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THE EFFECTS OF SLEEP PATTERNS ON ACADEMIC PERFORMANCE
AMONG SCHOOL-AGE CHILDREN

By
Evelyn M. Rosa

A Thesis

Submitted in partial fulfillment of the requirements of the
Master of Arts Degree
of
The Graduate School
at
Rowan University
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Approved by

(Professor
Date Approved 5-1-02

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ABSTRACT

Evelyn M. Rosa

The Effects of Sleep Patterns on Academic Performance Among School-Age Children
2001/02

Dr. Roberta Dihoff and Dr. John Klanderma
School Psychology Program

The purpose of this study was to assess the effects that sleep patterns have on a student's academic performance. The study intended to determine if sleep disruptions effect a student's capacity to learn at school by comparing a group of students with disrupted sleep patterns to a comparison group. The sample size was $n=46$, with 28 female students and 18 male students. The participants involved were from an inner city middle school and were of Caucasian, African American, Asian, and Hispanic descent. The students sleep patterns were monitored over a course of several months through self-report method. The students were required to complete a weekly log sheet, reporting the number of times, if any, the students had an awake period during the course of the night. Academic performance was measured through grade point averages. A multiple regression analysis was used to assess if any significant correlation existed between sleep patterns (disrupted or undisrupted) and academic performance (grade point average). The analysis of the data collected failed to reveal any significant correlation between sleep patterns and academic performance. Although, students with undisrupted sleep patterns did reveal higher grade point averages then those students with disrupted sleep patterns.

MINI-ABSTRACT

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Chapter I: The Problem

Need

Many students have difficulty in the school setting. Some students may have difficulty with their social skills, others may have learning problems, and others may just have difficulty adjusting to the high demands that school can place on a student, making it difficult for them to succeed in any realm of the school setting, socially or academically. The school system, today, is designed to meet the needs of the student. There are resources available to assist a student by developing an environment or educational program most conducive for his / her optimal learning. In order to achieve this, the entire network around the student (teachers, parents, counselors, and school officials) must get to the root of the problem.

The reason that one needs to study the effects of sleep patterns on academic performance are numerous. Trying to discover if sleep has a negative effect on a student's academic performance can shed light on many areas. First, it could lead to a more thorough explanation of a student's poor academic performance. If sleep patterns do, in fact, have an effect on how well or poorly a student performs in school, then it may rule out a potential learning disability. Overlooking the element of sleep during student's evaluation, could lead to a misdiagnosis of some other nonexistent problem. Something as simple as the lack of sleep can be the solution to many of the problems that a student is having in school.

Purpose

The purpose of this study is to assess the effects that sleep patterns have, if any, on a student's academic performance. We want to determine if sleep disruptions effect the student's capacity to learn at school by comparing them to students who do not have sleep interruptions during the night.

Hypothesis

The hypothesis to be tested in this study assumes that academic performance will be negatively effected by poor sleep patterns.

Theory

Human beings spend about one third of their lives sleeping. After hearing this, it is not difficult to understand why a person would not work up to his/her potential after lack of a full night of sleep. Sleep is essential for the brain to take what it had learned during the day out of short-term memory storage and place it into the areas of the brain responsible for long-term memory. In relation to a student's academic performance, it would make sense why interrupted sleep would affect his/her schoolwork. During the stages of sleep, the REM stage is the stage in which the process of placing short-term memory into long-term memory storage is performed. If a child is constantly being woken up during the night, two things are possible. First, the child may not have been asleep long enough to even reach the REM stage, or, the child's REM stage may have been interrupted, making the process of transforming short term memory into long term memory unfinished. With both of these possibilities in mind, imagine a child going to

sleep with all of the things learned during the day, things learned in school or even things studied for a test, stored in his/her short term memory. Just as the brain begins to transfer that information into long-term memory, the process comes to a halt because of a sleep disruption. If the sleep disruptions are frequent enough during the course of one night, it is possible that all of that information stored in short term memory to be completely lost because the brain never had the chance to complete the process. Therefore, when it comes time for the child to perform on a test or participate in the classroom, he/she is completely at a loss for the information that was temporarily in the brain.

In addition to memory problems, another negative effect that poor sleep patterns may have on academic performance are the physical effects that sleep deficit makes on the body. A full night of sleep yields alertness and a good feeling of well-being. Therefore, lack of sleep reduces an individual's alertness and causes mood problems. For a student, poor alertness and a negative mood are not conducive to learning. A basic lesson in arithmetic is more challenging to a student with physical exhaustion because he/she is unable to maintain focus and concentration and is uninterested in learning the material. Physical exhaustion also leads to a suppressed immune system. Children with low immunity levels are more susceptible infection and illness, which in turn yields higher absenteeism. A child is unable to learn if he/she is not present to receive the instruction.

