio State University.

The mothers of potential subjects will be told that the purpose of the study is to examine the effects of a mother's voice audiotape on 3 to 5 year old children having elective surgery. The mothers will be told that I am looking for 3 to 5 year old children scheduled for surgery to have tubes put in their ears, who live at home with their biologic mothers. Mothers will be told that all information shared with me will be kept confidential and reports will be given in the form of group findings so that individual identification is not possible.

The mothers will be told that their child will be observed and have heart rate recorded for 20 minutes in the recovery room after surgery. The mother's voice tape group will be asked to record a ten minute tape to be played for the child while in the recovery room. The unknown female voice tape group will be told that a tape of a children's story will be played for the child while in the recovery room. The observation will not in anyway interfere with the medical and nursing care the child receives nor will it lengthen the time the child will be in the recovery room.

The mother will be asked to complete a short demographic information sheet on the day of surgery. No information will be asked of the child at any time. Time will be provided here for questions.

If the mother remains interested in having the child as a subject, I will ask the following screening questions:
1. What is your child's birthdate?
2. When is the surgery scheduled?
3. What type of surgery is the child scheduled for?
4. Does your child have any known health problems?
5. Are you the child's biologic mother?

I the answers to the screening questions indicate that the child can be entered into the study the mother will be invited to participate.

For the mother's voice tape group, the mother will be told that I would like to have a cassette tape delivered to the
home so the tape recording that will be played for the child can be created. It will take approximately 30 minutes of your time. I can bring a tape and tape recorded and you can record the tape at that time. The tape can include whatever message you think would be comforting to your child. It may be reading a favorite story, talking to your child, and/or singing a song. When would be a convenient time?

Again, time for questions will be provided.
CONSENT TO RESEARCH TREATMENT OR PROCEDURES

FULL TITLE OF STUDY: The Effect of a Maternal Voice Audiotape on Parasympathetic Tone and Behavior of Hospitalized Children.

1. INFORMATION FOR THE PARTICIPANT AND THE PARENT(S) OR GUARDIAN:
   1. PARTICIPANT'S LEGAL NAME: ____________________________
      DATE OF BIRTH: ____________________________
   3. PRINCIPAL INVESTIGATOR(S): Barbara Hoyer Schaffner, RNC, MS; Edna Menke, RN, PhD.
   4. PURPOSE OF THE STUDY: There are times in the hospital when young children are separated from their mother. Surgery and recovery after surgery are two of those times. The purpose of the study is to determine the effects of a mother's voice audiotape on preschool children who are separated from their mothers.
   5. HOW THE STUDY WILL BE PERFORMED: The study will be conducted in the recovery room after surgery for insertion of myringotomy tubes while the child is awakening from anesthesia. The child will be observed for 20 minutes and his/her behavior will be recorded. At the same time the child's heart rate will be recorded using a heart monitor connected to three patches on the child's chest. The patches will already be on the child's skin. During the observation time a ten minute audiotape, either made by the mother or of a children's story, will be played for the child. The child will receive all routine nursing care from the nursing staff in the recovery room.
   6. EXPECTED DURATION OF THE SUBJECT'S PARTICIPATION: One time for 20-30 minutes.
   7. EXPERIMENTAL PRODUCT(S) OR PROCEDURE(S): Not applicable.
   8. FDA INVESTIGATIONAL NEW DRUG (IND) OR INVESTIGATIONAL DEVICE (IDE) NUMBER: Not applicable.
   9. APPROVED OR ACCEPTED PRODUCT(S) OR PROCEDURE(S) WHICH MIGHT EXPOSE THE SUBJECT TO SOME RISK: Not applicable.
CONSENT TO RESEARCH TREATMENT OR PROCEDURES

FULL TITLE OF STUDY: The Effect of a Maternal Voice Audiotape on Parasympathetic Tone and Behavior of Hospitalized Children.

10. POSSIBLE RISKS: There are no known discomorts to the child. The child may develop a slow heart rate from not giving a medication prior to surgery but an anesthesiology protocol is in place so the child will be given medication during surgery as necessary.

