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The Effect of Lullaby Music versus Rain Sounds on Inducing Sleep in the First 20 Minutes of Daycare Naptime

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THE EFFECT OF LULLABY MUSIC VERSUS RAIN SOUNDS ON INDUCING SLEEP IN THE FIRST 20 MINUTES OF DAYCARE NAPTIME

By

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The Graduate School has verified and approved the above-named committee members.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The purpose of this study was to determine the effects of lullaby music versus rain sounds on the percent of children who fell asleep during the first 20 minutes of naptime. Fifty-one children (N=51) between the ages of two and five, from six classrooms within a north Florida day care center, participated in the study. Children invited to participate regularly attended the facility. Each classroom practiced afternoon naptime following lunchtime prior to this study. Participants in all six classrooms listened to lullaby music and rain sounds on an alternating ABABAB or BABABA schedule over the course of six days, excluding weekends. A specially created form was utilized to record the number of children awake, asleep, and off task, each minute for the first 20 minutes of naptime. Results of a Wilcoxon Signed Ranks Test demonstrated a statistically significant difference between the percent of children asleep at the end of 20 minutes for day one of the rain condition versus the lullaby condition across all classrooms. There were no statistically significant differences between the percent of children asleep at the end of 20 minutes for day two or three of the rain condition versus the lullaby condition across all conditions, as well as between the total average percent of children asleep at the end of 20 minutes across all days and classrooms for the rain versus lullaby condition. The advantage of the lullaby condition diminished over the three comparisons. Findings, suggestions for future research, and implications for music therapy practice are discussed.

INTRODUCTION

According to the Federal Interagency Forum on Child and Family Statistics (2010), approximately 61% of children ages birth to six years attend "non parental child care on a regular basis" ("Family and social environment", www.childstats.gov/amercaschildren/glance.asp). Research demonstrates that daycare facilities are high stress environments for young children (Dettling, Gunnar, & Donzella, 1999; Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Watamura, Donzella, Alwin, & Gunnar, 2003; Watamura, Sebanc, & Gunnar, 2002). Within this environment, many day care facilities require children to participate in naptime, following the afternoon meal. Daycare facilities try to provide children with lessons in a supportive environment and offset the documented anxiety. Stress impedes the ability to attain restful naps (Stevens, 2008; Walker, 1972), which are associated with increased ability to attend to tasks and process information (Sadeh, Raviv, & Gruber, 2000).

Research in the field of music therapy demonstrates that music is an effective means of increasing relaxation (Davis, 1992; Good et al., 1999; Lai, 2004; Liebman & MacLaren 1991; McCarthy, 1992; Robb 2000; Standley, 1986; Thaut, 1989; Thaut & Davis, 1989, 1993). This finding is consistent across a wide variety of populations (McCarthy, 1992; Thaut, 1989; Whipple 2000), when presented alone (Lai, 2004; Thaut & Davis, 1989, 1993), or paired with other relaxation techniques (Liebman & MacLaren, 1991; Robb, 2000).

Additionally, many studies have examined the effective use of music to assist with sleep in adults (Iwaki, Tanaka, & Hori, 2003; Lai & Good, 2005). When compared to silence, music can help prepare a sleep environment (Klein & Winkelstein, 1996). This can be achieved through masking environmental noises which can cause annoyance (Morrison, Haas, Shaffner, Garrett, & Fackler, 2003). Music has also been used to improve quality of sleep (Harmat, Takacs, & Bodizs, 2008). Bloch, Reschef, Vadas, Haliba, Ziv, Kreme, & Haimov (2010) found that listening to music significantly increased relaxation and sleep quality, as well as decreased sleep onset time in agitated adults who frequently suffered from insomnia.

Despite numerous studies examining music assisted sleep with adults, there has been little research in the field of music therapy assisted sleep in children. Two studies found improvements in sleep in the presence of music. Tan (2004) found when music was played for

naptime and bedtime for three successive weeks, elementary school aged children showed increases in sleep quality, efficiency, and duration. A similar study by Field (1999) asserted that children's sleep onset time was shorter while listening to music versus silence.

One dissertation study suggests that listening to a repetitive stimulus encourages sleep by providing the brain with a minimally stimulating focus (Walker, 1972). The nature sounds of rain can be described as such, suggesting that these sounds could prepare the sleep environment, thus leading to more children sleeping during naptime. Given the small amount of research on the use of music or rain sounds with children to facilitate sleep, further investigation in this field is warranted. Therefore, this research seeks to evaluate the use of music versus rain sounds during the first 20 minutes at naptime to assist children with sleeping in the daycare setting.

CHAPTER 1

LITERATURE REVIEW

Sleep: An Overview

Sleep can be defined as a period of time spent inactive and not alert to the external world (Crabtree & Williams, 2009). This Crabtree and Williams definition was consistent with the naptime "sleep" definition utilized for this paper: to facilitate a period of quiet time and rest for the children. This time prepares children for afternoon learning activities by increasing children's ability to attend to tasks and process information (Sadeh, Raviv, & Gruber, 2000).

To prepare for sleep, the body needs to relax a sufficient amount to decrease the stimulation of the brain (Stevens, 2008; Walker, 1972). Paul Walker (1972) suggests that one means of relaxing the brain would be to play a "noninformational, non-excitatory stimulus" that would captivate and essentially bore the brain in to relaxation (p. 4). Once the appropriate level of relaxation has been attained, neurobiological reactions in the brain cause neurotransmitters to initiate sleep, Stevens (2008) asserts:

> The "switch" for sleep is considered to be the ventrolateral preoptic nucleus (VLPO) of the anterior hypothalamus. This area becomes active during sleep and uses the inhibitory neurotransmitters GABA and galanin to initiate sleep by inhibiting the arousal regions of the brain. (p. 2)

Once the neurotransmitters have inhibited areas in the cortex and thalamus, the brain is no longer as responsive to outside stimuli (Stevens, 2008). The National Institute of Neurological Disorders and Stroke (2007) adds that balanced levels of serotonin and an increase in adenosine are also responsible for creating the relaxed, sleepy state of mind required for successful sleep.

Sleep not only improves the quality of life in young children and preschoolers, but studies have shown that poor or inadequate amounts of sleep can lead to decreases in physical, social, and emotional function, and overall health. The use of a sleep questionnaire by researchers examined correlations between sleep deficiency in children, decreased overall health and increased anxiety in caregivers (Goodlin-Jones, Sitnick, Tang, Liu, & Anders, 2008). In a study on sleep patterns and sleep disturbances in children, Sadeh, Raviv, and Gruber (2000) posit that children who do not sleep a sufficient amount may suffer from decreased ability to attend to tasks and process information. Though the research aimed to show the relationship of race to

sleep patterns through the use of a sleep questionnaire, the article asserts that in extreme cases, tired children of all races can take on behavioral patterns identical to characteristics of attention deficit hyperactivity disorder. A follow-up study by these same researchers found significant correlations between decreased quality of sleep and decreased neurobehavioral functioning (NBF) in school-age children (Sadeh, Gruber, & Raviv, 2002). Children wore wrist sized actigraphs to calculate sleep patterns over five days to collect information on sleep duration, quality, and patterns of onset and night awakenings. These findings were compared to results of NBF assessments conducted during the same week. Statistical analyses found significant correlations between the two sets of data, suggesting "reduced alertness or increased sleepiness" (p. 412) may inhibit children's cognitive abilities. Similarly, Touchette, Petit, Seguin, Boivin, Tremblay, and Montplaisir (2007) found that children who reported higher instances of daytime fatigue, also showed significantly lower scores for cognitive performance evaluations. Results were calculated utilizing sleep questionnaires filled out by parents and caregivers, as well as the testing children's cognitive abilities with the use of multiple neurodevelopmental tests. Daycare facilities increase children's chances of learning by providing them with a period of restful slumber, which can only be achieved after attaining a level of increased relaxation.