One final aspect of the importance of the examination of sleep patterns among adolescents is using it as a predictor. Sleep problems can be indicative of an underlying problem where sleep difficulty is the one of the only physical symptoms. Sleep problems can be caused by a number of ailments. For example, asthma, kidney or heart disease,

hyperthyroidism, depression, or stress. It is also believed that children with ADHD frequently exhibit abnormal sleep patterns as a symptom of the illness. It has yet to be determined which of the two conditions is the precursor. What is important to realize is that whether there is an underlying condition or not, sleep problems effect overall daily functioning.

Definitions

Sleep patterns are the characteristics of an average night of sleep of an individual. For example, we examine whether a person had any disruptions during a night of sleep.

Sleep disruptions are any awake period during the course of the night.

Academic Performance is the measure of a student's scholastic progress, such as grades or standardized tests. Simply stated, it is how well or poorly a student is doing in school.

Self Report is the manner in which information is obtained. In the case of self-report, is obtained from the individual on which the study is being performed, as opposed to obtaining information through observation or from a third party.

Assumptions

There are various confounding variables that relate to the study. Since a large part of the information obtained for the study is through self-report, we assume that all of the students will fill out any logs or questionnaires with honesty and integrity. Also, we

are looking at academic performance; therefore we must assume that the quality of teaching is the same with all of the students.

Limitations

The best manner in which to conduct this study is to have a sleep lab in which the students' sleep patterns are directly observed by the researcher. Since the time and money are unavailable for that type of study, we rely on the use of self-report questionnaires to give us the same information that we would have liked to have observed ourselves. Also, the population of students is taken from inner city public schools, which are predominantly from low SES families. Therefore, it would be difficult for us to assume that the results of this study would also apply to children with moderate to high SES living in the suburbs.

Overview

In the proceeding chapters several topics will be discussed. In Chapter two there will be a Review of Literature that is relevant to the study. Following the Review of Literature, the Design of the Study will be presented in Chapter three. The Analysis of the Results of the study will be discussed in Chapter Four. And finally, the Summary and Conclusions will be discussed in the last chapter.

Chapter II: Review of Literature

Introduction

The current chapter will present a review of literature that will overall provide findings that support the hypothesis that poor sleep patterns have a negative effect on academic performance among school children. In order to effectively and efficiently present the research, the literature will be divided into three categories: sleep and academic performance among college students, sleep and its effects on adolescents, and sleep and its effects on school age children. Within each category the articles will be discussed from specific to general, with the first article of the last section, on school-age children, pertaining the most to the experiment to be performed for the purpose of this thesis.

Sleep and Academic Performance Among University Students

There is a belief that there is a negative effect of sleep deprivation on college students' academic performance. Several studies will be reviewed that will provide evidence to support this belief.

In a study evaluating health related variables on academic performance, sleep had the largest effect on semester GPA than the other health related variables of exercise, nutrition, mental health, stress management, and time management (Trockel, Barnes, & Egget, 2000). The relationship between sleep habits and higher GPA had the most significant relationship with a significance level of $p < 0.001$.

The total population of students within the sample had an average of seven or eight hours of sleep a night. There were only two participants that reported obtaining less

than five hours of sleep a night. The study may have been more thorough if they possibly had a larger sleep-deprived sample than just two students.

Another aspect of sleep and its effects on academic performance was evaluated in a study that was performed to determine the relationship between sleep length and GPA among college students (Kelly, Kelly, & Clanton, 2001). The study categorized a group of 148 students into three groups: short sleepers, average sleepers, and long sleepers. Short sleepers obtained less than six hours of sleep a night, average sleepers slept from seven to eight hours a night, and long sleepers slept more than nine hours a night.

Participants were asked to fill out a questionnaire based on their average sleep length and then they were asked to self-report their GPA. A one-way ANOVA revealed a significant effect of sleep length on GPA, with a significance level of $p < 0.01$. Long sleepers reported higher GPA's than short sleepers. The study failed to find a significant difference between average sleepers and short sleepers, and also a significant difference between average sleepers and long sleepers.

A possible error in the study may have occurred when the students self-reported their GPA. Only 61% of long sleepers reported their GPA. One might assume that the 39% that didn't report their GPA may not have done so because their GPA's were poor. If that were the case than the difference between the GPA of long sleepers vs. short sleepers might not be so significant. That may also explain why there is no significant difference between long sleepers and average sleepers and short sleepers and average sleepers. In the absence of this information, the study is able to conclude that long sleepers have an overall higher functioning than the other two groups.