11. PREGNANCY STATEMENT: Not applicable.

12. POSSIBLE BENEFITS: The child may be comforted by the children's story or hearing his/her mother's voice.

13. APPROPRIATE ALTERNATIVE TREATMENT(S) OR PROCEDURE(S): This is not a treatment.

14. METHODS USED TO MAINTAIN CONFIDENTIALITY: Records of the child's behavior and heart rate will be identified by a code number only, no names will be used. Only the principal investigator and her teachers at the Ohio State University will be permitted to see data.

15. POSSIBLE ADDITIONAL COSTS TO THE SUBJECT OR THIRD-PARTY PAYER: None.

16. VOLUNTARY PARTICIPATION: Participation in this study is voluntary; refusal to participate will involve no penalty or or loss of benefits to which the subject is otherwise entitled.
CONSENT TO RESEARCH TREATMENT OR PROCEDURES

FULL TITLE OF STUDY: The Effect of a Maternal Voice Audiotape on Parasympathetic Tone and Behavior of Hospitalized Children.

II. INFORMATIVE STATEMENTS AND SIGNATURES:

PREGNANCY STATEMENT: Not applicable.

STATEMENT OF CONFIDENTIALITY:

I understand that all records, written and/or visual (if applicable) will be maintained in a confidential manner. These records will be available only to the investigators. Information may be published or shared with another person only with my permission or if personal identifiers have been removed.

COMPENSATION STATEMENT:

If I or my child should become ill, hurt or unusually upset due to participation in this study, I understand that immediate treatment is available at Children's Hospital. I also understand that costs of such treatment will be at my expense and that financial compensation is not available. For further explanation and for any questions concerning my rights, I may contact Legal Services Office at (614) 461-2557.

FREEDOM TO WITHDRAW:

I understand that I am free to withdraw my child (or myself) from the study at any time without affecting on-going or future care.

NEW DEVELOPMENTS:

I understand that any new information that becomes available during this study that might affect my willingness to stay in it will be discussed with me.

The information has been explained to me and I understand it. Any further questions I may have in regard to this study will be answered by:

Barbara H. Schaffner
(Principal Investigator)

(Phone Number)

RF-2 page 3 of 4
CONSENT TO RESEARCH TREATMENT OR PROCEDURES

FULL TITLE OF STUDY: The Effect of a Maternal Voice Audiotape on Parasympathetic Tone and Behavior of Hospitalized Children.

II. INFORMATIVE STATEMENTS AND SIGNATURES (CONTINUED):

I understand that I am not giving up my child's/my legal rights. I consent to enroll my child in this study.

CONSENT SIGNATURES

WRITTEN CONSENT

I have had the study explained to me and I agree to participate.

Date: ________________ Date: ________________

(Parent/Legal Guardian) (Parent/Legal Guardian)

(Person Obtaining Consent) (Witness)

I certify that I have explained the research, its purposes, and procedures to the subject or his/her representative or both before requesting the subject or representative to sign.

Signed: __________________________
(Principal Investigator)
APPENDIX D

Background Information Form
BACKGROUND INFORMATION

Please answer the following questions about your child and family. Circle one answer or fill in the blank space.

Child’s birthdate: _________________

Child’s sex:
  a. Male
  b. Female

Type of surgery your child is having today?

Does your child have any chronic or major health problems?
  a. Yes
  b. No

Who live in the same home as your child?
  a. Biologic mother
  b. Biologic father
  c. Stepmother
  d. Stepfather
  e. Brothers or sisters
  f. Other
     If other, please specify ______________________________

Has your child ever spent the night in a hospital?
  a. Yes
  b. No

Has your child ever heard your (the mother’s) voice on a tape recorder?
  a. Yes
  b. No
APPENDIX E

