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Sleep Patterns and the Behavior of Children in the Second-, Third-, and Fourth-Grades in Urban Public Schools

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SLEEP PATTERNS AND THE BEHAVIOR OF CHILDREN IN THE SECOND-, THIRD-, AND FOURTH-GRADES IN URBAN PUBLIC SCHOOLS

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DEDICATION

This work is dedicated to my husband, Earl Milten Hampel, who was a continuous and uninterrupted inspiration and source of energy assisting me to this point and whose dedication and devotion to detail both large and small made this dissertation materialize, to my children, Lindy and Frank who were understanding of my time constraints, and to my deceased mother and father who early instilled in me the quest for knowledge and the search for excellence.

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GLOSSARY

Circadian Rhythm. An innate, daily, fluctuation of physiological and behavioral functions, including sleep/waking; generally tied to the 24-hour day/night cycle but sometimes to a measurably different (e.g., 23- or 25-hour) periodicity when light/dark and other time cues are removed.

Electroencephalogram (EEG). A recording through the scalp of the electrical potentials from the brain and the moment-to-moment changes in these potentials. With the EMG and EOG, the EEG is one of the three basic variables used to score sleep stages and waking.

Electromyogram (EMG). A recording of electrical activity from the muscular system; in sleep recording, synonymous with resting muscle activity or potential. The chin/cheek EMG, along with EEG and EOG, is one of the three basic variables used to score sleep stages and waking.

Electrooculogram (EOG). A recording of voltage changes resulting from shifts in position of the eyeball--possible because each globe is a positive (anterior) and negative (posteria) dipole; along with the EEG and the EMG, one of the three basic variables used to score sleep stages and waking.

Excessive daytime sleepiness or somnolence. A subjective report of difficulty in maintaining the awake state, accompanied by a ready entrance into sleep when the individual is sedentary; may be quantitatively measured by use of subjectively defined rating scales of sleepiness.

Latency. When applied to children, the term can have many meanings. In this paper, it is simply a means to designate the childhood chronological age range of 6 to 12 years.

Multiple sleep latency test. A series of measurements of the interval from "lights out" to sleep onset that is utilized in the assessment of excessive daytime sleepiness. Subjects are allowed a fixed number of opportunities to fall asleep during their customary awake period. Long latencies are helpful in distinguishing physical tiredness or fatigue from true sleepiness.

Myoclonus. Muscle contractions in the form of "jerks" or twitches. In sleep-related (nocturnal) myoclonus, the jerks are primarily of the flexor groups in the lower extremities and have a characteristic frequency of 20-40 seconds.

Nightmare. Used to denote a dream anxiety attack, not a sleep (night) terror. In the past, and still in the European sleep literature, nightmare is used to indicate both sleep terror and anxiety dream.

Nocturnal sleep. Indicative of the typical "nighttime", or major, sleep period dictated by one's circadian rhythm of sleep and wakefulness; the conventional time for sleeping.

Normal "latency" sleep. Children between 6 and 12 years of age spend from 9.5 and 9 hours to 8 and 7.5 hours, showing a steady decline with increasing age. They sleep approximately 95% of that time.

Parasomnia. Not a disorder of sleep or wakefulness per se; rather, an event happening during sleep, or induced or exacerbated by sleep, such as sleepwalking or asthma; not a dyssomnia.

Polysomnogram. The continuous and simultaneous recording of physiological variables during sleep, i.e., EEG, EOG, EMG (these are the three basic stage scoring parameters), ECG, respiratory airflow, respiratory excursions, lower limb movement, and other electrophysiological variables.

Restlessness. (referring to quality of sleep) Persistent or recurrent body movements, arousals, and brief awakenings in the course of sleep.

Sleep efficiency. (Sleep efficiency index) The proportion of sleep in the period potentially filled by sleep; i.e., the ratio of total sleep time to time in bed.

Sleep hygiene. The conditions and practices that promote continuous and effective sleep. These include regularity of bedtime and arise time; conformity of time spent in bed to the time necessary for sustained and individually adequate sleep (i.e., the total sleep time sufficient to avoid sleepiness when awake); restriction of alcohol and caffeine beverages in the period prior to bedtime; employment of exercise, nutrition, and environmental factors so that they enhance, not disturb, restful sleep.

Sleep log. (-diary) A daily, written record of an individual's sleep/wake pattern containing such information as time of retiring and arising, time in bed, estimated total sleep period, number and duration of sleep interruptions, quality of sleep, daytime naps, use of medications or caffeine beverages, nature of waking activities, and other data.

Sleep pattern: (24-hour sleep/wake pattern) An individual's clock hour schedule of bedtimes and rise times as well as nap behavior; may also include time and duration of sleep interruptions. See Sleep/wake, 24-hour cycle; Circadian rhythm; Sleep log.

Sleep stage NREM. (NREMS) The other sleep state apart from REMS; comprises sleep stages 1 to 4, which constitute areas in the spectrum of NREMS "depth" or physiological intensity.

Sleep stage REM. (REMS) The stage of sleep (i.e., state of the CNS) found in all mammals studied, including man, in which brain activity is extensive, brain metabolism is increased, and vivid hallucinatory imagery or dreaming occurs (in humans). It is also called "paradoxical sleep" because, in the face of this intense excitation of the CNS and the presence of spontaneous rapid eye movements, resting muscle activity is suppressed. The EEG is a low-voltage, fast-frequency, nonalpha record. Stage REMS comprises usually 20 to 25% of total sleep time.

Sleepiness. (somnolescence, drowsiness) Difficulty in maintaining the wakeful state so that the individual falls asleep if not actively kept aroused; not simply a feeling of physical tiredness or listlessness. See Excessive daytime sleepiness.

Sleep talking. Talking in sleep takes place during REMS, at which time it represents a motor breakthrough of dream speech, or in the course of transitory arousals from NREMS and other stages. Full consciousness is not achieved, and no memory of the event remains.

Snoring. A noise produced primarily with inspiratory respiration during sleep owing to vibration of the soft palate and the pillars of the oropharyngeal inlet. Many snorers, have incomplete obstruction of the upper airway and may in time develop frank obstructive sleep apnea.

Total sleep period. The period of time measured from sleep onset to final awakening. In addition to total sleep time, it is comprised of the time taken up by arousals and movement time until wake-up. See Sleep efficiency.

Total sleep time. The amount of actual sleep time in a sleep period; equal to total sleep period less movement and awake time. Total sleep time is the total of all REMS and NREMS in a sleep period.

Twitch. (body twitch) A very small body movement such as a facial grimace or finger jerk; not usually associated with arousal.

ABSTRACT

SLEEP PATTERNS AND THE BEHAVIOR OF CHILDREN
IN THE SECOND-, THIRD-, AND FOURTH-GRADES
IN URBAN PUBLIC SCHOOLS

Yolanda Cardelli Hampel
Old Dominion University, 1991
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This investigation examined the relationship between nocturnal sleep patterns and behaviors in the classroom of seventy-four girls and fifty-nine boys from second-, third-, and fourth-grades attending five urban public schools in Norfolk, Virginia. Since the 133 subjects were under eighteen-years of age, parents/guardians were required to sign a consent form for their child to be included in the study. A cross section of schools representing a broad spectrum of socioeconomic strata were selected for the study.

The dependent variables were the classroom behavior that was subdivided into five personality areas for objective assessment of the student's adjustment areas labeled self, social, school, home, and physical. The objective assessment was observed and documented on a seventy-eight item questionnaire by their primary classroom teachers who were familiar with the subjects behavior. The parents observed and recorded data on a sleep log listing independent variables such as length of daytime naps, time to bed, number of hours slept, number of hours in bed, age, and gender. The parents recorded the data on the sleep log for seven nights. Other independent variables were grade ranking and type of lunch subsidy.

Stepwise regressions revealed that night awakenings have a significant impact on home, social, self, school, and total adjustment. A one-way MANOVA with hours of sleep as the categorical variable with three levels of sleep indicated that the length of sleep had no impact on a child's adjustment. The levels of sleep were less than nine-hours, 9.00-to-10.45 hours, and 10.5 hours and greater. The recorded time difference between the longest sleeper and the shortest sleeper is only 0.66 hours. Study findings suggest that continuous and uninterrupted sleep is more critical than actual length of sleep.

A two-way MANOVA yielded statistically significant main effects of gender and Tukey's HSD test revealed gender effects (self, social, school, and physical but not home) indicating better adjustment for girls than boys. The two-way MANOVA yielded nonsignificant main effects for age. The interaction effect of gender and age was significant.

Descriptive statistics reveal sixteen 7-year-old children as the best adjusted in areas involving social, school, home, physical, total adjustment, and they were surpassed only by the thirty-six 8-year olds in self adjustment. The 7-year olds awaken the least during the night, are second highest in length of sleep (9.84 hours nightly) in contrast to the longest sleepers (10.24 hours nightly), and are second lowest in ease of awakening 0.43 and are in the mid range regarding lunch type subsidy. The study mean (9.73 hours nightly sleep) is consistent with accepted published norms for nightly sleep of boys and girls of this age (9.68 hours nightly sleep).

The Pearson correlational coefficients revealed that all CBRS subscales (self, home, social, school, and physical) were significantly

correlated with each other (r values ranging from 0.32 to 0.87). The findings suggest as a child increases in age, his/her adjustment decreases indicating that younger children possibly have closer parental supervision. The type of lunch subsidy with home adjustment ($r = 0.20$, $df = 128$, $p < 0.05$), school adjustment ($r = 0.18$, $df = 133$, $p < 0.05$) and total adjustment ($r = 0.21$, $df = 133$, $p < .05$) indicate the better the socioeconomic status of the child, the better his/her adjustment.

In conclusion, the findings of the current study suggest practical applications to the urban environment. Parents can be educated to direct attention to their children's sleep practices, schedules, and daily stresses in order to enhance continuous and uninterrupted sleep. With increased sleep hygiene, students could increase attention span, improve academic achievement, create fewer classroom disturbances, distract others less often, and better utilize funds allocated to urban public schools.

CHAPTER I

INTRODUCTION

Background of the Study

While there has been a plethora of research conducted on sleep, there is a paucity of information regarding the relationship between length and continuity of sleep and daytime alertness and classroom behavior among children. Carskadon (1990) reports that very few studies have directly examined specific factors that might influence the development of adolescent sleep patterns.[1] It is thought that this circumstance also exists for the child. Coble et al., suggest that despite increasing application of all-night electroencephalographic (EEG) sleep studies to latency children for clinical as well as for research purposes, the number of published and purely normative reports for these age groups is relatively small and reflects mostly work conducted nearly two decades ago.[2] A number of excellent normative studies of sleep in age group (4-7) exist, but none has linked an assessment of daytime sleep tendency to the nocturnal evaluations and data gathered in a structured, reproducible setting may be more applicable as clinical norms than most normative data.[3]

Historically, it has been believed that children generally sleep well and this belief is buttressed by the assumption that in childhood (4-10), children as a group are in excellent health. Dement asserts people complain little about sleep problems because physicians often respond negatively to sleep complaints.[4] Actually, less attention is given to

children unless there are abnormal behavior problems and most of the studies of children's sleep and attention involved emotional disorders or pathological conditions.[5] Anders et al., reported, "Major pediatric textbooks say very little about even the well known disorders and absolutely nothing about excessive daytime sleepiness."[6]

Roffwarg postulates that the recent advances in knowledge about sleep research resemble the pattern of advance in other medical fields. The emergence of sleep research advances has waited until the very last decades. In the late seventies, the first mandated nosological system makes possible a coherent categorization of the sleep disorders and the construction of a rational system of diagnosis that will permit the sleep and arousal disorders to be finally "demystified" for the practitioner.[7] The Association of Sleep Disorders Centers and the Association for the Psychophysiological Study of Sleep published the Diagnostic Classification of Sleep and Arousal Disorders in 1979. The four clusters of disorders within the classification system are: (1) Disorders of Initiating and Maintaining Sleep: DIMS "The Insomnias," (2) Disorders of Excessive Somnolence: DOES, (3) Disorders of the Sleep-Wake Schedule and (4) Dysfunctions Associated with Sleep, Sleep Stages, or Partial Arousals "Parasomnias."[8] These categories are applicable to children who have reached school age and comply with school and social time schedules.[9]

The recent literature points up greater numbers and varieties of sleep problems than heretofore. Servonsky and Opas suggest that chronically tired children often lack vitality, cannot concentrate, perform poorly in school, and are more susceptible to minor illnesses, thus missing more school than their rested peers.[10] Ferber feels that sleep

problems are extremely common in children and often cause tremendous worry, frustration, and anger at home.[11] These children no longer have to be ignored since the advent of polysomnography involving the recording of electrophysiologic activity from various organ systems during sleep in this emerging new field of sleep disorder medicine and the renewed interest in its research.

Purpose of the Study

Examination of sleep and children's behavior in school needs investigation for they are related to the ability to learn. Many problems relating to school success are learning disabilities, many of which undoubtedly are sleeping difficulties. The purpose of this research is to ascertain the relationship of sleep patterns among second-, third-, and fourth-graders and their behavior in urban public schools. Beyond this, a secondary focus is to examine the literature for definitive information on the relation of children's sleep and school behavior suggested by other studies on sleep and its wider implications.

This study is organized to test various elements of the general sleep theories as they relate to school children, i.e.:

1. Whether the sleep patterns of second-, third-, and fourth-grade boys and girls that are adequate will reveal fewer behavior anomalies in social, home, physical, school and self-adjustment?

2. Obversely, where sleep is inadequate or disturbed in its pattern, will there be an indication among children of poorer performance in school classes and degraded mood patterns judged by a test of behavior clusters?

3. Stated in other terms, what is the relationship between sleep patterns of second-, third-, and fourth-graders and school behavior?

4. A final purpose of this study is to examine the length of sleep obtained by the typical child in the second-, third-, and fourth-grades in an urban setting and ascertain how it compares with accepted standards

of sleep requirements as judged by experts in the field. Further, what relationships exist in the kinds and length of sleep that provides insight into school performance is important for urban public education as it has implications for the facilitation of education.

This investigation is designed to isolate certain aspects of the problems involved and probe sleep patterns of children and their relationship to school behavior thereby generating additional information for the literature and the stimulation of research. Some optimism exists for the results of this exercise to have salutory results for it promises greater understanding of the problems of sleep and the relation of school behavior among urban children.

Significance of the Problem

The outcomes expected by this study relating to a wide population are important both theoretically and practically, and as an effort to fill a research gap can:

1. compare the theories on sleep as to whether this research confirms positive or negative support for them,

2. confirm the general theory by providing an examination of the thesis that longer sleep will enhance the production of positive behavior in the classroom and will facilitate learning,

3. create possible research stimulation regarding emotional and social functioning of young children,

4. assist parents in becoming sensitive to this area of concern in child development,

5. assist teachers in identifying classroom behaviors that relate to sleep,

6. foster cooperation between parents and teachers on children's progress,

7. improve student learning,

8. support homeostasis of the child via feedback of sleep patterns and school behavior in order to enhance academic achievement and a healthier personality.

Early recognition of sleep-related atypical classroom behaviors would allow educators and related professionals involved in the intellectual growth and academic achievement of school children to focus attention on remediation before the problems are out of control. The future use of this type of study should provide useful information for practical application. The implications derived from the current investigation possibly can be utilized by urban school systems as well as parents. The patterns of sleep will be examined to determine relationships to various factors in school life, i.e., behavior, morals, academics, achievement, citizenship, and general well-being. The findings of this investigation may fill a research gap and add to the theoretical framework. Current concern regarding depressed achievement scores and renewed interest in curricular changes are focal points receiving special attention today. Such data could provide a basis for the consideration of public policy issues that could affect both the present and future generations in the urban setting.

Research Procedures

This study attempted to determine the nature of the relationship existing between length of nocturnal sleep and certain classroom behaviors. The evaluation was accomplished by use of statistical vehicles utilizing data which yielded information on relationships among parameters and their significance in the study.

The Treatment and Collection of Data

The classroom behaviors of children were classified into five personality areas for objective assessment of the students' adjustments labeled self, home, social, school, and physical. The seventy-five primary teach-

ers knew the children in their respective classes and could have kept anecdotal records if necessary. At a single sitting, the primary teacher (observer) checked the items on a 78-item questionnaire from The Child Behavior Rating Scale (CBRS), written by Russell N. Cassel and published by Western Psychological Services (see Appendix 1).[12]

The challenge of this investigation was to attain a high order of response from parents of the children selected for the study in recording the various protocols required. Data was collected on nocturnal sleep parameters including length of daytime naps, usual bedtime, arising time, number of arousals during the night and length of sleep. A simple log was given to parents for documenting this information (see Appendix 2).

The Subjects

One hundred and thirty-three second-, third-, and fourth-grade boys and girls from five urban public schools in Norfolk, Virginia agreed to participate in this investigation. The study, approved by Old Dominion University for the Protection of Human Subjects Committee, was fully explained to the parents by letter and confidentiality was assured. Informed consent was obtained from parents. A cross section of schools representing the various economic strata was selected for the study. Those included in this investigation were the pupils who had a complete file i.e., sleep pattern logs from parents and inventories from teachers.

Statistical Analysis

The CBRS scores for subscales and demographic variables are examined for interrelationships using Pearson correlation coefficients to express degrees of relationship. Descriptive statistics have been computed on

the overall sample and for each year of age of the subjects. CBRS subscale scores were analyzed in a one-way MANOVA with average hours of sleep as the categorical variable. A two-way MANOVA was performed with hours of sleep as a covariate. A factorial MANCOVA design was used with age and gender as independant variables and hours of sleep as a covariate. The dependant variable behavior was subdivided into five adjustment areas: (1) home, (2) self, (3) social, (4) school, and (5) physical. Tukey's test of significance was executed in relation to MANOVA. Stepwise regression was the preferred option of the most useful technique in determining proportion of variance of a single predictor variable. The design will be discussed in further detail in Chapter III.

Limitations of the Study

Since this investigation may be considered an evaluative observational study and is dependent on observational documentations from both parents/guardians and teachers, limitations of observational research prevail. The accuracy of both groups of observers was a concern that was addressed early in the planning stages. Efforts were made to reduce observer effect.

Parents could exhibit bias, forget, overlook pertinent information, check materials late or fill in the information in retrospect, and over- or under-evaluate their children. Attempts were made to motivate parents to keep accurate records by assisting them to realize advantages accruing to their children by particular participation in the study. Five teachers reviewed the sleep log parents would use. Their suggestions were incorporated into a revised, simplified log to facilitate parent documentation. Having the parents record the sleep log for only seven nights was

a limiting factor, but it was felt that a longer period, although advantageous for additional data, would not have held the interest and cooperation of the parents.

The principals and teachers are trained in getting data from questionnaires and testing pupils; but even so the issue of objectivity of assessment to elicit consistency and standardization was addressed with them in orientation sessions. This effort was initiated in an attempt to control rater errors, such as those of leniency, central tendency, halo effect and other rating errors. Five teachers randomly selected reviewed the rating scale prior to the investigation and felt it was realistic and of appropriate length and content. The five teachers did not anticipate problems with the home adjustment area. They felt that persons most familiar with the behavior of children during the primary grade years are teachers and parents. They also indicated the teachers could check "no" or the number 6 box when they did not observe the behavior or know the behavior as applicable to the child. However, upon completion of the study and the analysis of the data, items in the home adjustment section were found to be stated in somewhat amorphous terminology that created a degree of hesitancy for some teachers.

Spivack and Swift thought it impossible for one teacher to rate certain items in nonschool areas due to lack of direct observations.[13] Dunn offered examples reflecting rater inferences such as "Parents often use corporal punishment," and "Parents have little or no religious affiliation."[14] He also cited a multiple referent item, "Has uncorrected poor vision or poor hearing," as being ambiguous. Does a "no" answer mean his poor vision or poor hearing has been corrected? Or does it mean the child

does not have poor vision; or vision which is only partly corrected? Or does it mean the rater is uncertain?[15] However, Dunn praised Cassel for the CBRS when he stated (1) that the strategy of attempting to limit the scale to explicit, observable behaviors, and (2) to the systematic identification of those behaviors from an empirical study of a large number of real life cases were evidence of the soundness of the author's basic judgment.[16] Furthermore, Spivack and Swift included The CBRS in their critical review stating they only included studies judged as serious attempts to specify and measure certain classroom behaviors.[17]

Dunn questioned the reliability and validity of the CBRS.[18] Cassel used the split-half method and the alternate-forms method to estimate reliability and this is commonly used in practice.[19] Guilford and Fruchter state, "When seeking to make a single test both highly reliable (internally) and also highly valid, working at cross purposes is possible as the two goals are incompatible in some respects. In aiming for one goal, defeating efforts toward the other goal is conceivable." Guilford and Fruchter further report that homogenous tests have high internal-consistency reliability but they can have no validity for predicting variations in certain criteria and heterogeneous tests have relatively low reliability, and yet some have been known to show relatively high predictive validity.[20]

The CBRS is in its eighth printing and the latest printing in 1981 is still in use. Obviously many practitioners have found it to be effective in providing information on children when used in the classroom. Dunn feels it to be attractively packaged and the five adjustment areas with which the instrument deals to be of special importance to those working

with children.[21] In his research, Crnic used Cassel's CBRS and his resultant personality total adjustment score (PTAS) fell within the normal range as described by Cassel.[22] Also the investigators Moracco and Kazandkian (1977) report some validity for school use of the CBRS.[23]

This study was limited by the absence of polysomnographics and the structured laboratory setting. However, this study was planned for the classroom in public schools. In their critical review of rating scales for measuring classroom behavior of children, Spivack and Swift cite three reasons why such a review is timely. They feel (1) it reflects the extent the child benefits from the educational enterprise, (2) those in the educational system may be least well equipped to appreciate the devices available to them, and (3) such a review may highlight areas requiring development of classroom-behavior measurement.[24]

Organization for the Remainder of the Dissertation

Chapter II provides the theoretical framework for this investigation as the literature is reviewed. The next chapter discusses the methodology in detail as relating to research design, sampling procedure, instrumentation, and data collection methods. The fourth chapter will incorporate the presentation and analyses of the data. The final chapter will present a brief summary of the investigation, conclusions and results will be addressed, and recommendations offered for further research.