In Lack's Study, *Delayed Sleep and Sleep Loss in University Students* (1986), he discovers evidence that also supports the belief that poor sleep is followed by inefficient daytime behavior and variability of mood (105).

Lack studies 211 college students through a questionnaire about their sleeping habits and sleep difficulties. The results of this study found a very small population of students that actually had sleep difficulties. Those students who did report sleep difficulties did not have a significantly different academic performance than those students in a control group. However, there was a significant difference between students with delayed sleep onset than those students in the control group. This may be due to the fact that Lack measured academic performance just by the grade that was received in one particular class. This was a poor measure of academic performance. Obtaining the students' GPA would have provided a better measure of academic performance.

A fourth study evaluated the effects of peak activation time and extraversion on student's achievement (Beaulieu, 1991). The experiment involved 55 college students that were given the Eysenck Personality Inventory and seven additional questions to assess their peak activation time and sleep patterns. The student's were asked questions about when they usually wake up, when they prefer to wake up, when they go to bed, when they felt most alert and sluggish, and when they felt they did their best work.

The analysis of data obtained showed that students that went to bed earlier and woke up earlier had higher GPAs than students that went to bed later. There was a significance level of $p < 0.004$.

Beaulieu controlled for response reliability by eliminating any individual whose responses were inconsistent with another related item. The Lie Scale was used to assess

the reliability of the Eysenck Inventory, and the students' GPAs were validated with school records. Overall the study was very thorough and the results can be seriously considered.

The final study in this section discusses the *Aspects of Personality Associated with Irregular Sleep Habits in Young Adults* (Taub & Hawkins 1979). The experiment compares two groups of students, habitual sleepers and irregular sleepers. Habitual sleepers are individuals that obtain eight hours of sleep consistently and irregular sleepers are individuals that vary for two to four hours in the amount of sleep they receive each night.

Each group was given the California Psychological Inventory (CPI) to assess certain aspects of personality such as sociability, achievement potential, and intellectual efficiency. The analyses of the CPI Scale revealed a statistically significant difference between habitual sleepers aspects of personality and the irregular sleepers aspects of personality with a significance level of $p < 0.002$. Habitual sleepers demonstrated higher sociability, achievement potential, and intellectual ability.

Most of the studies performed on a population of college students, demonstrated evidence to support the belief that sleep patterns do have a negative effect on academic performance. Next, the relationship of sleep patterns and its effects on adolescents will be discussed.

Sleep and its Effects on Adolescents

The articles reviewed on sleep and academic performance among university students all, but one, provided evidence to stress the importance of sleep in relation to

academic performance. This section will provide further evidence that sleep also has a profound effect also, if not more, on adolescents.

As Black (2000) explains in her article *Sleep Tight*, adolescents need the same amount or more sleep at this age than when they were children. She states that adolescents need 9.25 hours of sleep to function optimally. Students who lack the proper sleep receive lower grades because they have memory lapses, an inability to pay attention, and difficulty concentrating. Black also states that the effects of sleep deprivation carry over from school to the students' social lives. Their relationships suffer because of their irritability and ability to become easily aggravated. These same ideas are supported in the articles by Wolfson & Carskadon (1998) and On & Watkins (1994).

Wolfson & Carskadon focus on the many effects that poor sleep has on adolescent's daily activities. Allen (1992), Link & Ancoli-Isreal (1995), and Manber, et.al. (1995), as cited by Wolfson and Carskadon, surveyed 200 high school students and reported that students with more total sleep, earlier bedtimes, and later weekday rise times have better grades in school. The authors also state that persistent sleep problems have also been associated with learning difficulties (Quine, 1992, as cited in Wolfson and Carskadon).

Their study was performed on 3,120 students. They students were asked to complete a survey that assessed their sleep patterns, sleep behavior problems, and also their academic performance. Based on these questions, students were given a score for sleepiness, and sleep/ wake behavior problems. The analyses of this data using MANOVA, revealed that students with higher grades reported longer sleep, more total sleep, and earlier bed times than did students with lower grades. Post hoc analysis

showed that there was a significant difference between sleep patterns and those students reporting C's from those students reporting mostly B's. Also consistent with the findings of Allen, Link & Ancoli-Isreal, and Manber, students that described themselves as struggling or failing school, reported that they obtained less sleep, had later bed times, and had more irregular sleep/wake schedules than students with higher grades.

On & Watkins (1994) examined the daily living and study habits on academic achievement and students in Hong Kong. Although sleep duration was not the most influential daily habit on academic achievement (study habit was), it did have a relationship. On & Watkins revealed that out of the 80 girls studied, the girls that received between seven and nine hours of sleep demonstrated better academic performance.