Post-Anesthesia Care Unit Record
### POST-ANESTHESIA CARE UNIT RECORD

**POST-ANESTHESIA RECOVERY SCORE**

<table>
<thead>
<tr>
<th>Activity</th>
<th>0=Unable to lift head or move extremities voluntarily or on command</th>
<th>1=Uncontrolled movement of extremities</th>
<th>2=Can lift head - Has controlled movement of extremities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Can follow commands</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Respiration</th>
<th>0=Condition necessitates ventilator or assisted respiration</th>
<th>1=Labored or limited respirations - Breaths by self but has shallow, slow respirations - May have an oral airway</th>
<th>2=Can take a deep breath and cough well, has normal respiratory rate and depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circ</td>
<td>0=Bradycardic-pulse thready</td>
<td>1=Pulse irregular, BP unstable</td>
<td>2=Pulse regular, BP normal for age</td>
</tr>
<tr>
<td>Neuro</td>
<td>0=Not responding to verbal/painful stimuli</td>
<td>1=Arouses to stimulus, drifts off to sleep</td>
<td>2=Awake, alert, oriented for age or pre-op state</td>
</tr>
<tr>
<td>Color</td>
<td>0=Cyanotic, dusky</td>
<td>1=Pale or blotchy</td>
<td>2=Pink</td>
</tr>
</tbody>
</table>

#### TOTAL

#### IV SUMMARY

<table>
<thead>
<tr>
<th>TIME</th>
<th>IV FLUID AND ADDITIVES</th>
<th>RATE</th>
<th>AMOUNT RECEIVED</th>
<th>AMOUNT ADDED</th>
<th>AMOUNT OUTPUT</th>
<th>SIGNATURE/INITIAL</th>
<th>FLUID</th>
<th>OR</th>
<th>TOT</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>URINE OUTPUT</th>
<th>TIME</th>
<th>CC</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>OUTPUT/DRAINAGE</th>
<th>TIME</th>
<th>CC / FROM</th>
</tr>
</thead>
</table>
DATA SHEET

ID Number: 

Birthdate: 
Age in months: 

Gender:  Male (01)  Female (02)

Family type:  Biologic parents (01)
              Biologic mother only (02)
              Biologic mother with stepdad (03)
              Other (04)

Previous Hospitalizations:  Yes (01)  No (02)

Have heard mom's voice:  Yes (01)  No (02)

Height:  in.
Weight:  kg.
Height/Weight:  %

Received pre-op:  Yes (01)  No (02)

PACU Admission time: 

Time observation began: 

Anesthetic agent:  Halothane (01)
                  Other (02), list:

Medications received:  None (01)
                      Other (02), list:

Blood pressure:  Admission 
                 15 min.  

Heart rate:  Admission 
            15 min.  

Respiratory rate:  Admission 
                 15 min.  

APPENDIX G

Sleep Onset Latency Behavior Catalogue
SLEEP ONSET LATENCY BEHAVIOR CATALOGUE

1. Subject
2. RN or other nurse
3. MD or medical student
4. Teddy, toy, child's object
5. Observer

<table>
<thead>
<tr>
<th>Child's behavior</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye rub</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blink eyes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyes closed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyes open</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Look</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yawn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ear rub</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whimper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk/pleasure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk/displeasure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk/help</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk/separation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk/experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk/reassurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Movement of extremities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change of position</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body still</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bounce</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of bed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In bed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lie down</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reprimand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusts covers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-interactive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX H

Sleep Onset Latency Behavior Catalogue and Definitions
Phase III
SLEEP ONSET LATENCY BEHAVIOR CATALOGUE AND DEFINITIONS
PHASE III

1. Subject
2. RN or other nurse
3. MD or medical student
4. Teddy, toy, child’s object
5. Observer

Behavior Definitions

<table>
<thead>
<tr>
<th>Child’s behavior</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye rub</td>
<td>eye rub with finger, fists, etc.</td>
</tr>
<tr>
<td>Whimper</td>
<td>soft moan, high or low pitched</td>
</tr>
<tr>
<td>Pout</td>
<td>protrude lower lip - serious face</td>
</tr>
<tr>
<td>Scream</td>
<td>yell</td>
</tr>
<tr>
<td>Ear rub</td>
<td>ear rub with finger, fists, etc.</td>
</tr>
</tbody>
</table>
APPENDIX I