Summary

This chapter has provided an overview of the investigation of sleep patterns of children and their school behaviors. While there has been a plethora of research conducted on sleep and an increase in the application

of all-night electroencephalographic sleep studies, the number of published and purely normative reports for latent-aged children is relatively small and reflects for the most part, work conducted nearly two decades ago. The historical assumption that children sleep well continues. However, the belief that actually less attention is given to children unless emotional disorders or pathological conditions are identified also prevails. Many sleep problems go unreported because systematic physician response historically has been non-existent. Hence there is a need for investigation on the various aspects of sleep as they bear on family, work, and schooling.

Currently, the focus is on establishing a data base on normal sleep/wake patterns. A better vantage point exists from which to assess the pathological conditions since the advent of an expanded understanding of the normal processes of the sleep/wake patterns. Much of the work in this area has depended on the diagnostic classification of sleep and arousals published in 1979 by the Association of Sleep Disorders Centers and the Association for the Psychophysical Study of Sleep.

Daytime sleepiness in children may not be considered a problem, but students may find it difficult to learn in the classroom. The purpose of this study is to ascertain the relationship of sleep patterns among second-, third-, and fourth-grade boys and girls from intact classrooms in public schools in a metropolitan area and school behavior. The study also will test various elements of the general sleep theories as they relate to latent-aged school children.

The significance of the problem is both theoretical and practical. An exploration of these issues will provide additional data on which to

build new information and raise some questions of existing theories. The focus directs parents to become sensitive to this area of concern in child development by becoming knowledgeable of the significance of sleep as it relates to school behavior. Early recognition of sleep-related atypical classroom behaviors ultimately will allow educators and professionals involved in the intellectual and academic achievement of children to focus attention on remediation before the problems are out of control.

The research treatment involves five areas of child adjustment namely self, home, social, school, and physical. According to the five school principals, the primary teachers are reasonably familiar with their students by the sixth month, therefore February was selected as the ideal time for teachers to rate the children on a 78-item questionnaire to determine scores for the five adjustment areas. The parents recorded nocturnal sleep parameters on the sleep log nightly for seven nights. The subjects consist of 133 second-, third-, and fourth-grade boys and girls chosen randomly from five urban public Norfolk, Virginia schools. Six null hypotheses were tested separately along with one amalgam hypothesis. Basically the assumption is that there is no statistically significant difference between sleep patterns and presenting behaviors in the classroom.

The research involves rater observations and documentation. The specific limitations have been addressed to control for rater effects such as bias, leniency, halo, and others. The parents were encouraged to record on the sleep log accurately. Finally, organization for the four ensuing chapters was presented.

ENDNOTES

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CHAPTER II

REVIEW OF THE LITERATURE

The purpose of Chapter II is to present the empirical research that forms the theortical framework for the current study. A review of the literature will be presented in six major sections, history of sleep, nature of sleep and normal sleep, disorders of sleep, sleep in children, relation of sleep patterns to children's school behavior, and summary.

Background

Chuman postulates that the rhythmic nature of sleep and wakefulness has fascinated humans from antiquity to the present.[1] Poetic and magical conjectures about sleep are as ancient as the race. Animistic beliefs held that the soul leaves the body during sleep, wanders the world at will (evidenced by what some call dreams), and wakes us when it returns to its corporal encasement. The preceding belief had the sanction of Plato: "In sleep, when the rest of the soul, the rational, gentle, dominant part, slumbers, the beastly, and savage part, replete with food and wine, endeavors to rally forth to satisfy its own instincts."[2]

Aristotle considered sleep a necessity, related to the activity of the heart from which "both motion and sense-perception originate." He envisioned sleep as arising from the evaporation attendant upon the process of nutrition and the ascendancy of heated matter thus he accounted rather neatly for the somnolence that follows a heavy meal, but Aristotle rarely experimented. His belief that women have fewer teeth than men

suggest a distaste for observational methods, and it has been remarked that his relations with women must have been of the most amicable sort.[3] In his time, sophisticated research tools for precise data collection and significant documentation regarding sleep and wakefulness did not exist.

The anthropological and the sociological implications of sleep are vast and complex. Yet down through the centuries, while scientists have probed and analyzed man's every waking moment, they apparently dismissed sleep as a time of rest and quiet when absolutely nothing was happening. Those who did pay attention to sleep did so because of its function as the springboard for dreams.[4]

History on Sleep Studies

Dreams have enjoyed historic, personal, and religious significance for as long as recorded time.[5] Practically all information on dreaming was derived from the subjective experiences and reports of the dreamers who decided whether or not they had dreamed.[6] It was not until the beginning of the century that views of sleep began to change, but even then sleep research was viewed as a study of the mind, according to Ware.[7] Martin points out that the history of evaluating sleep physiology is in its relative infancy compared to other medical specialties.[8] Interestingly, brain wave activity was reported in 1875 by Caton using rabbits and monkeys.[9] Berger discovered the electroencephalogram (EEG) in 1929.[10] Over the next decade, this extensive EEG research supported previous animal studies indicating that the electrical activity evolved from neuronal tissue which responded to sensory stimulation and that abnormal electrical discharges occurred during epileptic seizures. Berger's remarkable series of papers describing this research were essentially ignored.[11]

In the 1930s, Loomis and associates classified electroencephalographic patterns that accompany the passage from wakefulness to sleep into five levels and this classification was widely adopted thus paving the way for later discoveries by Kleitman and associates.[12] Jacobson (1937) stated that when a person dreams most often his eyes are active.[13] Kleitman et al., claim, "We literally stumbled on an objective method of studying dreaming while exploring eye motility in adults, after we found that in infants eye movements persisted for a time when all discernible body motility ceased. Instead of direct inspection, as was done for infant eye movements, those of adult sleepers were recorded indirectly, to insure undisturbed sleep in the dark."[14] Aserinsky and Kleitman (1953) noted recurrent periods of sleep, roughly every 90 minutes, in which jerky, binocularly conjugate rapid eye movements (REMS) could be seen beneath the closed eyelids of the sleeper.[15] About three-fourths of the subjects awakened during REM sleep reported dreams involving visual imagery. Increased heartbeat and respiration rates were noted.[16]

According to Mendelson, after the description of REM sleep two findings in particular led to a more complete understanding of its physiology, he concluded:

> Jouvet and Michel (1959) reported that there was a marked decrease in muscle tone during REM sleep in animals; this was confirmed in humans by Ralph Berger in 1961. The second finding was a report by Dement and Kleitman in 1957 that REM sleep recurred in a cyclic fashion throughout the night, with interspersed periods of non-rapid eye movement (NREM) sleep. Each REM-NREM cycle was thought to last 90-100 minutes. Dement and Kleitman then proposed a classification system in which REM was differentiated from NREM sleep, which in turn was divided into four stages. This was the basis of an approach to classification that, with some revisions (Rechtschaffen and Kales, 1968), is still in use. Authors such as Oswald (1962) and Jouvet (1962) began to emphasize the concept that sleep is not a unitary process but rather is composed of REM sleep and NREM sleep, which differ fundamentally in most physiological parameters. Thus, REM sleep, NREM sleep, and waking have come to

be thought of as the three states of consciousness.[17]

On the basis of a large number of subsequent all-night recordings of undisturbed sleep, Dement and Kleitman defined five electroencephalographic stages of sleep, stages 1 through 4 during which REMS are absent, referred to as NREM sleep stages and a fifth stage, stage 1 REM, which is accompanied by REMS.[18] This staging system has been widely accepted and has replaced the Loomis system.

In the 1960s a small group of investigators trained in electrophysiology began to be concerned with the nature of complaints about disturbed sleep, the physiological anatomy of sleeplessness, the patterns of excessive sleep and sleepiness, the pathophysiological disturbances linked to certain sleep stages and the process of arousal, and the effects of hypnotic agents.[19] Tanner's (1962) maturational staging from prepubertal development to adult maturation on a five-point scale paved the way for numerous studies of children's sleep.[20] In the late 1970s the Multiple Sleep Latency Test (MSLT) directly reflecting an individual's readiness to fall asleep provided structure for a plethora of studies on alertness/sleepiness with standard laboratory measurements.[21] The Diagnostic Classification of Sleep and Arousal Disorders (1979) satisfied a manifest need for an inclusive framework for ordering and recording the full spectrum of maladies presented and served as a basis for increased research that could be precisely documented.[22]

Several sleep laboratory studies (Williams et al., 1972, 1974; Karacan et al., 1975) have evaluated nighttime sleep during puberty.[23] Effects of temporal variables (age, length of time asleep, length of wakefulness before the sleep period, and time of the day at which sleep occurs)

have been studied by (Webb and Agnew, 1975); (Gagnon and deKoninck, 1984); (Weitzman et al., 1980) and a host of other investigators.[24] Further Simonds and Parraga (1982) suggest that sleep disorders in children have become the focus of interest both as primary disorders and disorders secondary to other emotional and medical conditions, and this trend will herald copious studies regarding children in all facets.[25]

Total sleep time and total nightly amount of individual sleep stages were found to be age dependent (Feinberg and Carlson, 1968; Roffwarg, Muzio, and Dement, 1966; Kupfer and Reynolds, 1983).[26] Pysiological variables studied ranged from the early studies of REM sleep (Berger, 1969) defining decreased muscle tone to the later studies showing loss of temperature regulation (Parmeggiani, 1980) and complex changes in cardiovascular (Mancia and Zanchetti, 1980) and respiratory (Sullivan, 1980) activity.[27] Sleep deprivation studies from the early 1960's to the present have experimented with total sleep deprivation, selective sleep stage deprivation, and partial sleep deprivation.[28] The fact that loud snoring often accompanies sleep apnea, is widely accepted but not all snorers have sleep apnea and not all persons with sleep apnea snore. The research of Lugaresi et al., (1980) examined 5,712 individuals to see whether or not they snored. His conclusions suggested that snoring was a risk factor for hypertension. We now recognize as many as 15 percent of all people with essential hypertension have sleep apnea.[29] This knowledge impacts the medical community. Fujita and colleagues (1980) described a surgical procedure to reduce the severity of sleep apnea, and this procedure has proved to be a popular alternative. Another outcome of sleep research is an external nasal device for treating sleep apnea that was FDA approved in

1984. This device can be used on a long-term basis as an alternative to more complex treatments.[30]

Natural long, short and variable sleepers have been subjects of many investigations. In a five-day laboratory study, Meddis et al., (1973) observed a seventy-year-old woman who claimed to have slept for only one hour a night for many years. They reported:

> She averaged 67 minutes of sleep within a 24-hour period without any indication of fatigue and demonstrated long periods of stage 2 and REM. Similarly, Jones and Oswald (1968) studying two men averaging less than 3 hours of sleep a day for years indicated high proportions of delta and REM sleep. Other laboratory studies indicate that natural long and short sleepers have equal amounts of delta sleep, but that long sleepers have much more REM sleep than short sleepers (Webb and Agnew, 1970; Webb and Friel, 1971; Hartmann, Chung, and Chien, (1971). Napoleon, Edison, and Chou En-lai are recorded as natural short sleepers and Einstein a natural long sleeper. Hartmann Baekeland, and Zwilling (1972), found short sleepers (defined by less than 6 hours of sleep a day) to be more efficient, hardworking, conformist, and less creative than long sleepers (defined by more than 9 hours).[31]

Napping and Current Research Interests

Napping has been extensively researched. An episode accompanied by intensified drowsiness is superimposed upon the diurnal cycle for a limited period of time (1:00-3:30 P.M.) which has been shown to occur during the afternoon (Taub, 1980).[32] Numerous researchers support this premise. A conspicuous rhythm for REM and stage 4 sleep continues during naps (reviewed by Taub, 1977, 1979) interposed into the customary morning, afternoon or evening hours (e.g., Karacan, Finley, Williams, & Hursch, 1970; Maron, Rechstschaffen, & Wolpert, 1964; Ichichara, Isishara, Miyasita, Miyauchi, & Nime, 1978).[33]

Current research is varied and addresses a myriad of issues heretofore unresearched. The Association of Professional Sleep Societies (1986) accepted the challenge for a committee of scientists to review

recent reports and related information on the role of human sleep and brain clocks (time-of-day variation in physiology and alertness) in the occurrence of medical and human error catastrophies. "Catastrophies, Sleep, and Public Policy: Consensus Report" (1988) proclaimed one major discovery has been that the neural processes controlling alertness and sleep produce an increased sleep tendency and diminished capacity to function during certain early morning hours (circa 2:00-7:00 A.M.) and, to a lesser degree, during a period in the midafternoon (circa 2:00-5:00 P.M.), whether or not we have slept.[34] Figure 1 depicts Carskadon's summarization of the number of unintentional sleep episodes as a function of time of day.[35]

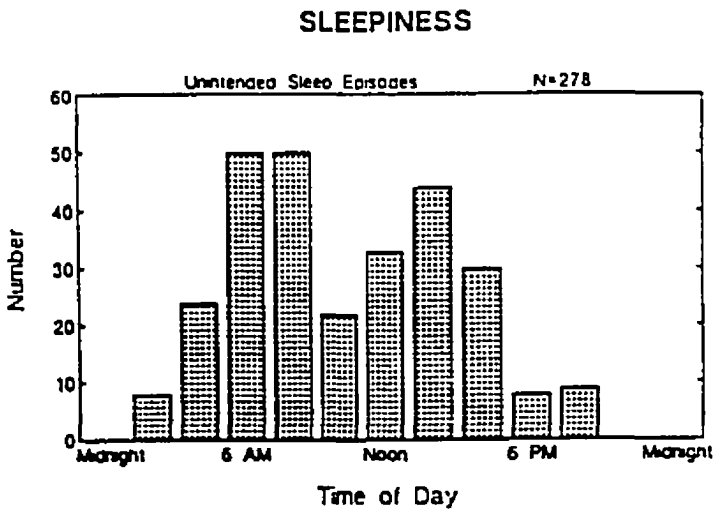


Figure 1 The number of unintentional sleep episodes observed at various times of day in the studies of Carskadon et al. The pattern from noon to 8:00 P.M. has been widely replicated in studies using the Multiple Sleep Latency Test and the Maintenance of Wakefulness Test. (Carskadon)[35]

Serious incidents such as mortality (4:00 to 6:00 A.M.), heart attacks (6:00 to 10:00 A.M.), vehicular accidents (1:00 to 4:00 A.M. and 1:00 to 4:00 P.M.), and commercial nuclear power plant incidents (Chernoble - 4:00 A.M.), occur during zones of vulnerability. This data could signal policy

and regulatory agencies in both the private and public sectors to be more aware of consequences of accident and errors during these periods.[36]

Clinics in Geriatric Medicine (May 1989) is devoted in its entirety to sleep disorder in the elderly. Guest editors Roth and Roehrs suggest that the disciplines of sleep and gerontology have several common features since both fields deal with the totality of the human organism during a specific phase of life rather than with a specific organ system. Given the dramatic changes in sleep physiology and pathophysiology that accompany aging, it is perplexing that the convergence of these two fields has been so grossly neglected.[37] Among the 17 distinguished contributing investigators are Roehrs and Roth (Drugs, Sleep Disorders, and Aging), Webb (Age-related Changes in Sleep), Vitiello and Prinz (Alzheimer's Disease), Ware (Impotence and Aging), and Bonnet and Arand (Sleep Loss in Aging). This knowledge will serve a twofold purpose such as primarily revealing the relationship of sleep and human functioning in the normal aging process and secondly, challenging the researcher to develop new data to add to the theoretical framework presented here.[38]

Another area of interest and importance impacting modern society is the continuing investigations of male impotency and "nocturnal penile tumescence" (NPT). Ware (1989) surmised that when Fisher and Karacan (1970) independently demonstrated that REM sleep, a normally occurring physiological sleep state, was usually accompanied by penile erections, then measuring variation from thispredictable pattern offered the possibility that the sleep erection response could be used diagnostically. He considered these measurements a reasonable basis for initially dichotomizing a patient's problem into either organic or psychogenic categories.

Because treatments were generally either a penile prosthesis or some form of psychotherapy or sex behavior therapy, the degree of physical impairment or the precise etiology made little difference. Ware concludes that with improvements in vascular surgery and advancements in pharmacotherapy there is now a greater need to provide diagnostic specificity, so that the treatment can be matched to the specific problem.[39]

Finally, Czeisler et al., (May 1990) comment in the New England Journal of Medicine that working at night results in a misalignment between the sleep-wake cycle and the output of the hypothalamic pacemaker that regulates the circadian rhythms of certain physiologic and behavioral variables. Their investigation evaluated whether such physiologic maladaptation to nighttime work could be prevented effectively by a treatment regimen of exposure to bright light during the night and darkness during the day. The findings could impact the approximately 7.3 million Americans working at night.[40]

Medical disorders related to sleep are obviously not new. Yet the discipline of sleep disorders medicine is in its infancy. Sleep research has increased dramatically in the last decade. Ware (1988) stated that as recently as five years ago, only three medical schools in the country had any systematic presentation of sleep and sleep disorders in their core curricula.[41] According to Ware, the Sleep Disorders Center at Sentara Norfolk General Hospital in 1985 was the first sleep center in Virginia and North Carolina and the 60th in the country to be accredited.[42]

The Diagnostic Classification of Sleep and Arousal Disorders (First ed., 1979) paved the way for coherent categorization of the sleep disorders and the construction of a rational system diagnosis. At present

there is a large body of knowledge on which to base the discipline of sleep disorders medicine in the accepted handbook Principles and Practice of Sleep Medicine (Kryger).[43]

The Nature of Sleep

Sleep is a reversible behavioral state of perceptual disengagement from and unresponsiveness to the environment. Sleep is a very complex amalgam of physiological and behavioral processes.[44] Encyclopedia and Dictionary of Medicine, Nursing and Allied Health reads:

> Most theorists agree that sleep has value as a recuperative and adaptive function in the lives of humans. The relatively high metabolic needs of mammals and birds to maintain a constant body temperature in a wide range of environmental temperatures suggests that the periodic decreases in metabolic rate and body temperature that occur in NREM sleep allow for recuperation and restitution of body tissues. For example, even though the function of stage 2 NREM sleep is not clear, approximately half of human sleep is spent in this stage.
>
> It is also theorized that REM sleep provides a period of recuperation of mental activities and preparation for wakefulness. During REM sleep it is believed that there is increased metabolic activity in the brain so that during waking hours it is more receptive to new information and can assimilate it more easily.[45]

In an overview of normal human sleep, Carskadon and Dement (1989) write that within sleep, two separate states based on a constellation of physiological parameters are (1) NREM and (2) REM which are as distinct from one another as each is from wakefulness. They continue:

> NREM sleep is conventionally subdivided into four stages (stages 1, 2, 3, and 4) which roughly parallel a "depth of sleep" continuum, with arousal thresholds generally lowest in stage 1 and highest in stage 4 sleep. The EEG pattern in NREM sleep is commonly described as synchronous. A shorthand definition of NREM is a relatively inactive, yet actively regulating brain in a movable body.[46]

> REM sleep, by contrast, is defined by EEG activation, muscle atonia, and episodic bursts of rapid eye movements. REM sleep generally is not divided into stages, though "tonic" and "phasic" distinction is based upon shortlived events that tend to occur in clusters separated by episodes of relative quiescence. As sleep is extended, the amount of REM sleep will increase, because REM is quite dependent upon the persistence of sleep into the peak circadian time for this state to occur.[47]

Sorensen and Luckmann (1986) report that far from the traditional view of sleep as a quiescent, anesthetic-like state, REM sleep actually involves intense physiologic activation. For this reason, REM sleep is often referred to as "active" or "paradoxic" sleep. NREM sleep, on the other hand, is associated with progressive relaxation. NREM stages 3 and 4 are often referred to as "slow wave," quiet sleep (see figure 2).[48] The following summary differentiates between REM and NREM in relation to synonyms, characteristics, physiologic correlates, hypothesized function, rebound effects, and dreams.