Stress

As explained earlier, in order to induce sleep, it is first necessary to decrease stress levels and increase relaxation within the body. Stress is a normal facet of the human condition (Watamura, Donzella, Alwin, & Gunnar, 2003). However, periods of heightened and prolonged stress are associated with negative effects on health and quality of life. High levels of the hormone cortisol are indicative of increased stress in individuals, including children (Sims, Guilfoyle, & Perry, 2005). Cortisol is defined in one study as a stress-sensitive hypothalamic-pituitary-adrenocortical (HPA) axis hormone (Watamura et al., 2003). High levels of cortisol are associated with decreases in social ability, communication, memory, and cognition, and increased risk of illness, infection, and immunodeficiency.

Daycare facilities are described in literature as potentially high-stress environments for young children. With approximately 61% of children ages birth to six years who participate in regular, non parental child care, the numbers of children in the United States who are exposed to this potentially stressful environment is high (Federal Interagency Forum on Child and Family Statistics, 2010). Several studies found that children attending daycare facilities experienced an

increase in cortisol throughout the day, suggesting that the daycare environment influences stress levels (Dettling, Gunnar, & Donzella, 1999; Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Watamura, Donzella, Alwin, & Gunnar, 2003; Watamura, Sebanc, & Gunnar, 2002). Watamura, Sebanc, & Gunnar (2002) theorize that explanations for this increase in cortisol may be related to increased social interaction with other children, decrease in individual attention from adults, and fatigue. Sims et al. (2005) found heightened levels of cortisol in children who attended daycare facilities where children did not receive great amounts of attention as compared to children who stayed home with parents or guardians. One study documents the association between stress and decreased memory functioning in adults (Newcomer, Selke, Melson, Hershey, Craft, Richards, & Alderson, 1999). Researchers had adult subjects orally ingest cortisol to mimic low and high levels of stress over a four day period (Newcomer et al., 1999). Cortisol at the high stress levels caused significant decreases in memory performance in those subjects (Newcomer et al., 1999). If high levels cause stress, the transfer can be made that children attending stress inducing daycare facilities would also experience decreases in attention, memory performance, and social ability as well.

Watamura et al. (2002) assert increased social interaction with other children may cause high levels of cortisol, therefore, a period spent sleeping, or as we can also define it: inactive and not alert to the external world, may effectively reduce stress levels and cortisol within the brain, and reduce possibility of stress decreasing social ability, communication, memory, and cognition.

The noise of a crowded daycare classroom could also increase anxiety in children already experiencing high stress levels. Morrison, Haas, Shaffner, Garrett, and Fackler (2003) identified a correlation between increased levels of stress and noise. Over a three hour observation period, nurses in pediatric intensive care showed higher self rated “annoyance” levels and faster heart rates when presented with louder environments; a physiological indication of increased stress (Morrison et al., 2003).

Music and Relaxation

There is ample research documenting the use of music as a means of relaxation. Research posits that participants who listened to music while attempting to relax achieved an increase in relaxation levels (Lai, 2004; Thaut & Davis, 1989, 1993). It has also shown physiological evidence of relaxation through decreases in respiratory rates, heart rates, anxiety reports, blood pressure, and in some instances, behavioral indices of pain or self-reported pain (Davis, 1992; Good et al., 1999; Standley, 1986).

Two studies support music listening as a successful means of increasing relaxation when coupled with instruction in other relaxation techniques (Liebman & MacLaren, 1991; Robb, 2000). Robb (2000) asserts that the use of music with progressive muscle relaxation showed the greatest decrease of anxiety as measured by state trait anxiety inventory scores and visual analog scale scores. Adolescents in their third trimester of pregnancy who received music paired with relaxation techniques showed less anxiety than adolescents who were only given instruction in relaxation techniques (Liebman & MacLaren, 1991).

Evidence suggests that music therapy can be used to assist with relaxation across a wide variety of populations. A pilot program at a nursing home examined the effective use of music alone to relieve stress in nursing home staff (McCarthy, 1992). Self-perceived ratings on all scales completed by psychiatric prisoner-patients showed music therapy interventions were successful in increasing relaxation, affect, and positive thought (Thaut, 1989). Infants who received music and massage in multimodal stimulation techniques used by parents in a parent-neonate parent training study showed less infant stress behaviors and demonstrated behaviors typical of infants with lower stress levels, such as shorter lengths of stay in the neonatal intensive care unit and higher average daily weight gain (Whipple 2000). This positive reception across a myriad of populations suggests that music would be a useful tool with the population of children at a daycare facility.

In summary, music has the ability to increase relaxation, across a wide variety of populations, when presented alone, or paired with other relaxation techniques.

Music and Children

Many studies make evident the benefits of music with children (Berger & Cooper, 2003; Bilhartz, Bruhn, & Olson, 1999; Gromko & Poorman, 1998; Suthers, 2004). In an experiment by

Gromko and Poorman (1998), training preschoolers in music showed an increase in the raw scores of spatial performance tasks, suggesting that this type of intelligence can be encouraged with musical education. Musical training of children led to improvements in intelligence and memory test scores in an experiment conducted by Bilhartz, Bruhn, and Olson (1999).

Two studies with preschoolers and toddlers examined music education and appreciation classes, and the effect of praise on musical play within these environments. Eighteen preschoolers, ages two to five years of age, participated in ten weeks of a weekly, 45-minute long music education program with parents, caregivers, and additional adults and children (Berger & Cooper, 2003). Suthers (2004) with seventeen toddlers, ages 12 to 20 months, also examined music in structured and unstructured activities in the playroom. Both experiments found that preschool children experimented with musical play when given periods of unstructured time coupled with periods of structured activities. It was determined that if adults praised musical activities, children found deeper satisfaction, higher attention to the activity, and other qualifiers of increased enjoyment and participation in the music. (Berger & Cooper, 2003; Suthers, 2004). Črnčec, Wilson, and Prior (2006) suggest that music education and music instruction can improve spatial reasoning intelligence.

The research presented documents a link between music and improved learning outcomes with children (Berger & Cooper, 2003; Bilhartz, Bruhn, & Olson, 1999; Gromko & Poorman, 1998; Suthers, 2004). When paired with evidence suggesting a correlation between restful sleep and improved learning outcomes (Sadeh, Raviv, and Gruber, 2000), introducing music before children's naptime may adequately prepare the environment for restful slumber.

Music and Sleep

Music can prepare an environment and sleeper's mood for rest (McDowell 2005; Iwaki et al., 2003). A recent study in a pediatric intensive care unit found music listening encouraged rest in pediatric patients, whilst also demonstrating increases in relaxation and oxygen saturation, as well as decreases noise, anxiety, pain, heart rate, respiratory rate, and metabolic rate (McDowell 2005). Additionally, Iwaki et al. (2003) theorize that music may be used to manipulate moods and assist with the progression from awake to asleep, after their studies showed that preferred music was an effective means of helping participants fall asleep. Unlike other experiments using music to help induce sleep, Iwaki et. al examined the use of music with college students who previously listened to music at bedtime. The implication of this difference sheds light on the

questions of the effectiveness of music versus no music, preferred music versus non-preferred music, and of familiar stimulus versus unfamiliar stimulus.

In an article in the *Journal of Pediatric Health Care*, it is stated that background music can improve an environment by distracting from silence, thus reducing anxiety and stress, and increasing relaxation and feelings of security (Klein & Winkelstein, 1996).