Morrison & Storey (1986) strongly feel that sleep is the most influential daily habit that effects academic performance. Morrison & Storey believe that poor sleep can lessen an adolescent's full learning potential. The researchers defined a chronic sleep condition as taking 45 minutes or longer to fall asleep on three or more nights a week or one or more awakenings followed by thirty minutes of wakefulness occurring on three or more nights a week.

Thirteen percent of students with this presenting problem described themselves as tense, anxious, depressed, introverted, moody, had difficulty coping with personal problems, and had poor self-images. Morrison & Storey also revealed that even one night of disturbed sleep can significantly impair an adolescent's performance on tests (Carskadon, 1980, as cited in Morrison & Storey). Therefore, one can imagine the effects of chronic sleep problems.

Kirmil-Gray, Eagleston, Gibson, & Thoreson studied a population of 277 high school students and based on their answers to a questionnaire, categorized the students as good sleepers, occasional poor sleepers, or chronic poor sleepers. The researchers found that poor sleepers exhibited more cognitive and behavioral signs of daytime stress than good sleepers, but the study did not assess the effects of sleep on academic performance.

Morrison, McGee, & Stanton (1992), also did not assess the effects of sleep on academic performance, but they examined 943 adolescents and other effects caused by sleep problems. The researchers found a significant main effect of sleep problems for both anxiety and depression. There was also relationship between sleep problems and inattention, hyperactivity, and conduct disorder. All of these factors could have an effect on academic performance even though it was not assessed in this particular study.

All of these findings are reaffirmed in an article published by the National Sleep Foundation (1999). The NSF link poor sleep on adolescents to unintentional injuries and death, low grades and poor school performance, negative moods, and increased likelihood of stimulant use. The NSF urges parents and school officials to be aware of the importance of determining sleep problems in order to avoid the negative effects that sleep problems can cause. Also, the symptomology of poor sleep patterns can be easily confused with other disorders such as ADHD and depression. This will also be seen in the following section of sleep and its effects on children.

Sleep and Its Effects on Children

The idea that sleep can be confused with problems such as ADHD and depression as stated in the article from the National Sleep Foundation is also supported by Sadeh,

Raviv, & Gruber (2000). In the article entitled *Sleep Patterns and Sleep Disruptions in School-Age Children*, Sadeh et.al. revealed that sleep could be a symptom of psychopathology, such as ADHD, or sleep problems may even consequent in psychopathology (APA,1994; Dahl,1996; Dahl & Puig-Antich,1990; Ford & Kamerow,1989; Sadeh & Gruber,1998; Sadeh et.al., 1995; Wolfson & Carskadon, 1998; as cited in Sadeh, Raviv, & Gruber). The researchers of this study also place a connection between learning and attention skills and insufficient sleep and sleep disruptions.

Sadeh et.al. attribute night wakings as the most prevalent sleep problem in early childhood. This is the phenomenon that will be examined in the experiment of this thesis. According to Sadeh et.al., objective data on night waking beyond early childhood are still lacking, and therefore it is impossible to describe the night-waking phenomenon across the entire span of development. The experiment of this thesis will hopefully help bridge the gap that exists in this area of research.

Researchers report only a 1%-5% prevalence of sleep problems in school-age children, which is a drop from 20%-30% of children up to age three. Although, researchers do suggest that these numbers are an underestimate of the actual population, because older children are less likely to report night-wakings to their parents. This thesis will attempt to prove this concept.

Sadeh et.al. examined 140 children in this study. The Child Behavior Checklist was used to assess behavior problems and each child was measured with an actigraph across five nights, which provided data for sleep-wake measures. Obviously, the design of this study is more sophisticated than the design of the study for this thesis because of the financial factor, and because the data used is ex post facto. In addition, to the

actigraph measures, daily logs were used to obtain subject information. Daily logs were the main instrument used in the design of this thesis study.

The data obtained from the actigraph had an adequate reliability ($>.70$). Poor sleep was assessed if the child had more than three wakings a night. Similar criteria will be used for this thesis experiment. The researchers discovered that the night-waking phenomenon still exists into early adolescence. They detected an average of close to two night wakings per night for most school children.

The study was limited to finding a prevalence of sleep disruptions among school-age children. The experiment that is to be performed for the purpose of this thesis will take the experiment one step further. It will identify the existence of a sleep problem and determine if there is a significant relationship between sleep problems and academic performance.

Studies performed by Gozal & Pope (2001) and Ferreira et.al.(2000) both examine the effects of snoring on school-age children. The findings in both studies were consistent with one another. They attributed daytime sleepiness, irritability, and behavioral disturbances to snoring. Gozal & Pope found that children with lower academic performance were more likely to snore. They assessed that snoring certainly had a negative overall effect on working memory, motor control, attention, behavior, and cognitive and academic performance. Sleep and behavior was also examined by Stein, Mendelsohn, Obermeyer, Amromin, & Benca (2001).