Ferber (1985) postulates that the stages of sleep represent progressive levels of sleep from drowsiness to very deep sleep, and each can be identified by monitoring brain waves, eye movements, and muscle tone. The brain wave patterns are depicted in figure 3. In stage 1 (drowsiness), the alpha waves disappear and slower waves present as the eyes move slowly about underneath closed eyelids and with the transition through drowsiness, a sudden jerk (hypnogogic startle) may interrupt sleep descent momentarily. Stage 2 can be identified by the presence of short bursts of very rapid activity called sleep spindles, and large, slow waves called K-complexes, begin to appear. One can be awakened easily from this stage, but on awakening, one may not believe that they had been

asleep, depending on how long they had been in stage 2. Stage 4 is characterized by large, slow delta waves.[50]

Features	REM (rapid eye movement)	NREM (Non-rem)
Synonyms	Active, paradoxic sleep	Slow wave, quiet sleep (Stages 3 and 4)
Characteristics	Large muscle immobility	Muscular relaxation
	Rapid, darting eye movements	Slow, rolling eye movements or no eye movement
Physiologic Correlates	Cardiac rate increased and rhythm may become erratic; blood pressure and cardiac output increased; respiratory rate highly variable	Basal levels of cardiac and respiratory rates as well as body temperature
	Central and obstructive apneas	Obstructive ?Central apneas
Hypothesized Function	Mental emotional equilibrium	Physiologic anabolism
Rebound	Yes	Stages 1, 2, and 3: None Stage 4: Yes
Dreams	Vivid, full color, and bizarre	Stages 1, 2, and 3: Probably not
	Emotionally charged	Stage 4: Realistic, like thought process

Figure 2 REM vs. NREM activity summary (Luckmann and Sorensen)[49]

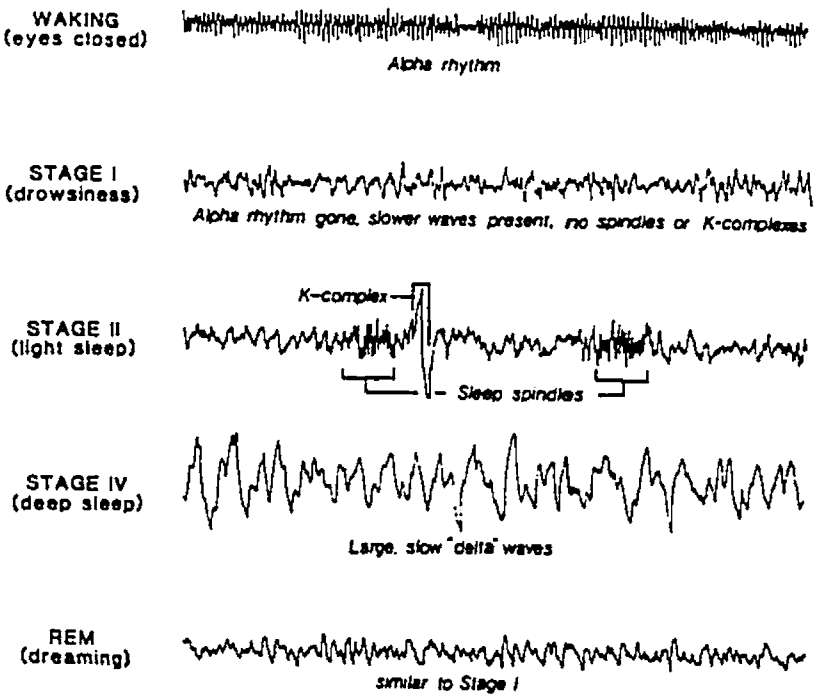


Figure 3 Brain Wave Patterns in waking and sleeping (Richard Ferber)[51]

Circadian Rhythms

Circadian rhythms refer to biological cycles that repeat about every twenty-four hours.[52] Our ability to fall asleep and to stay asleep is closely tied to the timing of these cycles.[53] Czeisler et al., (1980) feel that sleep duration depends more on circadian phase of body temperature than on the prior amount of wakefulness. A maximum sleep time is obtained when sleep onset occurs at the maximum core body temperature. The composition of sleep cycles changes with temperature fluctuations; the propensity for REM sleep is increased when sleep onset occurs after the low point of the temperature cycle.[54] Sorensen and Luckmann (1986) claim that when sleep is synchronized with the circadian rhythm, sleep

activity occurs during the low phase of the physiologic and psychologic rhythm whereas wakefulness and activity, on the other hand, occur during the higher phases (see figure 4). In contrast, attempts to sleep during hours customarily spent awake and active, or to be awake and active during hours customarily spent in sleep, produce circadian desynchronization or a phase shift creating sleep of poor quality.[55]

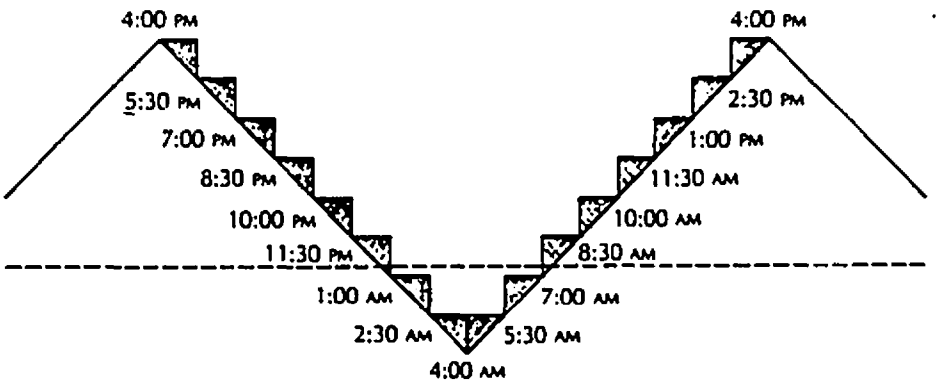


Figure 4 Schematic depiction of circadian rhythm reflected by body temperature. Highest readings occur at roughly 4 PM. The lowest occur close to 4 AM. Hours falling below the dashed line (approximately 12 midnight to 8 AM) reflect the "lowest" portion of the circadian rhythm. Thus, they are the physiologically and psychologically optimal period to sleep. Hours above the dashed line correspond to the "higher" phases of the circadian rhythm, and hence those most appropriate for waking and activity. Superimposed on the overall circadian pattern are "high" (and "low") oscillations roughly every 90 minutes. Known as basic rest-activity cycles, or BRAC"s (shaded areas), these oscillations reflect physiologic and psychologic ups and downs dictated by the central nervous system that occur 24 hours a day. During the bulk sleep period, each 90-minute BRAC reflects a full cycle of sleep stages, and the active or high point of each BRAC corresponds to the REM portion of each sleep cycle.

Figure 4 Circadian rhythm reflected by body temperature (Sorensen and Luckmann)[56]

Potter and Perry (1986) remark that each person has an individualized biological clock that synchronizes the sleep cycle.[57] Mitchell feels that the character of sleep cycles varies greatly between individuals but

remains remarkably consistent for any particular person.[58] Potter and Perry describe two specialized areas of the brainstem that control the cyclical nature of sleep: (1) the reticular activating system (RAS) in the brainstem, spinal cord, and cerebral cortex, and (2) the bulbar synchronizing region (BSR) in the medulla (see figure 5).

> The two systems work together, intermittently activating and suppressing the brain's higher centers. Stimulation of the RAS through sensory input, thought processes, and emotions maintains alertness and wakefulness. While the BSR is less understood, researchers know that activity of the BSR increases with the onset of sleep. When RAS stimulation declines sufficiently, the BSR takes over, causing the person to fall asleep. Normally in the early morning the RAS again becomes stimulated and the person awakes.[59]

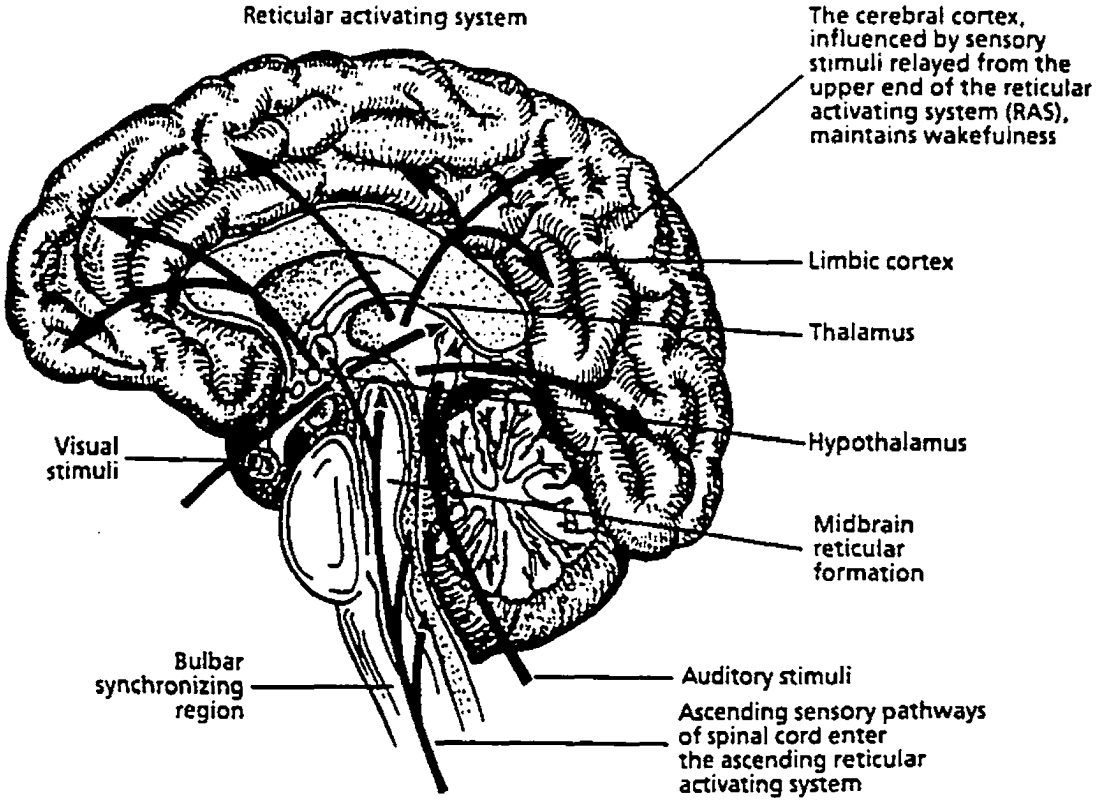


Figure 5 Reticular Activating System (RAS) and the bulbar synchronizing region (BSR), control sensory input, intermittently activating and suppressing the brain's higher centers to control sleep and wakefulness. (Potter and Perry)[60]

Generalizations About Sleep in the Normal Young Adult

Carskadon (1989) suggests a number of general statements that can be made regarding sleep in the normal young adult individual who is living on a conventional sleep-wake schedule and who is without sleep complaints:

1. Sleep is entered through NREM.
2. NREM sleep and REM sleep alternate with a period near 90 minutes.
3. Slow wave sleep predominates in the first third of the night and is linked to the initiation of sleep.
4. REM sleep predominates in the last third of the night and is linked to the circadian rhythm of body temperature.
5. Wakefulness within sleep usually accounts for less than 5 percent of the night.
6. Stage 1 sleep generally comprises about 2-to-5 percent of sleep.
7. Stage 2 sleep generally comprises about 45-to-55 percent of sleep.
8. Stage 3 sleep generally comprises about 3-to-8 percent of sleep.
9. Stage 4 sleep generally comprises about 10-to-15 percent of sleep.
10. NREM sleep, therefore, is usually 75-to-80 percent of sleep.
11. REM sleep is usually 20-to-25 percent of sleep, occurring in four to six discrete episodes.[61]

Concern with the relative effectiveness of nocturnal sleep to produce restorative functions for the body and mind to enable maximum daytime alertness in order to optimize individual potential have prompted numerous studies on sleep over the past forty years. Little is known about why people need sleep and what purpose it serves. Without sleep, drowsiness occurs and is only relieved by sleep. The length of nocturnal sleep is dependent upon various factors, of which volitional control is amoung the most significant in mankind and it is difficult to identify a "normal" pattern.

Disorders of Sleep

An estimated 100 million people in the United States have some complaint related to sleep-wake functions yet an important thing to know is that sleep complaints, for one reason or another, are volunteered far less often than is warranted.[62] Simonds and Parraga stated, "Sleep disorders in children have become the focus of interest both as primary disorders and disorders secondary to other emotional and medical conditions."[63] Over the last 15 years dramatic advances in the ability to diagnose, evaluate, and treat disorders of sleep and arousal have led to the description of over 60 disorders.[64] As a result, a new nomenclature is provided through the publication of Diagnostic Classification of Sleep and Arousal Disorders (1979) by the combined efforts of the Association of Sleep Disorders Centers (ASDC) and Association for the Psychophysiological Study of Sleep (APSS) categorizing four major clusters of disorders in the nosology, (see figure 6).[65]

Thorpy (1989) reported that the first two groups of the classification were organized under two major symptoms: (1) those that related to insomnia, called the disorders of initiating and maintaining sleep (DIMS), and (2) those that related to excessive daytime sleepiness, termed the disorders of excessive somnolence (DOES). Group (3) was listed according to their pathophysiological basis rather than their symptoms and include disorders of the sleep-wake schedule (DSWS), and the final group (4) comprised those sleep disorders that could intrude into sleep but did not primarily produce a complaint of either difficulty in initiating or maintaining sleep or excessive somnolence, namely the dysfunctions associated with sleep, sleep stages, or partial arousals (parasomnias).[66]

DIMS: Disorders of initiating and maintaining sleep (insomnias)
- Psychophysiologic
  - Transient and situational
  - Persistent
- Associated with psychiatric disorders
  - Symptoms and personality disorders
  - Affective disorders
  - Other functional psychoses
- Associated with use of drugs and alcohol
  - Tolerance to or withdrawal from CNS depressants
  - Sustained use of CNS stimulants
  - Sustained use of or withdrawal from other drugs
  - Chronic alcoholism
- Associated with sleep-induced respiratory impairment
  - Sleep apnea DIMS syndrome
  - Alveolar hypoventilation DIMS syndrome
- Associated with sleep-related (nocturnal) myoclonus and restless legs
  - Sleep-related (nocturnal) myoclonus DIMS syndrome
  - Restless legs DIMS syndrome
- Associated with other medical, toxic, and environmental conditions
- Childhood-onset DIMS
- Associated with other DIMS conditions
  - Repeated REM sleep interruptions
  - Atypical polysomnographic features
  - Not otherwise specified

DOES: Disorders of excessive somnolence
- Psychophysiologic
  - Transient and situational
  - Persistent
- Associated with psychiatric disorders
  - Affective disorders
  - Other functional disorders
- Associated with use of drugs and alcohol
  - Tolerance to or withdrawal from CNS stimulants
  - Sustained use of CNS depressants
- Associated with sleep-induced respiratory impairment
  - Sleep apnea DOES syndrome
  - Alveolar hypoventilation DOES syndrome
- Associated with sleep-related (nocturnal) myoclonus and restless legs
  - Sleep-related (nocturnal) myoclonus DOES syndrome
  - Restless legs DOES syndrome
- Narcolepsy
- Idiopathic CNS hypersomnolence

DOES: Disorders of excessive somnolence (continued)
- Associated with other medical, toxic, and environmental conditions
- Associated with other DOES conditions
  - Intermittent DOES (periodic) syndromes
    - Kleine-Levin syndrome
    - Menstrual-associated syndrome
  - Insufficient sleep
  - Sleep drunkenness
  - Not otherwise specified
- No DOES abnormality
  - Longer sleeper
  - Subjective DOES complaint without objective findings
  - Not otherwise specified

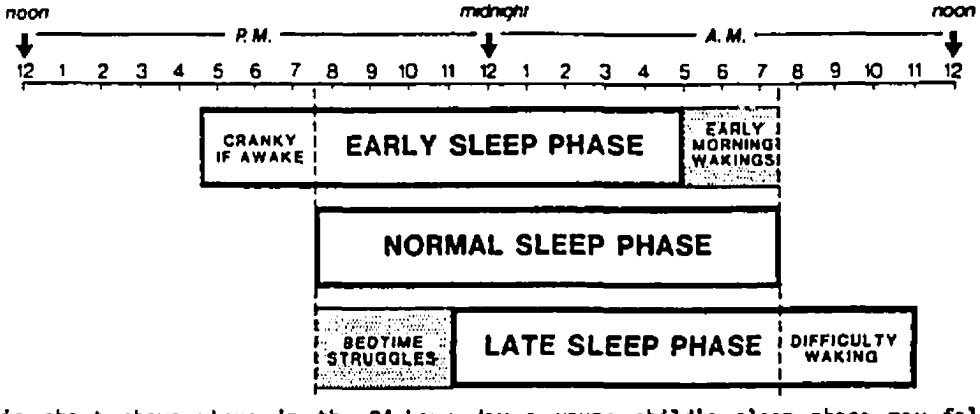
Disorders of the sleep-wake schedule
- Transient
  - Rapid time zone change (jet lag) syndrome
  - Work shift change in conventional sleep-wake schedule
- Persistent
  - Frequently changing sleep-wake schedule
  - Delayed sleep phase syndrome
  - Advanced sleep phase syndrome
  - Non-24-hour sleep-wake syndrome
  - Irregular sleep-wake pattern
  - Not otherwise specified

Dysfunctions associated with sleep, sleep stages, or partial arousals (parasomnias)
- Sleepwalking (somnambulism)
- Sleep terror (pavor nocturnus, incubus)
- Sleep-related enuresis (bedwetting)
- Other dysfunctions
  - Dream anxiety attacks (nightmares)
  - Sleep-related epileptic seizures
  - Sleep-related bruxism
  - Sleep-related headbanging (jactatio capitus nocturnus)
  - Familial sleep paralysis
  - Impaired sleep-related penile tumescence
  - Sleep-related painful erections
  - Sleep-related cluster headaches and chronic paroxysmal hemicrania
  - Sleep-related abnormal swallowing syndrome
  - Sleep-related asthma
  - Sleep-related cardiovascular symptoms
  - Sleep-related gastroesophageal reflux
  - Sleep-related hemolysis (paroxysmal nocturnal hemoglobinuria)
  - Asymptomatic polysomnographic finding
  - Not otherwise specified

From Association of Sleep Disorders Centers 1979

Figure 6 Diagnostic Classification of Sleep and Arousal Disorders (Sleep 1979)[67]

In figure 6, delayed sleep-phase syndrome and advanced sleep phase syndrome appear under disorders of the sleep-wake cycle. Ferber (1985) differentiates these two syndromes as early sleep phase and late sleep phase. Ferber writes, "Your child has an early sleep phase if his natural sleep period--the time from when he falls asleep at night to when he wakes in the morning--occurs earlier in the twenty-four-hour day than you would like (see figure 7).[68] If your child's natural sleep period occurs later in the twenty-four-hour day than you would like, he has a late phase (see figure 7).[69] An early sleep phase is less common than a late sleep phase, because our natural tendency is to shift later.[70]



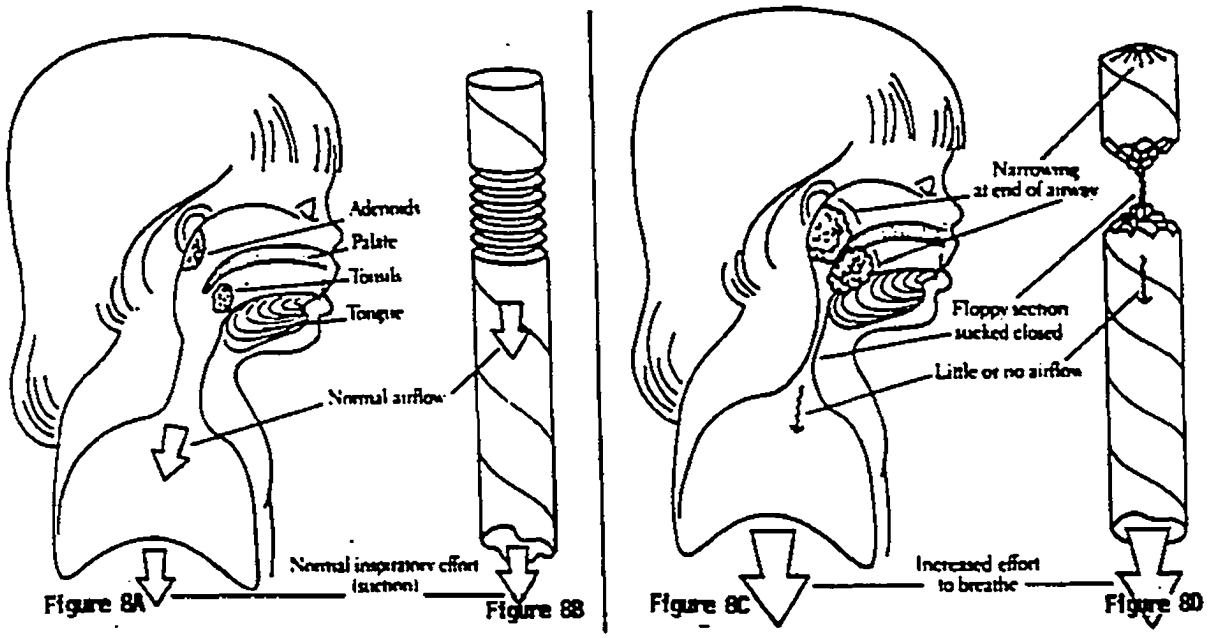
This chart shows where in the 24-hour day a young child's sleep phase may fall. Here a normal phase is assumed to run from 7:30 p.m to 7:30 a.m. An early sleep phase occurs when the phase shifts to earlier hours, and a late sleep phase occurs when it shifts to later hours. Of course, the position of the "normal" phase depends on the particular schedule required by your family. For an older child, the length of the normal phase will be shorter and will begin later.