In addition to being an efficient means of preparing the sleep environment, music can be used to improve many aspects of sleep. Harmat et al. (2008) conducted a sleep study of 19-28 year olds. After listening to forty-five minutes of classical music, participants showed statistically significant improvements in sleep quality.

A research study by Lai and Good (2005) examined the use of relaxing music on sleep in people ages sixty and older. Data from this experiment showed significant improvements in sleep quality, efficiency, and quantity, as well as daytime improvements in behavior and ability to pay attention. More importantly, participants in this study demonstrated decreases in sleep onset time.

Recently, Bloch et al. (2010) studied twenty-four subjects diagnosed with schizophrenia who received forty minutes of specially recorded classical music before sleeping. Researchers found that listening to music was an effective means of increasing relaxation and sleep quality, as well as decreasing sleep onset time.

Relaxing music has shown some of the same results with children on decreasing sleep onset time and increasing quality and duration of sleep, as seen with adults. In 2004, Tan found that when music was played at naptime and bedtime for three successive weeks, elementary school aged children showed increases in sleep quality, efficiency, and duration. A similar study in 1999 found that children's sleep onset time was shorter while listening to music versus silence (Field, 1999).

Research suggests that listening to a repetitive stimulus would encourage sleep (Walker, 1972). The repetitive sounds of rain sounds can be qualified using Walker's definition, suggesting that these rain sounds could prepare the sleep environment, thus leading to more children sleeping during naptime.

This research seeks to examine the relationship between stress on relaxation and the subsequent ability to fall asleep, as well as make a case for using music therapy as an intervention to encourage sleep in young children. The purpose of this study was to determine

the effects of lullaby music versus rain sounds on the percent of children who fell asleep during the first 20 minutes of naptime. It was hypothesized that there would be no statistically significant difference between the percentage of children who fell asleep while listening to lullaby music or rain sounds.

CHAPTER 2

METHODS

Purpose

The purpose of this study was to determine the effects of lullaby music versus rain sounds on the percent of children who fell asleep during the first 20 minutes of naptime. This study was approved by the FSU IRB prior to approaching the participating daycare facility (Appendix A).

Design

This study used subjects as their own control in a reversal design (ABABAB) where A equaled rain sounds and B equaled lullaby music. Order was balanced across six classrooms. For this study, the independent variable was the use of music or rain sounds during naptime. The dependent variables were the percent of children who fell asleep, stayed awake, or presented off task behaviors. The null hypothesis was that there would be no difference between the percent of children who fell asleep listening to lullaby music versus the percent of children who fell asleep listening to rain sounds.

Participants

Fifty-one preschoolers and toddlers (N=51) between the ages of two and five years of age from a daycare center in Northern Florida participated in this study. Goodlin-Jones et al. found no statistical differences in the Children's Sleep Habit Questionnaire between preschoolers and toddlers, suggesting that it was appropriate to combine the two age groups for the purpose of this thesis study (2008). Children invited to participate regularly attended the facility. Each classroom practiced afternoon naptime following lunchtime prior to this study. Participants ranged in ethnic and socioeconomic backgrounds. The following table describes the number of males and females who participated in the study for each classroom (see Table 1).

Table 1: Demographic Information

Classroom	Females	Males
A	11	3
B	4	5
D	4	5
E	4	3
F	5	2
G	2	3
Total:	30	21

Children were invited to participate in the study by means of letter (Appendix B), discussions with parents, and conversations with center staff. A permission slip and release form was signed by a participant's parent or guardian before being allowed to participate in the study (see Appendix B). Children were excluded from the study if permission was not granted from parents or guardians, if they left the nap area, or if a teacher or aide provided the child with additional attention during naptime.

Dependent Measurements

The following definitions were used for recording child behavior during naptime:
"Off task behavior": crying, talking, yelling, moving outside of designated nap area, or participating in any activity that would prevent the child from falling asleep.
"Asleep": lying still in designated nap area, no movement, eyes closed, deep breathing, no verbalizations.
"Awake": lying quietly in designated nap area, minimal movement, no verbalizations, eyes open

Procedure

Informational meetings discussing the research experiment were conducted with daycare staff during the first week of the experiment. Staff received letters detailing the purpose and procedure of the research experiment which were distributed to parents and caregivers of children attending the daycare facility (Appendix B). The researcher was on site during pickup and drop off times to answer any questions concerning participation in the study. Consent was

obtained through the acquisition of a permission slip and release form, signed by the parent or caregiver (see Appendix B).

Observers were trained by the researcher how to utilize stopwatches and how to fill out observation forms prior to beginning formal observations. Trained observers were placed in classrooms at least 30 minutes prior to naptime. Each observer was equipped with a stop watch, clock, clipboard, writing utensil, and observation form (Appendix C). Each classroom provided a boombox cd player, with the same capabilities of a Memorex Portable CD Boombox with AM/FM tuner or better. Volume was set prior to the observation by the researcher at a soft level, audible at all points in the room. This volume level was predetermined by the researcher when children were absent from the classroom, so that the music or rain sounds could be heard despite children's placement or distance in the room from the sound source. For the lullaby music condition, the Disney's Lullaby Album: Gentle Instrumental Favorites for Baby cd was played. For the rain sounds condition, the Lifescapes Rain & Thunder cd was played. After children were in their instructed places for naptime, the independent variable of lullaby music or rain sounds was started by the researcher by pressing play on a cd player setup up prior to naptime. Every minute, the number of children awake, off task, and asleep was recorded by observers on a data sheet designed by the researcher, for exactly twenty minutes (Appendix C). Observers were allowed to tally the number of children in one scan of the room by using one tic mark per child exhibiting the behavior, or create three total numbers by conducting three scans within the minute totaling the number of children for each category of behavior.

Participants received the conditions over the course of six days following an ABABAB pattern. On A days, the rain sound cd was played for children. On B days, the lullaby music cd was played for the children. The order was reversed in other classrooms to BABABA to prevent order effect. The classrooms were randomly assigned an intervention. Classrooms A, B, and F received the rain (R) sounds intervention on days one, three, and five, and received lullaby (L) music on days two, four, and six. This was known as order #1: RLRLRL. Classrooms D, E, and G received order #2: LRLRLR, or lullaby music on days one, three, and five, and rain sounds on days two, four, and six.

After twenty minutes, data collection ceased. Staff were allowed to choose if music or sounds were faded completely out and replaced with staff preferred music following

observations, or allowed to play for the entire nap duration. Observers quietly exited the nap area and gave observation sheets to the researcher.

CHAPTER 3

RESULTS

The Wilcoxon signed ranks test, a non-parametric alternative to the paired sample t-test, was utilized to determine whether there were significant differences in the number of children asleep between the two conditions at the end of 20 minutes. Four different comparisons were made: 1) between the percent of children asleep at the end of 20 minutes for day one of the rain condition versus the lullaby condition across all classrooms, 2) between the percent of children asleep at the end of 20 minutes for day two of the rain condition versus the lullaby condition across all conditions, 3) between the percent of children asleep at the end of 20 minutes for day three of the rain condition versus the lullaby condition across all classrooms, and 4) between the average percent of children asleep across all days and classrooms for the rain versus lullaby condition (see Table 2).