Similar to snoring is sleep-disordered breathing. This phenomenon is the last article in this section that discusses sleep and its effects in school-age children. Gozal (1998) discovered that students with sleep disordered breathing exhibited negative

learning performance. He suggests that children with behavioral or learning disabilities should be medically examined for sleep-disordered breathing, so they could be properly treated.

Summary

The overall findings for the research discussed were that poor sleep patterns negatively effected academic performance across all groups that were studied. Poor sleep patterns negatively effected college-age students, adolescents, and school-age children. The research also provided evidence for poor sleep patterns to contribute to certain psychopathologies such as ADHD, depression, and other learning disabilities and behavioral problems.

The following chapter of this thesis will discuss the design of the study, which will provide detail to the steps and procedures that will be taken to carry out the experiment. Immediately following, chapter four will analyze the data and discuss the results. Finally, chapter five will provide a summary and conclusions of the research performed, and it will negate or support the hypothesis that poor sleep patterns will have a negative effect on academic performance among school children.

Chapter III: Design of the Study

Sample

The students who participated in this study were from three inner city Public Middle Schools in the Philadelphia area. One of the three schools was considered a magnet school. Children that have a desire to attend this school are required to go through an application process in order to be accepted. There is a minimum GPA requirement necessary for their application to be considered. The three schools mixed with African American, Asian, Caucasian, and Hispanic students.

The students were selected to participate in a study that examined the prevalence of Asthma among Philadelphia minorities. They were originally selected if they tested positive for Asthma, through the use of a prescreening tool called ISAAC. This was a tool that tested for Asthma, with 80% accuracy, through a series of questions after viewing a videotape, the demonstrated the five major symptoms of Asthma. Students were asked if they had exhibited any of the symptoms they had viewed on the videotape and if so, with what kind of frequency. Following the prescreening, the students were then given a physical examination and sophisticated breathing tests, with the use of a spirometer, by a pulmonologist. After the physical examinations, about eighty percent of the students tested definitively for Asthma and the other twenty- percent were used as the control population for the study.

There were 46 students total. Of the population, 28 were female and 18 were male. Among the 46 children, 7 were African American, 29 were Hispanic, and 10 were Caucasian. Their ages ranged from 11 years old to 14 years old with a mean age of 11.98.

The 46 students were divided into two groups, group 0, students with no sleep disruptions, and group 1, students with disrupted sleep patterns. The groups were then categorized by amount of night wakings, group 0 having zero night wakings, and group 1 being subdivided as having an average of either one sleep disruption per night, two sleep disruptions per night, or three or more sleep disruptions per night. Of the 46 students, 23 had zero disruptions, 14 had one disruption, 6 had two disruptions, and 4 had three or more disruptions.

The students were asked to participate in the study on a voluntarily basis. Written consent had to be obtained from them and their parent or guardian in order to participate. The total population was about 450 students. Both sexes were represented equally with 230 males and 220 females. The racial make-up of the population was very diverse with 200 Hispanics, 140 African Americans, 25 Asians, and 85 Caucasians. The students ranged in age from ten to twelve years old. They were intentionally selected from the fifth grade because it was believed that students at this age would be more cooperative and willing to participate. Most of the students came from low socio-economic backgrounds and they came from all areas of the city.

Method

The students were asked to participate in the study on a voluntary basis. Informed consent was received from the students and their parents. Over a period of five months, the students were asked to complete weekly logs, which tracked the frequency of five Asthma symptoms, one of those being sleep patterns. The students were asked to rate the symptoms' severity for the week and record the ratings on a log sheet. The sleep patterns

were measured by asking the students how many, if any, sleep disruptions did they have during the course of the night. The possibilities were no disruptions, one disruption, two disruptions, or three or more disruptions. Each student was then designated with a sleep pattern score based on the average of their sleep disruptions over the course of the five months.

The students were asked to complete the logs independently, on occasion, and on other occasions their logs were completed through one-on-one interview with a research assistant to insure that the logs were completed accurately. Due to a lack of time and personnel, it was impossible to complete the logs every time through an interviewing process, which would have insured greater accuracy.

The score used to measure academic performance of the students was their grade point averages. Grade point averages for the entire year school year were calculated based on the students' grades in Science, Math, Social Studies, Reading and Language Arts, Health and Physical Education.

Design

The present study followed a correlational design. This design tested for the presence of a relationship between the many variables and their effects on academic performance. The variables involved in this study are sex, age, race, and most importantly, the students' sleep patterns.