Figure 7 Sleep Phase Shifts (Ferber)[71]

Mitchell et al., report, "Apnea is defined as the cessation of airflow at the nose and mouth of greater than 10 seconds duration. . . . Single apneas last from 10 to 120 seconds and end with partial arousal of the individual. . . . Sleep is associated with the relaxation of upper airway muscles, and the airway can become smaller (e.g., snoring is due to compromised airflow) or collapse (obstruction)."[72] Ferber explains:

To give you an idea how such an obstruction occurs, imagine for a moment what it is like to breathe through a straw, so that the straw represents your respiratory system (see figure 8). The end of the straw away from you would be the air inlet (like your diaphragm). As long as the straw is formed normally you can breathe without difficulty. However, if you bend the straw in the middle several times so that it becomes floppy you will find that if you breathe in too rapidly, the weakened part of the straw will collapse. Still, if you breathe slowly and regularly it will not.

Now imagine pinching the far end of the straw. In order to breathe through that narrowed opening at the end you would have to suck harder than usual and the floppy part would surely collapse and cause an obstruction. This is analogous to what happens in a child whose upper airway is narrowed perhaps because of enlarged tonsils or adenoids. In order to get enough air she has to breathe harder, but in the process the floppy area in the back of throat may be sucked closed. This will not happen when she is awake and able to control the muscles of the tongue and throat to keep the passage open.[73]



In Figure 8A, a girl with normal sized tonsils and adenoids breathes well with little effort. One could do the same, breathing through a straw of sufficient caliber (Figure 8B).

In Figure 8C, the air passages are narrowed by markedly enlarged tonsils and adenoids. Now the girl must breathe in strenously in an effort to get air past the narrowing. But the floppy part of the airway just below the tonsils and adenoids only gets sucked closed and there is little or no airflow (apnea). This is similar to breathing through a straw that is pinched off at the far end (Figure 8D).

Figure 8 Obstructive Sleep Apnea (Ferber 1985)[74]

Marlow suggests, "The sleep of the school child is rarely quiescent. Fears in the form of night terrors or nightmares prevent his sleeping peacefully because for one reason he has reached the point in his mental development at which he has a concept of death."[75] Ferber adds that he may have serious concerns about falling asleep and never waking up.[76]

Hoelscher (1990) explains that night terrors and sleepwalking tend to occur during deep sleep thus, these phenomena are more common in children, since they have more deep sleep than adults. He adds that during night terrors the person will often awaken from sleep with a scream, will notice signs of autonomic arousal such as a racing heart and shortness of breath, often be afraid, and be hard to console and orient.[77] Ferber suggests, "Let the screaming subside, let the child return to sleep, do not question or embarrass the child however protect from injury as a primary concern and this should be done quietly."[78] Hoelscher describes another parasomnia called REM behavior disorder in which persons do not have the customary loss of muscle tone, which means that they may be able to enact some of their dreams or portions of their dreams and injure themselves.[79]

Studies of Abnormal Sleep

From the few studies which have investigated the personality characteristics of children who sleepwalk, no consistent picture has emerged. Using the Rorschach, Klackenberg (1982) reported that sleepwalkers had more inhibited aggression and better defenses against anxiety than nonwalkers. On the basis of peers' and teachers' ratings he also reported that sleepwalkers were better liked than nonwalkers. Whereas Kales, et al., (1980) commented on the absence of psychopathology in children who

sleepwalk, Dollinger (1982) reported that among children referred to a clinic, those with severe sleep problems, including sleepwalking, were characterized by high anxiety, increased sensitivity to others' impressions of them and high susceptibility to hurt feelings.[80]

Simonds and Parraga reported, "A comprehensive study of the prevalence of a range of sleep disorders and sleep behaviors in a child and adolescent population has not been reported in the literature."[81] Price et al., revealed in their Stanford University study that 37.6 percent of the adolescent population reported occasional sleep disturbance while an additional 12.6 percent suffer chronic and severe sleep disturbance. They state a need to study the "normal" population to determine if we need to be concerned about sleep problems in a younger population.[82] Of particular interest is a study by Kataria and colleagues whereby they interviewed mothers of children aged 15 to 48 months, initially and after three years, to determine if common sleep disturbances in young children tend to persist. Kataria et al., concluded that generally sleep habits established early carry over a lifetime.[83] This sample would be of special interest to investigate further since they would fall within the age range of this current study.

In an attempt to gain a clearer understanding of the relationships between sleep of children and attention, investigators have studied children with attention deficit disorder, a term used to describe a syndrome of behaviorally related problems that impair learning, including distractibility, hyperactivity, impulsivity, and excitability. The Diagnostic and Statistical Manual of Mental Disorders (APA 1980) delineates this disorder into two subtypes; attention deficit disorder with hyperactivity

(ADDH), and attention deficit disorder without hyperactivity (ADD).[84] Greenhill and co-workers examined forty-eight ADDH children and reported significantly higher parental ratings in their group for restless sleep, very early rising and difficulty falling asleep.[85] The hyperactive restless sleeper may create classroom problems resulting from the short attention span, impulsive behavior, and noncompliance with adult authority usually causing low academic achievement even though the child has the intellectual ability to succeed.[86]

Sleep problems of children with high intelligence are less likely to be detected as early as those of children of average intelligence.[87] Foster et al., (1989) claim that the onset is before the age of seven. Estimates of the prevalence range from 1.2- to 20-percent of all school-age children, and the syndrome occurs nine to ten times more often in boys.[88] Some investigators believe the syndrome to have genetic predisposition (Ack et al., 1982).[89] However, Botshaw and Perret (1981) claim that the reticular activity system of the midbrain controlling consciousness and attention may be deficient of neurochemicals that may be replaced with amphetamine medication.[90] Some drugs used are dextroamphetamine (Dexedrine), methylphenidate (Ritalin), and recently, pemoline (Cylert) all of which possess no specific ability to enhance learning, or promote attention to tasks. However, the increased ability to complete assignments and to avoid distractions enhances learning and school achievement.[91]

Management of the child with attention deficit disorder usually involves a multiple approach that includes family education and counseling, medication, remedial education, environmental manipulation, and sometimes psychotherapy of the child.[92] Whalen and Henken(1982) believe the most

promising treatment is a combination of various forms of behavior modification approaches including contingent rewards or behavioral contracting programs and/or cognitive-behavioral approaches that teach children self-instructional and self-reinforcement skills that they can use to guide their own behavior and systematically monitor their own progress. Some programs include metacognitive training that is designed to teach children how to analyze the components and demands of a given task, to generate appropriate problem-solving strategies, and to assess and modify their performance as necessary.[93]

The Feingold diet (1975) reducing sugar intake and eliminating artificial colorings and flavors has received popular support but little support from the scientific community.[94] Kaplan (1989) investigated twenty-four hyperactive boys in a ten-week study utilizing a diet low in simple sugars that eliminated artificial colors, flavors, chocolate, monosodium glutamate, preservatives, caffeine, and any substance that families reported might affect their specific child. More than half the subjects exhibited a significant improvement in behavior and improvement in nonbehavioral variables, particularly night awakenings and latency to sleep onset which indicated larger improvement scores than challenge studies with the possible exception of Swanson and Kinsbourne (1980).[95]

Sleep in Children

The specific functions and processes of sleep are largely taken for granted. To most normal people, sleep is not only a need but a pleasure; however, some children can find many excuses for delaying bedtime, and this often generates frustration and anger at home. Of what use is sleep? How does it refresh us? What damage does its absence create? How much

restorative power does sleep possess? How much do we actually need?

Ferber alleges that there is no absolute way of measuring whether the amount of sleep your child gets per day is appropriate.[96] Figure 9 documents the average amount of sleep children get at various ages during the night and at naptime.[97] This "normal" amount of sleep would provide optimal daytime alertness, thus increasing power of concentration of the individual. Insufficient, disturbed sleep could result in daytime fatigue, drowsiness, irritability, impaired attention span, and inability to concentrate. Ferber indicates that nighttime sleep slowly decreases from about twelve hours in the preschooler to about ten hours in the preadolescent and that children aged fourteen to seventeen sleep only about seven or eight hours, although we believe this amount of sleep is culturally imposed and probably inadequate.[98]

The sleep of the newborn infant consists of approximately 50 percent REM sleep, in contrast to approximately 20 percent in the older child. The large amount of active REM sleep in early infancy is believed to serve as an endogenous source of stimulation to the higher brain centers, and is important for normal development at a time when exogenous sources are minimal because of the short periods of arousal. The decrease in REM sleep as development progresses may indicate that with longer periods of wakefulness, the more mature brain has less need for endogenous stimulation. The deep, restful NREM sleep increases proportionately with age; children who have recently given up napping take a longer time to get into REM sleep during the initial sleep cycle than do either older or younger children, which suggest they are more fatigued.[99]

Disagreement exists regarding whether the proportion of nocturnal

sleep spent in REM (i.e., REM percentage) varies with aging. Many studies have reported data indicating that REM percentage does not vary appreciably with aging, but other studies have reported relatively lower REM percentage in the aged than in younger subjects or negative relationships between REM percentage and age.[100] Mussen and colleagues (1990) depict

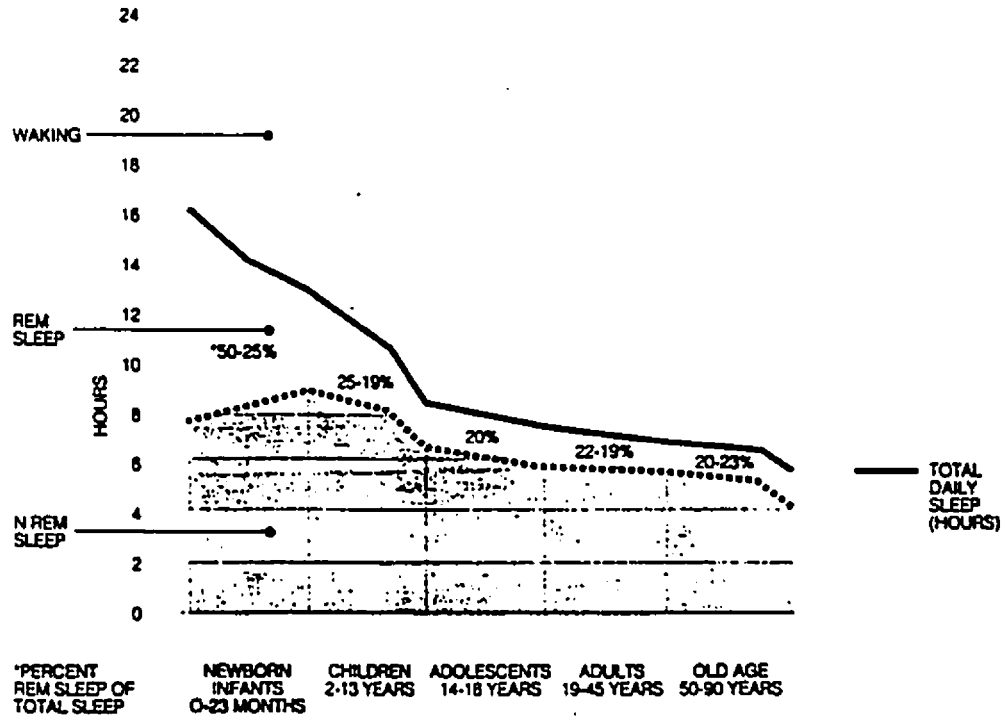


FIGURE 9 Age changes in the total amounts of daily sleep and daily REM sleep and in percentage of REM sleep. The percentage of REM sleep is indicated by the nonshaded area of the graph. The percentage of REM sleep drops from 50% in the newborn period to only 25% in the 2- to 3-year-old child. (Adapted from Roffwarg, Munzio, & Dement (1966); revised since publication in Science by Dr. Roffwarg. By permission of the senior author.). (Mussen & colleagues 1990).[101]

revised work of Roffwarg et al., regarding total amounts of daily sleep, daily REM sleep, and percentages of REM sleep across the lifespan. The percentage of REM sleep drops from 50-25 percent in the newborn period to 20-23 percent in old age. Of special interest is the group of children

(2-13 years) who are reported to have 25-19 percent REM sleep (see figure 9).[101] Ware (1990) suggests that the amount of time spent in the deep sleep stage also declines with age to approximately 3 percent in a sixty-year-old male and 7 percent in a sixty-year-old female.[102]

According to Dement, Kleitman, and Oswald, generally speaking, a typical episode of sleep consists of from four to six complete cycles, each of which is composed of five stages. Each of the five stages has its own special characteristics. (See figure 10).[103] Carskadon and Dement (1989) explain:

> An incrementally larger stimulus is generally required to produce an arousal from stage 3 or 4 sleep than from stage 1 or 2 sleep. (Investigators often refer to the combined stages 3 and 4 sleep as slow wave sleep, delta sleep, or deep sleep.) Slow wave sleep is maximal in young children and it is nearly impossible to waken youngsters from the slow wave sleep of the night's first sleep cycle. As depicted in figure 10, from stage 4 sleep, a series of body movements usually signals an "ascent" to lighter NREM sleep stages. There may be a very brief (1-or 2-min) episode of stage 3 sleep, followed by perhaps 5 to 10 min of stage 2 sleep interrupted by body movements preceding the initial REM episode.[104]

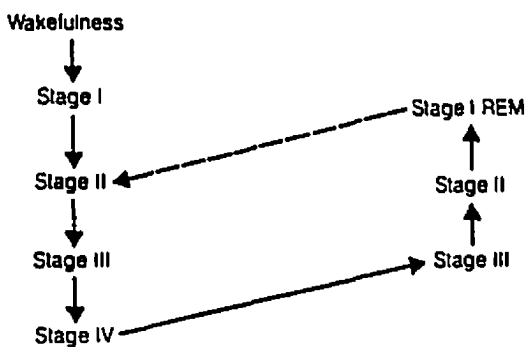


Figure 10 The sleep cycle (Dement, Kleitman, and Oswald)[103]

The sleep cycle length, or the time between two consecutive appearances of the same sleep state, increases from about fifty minutes in a full-term baby to the adult level of ninety minutes by adolescence. A young child will plunge rapidly through drowsiness and the lighter stages

of NREM sleep into Stage IV usually within ten minutes (see figure 11) and in the youngster this is an extremely deep sleep, and waking a child from Stage IV sleep may be almost impossible. Ferber continues:

> After about an hour in stage 4 sleep there will be a brief awakening, possibly sudden movement, and a mixture of brain wave patterns from deep sleep, light sleep, drowsiness, and even awakening. The first REM episode, whenever it appears, tends to be relatively short, lasting only five to ten minutes and is usually not very intense. After forty to fifty minutes another arousal will occur followed almost certainly by a REM episode lasting five to twenty minutes. The rest of the night is spent alternating between REM and stage 2 sleep.[105]

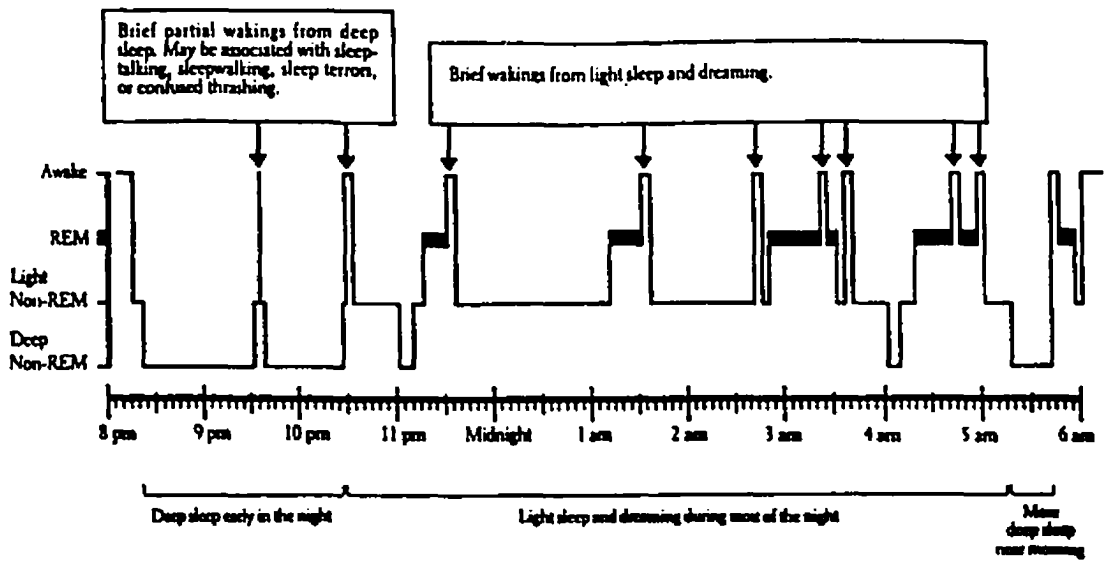


Figure 11 Typical sleep stage progression (Richard Ferber)[105]

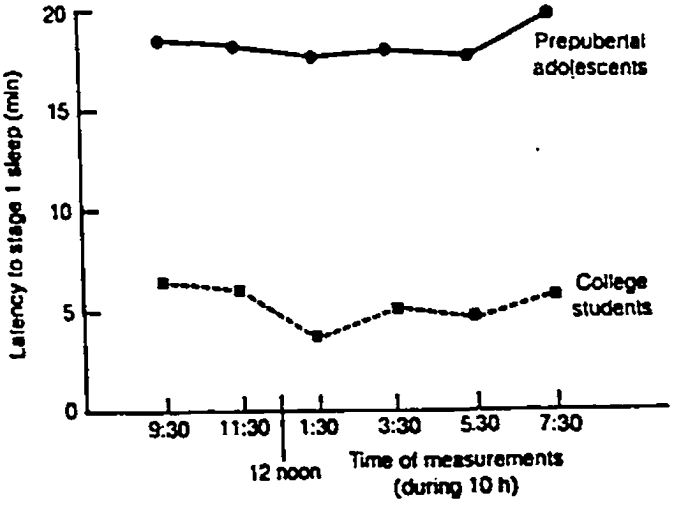
Studies of Normal Sleep

The patterns of nocturnal sleep and diurnal sleep tendency of normal adolescents have been studied by Carskadon (1980, 1982, and 1983), Orav (1983), Dement (1980, and 1983), Harvey, Duke, Anders, and Litt (1980). Although there are a number of excellent normative studies in preadolescents, Feinberg (1974), Coble, Kupfer, Taska, and Kane (1984), Ross,

Agnew, Williams, Webb (1968), and Williams, Karacan and Hursch (1974), none have linked an assessment of daytime sleepiness to nocturnal evaluations. The Carskadon group (1984) studied sixteen second-, third- and fourth-grade boys and girls (mean age nine years one month). The MSLT findings on this group of preadolescents are consistent with their previous results and largely in agreement with data described by other groups, indicating that prepubescent adolescents are alert throughout the day emphasizing the optimal pattern of deep sound nocturnal sleep and alert waking function in preadolescents.[106]

Daytime drowsiness is rarely reported.[107] Dement and Carskadon observed:

> Quite a different outcome was found in a study of daytime sleep tendency in college students. Even though they spent 8 hours in bed and got a "normal" amount of sleep, these students were extremely sleepy in the daytime. Figure 12 documents physiologic sleepiness profiles in prepubescent children ages 10 to 12 and college students.[108]



Physiologic sleepiness profiles in prepubescent children ages 10 to 12 and college students. Even though college students have had an average sleep time of about 8 hours, they show considerably greater physiologic sleepiness than the young adolescents, indicating a need for more sleep.

Figure 12 Physiologic sleepiness profiles (Dement and Carskadon)[108]

In a recent study of forty-three boys and girls ranging in age from six years to eleven years eleven months, overall findings were consistent with previous reports by other investigators such as Benoit and colleagues (1978), and Agnew and Co-workers (1966). First-night effect evidenced by sleep onset difficulty and increased wakefulness after sleep onset, resulted in lower sleep efficiencies on their first night compared with subsequent nights in the laboratory. First-night effect was most pronounced in younger children. Coble et al., (1987) continue:

> The total recording period and the time spent asleep show a steady decline with increasing age (from 9.5 and 9 hr to 8 and 7.5 hr, respectively; $p<0.001$), whereas specific measures of sleep continuity remain constant, with high sleep efficiencies of 94 to 95% for children in all three latency-age groups. The NREM sleep measures were marked by a gradual decline in slow wave stage 4 sleep from approximately 18% in 6- and 7-year-old children to 14% in 10- and 11-year-old children ($p<0.01$), whereas the amount of REM sleep remained relatively stable at 20 to 22% for all three groups (see Figure 13.)[109]

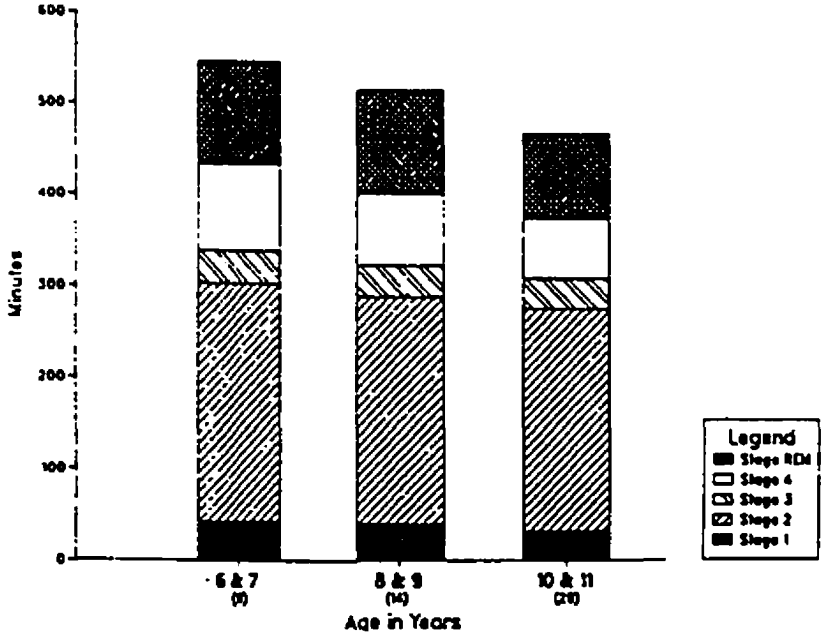


Figure 13 Time spent asleep (minutes) by sleep stage in healthy latency-aged children (6 to 12 years old); mean of nights 2 and 3. ANOVA results significant for: time spent asleep (TSA), $p<0.001$; stage 2 percent, $p<0.05$; stage 4 percent, $p<0.01$. (Coble et al. 1987)[110]

Coble et al., (1984) examined EEG sleep of eighty-seven normal healthy boys and girls ranging in age from six years to fifteen years eleven months and found that boys consistently spent more time in bed than did girls. Two significant effects were noted for sex: for percent of stage 3 sleep ($F = 5.86$, $p < 0.05$) and for Delta ratio ($F = 6.91$, $p = 0.010$) generally accounted for by higher stage 3 percents and, accordingly, higher Delta ratios among the boys in this sample (see figure 14).