Table 2: Mean percentage of students asleep at the end of 20 minutes by condition

	R1	L1	R2	L2	R3	L3	R Avg.	L Avg.
A	0.69	0.62	0.71	0.22	0.64	0.46	0.68	0.43
B	0.78	0.25	0.7	0.67	0.56	0.67	0.68	0.53
F	0.67	0.5	0.8	0.6	1	0.6	0.82	0.57
D	0.55	0.36	0.33	0.1	0	0.36	0.29	0.28
E	0.83	0.57	0.43	0.6	0.83	0.8	0.7	0.66
G	1	1	0.8	1	0.8	1	0.87	1

A Wilcoxon Signed Ranks Test demonstrated a statistically significant difference between the percent of children asleep at the end of 20 minutes for day one of the rain condition versus the lullaby condition across all classrooms (see Table 3). However, there were no statistically significant differences between the percent of children asleep at the end of 20 minutes for day two or three of the rain condition versus the lullaby condition across all conditions, as well as between the total average percent of children asleep at the end of 20 minutes across all days and classrooms for the rain versus lullaby condition (see Table 3). The advantage of the lullaby condition diminished over the three comparisons.

Table 3: Wilcoxon Signed Ranks Test Results

	L1 - R1	L2 - R2	L3 - R3	L avg. – R avg.
Z	-2.023	-1.051	-0.105	-1.572
Asymp. Sig. (2-tailed)	0.043*	0.293	0.917	0.116
Based on positive or negative ranks	positive	positive	negative	positive

*significant p < .05

The graph below (Figure 1) represents the percentage of children asleep by minute across both rain and lullaby conditions for all classrooms. Each point represents the average percentage of children that were asleep across all classrooms at that point in time over the observation. For example, at one minute in to the observation, the average percent of children asleep while listening to rain sounds in all classrooms was 6%.

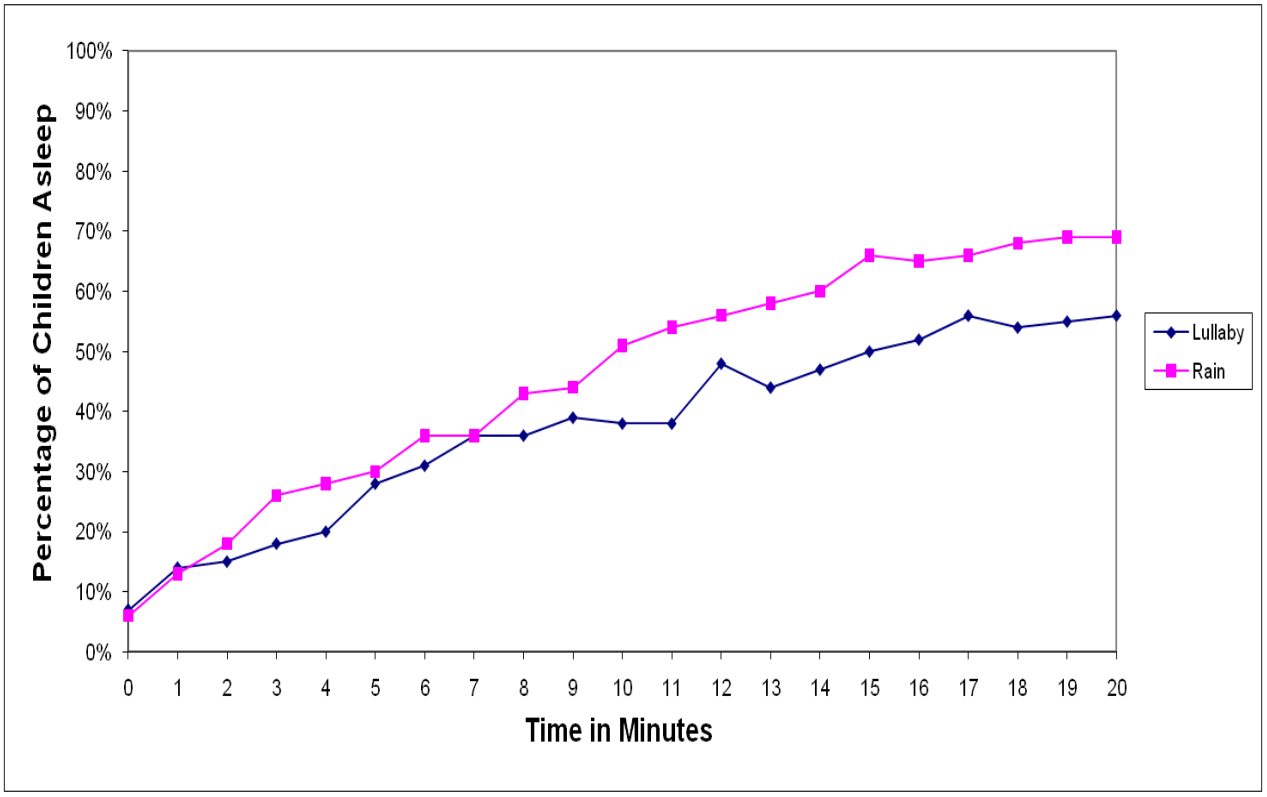

Figure 1: Percentage of Children Asleep by Minute across Both Conditions

The graph clearly demonstrates that after the first couple of minutes, the rain condition showed a higher percentage of children asleep. It also demonstrates that children fell asleep faster while listening to rain sounds as opposed to lullaby music.

Though the two conditions were reversed in some classrooms for order effect, the rain condition continued to show some increased success empirically, despite lacking statistically significant results. The figures below shows the average proportion of students sleeping after 20 minutes across both conditions for order 1, or RLRLRL, and order 2, or LRLRLR.

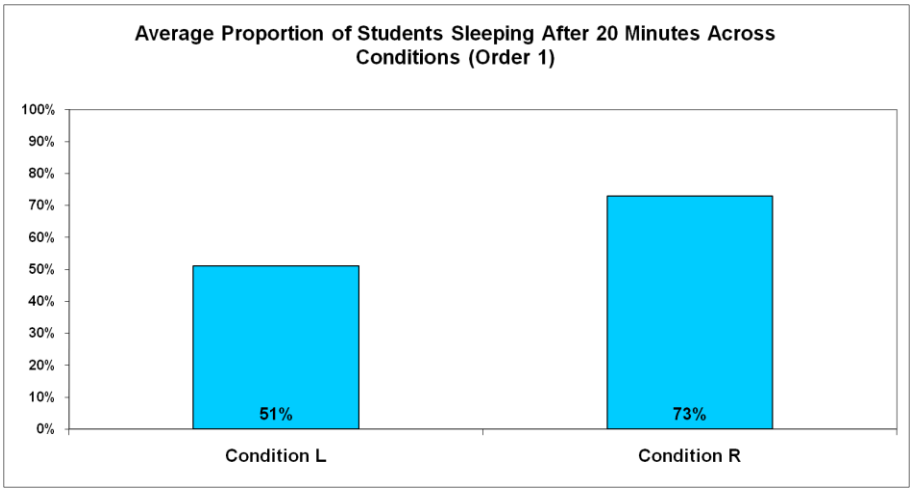

Figure 2: Average Proportion of Students Sleeping After 20 Minutes Across Conditions (Order 1)

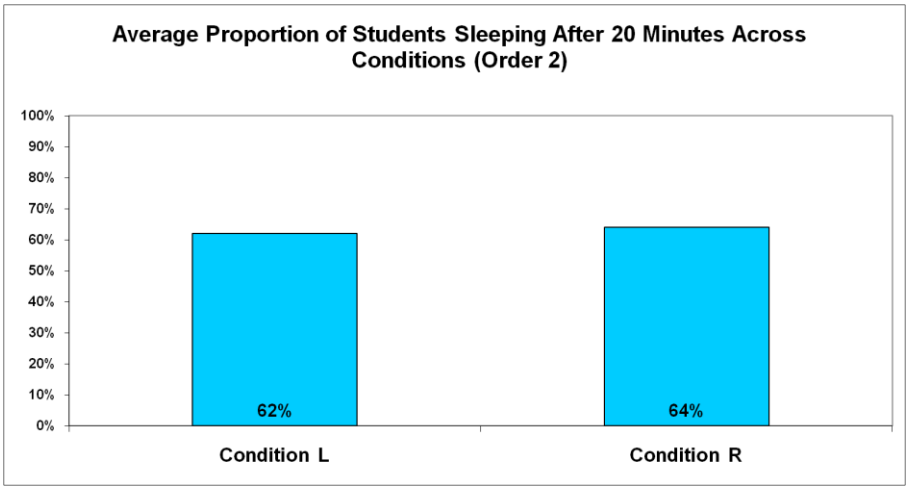

Figure 3: Average Proportion of Students Sleeping after 20 Minutes Across Conditions (Order 2)

By comparing the two figures, it appears that when the rain condition was introduced first, it increased the average proportion of children asleep at the end of 20 minutes. In contract, the introduction of the lullaby music first did not appear to greatly influence the proportion of children asleep at the end of 20 minutes.