Testable Hypothesis

In the study, the null hypothesis was tested. The null hypothesis assumed that there was no difference between the academic performance of students with disrupted sleep patterns from the academic performance of students with uninterrupted sleep. The alternate hypothesis assumes that there was a difference between the academic performance of the students with interrupted sleep patterns from the academic performance of the students with uninterrupted sleep patterns. In other words, the academic performance of the students with uninterrupted sleep will exceed the academic performance of those students with disrupted sleep patterns. Other variables that were also tested for effects on academic performance are sex, age, and race.

Analysis

The data obtained in this study was analyzed using a multiple regression analysis of data. Using this method will allowed for the analysis of all the variables that may have affected the students' academic performance, such as sex, age, and race, along with their sleep patterns. This method determined if there was any correlation between all of the mentioned variables and academic performance.

A two-way analysis of variance was used to determine if a significant difference existed among GPA and the variables of sex, age, race, and sleep patterns.

Summary

In summary, this chapter detailed the sample used in the study, the design of the study, and the methodology that will be used in the analysis of data. In chapter four, the data collected will be analyzed using a multiple regression analysis and a two-way analysis of variance. The results of the analysis of the data will be interpreted and discussed. There will also be a determination of the significance of any differences that exist and of any correlation that is assessed.

Chapter IV: Analysis of Results

The purpose of this study was to test for a difference among academic performance and sleep patterns. The prediction made for this study is that the academic performance of those students with uninterrupted sleep patterns will exceed the academic performance of those students with interrupted sleep patterns. The null hypothesis assumes that there is no significant difference between the academic performance of the students with interrupted sleep patterns from the academic performance of the students with uninterrupted sleep patterns. The alternate hypothesis assumes that there was no difference between the academic performance of the students with interrupted sleep patterns from the academic performance of the students with uninterrupted sleep patterns. Other variables that were also tested for effects of academic performance were sex, race, and age.

Results

Of the total population, a total of 23 (50%) students qualified as having sleep disruptions and 23(50%) students had no sleep disruptions. A multiple regression analysis performed showed no significant correlation between GPA and the variables of age($r=-.262$, $p=.039$), sex($r=-.208$, $p=.083$), race($r=-.135$, $p=.185$), and sleep patterns($r=.270$, $p=.035$).

A two-way analysis of variance (ANOVA) showed no significant differences among GPAs between age, sex, race, and sleep patterns. Also, a Tukey's post-hoc analysis was ran revealing no significant differences among GPA within number of night wakings, age, sex, and race.

The mean GPAs for the no sleep disruptions group and the group with sleep disruptions were 2.75 and 2.45, respectively, as depicted by Figure 4.1. The group with 1 night waking had a mean GPA of 2.44, the group with two night wakings had a mean GPA of 2.22, and the group with three or more night wakings had a mean GPA of 2.38, which can be seen in Figure 4. 2.

Mean GPAs By Group

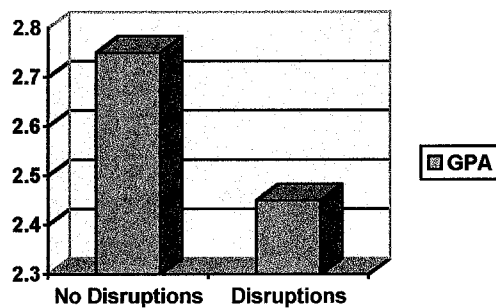


Figure 4.1

Mean GPAs By Night Wakings

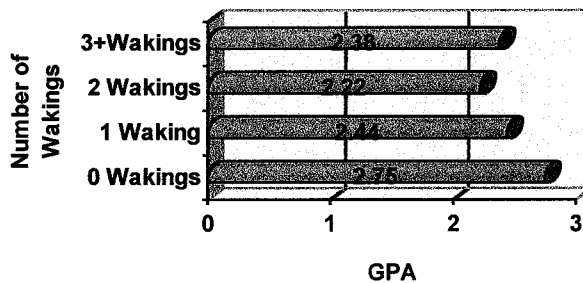


Figure 4.2

Discussion

The results of this study did support the hypothesis that students with no sleep disruptions have higher GPAs than students who experience sleep disruptions. The

results of the statistical analysis failed to reveal any significant difference or correlation between GPA and the variables of sex, age, race, and sleep patterns.

The prediction that disrupted sleep patterns will have a negative impact on academic performance at a significant level was not validated by the data collected in this study. The sample used was not entirely representative. Out of the 46 children in the total population, 65% were Hispanic and 65% were female. When the sleep disrupted group was placed into subgroups, the group with 2 and 3+ wakings were not large enough samples. The 2 wakings group made up about 13% of the population and the 3+ wakings group made up about 10% of the population. The number of subjects in these subgroups was disproportionate to the entire population.