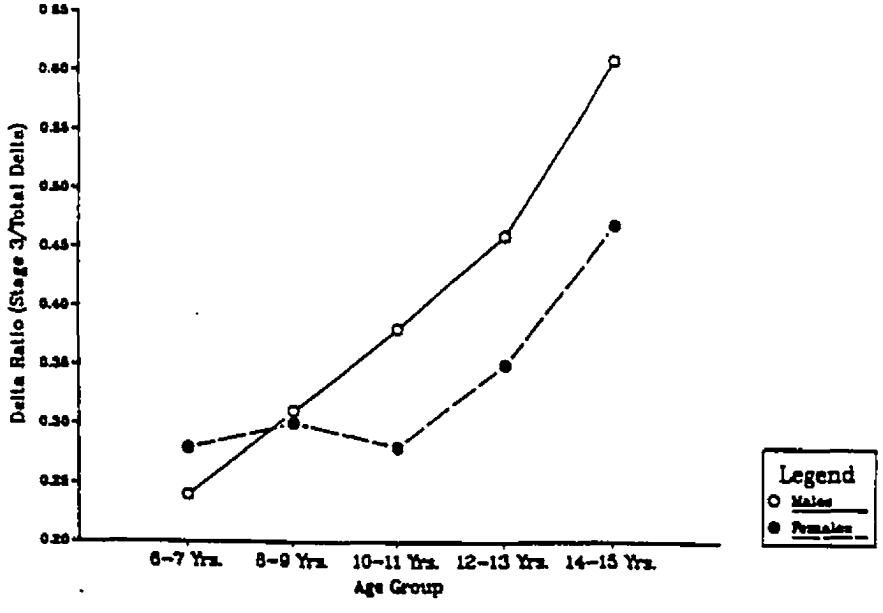


Figure 14 Sex differences in Delta ratio as a function of age.[111]

They concluded that among normal, healthy children chronological age appears to exert the strongest effect on sleep pattern differences observed in this age range and like other investigators, observed few gender differences and were unable to demonstrate significant and unique effects attributable to pubertal development.[112]

In a comparison EEG-EOG study of typical all-night sleep patterns of eighteen schoolboys (range eight to eleven years) and adults, Ross et al.,

(1968) found the boys total sleep time was 2½ hours longer and with unequal distribution of the added time to each of the sleep stages. Although individual variations were apparent, it was found that each boy maintained approximately the same percentage of total sleep for each sleep stage from night to night.[113]

Information regarding the relationship between sleep patterns and measured intelligence in children of superior IQ is practically non-existent. Eleven non-medicated male children (range eight-to twelve-years) participated in a study undertaken to investigate the relationship among sleep patterns and events and measures of intellectual functioning (IQ) comparing those with superior intelligence with those of average intelligence. Clearly, the data from superior IQ children do not differ dramatically from those of normal controls, according to Busby and Pivik (1983), however, the greater absolute amounts of stages 2 and 3, and consequently of NREM sleep, could be attributed to the greater total sleep time observed for the high IQ group. They stress that this finding of greater total sleep time in gifted children confirms with polygraphic monitoring of sleep what Terman (1925) noted in his survey study of 1000 gifted children , i.e., that brighter children between the ages of eight and twelve sleep longer than non-gifted normal children of the same age whereby Kleitman (1963) speculated that this effect might result from increased cognitive activity during wakefulness in these children.[114]

Simonds and Parraga (1982) attempted to determine the prevalence of various sleep disorders and sleep behaviors in a cross-sectional study of a random sample of subjects ranging in age from five years to eighteen years. Their findings included irresistable urges to sleep during the

day occurring in 5.3 percent of five-to-eight-year olds, 1.5 percent of nine-to-eleven-year olds, 3.5 percent of twelve-to-fourteen-year olds and 10 percent of fifteen-to-eighteen-year olds. Daytime drowsiness was reported in 5.3 percent of five-to-eight-year olds, 6.2 percent of nine-to-eleven-year olds, 12.1 percent of twelve-to-fourteen-year olds, and 11.8 percent of fifteen-to-eighteen-year olds. One questionnaire was mailed to parents and the second one was administered to faculty and staff.[115] These data supported the concept of daytime drowsiness being more frequent in adolescents and perhaps daytime naps are attempts to compensate for sleep needed. It would be of paramount interest to consider the effect of daytime sleepiness on performance and school behaviors.

Relationship of Sleep Patterns to Children's School Behaviors

Dement and Carskadon (1982) philosophize that everyone realizes overwhelming drowsiness in the daytime is the inevitable consequence of failing to sleep at night but that, in spite of this, sleepiness was virtually ignored as an experimental variable by sleep researchers for many years. They add that it is widely believed that sleepiness impairs performance; however, documenting this belief is difficult, and essentially impossible when sleepiness is mild.[116] Early attempts to quantify daytime sleepiness included the following elements: pupillometry, introspective rating scales and performance testing, none of which achieved widespread acceptance. In the late 1970s, the introduction of the Multiple Sleep Latency Test (MSLT) greatly enhanced the acquisition of accurate information regarding sleepiness. The MLST is a simple, objective, quantifiable measure of diurnal somnolence that utilizes EEG, EOG, and EMG recordings to determine the speed of falling asleep.[117]

The availability of systematic and diagnostic information measuring sleep quantitatively stimulated extensive research involving sleepiness as a phenomenon in an attempt to answer questions long in the mind of sleep researchers. How does daytime sleepiness impact on behavioral responses of children in the school setting or any setting? Is the educational process compromised by daytime sleepiness? Does the sleepy child do more poorly in school? Does the alert student get better grades and present with fewer problems in the classroom? The sleepy student may not necessarily become a problem student but can he achieve to full potential? The extent to which students pay attention to the information presented to them in school is commonly associated with their level of academic performance. A logical assumption is that sleepy children could be inattentive, unable to concentrate, unmotivated to excel, restless, and present other behavior problems.

Progression of Sleep Patterns Relating to Behavior and Performance

Bonnet claims that many recent studies have shown a significant incidence of daytime sleepiness in the population.[118] A focus of interest centers on where this sleepiness begins, factors that may initiate or exacerbate the phenomenon, and if it correlates with sleep disturbances and behavior problems. Richman (1981) suggests the incidence of daytime sleepiness begins in infancy. Conducting a community survey of characteristics of 1,158 children one-to-two-years old, Richman reported that the wakers more commonly had other behavior and temperamental difficulties, irritability in the early months, and an adverse perinatal history. She added that their families had more stress and their mothers were more likely to have psychiatric symptoms.[119]

Thomas, Chess, and Birch (1968) suggest continuing sleep difficulty persists beyond infancy. In a longitudinal study of infants who developed behavioral problems, many of the younger children also had sleep disturbances.[120] Kataria, Swanson and Trevathan (1987) studied sixty children (mean age 26.4 months) from well-child clinics of a medical school and private pediatric offices in an attempt to determine (1) if common sleep disturbances of young children persist and (2) if sleep disturbances are accompanied by other behavioral problems. After three years, of the sleep-disturbed children, 85 percent demonstrated persistence and 30 percent exhibited other generalized behavior difficulties including excessive talking, high activity level, excessive crying, temper tantrums, and difficult peer relations.[121]

The Carskadon group (1982) report that a study of preadolescents proved them to have no physiological sleepiness whatsoever. They sleep well at night, are alert and energetic all day long, never nap, and never fall asleep during MSLT testing. They add that the findings tempt them to conclude that these children were also functioning at peak levels in other ways: learning, remembering, initiative, creativity, and enthusiasm.[122] Further support of these findings are presented by Keenan and colleagues (1987) who comment on a study of sixteen second-, third-, and fourth-graders who took part in a sleep habits survey and concluded that their findings of optimal pattern of deep, sound nocturnal sleep and alert waking function were in agreement with data described by Feinberg (1974), Coble and colleagues (1984), Williams and colleagues (1974), and Ross and coworkers (1968).[123]

Carskadon (1990) states that very few studies have directly examined

specific factors that might influence the development of adolescent sleep patterns. She continues that no studies have looked at the possibility that preventive measures can alter patterns of sleep and wakefulness during adolescence.[124] Carskadon and Dement (1987) suggest that adolescence is fraught with striking changes such as statural, hormonal, physical, psychological, and emotional, therefore, a percentage of "normal" adolescents have a significant disturbance of waking function as a result of (1) the pubertal increase of daytime sleepiness, (2) restriction of nocturnal sleep to meet societal expectations or obligations, and (3) the additive impact of chronic sleep restriction.[125]

Carskadon (1990) claims that most studies of adolescent sleep habits show a pattern of decreasing total sleep time, a tendency to delay the timing of sleep, and an increased level of daytime sleepiness conflicting with the reality substantiated by laboratory tests indicating that adolescents probably need more sleep than prepubertally. She surmises that the consequences of the chronic pattern of insufficient sleep are daytime sleepiness, vulnerability to catastrophic accidents, mood and behavior problems, increased vulnerability to drugs and alcohol, and development of major disorders of the sleep/wake cycle.[126] As mentioned earlier, even though college students spent eight hours in bed and get a "normal" amount of sleep, these students were extremely sleepy in the daytime.

As many as 13 percent of the adolescent population may suffer from chronic insomnia that can impair the victim's daily existence and affect personal life, school performance, and school attendance.[127] Price and associates, (1978) noted that sleep complaints among adolescents are usually associated with daytime fatigue, irritability, or depression, and

they collected data suggesting that adolescent poor sleepers, especially those complaining of chronic and frequent sleep disturbance, may be characterized as tense, worried, and less able to solve personal problems, and may experience low-self esteem.[128] Weissbluth et al., (1983), claim that children with behavioral, developmental, or academic problems had a significantly later bedtime hour, briefer duration of total sleep, longer night awakenings, and an increased latency to sleep, as compared to children without those problems.[129]

Morrison, et al. found that while the relationship between poor sleep and performance of daily tasks among adolescents has received little attention, research among the young adult population suggests a strong positive correlation between quality of sleep and quantity of job performance. According to a six-year Navy study on younger recruits relating quality of sleep to job performance, performance was found to be significantly diminished by poor sleep and in comparison to a control group of "good sleepers," the group of poor sleepers received fewer promotions, remained in the lower pay grades, were less likely to be evaluated positively, and experienced a higher rate of attrition.[130]

Sleep researchers have examined the relationship of the sleep behavior and examination results of medical students. Data of particular interest collected by Shapiro et al., (1980) indicating subjective sleep quality was in no way related to academic performance support findings by Holdstock and Verschoor (1974) who showed no relation between examination grades and REM sleep or any other sleep parameter during an examination period, and the observations of Webb and Freil (1971) who found no differences in scholastic measures when comparing those who sleep a short

period with those who sleep longer. The latter findings are contrary to those reported by Johns and coworkers (1976) who found a valid relationship between sleep and academic performance of medical students.[131]

Several studies have focused on anxiety as a personality dimension of short and long sleepers. Hartmann (1973) described consistent short sleepers as ambitious, socially aggressive "non-worriers" who work hard and keep busy and long sleepers as reflective and critical "worriers" who tend to be non-conformist in their attitudes. The latter conclusions are incongruent with the findings of Kumar and Vaidya (1984) and (1982) which support Hicks and Pellegrini's (1977) results in which short sleepers showed significantly higher levels of anxiety.[132]

In examining the effectiveness of behavioral techniques for sleep problems in children, Richman and associates (1985) found that apparently parents adhered to treatment plans and by altering their responses to their child's behavior were able to achieve the desired results whereby their child began to sleep longer as well as wake less often. The evidence that children's night-time behavior could thus change so radically, often within a surprisingly short time, suggests that parental responses were extremely important in maintaining waking behavior and supports our initial hypotheses (1) that the sleep problem was not due to the children needing little sleep, to anxiety or to lack of parental attention, (2) that the parents were inadvertently maintaining the habitual sleep pattern by their responses, which acted as positive reinforcers to not settling or to waking or crying in the night, and (3) withdrawing this positive reinforcement and helping the child to develop alternative reponses would lead to extinction of the unwanted behavior and an improved

sleep pattern with the child able to settle alone without parental attention. There was no evidence that the children in this selected sample needed very little sleep or were unable to sustain a prolonged period of sleep during the night.[133]

Research indicates that even one night of sleep loss in children can significantly impair their ability on several performance tests.[134] The effects of sleep deprivation on subject's ability to perform a series of cognitively-demanding tasks has been explored by Webb (1985), and Webb and Levy (1984, 1982). Their data, relative to kinds of measures which are more or less sensitive to the effects of sleep loss (addition, auditory vigilance, word memory, and reasoning), reflect the history of efforts at measuring sleep loss (Johnson and Naitoh (1974). Subjective and persistence/attention measures are highly sensitive to sleep loss effects whereas precision and cognitive processing tasks are less sensitive.[135]

Attention Problems and School Behavior

Kaplan, McNicol, Conte, and Moghadam (1987) suggest that in spite of inadequate laboratory demonstrations of sleep problems in children with attention deficit disorder with hyperactivity, the belief persists that such problems exist. Results of two experiments demonstrated clearly that parents of ADDH children perceive them to be poor sleepers and data from another experiment offer support for the existence of a relationship between sleep variables and behavior problems, as previously reported in infants by Weissbluth (1983). Parental daily documentation, which is less likely to be affected by reporting bias, was used in the third study.[136]

Greenhill, Puig-Antich, Goetz, Hanlon, and Davies (1982) performed a

rigorous comparison of sleep architecture in nine children with ADDH and eleven control children and found no major differences in sleep characteristics other than decreased REM activity.[137] Busby, Firestone, and Pivik (1981), found no major differences in sleep charateristics of ADDH children in comparison to normal children concluded that the sleep of ADDH children does not differ significantly from that of normal children with respect to amounts of conventional sleep stages, cycle durations (with the exception of the initial NREM cycle), or autonomic nervous system activity as indexed by spontaneous skin potential responses(SSPR).[138]

Daytime symptoms of sleep apneas are varied in children. According to Orr, obvious sleepiness is common in adolescents but may be subtle in younger children who may instead manifest hyperactivity, attentional difficulties, behavior problems, and decreased school performance.[139] Guilleminault (1987) concludes that in children over five-years old, excessive daytime sleepiness (associated with complaints of tiredness and daytime fatigue), abnormal daytime behavior ranging from aggressiveness to hyperactivity to pathologic shyness and social withdrawal, learning disabilities, and major discipline problems are more common reasons for consultation.[140] Weissbluth (1983) reported consistent results with the latter study which demonstrated that the diagnosis of hyperactivity in older children were present in children with documented airway obstruction during sleep.[141]

Coble, Taska, Kupfer, Kazdin, Unis, and French (1984) compared the electroencephalographic sleep of conduct-disordered and normal boys using both standard and automated measurement techniques. While the standard sleep summary measures were not particularly robust in demonstrating

group differences, automated measures revealed quite striking differences in delta sleep activity indicating delta wave counts significantly higher in conduct-disordered subjects than in normal subjects. The findings clearly support future applications of automated techniques to child samples and, if replicable and specific to conduct-disordered subjects, strongly suggest that an abnormality in the expression of slow-wave sleep may be present in at least some of these children.[142]

Bonnet (1986) writes that while the function of sleep is controversial, total sleep loss reliably results in increased sleepiness, decreased performance ability, and degraded mood. In their experiment of performance and sleepiness as a function of frequency and placement of sleep disruption, they concluded that continuity of sleep rather than stage amounts (including SWS or REM) or total sleep determines restoration.[143] The continuity theory maintains that SWS is important because it institutes high sensory thresholds which reduce the probability of arousal and therefore increase undisturbed sleep.

In a Swedish longitudinal investigation of somnambulism in children six-to-sixteen-years of age, Klackenberg (1982) has examined the prevalence, course, and behavioral correlations. Some of his findings revealed the prevalence highest at eleven-to-twelve-years, no sex differences, nonsignificance with frequent awakening, and the children to have more inhibited aggression and a more developed mental defense against anxiety as determined by Rorschach tests. The somnambulists were appreciated more by the teachers (in grade five, $p=0.10$) as well as by their peers in the sociometric test (in grade three, $p=0.05$).[144]

The degree to which students pay attention to the information pre-

sented in the classroom is based on their ability to remain alert. This alertness and other classroom behaviors will affect their performance level. The lacuna in the literature, it is hoped, will be partially alleviated by this study which will attempt to investigate the nature of the relationship between length of sleep and behaviors exhibited in the classroom that would deter or enhance learning.

Summary

The literature reviewed here provides the theoretical framework for the current study. The background section acknowledged that the rhythmic nature of sleep and wakefulness has fascinated humans from antiquity to the present and the personal philosophies of Plato and Aristotle were mentioned. Down through the centuries, while scientists have probed and analyzed man's every waking moment, they apparently dismiss sleep as a time of rest and quiet when absolutely nothing was happening and those who did pay attention to sleep did so because of its function as the springboard for dreams.

Originally, practically all information on dreaming was derived from subjective experiences, and it was not until Berger (1929) discovered the EEG and the recognition by Kleitman and his colleagues (1953) of the REM stage of sleep did increased scientific interest emerge. The marked decreased muscle tone of REM and the cyclic nature of REM and NREM led to a more complete understanding of sleep physiology. Differentiation of REM and NREM into stages was the basis of an approach to classification that with some revisions (Rechtschaffen and Kales, 1968), is still in use.

Tanner's (1962) maturational staging from prepubertal development to adult maturation, the MSLT directly reflecting an individual's readiness

to fall asleep during the time he ordinarily would be awake, and polysomnography provided structure for a plethora of studies on alertness/sleepiness with standard laboratory measurements throughout the twenty-four-hour period. The clinician was now better able to understand, diagnose, and effectively manage disturbances of sleep and arousal. The advances in knowledge about sleep research made possible a coherent categorization of the sleep disorders and the construction of a rational system of diagnosis that would attempt to standardize common terminology in order to enhance communication among clinicians. The Diagnostic Classification of Sleep and Arousal Disorders (1979) satisfied a manifest need for an inclusive framework for ordering and recording the full spectrum of maladies presented and served as a basis for increased research that could be precisely documented. A future edition of 'The Diagnostic Classification of Sleep and Arousal Disorders' is in the planning stages and should be released momentarily, and it will be more comprehensive in scope and reflect needed changes.

Daytime sleepiness and nighttime sleep appear to be closely related. Sleepiness/alertness is of primary concern in the process of human function. The amount of sleep required to achieve an adequate or optimal sleep efficiency varies among individuals. With such a large and growing body of literature, various issues are being investigated and they range from infancy to old age. Some topics of investigation included duration, deprivation, disorders, short and long sleepers, napping, and current interests addressing the role of sleep regarding the occurrence of medical and human error catastrophies in relation to the formation and adoption of public policy.

The second section defines sleep as a reversible behavioral state of perceptual disengagement from and unresponsiveness to the environment. The nature of sleep was described as REM versus NREM activity. Summaries were presented as well as brain wave patterns in waking and sleeping. Circadian rhythms refer to biological cycles that repeat about every 24-hours and a schematic depiction indicates physiological and psychological optimal periods to sleep as reflected by body temperature. Two specialized areas of the brainstem that control the cyclical nature of sleep, the RAS and the BSR are discussed and schematically depicted. Generalizations about sleep in the normal young adult complete this segment of the chapter.

The next area for consideration was disorders of sleep. Dement stated that an estimated 100 million people in the United States have some complaint related to sleep-wake functions but often, do not seek help. The Classification of Sleep and Arousal Disorders (1979) is described fully as to its four major groups of categorization encompassing more than sixty disorders.