It is also noteworthy to examine the effect of class size on the number of children who fell asleep after 20 minutes. A graph showing the average class size versus the average proportion of students sleeping at the end of the observation period demonstrates that larger classes tended to have fewer children sleeping at the end of twenty minutes (Figure 5).

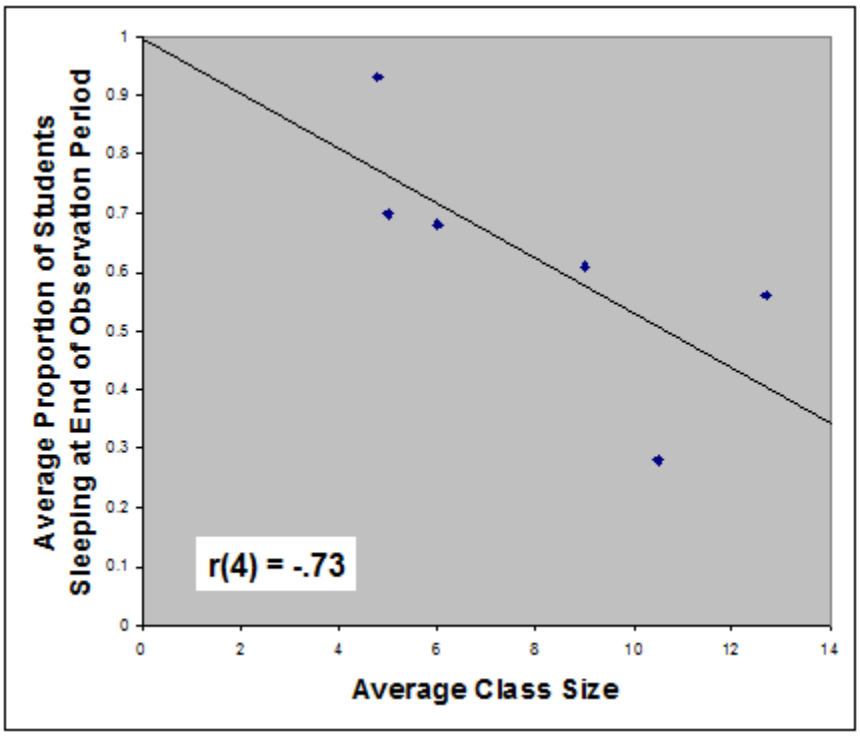

Figure 4: The Average Proportion of Students Sleeping at the End of the Observation versus Average Class Size

CHAPTER 4

DISCUSSION

This research sought to evaluate the use of music versus rain sounds during the first 20 minutes at naptime to assist children with sleeping in the daycare setting. Overall, statistical analyses did not demonstrate a significant difference between the two conditions, though charting averages by minute showed a slight advantage by the rain sounds condition. This implies that either may be used by daycare facilities to assist in the induction of sleep during naptime.

Statistical analyses found that rain sounds were more effective than lullaby music on the first day of intervention, though this was not true of days two and three. Additionally, analyses showed that the advantage of the rain sounds appeared to diminish over time. These findings suggest future studies are warranted on the effects of a novel stimulus versus a familiar stimulus on the induction of sleep. It could be hypothesized that as children become familiar with a stimulus, it loses efficacy as a means of inducing sleep.

There are many potential explanations for the lack of statistical significance in some of the analyses of the data. Iwaki et al. (2003) propose that instead of distracting the sleeper from the day's stressors, music may in fact distract from sleep itself by providing an attention holding stimulus. As the research supporting this theory has been primarily conducted with adult populations, further study may be considered with younger populations.

Another explanation for the lack of statistical significance may be the environment where the research was conducted. The researcher did not control for the physical sizes of the classrooms, number of children per classroom, location of each classroom within the daycare facility, age of the children in each classroom, differentiation in daily activities across classrooms, and differences in daily schedules. In addition to variations by classroom, there were several unforeseen factors, typical of daycare occurrences, which may have impacted the data of this experiment. Due to the space constraints of the environment in which this study was conducted, it was impossible for teachers and daycare assistants to pass from some classrooms to other areas without walking through classrooms where children sleep during naptime. This added another variable to the data, which may have resulted in the statistically non-significant calculations. Siren-Tiusanen and Robinson (2001) mention in an issue of *Early Childhood*

Research Quarterly that any sort of movement through the nap area can hinder children's ability to fall asleep and remain asleep. The article goes on to say that special attention should be paid to the sleep environment and creating a dark, quiet, consistent nap space; a fact also echoed by an article by the National Sleep Foundation (National Sleep Foundation, 2002; Siren-Tiusanen et al., 2001) It should be noted that the nap environment was interrupted at various points on different research days through such disruptions as children being picked up by parents, construction outside the building, sick children, and other unexpected distractions.

Despite studies that suggest little difference in the napping behaviors of children under the age of five, such as the Goodlin-Jones et al. experiment of 2008, there is research to suggest the contrary. There is evidence that as children mature, their napping decreases from figures of 100% of toddlers who take naps to less than 10% taking naps by age six, (Crosby et al., 2005; Crabtree & Williams, 2009). This difference is especially noticeable after two years of age (Crabtree & Williams, 2009). This decrease in need for sleep means not only a decrease in the occurrence of the nap altogether, but also a change in the length. Results of the 1999 research study by Field found that toddlers fell asleep faster than preschoolers; with a difference of 35% faster sleep onset time versus 19% faster sleep onset time when compared to a no music condition. Future studies may consider separating toddlers and preschoolers in to groups based on age or developmental level. There is additional room for research on the effects of age on nap duration, sleep onset, and frequency of naps.

In 2005, Crosby et al. found that there were significant differences in the parent and caregiver reported napping habits between white and black children of ages two to eight years of age. The race of the participants in this study was not considered or documented for the purposes of this investigation, as participants were already united in similar socioeconomic backgrounds.

The use of therapist selected music as opposed to patient preferred music was not considered for the purposes of this study, but may be a consideration in future studies. In a study by Logan and Roberts (1984), members who were forced to listen to "relaxation" music not selected by the participants themselves actually had higher tension levels than those who did not listen to music at all. Wolfe, O'Connell, and Walden (2002) mention in their study:
Personal preferences for different musical styles, amplitude preferences, masking effects, knowledge of important musical characteristics, and consideration of varying sound environments should make us aware of the numerous variables that contribute to the complexity

of selecting music for beneficial relaxation experiences. (p.55) Though the children who participated in this study were all under the age of 5, perhaps it is not too early to start considering even the youngest participant's musical preference. As this study did not allow participants to choose preferred music, it may be of interest to further studies in music preferences in young children. Other researchers may wish to consider how a child's preferred music can assist with relaxation.