The sample population used in this study was not congruent to the characteristics of the sample population used in the study conducted by Sadeh et. al.. In that study, Sadeh, et. al. examined the night waking phenomenon in early childhood. This study examined school age children, some of whom may have entered adolescence. The previous study had detected an average of two night wakings of all of the children in the sample. Therefore, those children having more than 3 night wakings were assessed as having poor sleep patterns. In the study conducted for the purpose of this thesis, night wakings were present in only 50% of the population. Of that 50%, only 10% had three or more night wakings, and of that 10%, there was no significant difference between their GPA and the GPA of the group with zero night wakings. In fact, as seen in figure 4.2, the students with 3 night wakings had a mean GPA higher than the mean GPA of the group with an average of only 2 night wakings.

The differences in the outcome of analysis between the two studies may be attributed to the difference in the age of the groups. Sadeh et. al. attribute night wakings as the most prevalent sleep problem in early childhood. This author also states that there is no objective data on night waking beyond early childhood. This thesis experiment collected that objective data and concludes that a night waking phenomenon does exist beyond early childhood.

Another characteristic that was incongruent with previous research (Gozol & Pope, 2001) is the percentage of sleep problems in school age children. Researchers reported only a 1%-5% prevalence rate of sleep problems in school age children. In this study, 50% of the population had disrupted sleep patterns and 20% of the sleep-disrupted population had three or more night wakings, which according to Sadeh et. al. is assessed as poor sleep. These findings vary greatly with previous research.

The statistical insignificance of the results calculated in this experiment could be attributed to low-measure reliability. The students were asked to report their night wakings on a weekly log sheet. Self-report, in general is not a reliable method of measurement. Measuring the students' night wakings using an actigraph as in Sadeh et. al. would have yielded a more accurate measure of night wakings.

Also, the measure of academic performance used was grade point average. Grade point averages are also low in reliability because there is much variability in the grading system, within an individual school and also between schools. A more accurate measure of academic performance would have been to use a score from a standardized test along with the students' GPAs. Finally, if the size of the sample population had been larger, it may have contributed to more favorable outcomes.

Summary

There were many hypotheses tested in this study. The first hypothesis states that the academic performance of those students with uninterrupted sleep patterns will exceed the academic performance of those students with interrupted sleep patterns. The second hypothesis states that age will have an effect on academic performance. The third hypothesis states that age will have an effect on sleep patterns. The fourth hypothesis states that sex will have an effect on academic performance. The fifth hypothesis states that sex will have an effect on sleep patterns. The sixth hypothesis states that race will have an effect on academic performance. Finally, the seventh hypothesis states that race will have an effect on sleep patterns. The null and alternate hypotheses are represented in Table 4.1.

The experiment failed to accept the prediction that sleep patterns, race, sex, and age had a statistically significant effect on academic performance. The experiment did reveal a difference in the mean GPAs for the subjects based on sex, race, and age as depicted in Table 4.2.

Although the study revealed no statically significant differences, there were differences. These differences, as seen in Table 4.2, suggest that there may be a trend that exists. A discussion of the conclusions, implications, limitations, and suggested further research will take place in Chapter V.

<i>HYPOTHESIS</i>	<i>ACCEPT</i>	<i>REJECT</i>
Ho: There is no significant difference between academic performance and sleep patterns	x	
H1: There is a significant difference between academic performance and sleep patterns		x
Ho: There is a no significant difference between age and academic performance	x	
H1: There is a significant difference between age and academic performance		x
Ho: There is no significant difference between sex and academic performance	x	
H1: There is a significant difference between sex and academic performance		x
Ho: There is no significant difference between race and academic performance	x	
H1: There is a significant difference between race and academic performance		x
Ho: There is no significant difference between age and sleep patterns	x	
H1: There is a significant difference between age and sleep patterns		x
Ho: There is no significant difference between sex and sleep patterns	x	
H1: There is a significant difference between sex and sleep patterns		x
Ho: There is no significant difference between race and sleep patterns	x	
H1: There is a significant difference between race and sleep patterns		x

Table 4.1: Table of Null and Alternate Hypotheses and whether they have been rejected or accepted

Variable	Mean GPA	Mean Night Wakings
SEX		
Female	2.68	.89
Male	2.39	.56
AGE		
11	2.82	.46
12	2.50	.95
13	2.46	.60
14	1.60	2.00
RACE		
African American	2.50	.71
Hispanic	2.69	.66
Caucasian	2.26	1.10

Table 4.2: Table of Mean GPA and Mean Night Wakings of sex, age, and race

Chapter V: Summary and Conclusions

The purpose of this study was to assess the effects that sleep patterns have on a student's academic performance. The study was performed in order to determine if sleep disruptions effect a student's capacity to learn at school by comparing the mean GPAs of a group the experiences sleep disruptions to the mean GPAs of a group that has uninterrupted sleep.