Fears regarding numerous concepts such as that of death may precipitate night terrors and/or nightmares especially in children. Some specific disorders mentioned include sleep phase, apnea, snoring, respiratory obstruction, night terrors, sleepwalking, and REM behavior. Studies of abnormal sleep mentioned that sleepwalkers had more inhibited aggression and better defenses against anxiety and were more popular in school with peers and teachers. Studies verify that sleep habits established early carry over a lifetime and that sleep disturbances tend to persist. Of all childhood psychiatric disorders, ADDH probably has generated the greatest

amount of research and controversy in recent years.

The fourth portion of this chapter discusses sleep in children. To most normal people, sleep is not only a need but a pleasure, yet some children can find many excuses for delaying bedtime generating frustration and anger at home. There is no absolute way of measuring whether the amount of sleep your child gets per day is appropriate. REM in infants and children is discussed and its percentage decrease over the lifespan is mentioned. The sleep cycle and the typical sleepstage progression were acknowledged. Physiological sleepiness profiles in prepubescent children ten-to-twelve-years old and college students indicated the former group exhibit the most consistent pattern of alertness throughout the day and the latter group demonstrated greater physiological sleepiness during the day even though they averaged eight-hours of nocturnal sleep. In concluding this section, of interest is the well documented data indicating that the total recording period and the time spent asleep show a steady decline with increasing age in studies of school-aged children.

The last segment for contemplation addressed the relationship between sleep patterns to children's school behaviors. Early attempts to quantify daytime sleepiness were imprecise. The MSLT (1970's) greatly enhanced the acquisition of accurate information for quantifiable measures of diurnal somnolence. The focus was on sleepiness which appears to start in infancy and persist over the lifespan. Infants, preadolescents, adolescents, young Navy recruits, and medical students were studied in an attempt to examine relationships of length of sleep, behavior, and performance.

Investigations concerning short sleepers and long sleepers produced

inconclusive and conflicting results. It is an accepted fact that even one night of sleep loss in children can significantly impair their ability on performance tests. Measures which are more or less sensitive to the effects of sleep loss include addition, auditory vigilance, word memory, and reasoning.

The final major area of concern in this fifth section was that of attention problems and school behavior. In spite of inadequate laboratory demonstrations of sleep problems in children with attention deficit disorder with hyperactivity, the belief persists that such problems do exist. Parents of ADDH children perceive them to be poor sleepers and data supports the existence of a relationship between sleep variables and behavior problems. A number of studies examining the sleep architecture of children with ADDH, have failed to report consistent results. The sleep of ADDH children is generally assumed to not differ significantly from the sleep of normal children.

Finally, topics mentioned included sleep apnea, airway obstruction, conduct disorder, total sleep loss, and somnambulism. The degree to which students pay attention to the information presented in the classroom is based on their ability to remain alert. This alertness and other classroom behaviors will affect their performance level.

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CHAPTER III

RESEARCH METHODOLOGY

Introduction

This investigation explored the nature of the relationship existing between length of nocturnal sleep and certain classroom behaviors of second-, third-, and fourth-grade children in urban public schools. The purpose of this chapter is to present the research methodology of this study. Included are a restatement of the research problem, the hypotheses, a description of the sample, introduction of the instruments and forms used, approval for the study, and the methodology employed for data collection. The CBRS is discussed regarding validity, reliabilty, normative group data, and critical reviews. Next, test administration, scoring, and interpretation, are addressed after which, the statistical analysis and design are presented. Following a brief discussion of MANOVA and Multiple Regression, a summary completes the chapter.

Research Problem

This research study examined the relationship between the length of sleep and behaviors in the classroom of seventy-four girls and fifty-nine boys from second-, third-, and fourth-grade classes of children attending five urban public schools. The classroom behaviors of the children were classified into five personality areas for objective assessment of the students' adjustment areas labeled self, home, social, school, and physical. Seven hypotheses were tested.

Hypotheses

1. There is no statistically significant difference between sleep patterns and presenting classroom behaviors.

2. There is no statistically significant difference between length of sleep and self adjustment.

3. There is no statistically significant difference between length of sleep and home adjustment.

4. There is no statistically significant difference between length of sleep and social adjustment.

5. There is no statistically significant difference between length of sleep and school adjustment.

6. There is no statistically significant difference between length of sleep and physical adjustment.

7. There is no statistically significant difference between length of sleep and total adjustment.

Subjects

The subjects for this study consisted of 133 boys and girls, selected from the Norfolk, Virginia Public School System. Second-, third-, and fourth-grade boys and girls were invited to participate in order to obtain adequate subjects in each age category. As many classrooms as were needed were used in order to yield sufficient subjects per cell. All children were of normal intelligence. Gifted children and retarded children were eliminated from the study. A decision was made by the primary teacher in conjunction with the parents to eliminate children with a past or present history of serious medical, neurological, or psychological illness from the investigation. Children that had ailments or were on medications two weeks prior to sleep study nights were also eliminated.

Child Behavior Rating Scale (CBRS)

The CBRS is a seventy-eight-item psychological instrument developed and standardized for the objective assessment of personality adjustments of kindergarten and primary grade pupils. The CBRS is used only by raters who have observed or know directly the behavior of the child to be rated. The five adjustment areas categorized on the scale are self, home, social, school, and physical (see Appendix 1).

Sleep Log

A Sleep Log was designed to collect data regarding the subject's age, gender, and sleep patterns. The specific sleep data sought included length of daytime naps, time to bed, number of night awakenings, length of night awakenings, arising time, number of hours slept, and number of hours in bed. A copy of the Sleep Log is included in Appendix (2).

Ranking Data Form

A Ranking Data Form was devised by the investigator for this research to gather information relating to each subject's lunch subsidy and academic ranking. The Ranking Data Form is included in Appendix (3).

Informed Consent

All subjects were under eighteen-years of age, therefore, informed consent was required from a parent or guardian (see Appendix 4). All participants returned a signed Informed Consent Form.

Approval for the Study

The appropriate channels were followed in seeking permission for this investigation through the Norfolk Public Schools. Approval from the

Old Dominion University's Institutional Review Board (IRB) for the Protection of Human Subjects was obtained. Conformity to Federal, State, and University policies providing for the protection of human subjects was strictly followed (see Appendix 5) for the letters of request and approval. The Norfolk Superintendent of Schools granted permission for the project and the Director of Research, Testing, and Statistics responded with a letter of approval (see Appendix 6).

Methodology

Cooperation and approval were obtained from the involved principals, teachers, parents/guardians, and students. Extensive briefing of the participants regarding the process and use of materials was accomplished in an effort to maximize standardization and minimize chance of error. This was completed well ahead of the project starting point to allow for clarification of all questions in a further attempt at standardization.

The parents/guardians were sent a letter specially devised for this research (see Appendix 7). The letter explained that Old Dominion University was supporting this investigator's research on sleep patterns and children's behavior in the classroom. Feed-back to the school and parents following the completion of the study was guaranteed. The parents/guardians were asked to observe their children's sleep patterns and record facts on the Sleep Log in the specified boxes indicated for (1) length of daytime naps, (2) time to bed, (3) number of night awakenings, (4) arising time, (5) number of hours slept, and number of hours in bed. Parents/guardians were requested to fill in the demographic information and record information on the Sleep Log for seven consecutive nights after documenting the date begun. A random sample of five parents/guardians were inter-

viewed by telephone as a follow-up and to check the consistency of their reported observations.

In addition to the sleep log, the children's school teachers observed them in the classroom and documented their behaviors on Cassel's CBRS. The CBRS is a structured rating scale that can be administered by a teacher familiar with the subject's everyday behaviors. The CBRS provides scores relating to the teacher's perception of the subject. The classroom teachers also furnished data requested on the Ranking Data Form regarding lunch subsidy and academic ranking of the students.

The Child Behavior Rating Scale (CBRS)

The CBRS is a psychological instrument developed and standardized for the objective assessment of personal adjustments of primary grade children. Range includes kindergarten, first-, second-, and third-grade pupils, as well as children unable to read or handicapped in completing the conventional paper-and-pencil personality tests.[1] Cosden concluded, "Although the test is designated and normed for children in kindergarten through third-grade, the nature of the test items render them suitable for use with other school-age children."[2] This study follows Cosden's belief and will test children in the second-, third-, and fourth-grades.

The CBRS is used by raters who have observed or know directly the behavior of the child to be rated. Some purposes of the CBRS are: (1) to obtain objective ratings of the behavior of children by raters who have observed or know the children to be rated, (2) to compare ratings of a specific child with the normative data (obtained through the standardization studies of the CBRS) of both typical and emotionally handicapped children, (3) to provide objective measurements of adjustment areas, (4)

to provide a single meaningful score to indicate total adjustment: The Personality Total Adjustment Score (PTAS), and (5) to provide another approach to facilitate research studies of the young child, especially the young child in his first years of adjustment to the school milieu.[3]

The seventy-eight CBRS items, each descriptive of some aspects of child behavior, are classified into five adjustment areas; (1) self adjustment, with twenty items, (2) home adjustment with twenty items, (3) social adjustment with twenty items, (4) school adjustment with twelve items, and (5) physical adjustment with six items.[4]

On each CBRS item the child is rated on a six-point scale as to degree or extent he/she presents a specific aspect of behavior to the rater. A value of 1, an unqualified "yes," indicates the behavior so described by the item occurs repeatedly and continuously, insofar as the rater views the child; values of 2, 3, 4, 5, have implications of gradually reduced behavior, while the value of 6, an unqualified "no," indicates the behavior occurs very seldom, or never, or the rater knows nothing about the presence of such behavior.[5]

The seventy-eight items comprising the CBRS were obtained by a careful study and screening of over 1,000 case studies of elementary school pupils referred for psychological or psychiatric services. All reports studied were official records of professionally serviced clinics and represented the findings and recommendations of qualified workers in the major disciplines of child study and treatment. Items appearing most frequently in the records and considered critical for understanding children and their problems were selected for the CBRS. The order of listing of these items within each of the five adjustment categories of the CBRS

was based on the frequency of occurrence of the specific behavior description in the case records examined.[6]

Dunn observes that a high percentage of the items do not actually deal with child behavior per se. He alleges, "Many [items] deal with rater inferences concerning the preferences, attitudes, and affect states of the child; degree of acceptance by peers; the child's physical health; the child-rearing practices of his parents; family religious commitments; living accommodations; and the like."[7] Cosden also feels that not all statements describe directly observable behaviors.[8] Cosden reports further, as indicated by Horne and Larrivee (1979), teacher perceptions of acceptable behavior vary for girls and boys as well as across grade levels which suggests that accurate interpretations would require separate norms for girls and boys.[9] Many rating scales have the same problem and it is believed that no scale can absolutely judge children's conduct.

Raters read the item, then place a check mark for each item in one of the six boxes or positions in the six-point scale. The boxes checked are the ratings which best describe the behavior of the child. If the rater has not observed or does not know the behavior as applicable to the child, he checks "no" or the number 6 box.[10] Dunn claims that a number of the items are worded in such a way that only a binary "yes" and "no" response would be appropriate and in these instances the existence of a six-point rating scale is irrelevant.[11] However, if one examines item number 1 on the self adjustment scale "often prefers to be alone," yes or no is a possibility but in most cases they need a value to be more accurate than the absolute yes (1) or no (6). Often can mean maybe 30 percent, 40 percent, or 50 percent, hence the need for item number 1 should be 1-6.

Dunn comments that the adjustment areas with which the instrument deals are of special importance to those working with children. He postulates, "The strategy of attempting to limit the scale to explicit, observable behaviors, and to the systematic identification of those behaviors from an empirical study of a large number of real life cases, is evidence of the soundness of the author's basic judgment."[12] Cosden suggests that the CBRS is a promising tool for assessing behavior problems in children across a wide range of settings.[13]

Since rating of mothers and fathers are relatively comparable, the CBRS lends itself to ratings by either parent.[14] Cassel reports that generally, the ratings by teachers reflected a higher and better personality total adjustment than did the ratings by either of the parents and the personality ratings by teachers are in good agreement with the grade-point average (GPA) marks of teachers when both ratings were accomplished by the same teacher.[15] Currently, however, plans provide for teachers completing the CBRS and parents/guardians recording the sleep-log data.

Construct Validity

Since all the CBRS items were obtained directly from summary case reports made by highly trained persons in the different disciplines dealing with child behavior, the CBRS is presumed to have high face validity.[16] Dunn feels that the CBRS Manual gives no report of any empirical validation of the judgments of the six psychologists nor any indication of the lack of professional qualifications of the six judges. In fact, he views the manual as claiming that construct validity is implicitly defined in the manual as face validity plus predictive validity since the scale is "presumed to have high face validity, 'because' all the CBRS

items were obtained directly from summary case reports made by highly trained persons in the different disciplines dealing with child behavior," (psychologists, psychiatrists, social workers, and pediatrists).[17]

Cosden indicates this "face validity" approach to item selection was also used in categorizing items into adjustment areas. She questions the six psychologists sorting and classifying items into the five areas cited above by "majority rule" when a unanimous classification response was not reached and further notes this approach to test construction weakens the utility of the CBRS.[18] Dunn supports her criticisms.[19] Why should they have to agree if only 1 of 6 or even 2 of 6 want to place an item of school adjustment into the home category? Cosden also maintains there are no indications that specific items were tested for their predictive validity before inclusion on the final form.[20] However, she alleges, "The test questions chosen for their face validity and not for their ability to predict a broader range of home and school performance measures, appear to be as appropriate for assessing the adjustment of older elementary children as they are for assessing the younger sample."[21] Her writings further suggest that evaluations of children across a variety of settings can be particularly helpful for either clinicians or educators who function in a "case manager" capacity for the children.[22]

Data dealing with construct validity, concerned with the relationship of scores on the CBRS with scores on other psychological instruments, are presented in table 1, which summarizes research findings on this instrument. Scores on the CBRS are highly significant statistically when related to school achievement test scores, intelligence quotients, and social development. Ratings by parents were negatively related to the

age of the children rated, indicating that younger children were rated as less well-adjusted than older children. The data presented in Table 1 indicate the CBRS to be an effective instrument for predicting performances on the Metropolitan Achievement Tests, intelligence quotients, and social quotients of the Vineland Social Maturity Scale.[23]

Table 1.--CBRS construct validity indicies[23] (N=600)

Rater	Metropolitan Achievement Tests				Months	Social
	Reading	Arithmetic	Language	I.Q.	of Age	Quotient
Teacher Ratings	.368*	.154*	.487*	.362*	.294*	.481*
Mother Ratings	.212*	.109**	.333*	.151*	-.242*	.374*
Father Ratings	.226*	.080*	.275*	.200*	-.106**	.413*
Grade Point Average***	.726*	.607*	.665*	.663*	.031*	.533*
Number	600	600	600	600	600	600
Mean (T-Score)	52.5	53.0	54.1	104.7	94.4	106.7
S.D.	7.6	6.6	7.8	13.1	8.7	14.5

*Statistically significant at 1% level of confidence.
**Statistically significant at 5% level of confidence.
***Values assigned were: above average= 3, average= 2, below average= 1.

Persons most familiar with the behavior of children during the primary grade years are teachers and parents. Table 2 presents intercorrelations of ratings made by teachers and parents of the same children. Uncompared ratings of mothers and fathers indicate an r of .656 {.023, high enough for statistical and clinical significance. Thus ratings completed by either mother or father would be germane.[24]

Table 2.--CBRS rater validity[24] (N=800)

Rater	Teacher Ratings	Mother Ratings	Father Ratings	Grade Point Average
Teacher Ratings	---	.280*	.333*	.416*
Mother Ratings	.280*	---	.656*	.119*
Father Ratings	.333*	.656*	---	.200*
Number	800	800	800	800
Mean (T-Score)	61.5	52.7	52.7	2.2**
S.D.	5.8	5.7	5.8	0.7

*Statistically significant at 1% level of confidence.
**Values assigned were: above average= 3, average= 2, below average= 1.

Status Validity

This type of validity determines if scores on the CBRS differentiate well-adjusted or typical children from those diagnosed by qualified professional workers as maladjusted children. Cassel involved 200 typical children, selected at random, ranging in age from five-to-nine-years, with a mean age of 6.2-years with 200 maladjusted children from the same community (referred [not diagnosed] for psychological services because of behavior adjustment problems) in the same age range and with both groups equally divided for sex. Statistically significant differences between the two groups were found on the CBRS as well as on scales in two other studies.[25]

Cassel emphasizes that the major test of effectiveness for a psychological instrument is the degree it accomplishes its goal task and he concludes that the CBRS does differentiate typical from maladjusted children. He feels that the referenced discriminate function indices indi-

cate clearly that CBRS scores are statistically and clinically effective in identifying referenced individuals, therefore, the CBRS has a high degree of status validity.[26] Dunn accuses Cassel of referring to concurrent validity as status validity and claims that his study is uncited.[27]

Cosden reported on a small number of experimental studies on the CBRS with equivocal results. Some were administered and scored in an unstandard fashion utilizing only portions of the instrument. She cites a study by Moracco and Kazandkian (1977) in which they had the school principal name six problem students and six well-functioning students and the six "problem" students scored below 40 on the CBRS and the six well-functioning students scored above 60 on the CBRS thus suggesting some validity for the CBRS for school use.[28]

In 1978, Crnic administered the CBRS along with with the Sensitivity to Children Questionnaire (STC) on maternal sensitivity and insensitivity under various experimental situations. CBRS scores did not correlate with maternal behavior but mothers with more children rated their children as better adjusted than did those with fewer children. The personality total adjustment score (PTAS) scores computed for each of the 60 children provided a range of scores from 375 to 540 and the manual normal adjustment range is between 375-500. These positive results validate the original normative sample of the CBRS.[29]

In a 1973 publication, Spivack and Swift noted that the CBRS was one of eight from nineteen scales reviewed that provided normative data. In a review of the school adjustment portion, they compared the reliability and validity of nineteen school behavior rating scales and found that many relied on mental health criteria for establishing item validity.[30]

Comments Regarding Validity

Donald T. Campbell and Julian C. Stanley write:

> Internal validity is the basic minimum without which any experiment is uninterpretable: Did in fact the experimental treatments make a difference in this specific instance? External validity asks the question of generalizability: To what populations, settings, treatments, variables, and measurement variables can this effect be generalized. While the internal validity is the sine qua non, and while the question of external validity, like the question of inductive inference, is never completely answerable, the selection of designs strong in both types of validity is obviously our ideal. . . . In the language of analysis of variance, history, maturation, testing, etc, have been described as main effects, and as such have been controlled . . . giving it internal validity. The threats to external validity, on the other hand, can be called interaction effects, involving X [treatment] and some other variable.[31]

J. P. Guilford and Benjamin Fruchter comment:

> We cannot give a single number to indicate the validity of a test. . . . CONSTRUCT VALIDITY Over the years there has been an increasing call for evidence that an instrument purported to measure trait X really measures it. . . . "What this test measures?" is in the form of a list of factors with which it correlates, or its loadings on those factors. This kind of information is factorial validity. . . . A distinction is made between two types of construct validity. (Campbell and Fiske, 1959). . . . There is said to be convergent validity when a test or other measure of a proposed trait correlates strongly with instruments of other kinds designed to measure the same trait or that are thought to measure it. . . . Discriminate validity is shown by the fact that the test correlates little or not at all with measures of other traits, whether by the same method or by other methods. . . . PREDICTIVE VALIDITY The vocational counselor and the personnel manager face a different kind of problem when they are concerned about the validity of a test. They want to know whether the test provides the information that they need for predicting outcomes in specific kinds of tasks and assignments--clerical performance, academic achievement, salesmanship, and the like. . . . It has been a common belief that the predictive validity of a test is directly proportional to its reliability--the more reliable the test, the more valid it is. Factor theory supports this principle to some extent, and under certain conditions. . . . One kind of exception to the principle that high reliability means high validity is seen in connection with homogeneous and heterogeneous tests. Homogeneous tests have high internal-consistency reliability, but they can have no validity for predicting variations in certain criteria, for lack of factors in common. Heterogeneous tests have relatively low reliability, and yet some have been known to show relatively high predictive validity. . . . When we seek to make a single test both

> highly reliable (internally) and also highly valid, we are often working at cross purposes. The two goals are incompatible in some respects.[32]

The above remarks by Campbell, Stanley, Guilford and Fruchter concerning validity have been included since Dunn raised the question about the various terminology used for validity in Cassel's CBRS manual. Cassel, in his attempt to develop a valid instrument for measuring academically relevant classroom behaviors, used a highly respected source of the day on which to base explanations for his research and methodology. He had strong convictions that his tool was valid and he cited Guildford and Fruchter as one of his three references.