Due to the change in daily occurrences, daycare teachers were not always able to start naps at exactly the same time every day. Holiday activities, parents, meetings, special events, and a variety of other reasons, force the daycare to adapt the daily schedule to meet the needs of each classroom. It is unclear if this change in scheduled naptime can impact the quality of sleep and quantity of children who fell asleep. The National Sleep Foundation states that regular routines can help children go to sleep and avoid any sleep impediments (NSF 2002). Similarly, Mindell (2005) suggests that children should adhere to sleep schedules, either napping at the same time every day by the clock or based off the time that children awaken. In future studies, it would be of interest to research the effect of the time children are put to bed/nap on the quality of sleep or sleep onset time of children.

For the purposes of this study, the data were collected by tallying the total number of children who were asleep, off task, or awake. The number of children varied per day due to attendance, as well as the exclusion of students who left the nap area during naptime or received extra attention from faculty. Future studies should consider other possible means of collecting data. Individual children could be tracked across each day of the study and excluded altogether for missing an observation. Not only would this provide consistent numbers of children, which would change the statistical analyses and strength of data, but it would also allow researchers to look at other correlations such as age, gender, race, and placement in classroom. Researchers could also consider taking measurements of the amount of time it takes for individual children to fall asleep when listening to rain sounds versus lullaby music. This could be accomplished by doing individual observations of students, or by the use of a measurement device such as an actigraph, capable of recording the actual time of physiological changes signifying sleep.

APPENDIX A

HUMAN SUBJECTS COMMITTEE APPROVAL

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 Â· FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 7/31/2008

To: Erin Patterson

Address:
Dept.: MUSIC SCHOOL

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
The effect of lullaby music verses nature sounds on the sleep onset time of preschoolers and toddlers

The application that you submitted to this office in regard to the use of human subjects in the research proposal referenced above has been reviewed by the Human Subjects Committee at its meeting on 07/09/2008. Your project was approved by the Committee.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 7/8/2009 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving

human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Jayne Standley, Chair [jstandley@fsu.edu]
HSC No. 2008.1552

APPENDIX B

INFORMED CONSENT LETTER

To Whom It May Concern:

I am inviting your child to participate in my master's thesis research study to look at the time it takes for toddlers to fall asleep to lullaby music as opposed to rain sounds. I want to understand if listening to lullaby music makes toddlers fall asleep faster or slower when compared to rain sounds. I am asking that your child take part because your child is in the age group I want to study. Please read this form and ask any questions you may have before agreeing to allow your child to take part in this study.

If you agree to allow your child to take part, your child will be one in a group of children who get to listen to these selections during their scheduled naptime. Your child will listen to lullaby music on two days and rain sounds on two days. Your child will be observed by trained students for how long it takes them to fall asleep. The study will take place over one week during their regularly scheduled naptime.

There are no risks to you or to your child if you decide to join my study. But if you choose not to participate that is fine. Even if you decide not to let your child participate, I would be very happy to share my results with you if you are interested. To get a copy of my results email me at xxxxx@xxxx.com. There are no benefits to you or your child if he or she takes part in the study.

The records of this study will be kept confidential, to the extent permitted by law. It will not be possible to figure out your child's results. Consent forms will be kept securely for three (3) years after this study ends in a locked cabinet and office.

Your child's participation in this study is completely voluntary. Your child may be removed from the room so as not to hear the music or rain sounds, or skipped during data collection if allowed to remain in the room where the study is taking place. Your decision whether or not to allow your child to take part will not affect your current or future relationship with Florida State University or with your child's school. If you decide to allow your child to take part, your child is free to not do the study or stop at any time. You are free to withdraw your child at any time without affecting your relationship with the University or your child's school.

If you have any questions, you may contact me, Erin Patterson, at xxx.xxx.xxxx. Please feel free to ask any questions you have now, or at any point in the future. If you have any questions or concerns about your child's rights as a research subject, you may contact the FSU Institutional Review Board (IRB) at 850-644-8633 or you may access their website at http://www.fsu.research.edu. You will be given a copy of this consent form for your records. My advisor, Dr. Jayne Standley, your day care center, and the human subjects committee at The Florida State University have approved this project.

Please enter your child's name and sign below if you give consent for your child to participate in this study.

Your child's name: _____

Your signature _____ Date _____

Sincerely,

Erin Patterson,
Music Therapist and Master's of Music Therapy Candidate

APPENDIX C

DATA COLLECTION FORM

Observation Sheet

Observer:

Date: Time:

Total number of participants:

Time (minutes)	Awake	Asleep	Off Task	
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

APPENDIX D

PERCENT OF CHILDREN AWAKE AND ASLEEP BY CLASSROOM

Table 4: Percent of Children Awake and Asleep by Classroom

Group	Day	Condition	Percent Asleep	Percent Awake	Total # Children Present
A	1	R	69%	31%	13
A	2	L	62%	38%	13
A	3	R	71%	28%	14
A	4	L	22%	77%	9
A	5	R	64%	36%	14
A	6	L	46%	54%	13
B	1	R	78%	22%	9
B	2	L	25%	76%	8
B	3	R	70%	30%	10
B	4	L	67%	33%	9
B	5	R	56%	44%	9
B	6	L	67%	33%	9
D	1	L	55%	45%	11
D	2	R	36%	63%	11
D	3	L	33%	67%	9
D	4	R	10%	90%	10
D	5	L	0%	100%	11
D	6	R	36%	63%	11
E	1	L	83%	17%	6
E	2	R	57%	43%	7
E	3	L	43%	57%	7
E	4	R	60%	40%	5
E	5	L	83%	17%	6
E	6	R	80%	20%	5
F	1	R	67%	33%	6
F	2	L	50%	50%	4
F	3	R	80%	20%	5
F	4	L	60%	40%	5
F	5	R	100%	0%	5
F	6	L	60%	40%	5
G	1	L	100%	0%	5
G	2	R	100%	0%	5
G	3	L	80%	20%	5
G	4	R	100%	0%	4
G	5	L	80%	20%	5
G	6	R	100%	0%	5