The overall findings for research previously conducted in this area have supported the hypothesis that poor sleep patterns negatively effect academic performance across all groups that were studied. Poor sleep patterns effect children in early childhood (Sadeh et. al., 2000), adolescence (Morrison et. al., 1992), and college students (Trockel et. al., 2000). The research also provides evidence that poor sleep patterns contribute to certain psychopathologies such as ADHD, depression, and other learning disabilities and behavioral problems.

The prediction made for this study is that the academic performance of those students with uninterrupted sleep patterns will exceed the academic performance of those students with interrupted sleep patterns. The null hypothesis assumes that there is no significant difference between the academic performance of the students with interrupted sleep patterns from the academic performance of the students with uninterrupted sleep patterns. The alternate hypothesis assumes that there was no difference between the academic performance of the students with interrupted sleep patterns from the academic performance of the students with uninterrupted sleep patterns. Other variables that were also tested for effects of academic performance were sex, race, and age.

Conclusions

The data collected in the study was analyzed using a multiple regression analysis. The results of the calculations did not support the prediction that the academic performance of those students with uninterrupted sleep patterns will exceed the academic performance of those students with interrupted sleep patterns. The analysis showed that there was no significant correlation between academic performance and sleep patterns. The analysis also showed that there was no significant correlations between sleep patterns and the other variable of sex, race, and age that were involved in the study. Furthermore, there was no significant correlation evident between academic performance and any of the variables of race, sex and age.

The results of the study conclude that students who had poor sleep patterns did not demonstrate poorer academic performance. It did not appear that obtaining a full night of sleep insured that a student would receive better grades.

Discussion

Students who had poor sleep patterns did not demonstrate poorer academic performance. Unfortunately, the students involved in this study all came from an underprivileged inner city community. Therefore, there were several factors influencing a student's academic performance. In some cases, sleep may have been the least of the problems of these students. One part of the study, *Asthma in Philadelphia Minorities*, from which this data was obtained, required the students to complete a Psychosocial analysis. The questionnaire was composed of 50 questions in order to obtain personal information from the students. From the questionnaire, the researchers learned some disturbing facts about the students involved in the study. For example, some of the

students had one or both parents incarcerated. Therefore, many of them were living with a relative or guardian. The children also came from homes that had very low socioeconomic status. In most cases the students' families had received or still received public assistance.

Another shocking finding was the amount of violence that students had witnessed in the home. For example, one student in particular was a victim of a drive by shooting. She was shot several times and almost lost her life. As a result, she has lost one side of her lungs and has to live with a constant fear. This and other situations like this give these children tremendous emotional stressors that can also play a part in academic performance.

Minor factors that may have contributed to findings of the research were the instrument used to measure sleep wakings and information that may have been obtained to provide a more extensive understanding of the results. These factors will be discussed in the following section, along with implications for future research.

Implications For Future Research

The sample used can be seen as a great limitation on the outcome of this study. First, the sample was too small and the sample had many confounding factors, as previously discussed, that may have influenced the results. For future research, one may conduct the study with a larger sample size and with students from both urban and suburban districts.

Another limitation to the study was the instruments used to measure sleep disruptions, which was self-reported on a daily log sheet. In a future study, and actigraph

can be used to electronically measure the child's night wakings. This instrument will yield more accurate data.

Another factor that can be implemented for future research would be to assess the students' study habits. This study failed to assess the study habits of the students prior to the experiment. If a student has excellent study habits, night wakings may not be a factor. The same applies if a student had no night wakings. If he/she has poor study habits, then one could not expect his/her academic performance to be better.

Two more factors that can be applied in future research are daytime functioning and length of sleep. A measure of daytime functioning would allow a researcher to determine if daytime functioning, in fact, is impacting the subject. Also, if length of sleep is measured, it may add more clarity to the findings. For example, if a child had no night wakings and only four hours of sleep, surely his/her academic performance may in fact be negatively effected.

Finally, there was a difference between the mean GPAs of the group with sleep disruptions and the mean GPAs of the group without sleep disruptions. Although it was not a significant, it still implies that students with no sleep disruptions did have better academic performance. This implication suggests the more extensive and sophisticated future research may yield a significant difference under more controlled conditions. The suggestions mentioned above may be applied to future research to determine if more favorable outcomes result.

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