Table 23

Regression Coefficients for Heart Rate Variability and Difference in Slopes by Subjects
Table 23

Regression Coefficients for Heart Rate Variability and Differences in Slope by Subject

**Group 1**

<table>
<thead>
<tr>
<th>Subject</th>
<th>5 minutes</th>
<th>10 minutes</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>-0.918</td>
<td>-2.070</td>
<td>-1.152</td>
</tr>
<tr>
<td>9</td>
<td>-3.390</td>
<td>0.060</td>
<td>3.990</td>
</tr>
<tr>
<td>10</td>
<td>0.513</td>
<td>0.816</td>
<td>0.303</td>
</tr>
<tr>
<td>15</td>
<td>-2.190</td>
<td>0.875</td>
<td>3.065</td>
</tr>
<tr>
<td>16</td>
<td>0.460</td>
<td>3.910</td>
<td>3.450</td>
</tr>
<tr>
<td>17</td>
<td>0.230</td>
<td>-3.820</td>
<td>-4.050</td>
</tr>
<tr>
<td>27</td>
<td>-0.196</td>
<td>0.019</td>
<td>0.215</td>
</tr>
<tr>
<td>32</td>
<td>-0.001</td>
<td>1.640</td>
<td>1.641</td>
</tr>
<tr>
<td>33</td>
<td>-1.200</td>
<td>1.110</td>
<td>2.310</td>
</tr>
<tr>
<td>41</td>
<td>0.186</td>
<td>3.350</td>
<td>3.164</td>
</tr>
<tr>
<td>46</td>
<td>0.801</td>
<td>-1.410</td>
<td>-2.211</td>
</tr>
<tr>
<td>50</td>
<td>-0.054</td>
<td>0.043</td>
<td>0.097</td>
</tr>
<tr>
<td>52</td>
<td>-0.485</td>
<td>-0.749</td>
<td>-0.264</td>
</tr>
<tr>
<td>53</td>
<td>0.186</td>
<td>-1.560</td>
<td>-1.746</td>
</tr>
<tr>
<td>54</td>
<td>0.553</td>
<td>-0.751</td>
<td>-1.304</td>
</tr>
<tr>
<td>57</td>
<td>1.640</td>
<td>-0.552</td>
<td>-2.192</td>
</tr>
<tr>
<td>59</td>
<td>0.352</td>
<td>-0.842</td>
<td>-1.194</td>
</tr>
<tr>
<td>61</td>
<td>1.110</td>
<td>2.020</td>
<td>0.910</td>
</tr>
</tbody>
</table>
Table 23 (continued)

Group 2

<table>
<thead>
<tr>
<th>Subject</th>
<th>5 minutes</th>
<th>10 minutes</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>1.080</td>
<td>-1.410</td>
<td>-2.490</td>
</tr>
<tr>
<td>13</td>
<td>0.759</td>
<td>0.201</td>
<td>-0.558</td>
</tr>
<tr>
<td>14</td>
<td>-0.537</td>
<td>-1.270</td>
<td>-0.733</td>
</tr>
<tr>
<td>20</td>
<td>0.293</td>
<td>1.160</td>
<td>0.867</td>
</tr>
<tr>
<td>21</td>
<td>-0.180</td>
<td>1.880</td>
<td>2.060</td>
</tr>
<tr>
<td>22</td>
<td>-0.192</td>
<td>1.290</td>
<td>1.486</td>
</tr>
<tr>
<td>24</td>
<td>2.120</td>
<td>1.030</td>
<td>-1.090</td>
</tr>
<tr>
<td>26</td>
<td>-2.050</td>
<td>0.176</td>
<td>2.226</td>
</tr>
<tr>
<td>30</td>
<td>-3.330</td>
<td>-0.620</td>
<td>2.702</td>
</tr>
<tr>
<td>34</td>
<td>-0.090</td>
<td>-3.540</td>
<td>-3.450</td>
</tr>
<tr>
<td>36</td>
<td>0.660</td>
<td>0.211</td>
<td>-0.449</td>
</tr>
<tr>
<td>37</td>
<td>-0.432</td>
<td>-0.895</td>
<td>-0.463</td>
</tr>
<tr>
<td>40</td>
<td>1.210</td>
<td>0.403</td>
<td>-0.807</td>
</tr>
<tr>
<td>44</td>
<td>-2.040</td>
<td>-0.003</td>
<td>2.037</td>
</tr>
<tr>
<td>45</td>
<td>-0.568</td>
<td>-0.935</td>
<td>-0.367</td>
</tr>
<tr>
<td>48</td>
<td>0.230</td>
<td>-0.019</td>
<td>-0.249</td>
</tr>
<tr>
<td>55</td>
<td>0.123</td>
<td>0.884</td>
<td>0.761</td>
</tr>
<tr>
<td>56</td>
<td>-0.960</td>
<td>-0.205</td>
<td>0.755</td>
</tr>
<tr>
<td>58</td>
<td>-0.058</td>
<td>-2.210</td>
<td>-2.152</td>
</tr>
</tbody>
</table>
### Table 23 (continued)