Reliability

Using a Spearman-Brown formula on odd-even CBRS items, indices of reliability were computed for the entire CBRS. On a sample of 800 typical children, the resulting r was .873 ±.003; on a sample of 200 maladjusted children, the r was .589 ±.042. In two other CBRS studies of reliabilty, Pearson r's were computed correlating scores of the first study: 50 parents r = .913 ±.024 with the second CBRS study, 50 Teachers r = .739 ±.065. These coefficients of correlations indicate a high degree of test reliability or consistency in the scoring of the CBRS.[33]

Guilford and Fruchter delineate three general categories for estimating reliability as (1) internal-consistency reliability, or simply internal consistency; (2) alternate-forms reliability, comparable-forms reliability, or parallel-forms reliability; and (3) retest relability, or test-retest reliability.[34] They suggest, "Preference for one of the three types of reliability estimate depends mostly upon several considerations: the type of test, the meaning of the statistic, and the purpose

for which the statistic will be used."[35] The odd-even choice for the CBRS falls into the second category and Cronbach speaks of this category as coefficients of equivalence and in the split-half method, the test is given in the usual fashion but then is scored in two parts. Cronbach relates his views: "It is necessary that the two halves be independent, so that success on an item in one half does not help with and item in the other half. Correlating the two parts gives a coefficient of equivalence for the half-tests, and the Spearman-Brown formula is often used (with n = 2) to obtain the coefficient for the full test."[36]

Guilford and Fruchter relate their views:

> If the odd-even technique is used in the split-half method (using two scores from two halves of the same test, in the same administration), the changes in conditions that may occur during a single admimistration of a test are rather uniformly distributed over all items in both halves, so that their effects would not show up as error variance.[37] The alternate-forms may tend to be slightly lower than the internal-consistency but this may mean that it gives a more realistic picture of how accurately the test measures the general traits, ruling out whatever variance is dependent upon the particular content of one form of the test.[38] Since comparability is probably never perfect, an estimate by use of the Spearman-Brown formula is likely to be conservative; that is, it tends to be an underestimate.[39] The full-length test is not twice as reliable as the half test, but its reliability is greater and can be estimated by the special Spearman-Brown formula with N - 2.[40]

Cosden raises questions pertaining to the utility of the reliability such as (1) insufficient information provided in the manual to fully describe these samples, (2) the length of the period between test and retest, (3) the number of cases involved not being specified, and (4) use of 123 fourth- and sixth-graders as reliability samples (Western Psychological Services, personal communication, Feb. 15, 1985) since the test is indicated for use with students in grades K-3.[41] Dunn questions the norming sample of "2000 typical primary grade pupils" as assuming grades

one, two, and three for norming thus making it difficult to use with preschool children as designated in the manual. He also questions the appropriateness of engaging in profile analyses using scores on subscales for which he claims reliability or validity data is not offered.[42]

Cosden praises the CBRS as being particularly helpful to both clinicians and educators since it assesses school-age children across a variety of settings and it appears to be appropriate for assessing the adjustment of older elementary children.[43] Dunn applauds the CBRS author for his attempt to validate the instrument because of the clearcut need for reliable and valid instruments in this area. The possibility exists that the CBRS will be reissued in a new, more rigorously developed version."[44] Refinement of existing measures of classroom behavior is justified as it provides useful knowledge about childhood adaptation to the classroom setting. The 8th printing of the the CBRS (1981), is still being offered by Western Psychological Services and is still being used with favorable results.

Normative Group Data

The normative group data is provided in Table 3 for two groups: a group of 2,000 typical children and another group of 200 maladjusted children. The weighted scores of the five adjustment areas, and the PTAS, by use of Table 3, are readily converted into McCally T-Scores. The standard error of the McCally T-Score for the CBRS was computed by the formula, SD 1-r. The standard error for data derived from the typical group was 4.88 T-Score points: For the emotionally handicapped group, it was 8.00 T-Score points. The McCally T-Score makes possible a comparison of a single child with the two normative groups, presented in Table 3.[45]

Table 3.--CBRS normative data for primary grade pupils[45]

Based on 2,000 Typical and 200 Emotionally Handicapped Primary Grade Pupils

T-Score	Self Adj.		Home Adj.		Soc. Adj.		School Adj.		Physical Adj.		Tot Personality	
	Typ.	E.H.	Typ.	E.H.	Typ.	E.H.	Typ.	E.H.	Typ.	E.H.	Typ.	E.H.
80	120	120	120	120	120	120	72	72	36	36	552	552
75	119	119	119	119	119	119	71	71	36	35	547	547
70	118	114	118	118	118	115	70	68	35	35	542	532
65	117	106	117	117	117	108	68	63	34	33	536	510
60	112	99	112	114	112	100	65	59	33	33	513	485
55	105	91	105	107	105	93	62	55	32	32	483	451
50	99	83	98	100	99	85	59	51	30	30	452	418
45	92	76	91	93	92	77	56	47	29	28	421	384
40	85	68	84	86	85	70	53	43	27	25	390	350
35	78	60	71	78	78	62	50	39	26	22	360	317
30	72	53	70	71	72	55	46	35	22	20	329	283
25	65	45	62	64	65	47	43	31	22	17	298	249
20	58	37	55	57	58	39	40	27	21	14	267	216
Mean T-Score	99	83	98	100	99	85	59	51	30	30	452	418
S.D.	13	15	14	14	13	15	6	8	3	3	62	67
Scoring Beta Wts.	2+	2+	0+	1+	0=Composite Raw Score							

Administration

In nearly all instances, the CBRS is a self-administering instrument completed individually or in groups. Any literate person can complete the CBRS. Instructions on the cover page of the CBRS rating booklet are sufficient in most instances to orient the rater. This researcher met with involved principals and teachers to review the administration procedure and to clarify any questions regarding the CBRS. Scoring was reviewed even though it was established that this investigator would complete the scoring.

Scoring

Scoring is a clerical operation and often is accomplished by office personnel. The following steps are followed:[46]

1. Begin with the self adjustment area. Count the check marks in the no. 1 column boxes and place this total directly below the no. 1 column of the self adjustment area. Do the same for columns 2, 3, 4, 5, and 6.

2. Follow the same procedure for the other four adjustment areas. To check addition, totals of all boxes for each of the five adjustment areas should be: (1) self adjustment - 20; (2) home adjustment - 20; (3) social adjustment - 20; (4) school adjustment - 12; and (5) physical adjustment - 6.

3. Multiply the total under each column by the number of the column. Totals under column 1 are multiplied by 1, under column 2 by 2, column 3 by 3, column 4 by 4, column 5 by 5, and column 6 by 6. Resulting totals are placed directly below first totals derived in step 1. These second totals are the weighted values.

4. Add weighted values for self adjustment and place this total at bottom of column for self adjustment on cover page of CBRS rating booklet. This sum is the weighted score for self adjustment. The same procedure is used to determine the weighted scores for each of the other four adjustment areas.

5. To compute the Personality Total Adjustment Score (PTAS), three of the five adjustment area weighted scores are used. The self adjustment weighted score is multiplied by 2, the home adjustment weighted score is multiplied by 2, and to these is added the school adjustment weighted score. The sum total is the PTAS.

6. Each adjustment area score and the PTAS are converted by use of a table provided in the CBRS Manual.

Interpretation

The PTAS is the most significant score on the CBRS. This single score indicates the overall adjustment of the child. The PTAS can be converted into a T-Score on the basis of the normative data for the group of typical children. If this T-Score is between forty and sixty, regardless of the T-Scores for the five adjustment areas, it can be said the over-all

adjustment of the child is comparable to that of the average typical child, since the T-Score falls within the middle range of the group of typical children. If the PTAS T-Score is sixty or higher, it can be said the child is making an excellent personality adjustment, regardless of the individual adjustment T-Scores. If the PTAS T-Score is below forty, it can be said the child, in some way, is emotionally handicapped.[47]

In a similar way the PTAS T-Score is used for comparing the rated child with the normative data of emotionally handicapped group. If the T-Score falls between forty and sixty, the child falls within the middle range of the handicapped group; if the T-Score is above sixty, the child can be said to be making an excellent personality adjustment, when compared with the group of emotionally handicapped children; if the T-Score is below forty, the child is making a poor adjustment in comparison with the group of emotionally handicapped children.[48]

The CBRS provides a great deal of significant information. The interpretation of such data depends on the skill and experience of the person who interprets the data. Utilization of the data depends on the expertise of the person who works with the child and his problems of personality and emotional adjustment.[49]

The five weighted personality area scores and the PTAS score will be utilized to determine if a relationship exists between length of sleep of each child and the behavior that child presents in the classroom. These six scores will constitute the several dependent variables (DVs) that will be used in a multivariate analysis of variance (MANOVA) along with the sleep-log data which comprises the independent variables (IVs). MANOVA will be fully described later in this chapter. The computer services of

Eastern Virginia Medical School are being utilized for assistance in computerizing the statistics involved in the increased complexity of MANOVA over simpler series of analyses of variance (ANOVAs). Tabachnick and Fidell (1983) claim that with many variables, multivariate techniques deal with all data in a single analysis, as an alternative to subjecting data to a series of univariate or bivariate analyses.[50]

The individual PTAS is the most significant score of the CBRS, and this single score indicates the overall adjustment of the child. The five adjustment area T-Scores deal with self adjustment, home adjustment, social adjustment, school adjustment and physical adjustment. The five T-Scores of these areas indicate the contributing factors to the PTAS; they point out more specifically the areas of good adjustment as well as of maladjustment, and thus provide a more clearly delineated picture of the childs's behavior.[51]

Statistical Analysis

After collating the data, Pearson correlations were calculated for the CBRS scores in an effort to examine the interrelations among subscales and demographic data. Descriptive statistics were computed on the overall sample and for each year of age of the subjects. CBRS subscale scores were analyzed in a one-way MANOVA with average hours of sleep as the categorical variable. A two-way MANOVA was performed with age and gender as factors and hours of sleep as a covariate. ANCOVA was used to answer certain research questions. Tukey's HSD test was performed on all significant effects in relation to MANOVAs and ANCOVA. Stepwise regressions were calculated to determine the proportion of variance accounted for with each single predictor variable.

Design

A factorial MANCOVA design was the analytical strategy of choice utilized in this investigation. The independent variables consisted of (G) gender and (A) age with hours of sleep as the covariate. This assignment of independent variables allows for an exploration of gender * age (G * A). The dependent variable is behavior which was subdivided into five adjustment areas: (a) home adjustment, (b) self adjustment, (c) social adjustment, (d) school adjustment, and (e) physical adjustment. A sixth score is the total adjustment score and these six scores comprise the six dependent variables. A one-way MANOVA was also computed and the independent variables used are (G) gender and (A) age with sleep groups as the factor component.

In a factorial design, the effects of several dependent variables are investigated simultaneously when MANOVA is used instead of ANOVA. MANOVA allows for multiple-factor factorial design with multiple levels for the factors.[52] MANOVA procedure computes a Wilks' Lambda for determining overall significance.

Stepwise multiple regressions were performed with variables of night awakenings, time of awakening, hours slept, and hours in bed as predictor variables. The purpose was to examine the predictors of adjustment and the proportion of variance. According to Tabachnick and Fidell, the squared multiple correlation, R}, is the proportion of sum of squares for regression in the total sum of squares for Y. The squared multiple correlation is then the porportion of variation in the DV that is predictable from the best linear combination of the IVs. The multiple correlation itself is the correlation between the obtained and predicted Y values.[54]

MANOVA

Since the application of MANOVA as an analytic strategy was a choice option for this investigation, a brief literature review will be presented in this section. MANOVA is a generalization of ANOVA to a situation in which there are several DVs. By measuring several DVs instead of only one, a researcher may improve the chance of discovering changes produced by different treatments and interactions at the expense, however, of increased complexity of analysis. MANOVA is quite similar to the t test and to ANOVA.[55] Borg and Gall (1983) suggest that a single MANOVA could elicit the same information as several separate t tests.

Some advantages of MANOVA over a series of ANOVA's, one for each DV, are (1) in protection against Type I error (rejecting the null hypothesis when, in fact, it is true), (2) revealing differences not shown in separate ANOVAs such as when responses to 2 DVs are considered in combination, group differences become apparent, and (3) may sometimes be a more powerful test than separate ANOVAs since MANOVA considers DVs in combination whereas ANOVA does not.[56]

In MANOVA procedures the subjects are randomly assigned to groups, usually in such a way as to achieve equal size sample groups.[57] In MANOVA, the question is whether the IVs (group assignments) significantly affect an optimal linear combination of DV means (optimal in the sense that group differences are maximized).[58] The goal in MANOVA is to discover whether behavior, as reflected by the DVs, is changed by manipulation (or other action) of the IVs. Making this discovery will depend on the choice of the DVs. To the extent that DVs can be seen as measuring the same or similar facets of behavior in slightly different ways.[59]

Choice of variables is a question of logic and research design rather than of statistics.[60] Whether or not appropriate behaviors are being sampled depends on theory and skill of the researcher in choosing those DVs that have some chance of showing effects of the IVs.[61] When planning research to be analyzed through MANOVA, having more cases than DVs in every cell is important. First the power may be lowered unless there are more cases than DVs in every cell because of reduced df for error. One likely outcome for reduced power is a nonsignificant multivariate F, but one or more significant univariate F's. The second reason for having more cases than DVs in every cell has to do with the assumption of homogenous variance-covariance matrices. With insignificant F's, no further MANOVA analysis would be warranted.[62]

In MANOVA where DVs are correlated, they can be seen as measuring overlapping aspects of the same behavior. To say that two correlated DVs are both "significant" mistakenly suggests that the IV is affecting two different behaviors. Consider two IQ tests. Any IV that affected one measure would surely affect the other, since they are so highly related that they basically measure the same thing. If the pooled within-group correlations among the DVs were zero, a series of univariate ANOVAs would give the most information about their importance. Those DVs that produce significant univariate F's would be the important ones and could be ranked in importance by magnitude of the univariate F.[63]

A further problem with reporting univariate F's is that of inflation of Type I error rate. With correlated DVs, the univariate F's are not independent, and no straight forward adjustment of error rate is possible. Cooley and Lohnes (1971) recommend reporting only univariate F's as an

aid in assessing DVs following a significant multivariate F.[64]

Multiple Regression

This study utilized Stepwise Multiple Regressions with their model-building procedures, and brief comments regarding their exploratory techniques are in order. Tabachnick and Fidell delineate three major analytic strategies in multiple regression and claim that the outcome of analysis can be drastically affected by choice of strategy. They relate their views regarding Stepwise Multiple Regression:

> At each step the variable that adds most to the prediction equation, in terms of increasing R^2, is entered until no more useful information can be gleaned from further addition of variables. A stepwise analysis might not lead to an optimum solution in terms of R^2 since several variables considered together might increase R^2, but any one alone would add no significant proportion of variance. Further, a stepwise analysis might not lead to an optimum solution in terms of R^2. For example, several variables considered together might increase R^2, but any one alone would add no significant proportion of variance.[65]

Summary

This chapter discussed the sample selection of 133 second-, third-, and fourth-grade boys and girls from five urban schools to engage in an investigation to determine the relationship existing between sleep patterns and certain classroom behaviors. The parents observed and recorded data on a sleep log indicating length of daytime naps, time to bed, number of night awakenings, length of night awakenings, arising time, number of hours slept, and number of hours in bed. The classroom behaviors were classified into five personality areas for objective assessment of the students' adjustment areas labeled self, home, social, school, and physical. The objective assessment was observed and documented on a seventy-eight-item questionnaire by their classroom teachers familiar with the subjects' everyday behaviors.

The questionnaire is titled the Child Behavior Rating Scale (CBRS). Both positive and negative critiques regarding the scale were presented as well as practical applications of its use. Discussions relative to the scales' validity and reliability ensued. Normative group data for devising the scale was provided in both narrative and table format. The administration and scoring of the tool as well as interpretation and analysis of data were described.

A factorial ANOVA design was used since multiple groups and multiple independent variables are involved. Each of the seventy-eight items were entered into the formula using MANOVA. In a factorial design, the effects of several different factors are investigated simultaniously when MANOVA is used instead of ANOVA. MANOVA will allow for multiple-factor factorial design with multiple levels for the factors. The MANOVA procedure computes four sets for significance tests: Roy's largest root, Hotelling's trace, Wilks' Lambda, and Pillai's criterion. By measuring several DVs instead of only one, a researcher may improve the chance of discovering changes produced by different treatments and interactions at the expense, however, of increased complexity of analysis. Therefore, the data will be computerized for increased preciseness and ease of analysis.

Finally, The choice of stepwise regressions was addressed. Six regressions were run, one for each CBRS scale score as the predictor. An attempt was made to determine the specific proportion of a single predictor variable in relation to the total variance.

ENDNOTES

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[7]James A. Dunn, "Tests & Reviews: Character Nonprojective," The Seventh Mental Measurements Yearbook, ed., Oscar Krisen Buros, (Highland Park, New Jersey: The Gryphon Press, 1972), 1, 101.

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[14]Cassel, 2.

[15]Russell N. Cassel, "A Comparison of Teacher and Parent Ratings on the Child Behavior Rating Scale for 800 Primary Pupils," The Journal of Educational Research, 57, no. 8 (April 1964): 437, 438.

[16]Cassel, The Child, 3.

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[19]Dunn, 102.

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[23]Cassel, The Child.

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[33]Cassel, The Child.

[34]Guilford, 414.

[35]Ibid., 417.

[36]Lee J. Cronbach, Essentials of Psychological Testing, 2d ed., (New York: Harper & Brothers Publishers, 1949, Lee J. Cronbach, 1960), 141.

[37]Guilford, 417.

[38]Ibid., 420, 421.

[39]Ibid., 426.

[40]Ibid., 425, 426.

[41]Cosden, 148.

[42]Dunn, 103.

[43]Cosden, 146, 147.

[44]Dunn

[45]Cassel, The Child, 4, 5.

[46]Ibid., 6.

[47]Ibid., 6, 7.

[48]Ibid., 7.

[49]Ibid.

[50]Barbara G. Tabachnick and Linda S. Fidell, Using Multivariate Statistics, (New York: Harper and Row, Publishers, 1983), 2.

[51]Cassel, The Child, 6, 7.

[52]Tabachnick, 3.

[53]Ibib., 248, 249.

[54]Ibid., 97.

[55]Ibid., 222.

[56]Ibid.

[57]Ibid., 224.

[58]Ibid., 222.

[59]Ibid., 225.

[60]Ibid., 230.

[61]Ibid., 225.

[62]Ibid., 231.

[63]Ibid., 253.

[64]Ibid.

[65]Ibid., 101-103.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

Introduction

The subjects for this investigation were 133 urban school children (seventy-four-girls and fifty-nine-boys) aged six to eleven, from second-, third-, and fourth-grades attending five public schools in Norfolk, Virginia. The purpose of this study was to determine the nature of the relationship existing between length of nocturnal sleep and certain classroom behaviors. The parent/guardians recorded specific data on a sleep log for seven nights. The information included time to bed, time arising, number of night awakenings, length of night awakenings, and length of daytime naps. An effort was made to determine the length of sleep of the children. The teachers checked the children's behavior on a seventy-eight-item CBRS in order to rate them in five areas of adjustment such as self, home, social, school, and physical. These five area scores resulted in a sixth score termed the total adjustment score. Degree of lunch subsidy and grade ranking were considered.

This chapter addresses the presentation and analysis of the data of this study and is organized in the following manner. First, the CBRS scores for subscales and demographic variables are examined for interrelations. Then, Pearson correlation coefficients are revealed and a table facilitates comprehension of the findings. Third, descriptive statistics on the overall sample and for each year of age for the subjects are cited

and six tables are displayed to depict the breakdown. Following is a comparison of CBRS subscales by average hours of sleep and a summary table of MANOVA and associated univariate ANOVAs for ease of examination of the findings. Fifth, six stepwise regressions are reported with sleep variables of night awakenings, bedtime, time of awakening, hours slept, and hours in bed as predictor variables. A table for the sleep variable accounting for the greatest percentage of the variance in total adjustment is included. Next, a table displays the frequencies and percentages for lunch subsidies for the overall sample data and each of the five schools. The final table compares the frequencies and percentages of the sample summary data and the Chi-square collapsing of all school data.

The latter part of the chapter focuses on the analysis of the results of the study. This section begins with a discussion of the unexpected finding that reveals the definite impact night awakenings exhibit on self, school, social, and home adjustments. The next area of concern addresses the sleep group findings with hours of sleep collapsed into three levels regarding length of sleep. The discussions that follow consider the application of MANOVA to gender and age, descriptive statistics for each age group, support for the CBRS normative data, comparison with other studies, and the impact lunch subsidy demonstrated. Finally, the hypotheses are restated and discussed, and summarization completes the chapter.

CBRS Scores for Subscales and Demographic Variables Interrelations

The scores obtained on the CBRS were analyzed for interrelations among subscales and demographic variables. Pearson correlation coefficients revealed that all CBRS subscales were significantly correlated with each other (r values ranging from 0.32 to 0.87). Also of note were the

negative correlations of age with several of the subscales (see table 4). These suggest that as a child increases in age, his/her subscale scores decrease. One surprising finding was that of type of lunch subsidy with home adjustment ($r = .20$, $df = 128$, $p < .05$), school adjustment ($r = .18$, $df = 133$, $p < .05$), and total adjustment ($r = .21$, $df = 133$, $p < .05$). All of these indicated that the better the socioeconomic status of the child, the better his/her adjustment.

Descriptive Statistics

Because the sleep patterns of normal school-age children have rarely been examined in conjunction with their adjustment, descriptive statistics have been computed on the overall sample and for each year of age. See table 5 for the means and standard deviation for the subjects. The minimum and maximum are included for all the variables. See tables 6, 7, 8, 9, and 10 for the breakdown for each year of age. Of particular interest are the relatively steady drop in CBRS scores, indication that this sample is similar to those upon which the CBRS was normed. No table appears for six-year-olds, as there was only one in the study.