APPENDIX E

GRAPHS OF PROPORTION OF CHILDREN ASLEEP AT THE END OF 20 MINUTES FOR EACH DAY OF OBSERVATION AND CONDITION BY CLASSROOM

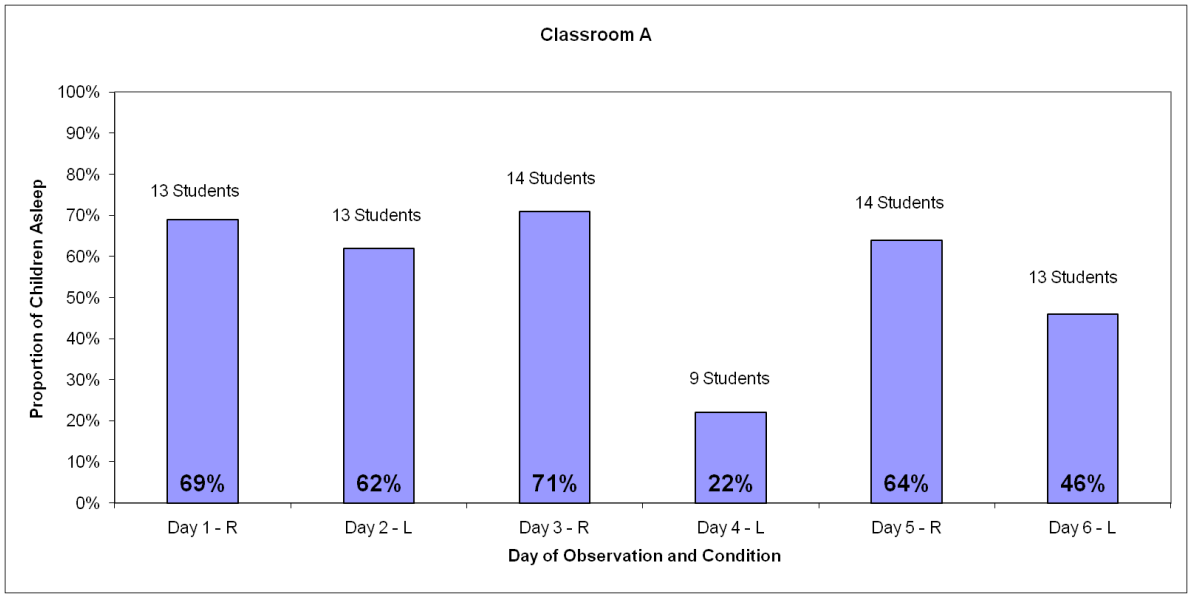

Figure 5: Proportion of Children Asleep at the End of 20 Minutes for Each Day of Observation and Condition for Classroom A

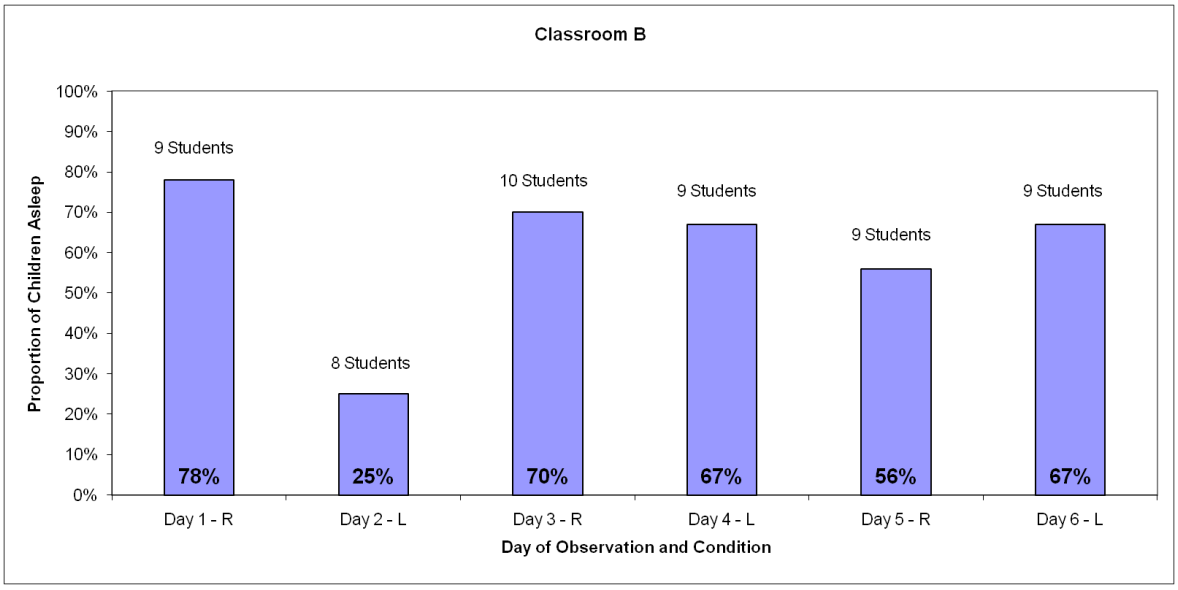

Figure 6: Proportion of Children Asleep at the End of 20 Minutes for Each Day of Observation and Condition for Classroom B

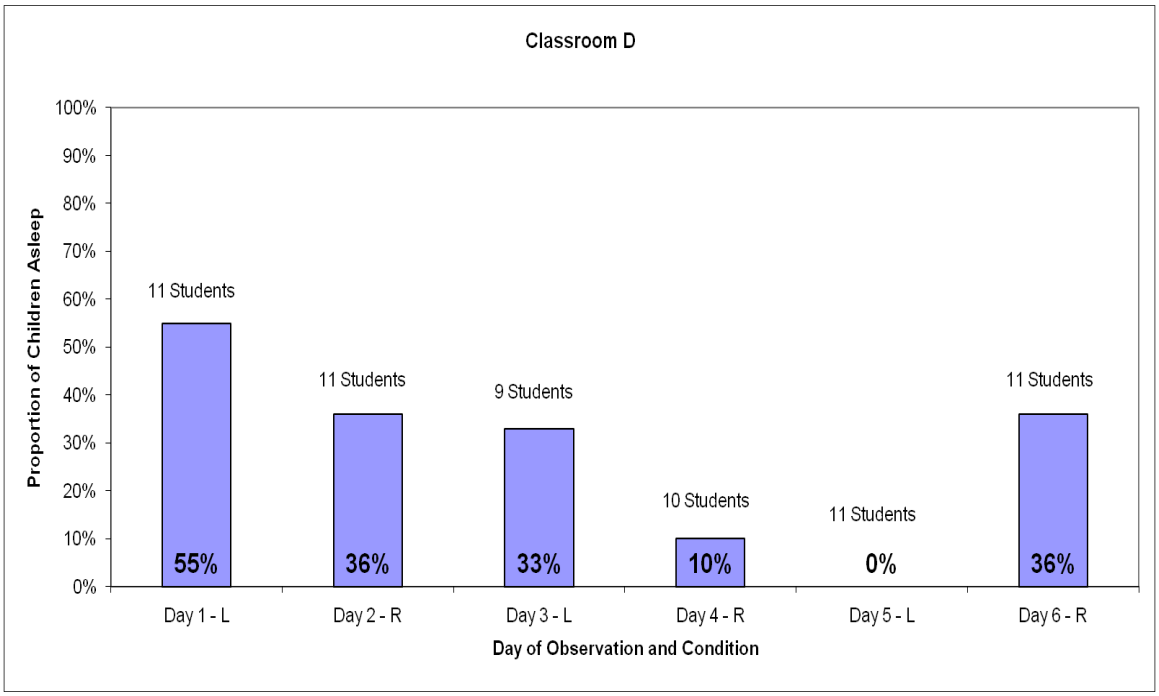

Figure 7: Proportion of Children Asleep at the End of 20 Minutes for Each Day of Observation and Condition for Classroom D