#### Group 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>5 minutes</th>
<th>10 minutes</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1.740</td>
<td>0.890</td>
<td>-0.850</td>
</tr>
<tr>
<td>3</td>
<td>0.150</td>
<td>0.135</td>
<td>-0.015</td>
</tr>
<tr>
<td>4</td>
<td>-2.350</td>
<td>-3.020</td>
<td>-0.670</td>
</tr>
<tr>
<td>11</td>
<td>0.005</td>
<td>2.800</td>
<td>2.795</td>
</tr>
<tr>
<td>18</td>
<td>0.029</td>
<td>0.063</td>
<td>0.034</td>
</tr>
<tr>
<td>19</td>
<td>0.067</td>
<td>1.980</td>
<td>1.310</td>
</tr>
<tr>
<td>23</td>
<td>1.220</td>
<td>0.329</td>
<td>-0.891</td>
</tr>
<tr>
<td>25</td>
<td>0.933</td>
<td>-1.220</td>
<td>-1.055</td>
</tr>
<tr>
<td>28</td>
<td>0.870</td>
<td>1.010</td>
<td>0.140</td>
</tr>
<tr>
<td>29</td>
<td>0.892</td>
<td>0.470</td>
<td>-0.422</td>
</tr>
<tr>
<td>31</td>
<td>5.500</td>
<td>3.870</td>
<td>-1.630</td>
</tr>
<tr>
<td>35</td>
<td>0.500</td>
<td>-0.251</td>
<td>-0.751</td>
</tr>
<tr>
<td>38</td>
<td>3.360</td>
<td>0.933</td>
<td>-2.427</td>
</tr>
<tr>
<td>39</td>
<td>0.344</td>
<td>1.270</td>
<td>-0.926</td>
</tr>
<tr>
<td>42</td>
<td>0.134</td>
<td>1.660</td>
<td>1.526</td>
</tr>
<tr>
<td>43</td>
<td>-1.810</td>
<td>-1.080</td>
<td>0.730</td>
</tr>
<tr>
<td>47</td>
<td>1.080</td>
<td>-0.428</td>
<td>-1.508</td>
</tr>
<tr>
<td>49</td>
<td>5.080</td>
<td>-0.570</td>
<td>-5.650</td>
</tr>
<tr>
<td>51</td>
<td>-0.822</td>
<td>-0.232</td>
<td>0.590</td>
</tr>
<tr>
<td>60</td>
<td>4.450</td>
<td>0.487</td>
<td>-3.963</td>
</tr>
</tbody>
</table>
BIBLIOGRAPHY


Campbell, D. (1991) Head Nurse, PACU, and Bobulski, L. Director of Surgical Nursing, Children's Hospital, Columbus, Ohio, 3/22/91.


Trudeau, M.D. (1991) Voice Disorder Lab and Clinic, Department of Otolaryngology, The Ohio State University, Columbus, Ohio 3/25/91.