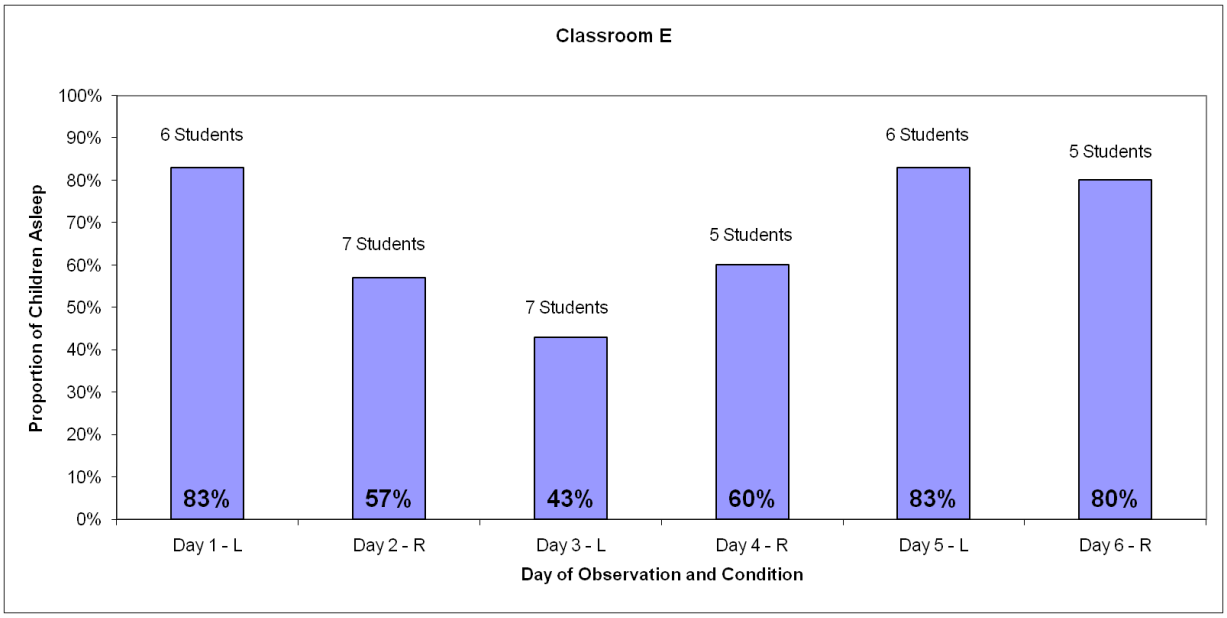

Figure 8: Proportion of Children Asleep at the End of 20 Minutes for Each Day of Observation and Condition for Classroom E

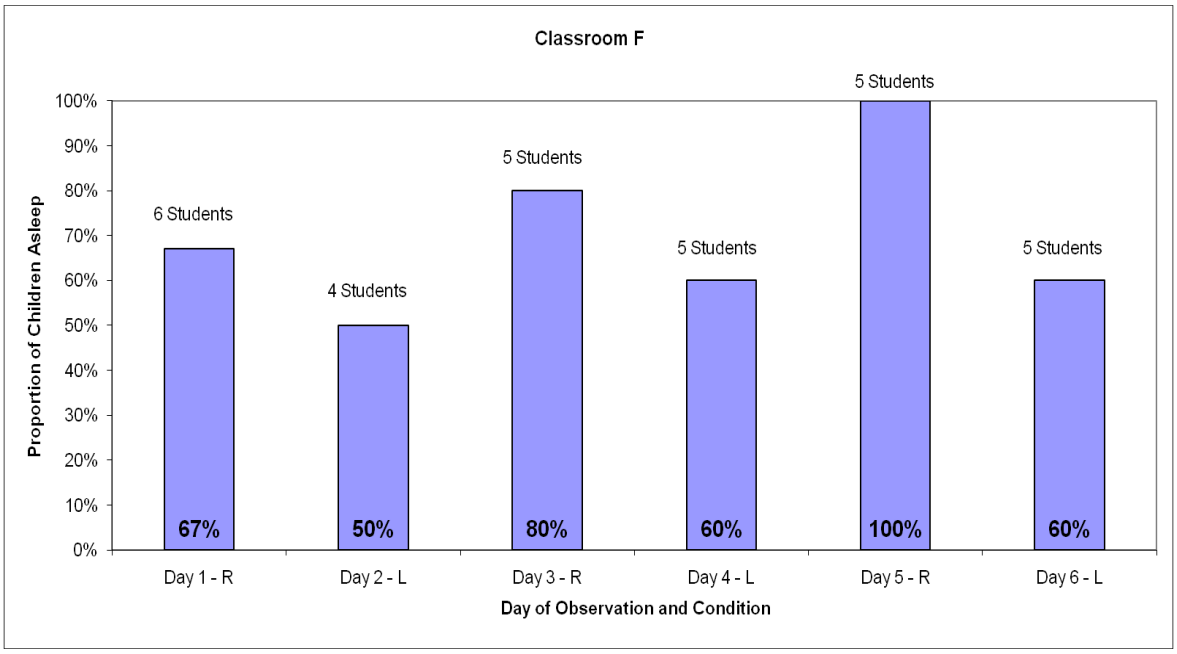

Figure 9: Proportion of Children Asleep at the End of 20 Minutes for Each Day of Observation and Condition for Classroom F

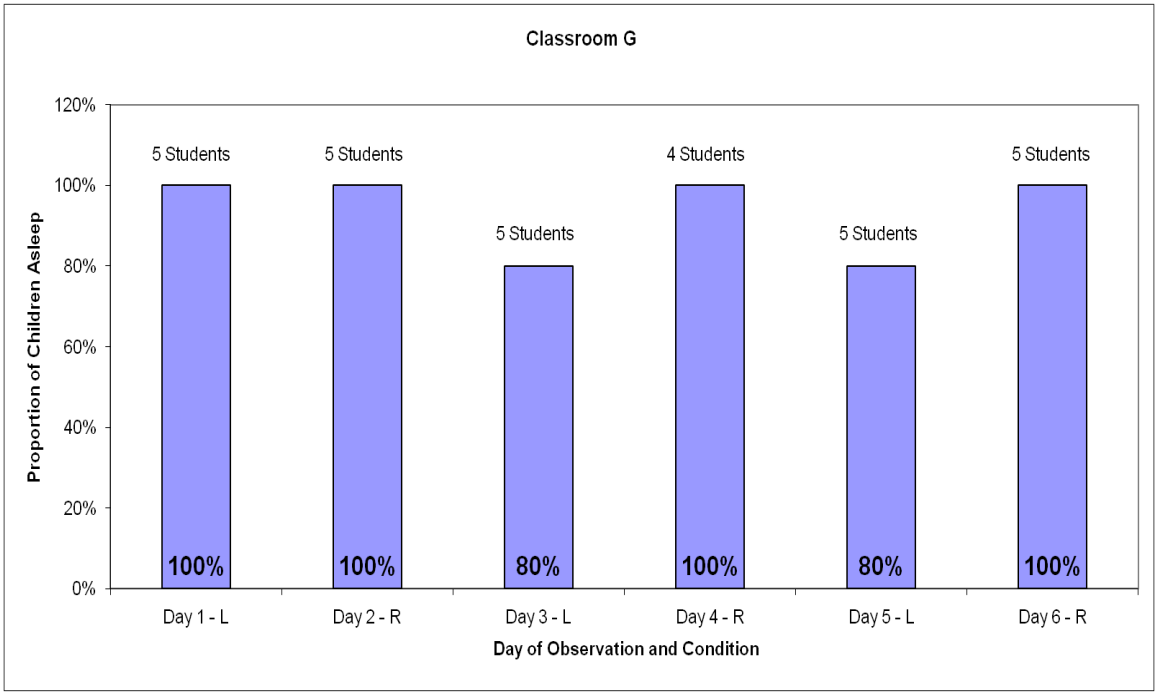

Figure 10: Proportion of Children Asleep at the End of 20 Minutes for Each Day of Observation and Condition for Classroom G

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BIOGRAPHICAL SKETCH

Erin Patterson was born in Henrico, Virginia on March 9th, 1983. She graduated cum laude from Berklee College of Music with a Bachelor's of Music with a concentration in Music Therapy in 2005. Prior to her graduation, Erin completed her internship at Tallahassee Memorial Hospital under the supervision of Judy Nguyen, MM, MT-BC. While at TMH, she received her credentials as a Neonatal Intensive Care Unit music therapist (NICU MT) through the National Institute for Infant and Child Medical Music Therapy. In 2006, she accepted a graduate assistantship and began her studies at Florida State University. Erin has held music therapy positions with Music to Grow On in Sacramento, CA, and Heartland Therapy in Phoenix, AZ. Upon the completion of her master's degree, she hopes to pursue her passions of early intervention and medical music therapy.