The tables address the CBRS subscale variables of self, home, social, school, physical and total adjustment as well as the sleep variables of night awakenings, wakens easily, hours slept, hours in bed, and lunch subsidy type. The tabular presentation of the descriptive statistics display the number of subjects in each age category as well as the mean and standard deviation for each of the variables. An analysis of this data will appear later in this chapter.

Table 4.--Pearson correlations of CBRS subscales, age and type of lunch subsidy

	Self	Home	Social	School	Physical	Total	Age	Lunch Type
Self	1.00	0.35***	0.85***	0.72***	0.55***	0.76***	--	--
Home	--	1.00	0.47***	0.49***	0.32**	0.87***	0.18*	0.20*
Social	--	--	1.00	0.76***	0.54***	0.78***	0.18*	--
School	--	--	--	1.00	0.59***	0.81***	--	0.18*
Physical	--	--	--	--	1.00	0.55***	0.18*	--
Total	--	--	--	--	--	1.00	0.19*	0.21*
Age	--	--	--	--	--	--	1.00	--
Lunch Type	--	--	--	--	--	--	--	1.00

* $p < .05$

** $p < .001$

*** $p = .0001$

Table 5.--Means and standard deviations for all subjects

	N	Mean	SD	Min	Max
Self	133	104.41	16.03	57.00	120.00
Home	128	93.38	28.82	6.00	120.00
Social	133	102.88	18.85	32.00	120.00
School	133	62.43	12.30	20.00	90.00
Physical	133	34.02	3.47	20.00	36.00
Total	133	86.43	15.75	41.67	104.00
Night awakenings	133	0.21	0.44	0.00	2.00
Wakes easily	133	1.01	0.87	0.00	3.00
Hours slept	133	9.73	0.68	6.97	11.36
Hours in bed	133	9.99	0.60	6.97	11.86
Age	133	8.70	1.00	6.00	11.00
Lunch type	133	2.62	0.73	1.00	3.00

Table 6.--Means and standard deviations for seven-year-olds

	N	Mean	SD
Self	16	104.31	12.03
Home	16	101.94	13.21
Social	16	106.38	10.47
School	16	63.31	7.73
Physical	16	34.63	2.19
Total	16	89.85	7.85
Night awakenings	16	0.13	0.16
Wakes easily	16	0.87	1.13
Hours slept	16	9.84	0.65
Hours in bed	16	10.11	0.69
Lunch type	16	2.56	0.81

Table 7.--Means and standard deviations for eight-year-olds

	N	Mean	SD
Self	36	106.78	14.14
Home	36	98.86	22.25
Social	36	103.61	17.92
School	36	62.97	10.41
Physical	36	34.28	2.45
Total	36	89.20	13.22
Night awakenings	36	0.20	0.43
Wakes easily	36	0.43	0.73
Hours slept	36	9.74	0.67
Hours in bed	36	9.97	0.61
Lunch type	36	2.67	0.59

Table 8.--Means and standard deviations for nine-year-olds

	N	Mean	SD
Self	52	104.12	16.57
Home	49	90.18	33.53
Social	52	104.92	17.59
School	52	62.88	13.18
Physical	52	34.17	3.54
Total	52	85.29	17.40
Night awakenings	52	0.24	0.37
Wakes easily	52	1.40	2.73
Hours slept	52	9.72	0.66
Hours in bed	52	9.97	0.59
Lunch type	52	2.69	0.73

Table 9.--Means and standard deviations for ten-year-olds

	N	Mean	SD
Self	25	103.88	18.12
Home	25	87.70	35.22
Social	25	100.04	19.09
School	25	62.48	11.51
Physical	25	33.52	4.39
Total	25	84.19	17.80
Night awakenings	25	0.30	0.48
Wakes easily	25	1.06	1.84
Hours slept	25	9.58	0.76
Hours in bed	25	9.93	0.58
Lunch type	25	2.44	0.82

Table 10.--Means and standard deviations for eleven-year-olds

	N	Mean	SD
Self	3	86.67	29.14
Home	3	83.33	15.04
Social	3	62.67	44.74
School	3	39.67	28.01
Physical	3	28.33	6.81
Total	3	69.89	23.49
Night awakenings	3	0.14	0.25
Wakes easily	3	2.14	3.71
Hours slept	3	10.24	0.42
Hours in bed	3	10.26	0.42
Lunch type	3	2.33	1.15

Table 11.--Summary comparison table for means by age and sample size for all variables

AGE	7 yrs	8 yrs	9 yrs	10 yrs	11 yrs	All ages
N	16	36	52	25	3	132*
Self	104.31	106.78	102.12	103.88	86.77	104.41
Home	101.94	98.86	90.18	87.70	83.33	93.38
Social	106.38	103.61	104.92	100.04	62.67	102.88
School	63.31	62.97	62.88	62.48	39.67	62.43
Physical	34.63	34.28	34.17	33.52	28.33	34.02
Total	89.85	89.20	85.29	84.19	69.89	86.43
Night Awakenings	0.13	0.20	0.24	0.30	0.14	0.21
Wakes Easily	0.87	0.43	1.40	1.06	2.14	1.01
Hours Slept	9.84	9.74	9.72	9.58	10.24	9.73
Hours in Bed	10.11	9.97	9.97	9.93	10.26	9.99
Lunch Type	2.56	2.67	2.69	2.44	2.33	2.62

* Note: Subject #133 is the only six-year-old in the study and does not appear on this table

Comparison of CBRS Subscales by Average Hours of Sleep

CBRS subscale scores were analyzed using a one-way MANOVA with average hours of sleep as the categorical variable. At first five levels were selected. However, there was such a small differential between the five levels that in order to show significance in analyzing the data, fewer levels must be chosen. Therefore, this researcher collapsed the five levels into three in an effort to examine the broader increments of data: (1) less than nine-hours, (2) nine-to-10.45-hours, and (3) 10.5-hours and greater. The results of the MANOVA were not significant, indicating that the average amount of sleep had no impact on a child's adjustment.

The subscale scores were also examined for differences by gender and age. A two-way MANOVA was performed with hours of sleep as a covariate. The MANOVA yielded statistically significant main effects for gender ($F(7,115) = 3.71$, $p < 0.001$). The interaction of gender and age was also significant ($F(21,331) = 1.63$, $p < 0.05$). All significant effects, both in the MANOVA and subsequent ANOVAs are presented in Table 12. The impact of hours of sleep when applied as a covariate enhanced significance. All results reported here are from the ANCOVAs. Tukey's HSD test was performed on all significant effects. For gender effects (all CBRS subscales but home) girls scored higher overall than boys, indicating that girls were better adjusted. The interaction scores should be interpreted with great caution, as cells accounting for the significance had only one or two observations, making differences prone to be caused by possible outliers. Interaction results suggest that two eleven-year-old boys were

more poorly adjusted than one six-year-old girl, one nine-year-old girl, and one eleven-year-old girl.

Table 12.--Summary table for multivariate analysis of variance (MANOVA) and associated univariate ANOVAs

MANOVA

Effects	F-value	p value
Gender (G)	3.71	0.001
Age (A)	0.60	NS
Gender*Age (G*A)	1.63	.05

UNIVARIATES (F,p)**

Effects	Self		Home		Social	
Gender (G)	11.15	0.001	--	--	18.22	.0001
Age (A)	--	--	--	--	--	--
Gender*Age (G*A)	--	--	--	--	3.82	.01

Effects	School		Physical		Total	
Gender (G)	15.01	0.0002	8.90	0.004	6.49	.01
Age (A)	--	--	--	--	--	--
Gender*Age (G*A)	3.38	.02	3.70	.01	--	--

**all results reported are co-variance

Stepwise Regression of Sleep Variables with CBRS Scores

Stepwise regressions were performed with sleep variables of night awakenings, bedtime, time of awakening, hours slept, and hours in bed as predictor variables. Six regressions were run, one for each CBRS scale score as the predictor. Results showed that night awakenings was the single (and consistent) predictor of poor adjustment in self, home, social, school, and total CBRS scales, but revealed no such impact on physical adjustment (see Table 13).

Night awakenings accounted for 13 percent of the variance in total adjustment scores, 11 percent of the variance in self adjustment, 9 percent of home adjustment, 7 percent of social adjustment, and 6 percent of school adjustment.

Table 13.--Relationship of night awakenings with CBRS scores

	R^2	df	F	p
Self	0.11	1,123	14.67	0.0002
Home	0.09	1,123	12.46	0.0006
Social	0.07	1,123	9.29	0.003
School	0.06	1,123	7.76	0.006
Total	0.13	1,123	17.96	0.0001

Note: No variables pertaining to physical adjustment met the 0.15 significance level for entry into the regression model.

Comparison of Types of Lunch Subsidies

The analytical strategy of choice for comparing the types of lunch subsidies was Chi-square (X^2). The types of lunch subsidies were divided into three levels: (1) free, (2) reduced and, (3) neither free nor reduced. Frequencies and percentages for lunch subsidy for second-, third-, and fourth-grade boys and girls, included the overall sample data and all data from each of the five participating schools. Omnibus permission from the central school administration made this information accessible (see Appendix 6).

The "neither" classification of the Chi-square findings of the five schools exposed a range from 28.31 to 70.54 percent (see Table 14 for frequencies and percentages of the sample and the individual schools). The sample data revealed that 75.94 percent of the 133 boys and girls from all five schools were in the neither category as compared with the collapsed Chi-square data, (see Table 15 for collapsed data), indicating only 45.61 percent of the 1868 children from all five participating schools were in the neither category. The results suggest that the study subjects (volunteered by their parents) represent a higher socioeconomic level than the child norm of any of the five participating schools.

The Chi-square reduced lunch subsidy group findings ranged from 1.24 percent to 20.60 percent in the five schools. The collapsed data finding from the five schools is 12.31 percent as compared to 9.77 percent in the sample group. The free lunch subsidy category data ranged from 28.21 percent to 60.23 percent in the five schools. The collapsed finding from the five schools was 42.08 percent as compared to 14.29 percent in the sample group.

Table 14.--Frequencies and percentages for lunch subsidy for second-, third-, and fourth-grade boys and girls, including the overall sample data and all data from each of the five participating schools.

Lunch Subsidy	Sample		School A		School B		School C		School D		School E		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Free	19	14.29	113	36.69	125	36.87	368	60.23	112	30.35	68	28.22	805
Reduced	13	9.77	55	17.86	26	7.67	70	11.46	76	20.60	3	1.24	243
Neither of Above	101	75.94	140	45.45	188	55.46	173	28.31	181	49.05	170	70.54	953
Totals	133		308		339		611		369		241		2001

Note: X^2 = N (2001), DF (10), SD (0.936), Value (264.134), probability 0.0001

Table 15.--Frequencies and percentages for lunch subsidy for second-, third-, and fourth-grade boys and girls, comparing sample summary data and the Chi-square collapsing of all school data.

Lunch Subsidy	Sample Data Freq.	Sample Data %	All Schools Freq.	All Schools %	Totals
Free	19	14.29	786	42.08	805
Reduced	13	9.77	230	12.31	243
Neither of above	101	75.94	852	45.61	953
Total	133	100.00	1868	100.00	2001

Note: X^2 = N(2001), DF (2), SD (0.9359), Value (48.477), probability 0.0001

Analysis of the Data

Stepwise regressions were performed with sleep variables of night awakenings, bedtime, time of awakening, hours slept, and hours in bed as predictor variables. Six regressions were run, one for each CBRS scale score as the predictor. Results revealed night awakenings the single (and consistent) predictor of poor adjustment in self, home, social, and total CBRS scales, however exposed no such impact on physical adjustment. The findings indicate that night awakenings have a definite impact on adjustment. Does this mean that children adjust poorly because they awaken at night or does it mean that daytime problems, stresses, and inability to cope create feelings of inadequacy and frustration that contribute to night awakenings? An exploration of each CBRS scale will follow in an effort to expose relationships.

Night awakenings accounted for 11 percent of the variance in the adjustment score for self. Self-adjustment involves self-esteem, the evaluative component of self-concept. As school children search for their individual identity, concepts such as self-definition, self-confidence and self-acceptance are influenced by peer approval. Without this peer approval, children could be unhappy, depressed, and have their feelings hurt easily. They could exhibit behavior they later regret. This inability to cope may lead to feelings of insecurity and frustration which could easily be manifested by night awakenings.

The variance for night awakenings in the home category was calculated as 9 percent of the variance. Home adjustment questions are concerned with issues such as fearing parents, expressions of dislike for home and family, talking about running away from home, parental neglect, and parents that are both overindulgent and overdomineering. In addition, children may be unable to deal with parents that use corporal punishment, do not trust them, show lack of confidence in them, and are too strict in minor matters. Parental quarreling and even divorce could create problems in this area that might lead to insecure feelings. Children may not feel comfortable sharing their concerns with their parents about home conditions they perceive as intolerable and this pent-up emotion could be manifested in not being able to sleep through the night, therefore, suggesting a relative association between the low score on home adjustment and night awakenings. Teachers utilizing Cassel's instrument had some difficulty rating the home area of twenty questions, undoubtedly because they felt they did not know enough about the family unit and/or the sensitive nature of the questions. Hesitancy on the part of teachers to

rate this home adjustment area as readily as the other areas certainly accounted for low scores for certain students which would have also depressed the total home adjustment score.

Night awakenings contributed 7 percent of the variance in social adjustment. The school-age child's emerging identity and self-definition are rooted in cultural and social experiences and are closely related to the family and ethnic influences. The child must feel accepted by the society surrounding him/her. Areas of concern in social adjustment include aggressiveness and hostility towards others, being a poor sport or loser, actually having physical fights, and experiencing trouble making and keeping friends. When children perceive themselves as lacking status and experience feelings of insecurity with their peers, resulting behaviors could present as selfishness, dishonesty, and the inability to communicate appropriately. Being stereotyped as an unacceptable and unpopular person among one's peers may stress some children to the extent that they cannot rise above a defeated mood. Such unrequited rejection suggests relatedness with night awakenings.

Night awakenings accounted for 6 percent of the variance attributed to school adjustment. Inspection of the CBRS school adjustment items offers a variety of aspects that could impact on night awakenings. Children who are restless and inattentive in the classroom may have difficulty expressing themselves, be afraid to speak out, have problems completing school work, or have a dislike for school. Such boys and girls could be disruptive forces in the classroom without actually being problem children in the psychological sense. Getting along poorly with one or more teachers could easily aggravate problems. Consequences could result in

poor achievement and feelings of inadequacy precipitating restless sleep and night awakenings.

In an examination of the personality total adjustment score (PTAS), one realizes that the five adjustment area scores point out specifically the areas of good adjustment and maladjustment and therefore present a more clearly delineated view of the child's behavior. The individual scores also indicate the contributing proportion of adjustment to the PTAS which is the most significant score on the CBRS since it represents the sum total of the child's adjustment. Poor adjustment in one or more of the five areas would contribute less to the PTAS, but good adjustment scores in other areas would demonstrate a leveling force.

Considerations when examining the night awakenings focus on whether there is a single area of poor adjustment or multiple areas that could be associated with sleep difficulties and more specifically night awakenings. PTAS is a composite of the individual areas. Since the individual scores discussed above indicate a definite relationship with night awakenings, it is reasonable to assume the composite score would also suggest such relatedness with night awakenings. Where children have witnessed model behavior of significant others including family members, teachers, and peers, sleep is less of a problem. They are more apt to sleep normally due to adequate life adjustment where the child's life reflects the milieu of this order. They are better able to develop a sense of security, a sense of identity, a sense of belonging, and a sense of purpose. The school-age child normally builds self-esteem through evidence of competency, achievements, and acceptance. The child must develop and maintain unique coping strategies. Children bring their total

developmental accomplishments and past experiences to each new encounter that requires their coping ability. One wonders anew if the child's awakening at night causes the maladaptation or are the maladjustment and inability to cope the precursors of the night awakenings.

Physical adjustment was not impacted by night awakenings. Growth is inevitable as a physiological principle and this finding was not considered unusual but rather a normal outcome. Growth could be stunted by a critical event, but sleep interruption and/or night awakenings do not seem sufficiently traumatic to halt physical adjustment. Children have less tolerance for disruption of regular sleep patterns and will nap spontaneously as the need arises. Missing a portion of nocturnal sleep should not affect this area of adjustment, and because it does not, it lends validity to the affected adjustment areas that depend on continuous rest for well-being, focused concentration, and maximum functional ability.

Theoretically related laboratory investigations conducted by Williams, Karacan, and Hursch in 1972 noted the comparison of night awakenings for the six-to-nine-9-year old with the ten-to-twelve-year old groups and found the means to be 0.77 and 1.38 respectively. They state that in general, males awaken more frequently during the night than females, and this may be related in some way to the disturbing effects of the phenomenom of nocturnal penile tumescence in males that accompanies the REM periods. The experimenters conclude that the increase in awakenings for males that is evident immediately after puberty and continues to old age lends credence to this hypothesis.[1]

Cognitive constructs as reported by Ware state that the occurrence of erections during REM sleep quite early in life also supported the hypothe-

sis that the erection response was physiological rather than psychological and generally, between the ages of two and four months. The majority of REM periods begin to be associated with penile erections. Ware writes that recent data suggest that certain depressed patients may have abnormal erection patterns during sleep other than just an increase in the number of fluctuations.[2]

The results of this study support the hypotheses regarding the impact of night awakenings and thus, add to the theoretical framework. This information has many implications for a wide range of practical problems within the urban milieu, and suggests application throughout the lifespan ranging from factors relating to night awakenings in all ages to factors relating to impotency, but awakenings may result from poor adjustment.

Sleep Group Findings

CBRS subscale scores were analyzed using a one-way MANOVA with average hours of sleep as the categorical variable. Hours of sleep were divided into three levels: (1) less than nine hours, (2) 9-to-10.49 hours, and (3) 10.5 hours and greater. The results were not significant, indicating that the average amount of sleep had no impact on a child's adjustment.

The one six-year-old girl was the longest sleeper (10.86 hours). There was no table for six-year olds as explained earlier, and she was not included on the summary comparison table. Therefore, as illustrated in Table 11, the difference between the shortest sleepers (9.58 hours mean) and the longest sleepers (10.24 hours mean) was 0.66 hours. The amount of sleep required is a highly individualized matter, and it is an accepted fact that usually individuals sleep as long as they need. For this reason, the 0.66 hours of difference is not that great a difference to determine

significance and suggests sameness for hours slept for the 133 subjects. Also, statistical power increases as the sample size increases. The 133 subjects in this study were not a sufficient number to detect small differences. Selection of "Subjects" was made as stated in Chapter III.

Extensive laboratory studies directed by Williams, Karacan, and Hursch in 1972 greatly strengthened the existing theoretical framework relative to normal sleep patterns. They concluded that in the six-to-nine-year-old children, the mean sleep time for girls was 9.81 hours and 9.54 hours for boys, thus indicating an overall mean of 9.68 hours.[3] Results in the current study revealed an overall mean total sleep time of 9.73 hours as reported by parents. The laboratory findings of Williams and colleagues suggest validation for the results of the current investigation thus adding relevant data to the existing body of information. Findings suggest practical applications such as educating parents to direct attention to their children's bedtime, encouraging policy makers to set school schedules with travel time in mind, and develop measures of classroom behavior that may be predictive of later difficulties when inadequate sleep is the culprit.

When considering individual sleep requirements and the sample size from these viewpoints, comprehension of the fact that the average amount of sleep had no impact on the children's adjustment scores, is facilitated. Average sleep is a final outcome variable and even though closely associated with the other variables such as bedtime, time of awakening, and hours in bed, is completely dependent on them. If hours of sleep failed to impact adjustment, an assumption can be made that bedtime, time of awakening, and hours in bed would not impact adjustment significantly. The

findings that night awakenings would disrupt sleep and exert such a significant impact on adjustment and also achievement supports existing theory. A concept that unbroken, continuous sleep is essential for well-being, is generally accepted.

Bonnet's hypothesis states that continuity of sleep rather than stage amounts (including SWS and REM) or total sleep times determines restoration.[4] He continues that the continuity theory maintains that SWS is important because it institutes high sensory thresholds, which reduce the probability of arousal and therefore increase undisturbed sleep. These data suggest validation for findings in the current study revealing night awakenings as the single (and consistent) predictor of poor adjustment in self, social, home and school adjustment. These data can serve as a basis for further research to identify antecedent manifestations of night awakenings.

MANOVA for Gender and Age

A two-way MANOVA yielded statistically significant main effects for gender (F-value = 3.71, $p < 0.05$) with hours of sleep as a covariate. Tukey's HSD test revealed gender effects (all CBRS subscales except home) indicating better adjustment for girls than boys. The girls may be better adjusted than the boys because at these ages girls may not be quite as aggressive as boys. However, an important point to consider is that teachers may tend to rate girls slightly higher than boys, thus accounting for some of the difference if not all of the difference. Could socialization expectations contribute to the better adjustment score for girls to any degree? If the answer is yes, then the boys'adjustment scores could be corrected slightly to bring them closer to the girls'adjustment scores.

These results are inconsistent with Coble and colleagues (1984). They concluded the effects of gender on the EEG sleep measures in their sample of one hundred children six-to-sixteen-years of age were overwhelmingly nonsignificant. They further stated that their findings of few gender differences were consistent with other investigators.

The two-way MANOVA yielded non-significant main effects for age (F-value = 0.60). The result is not too astonishing a finding. With only three 11-year olds observed, similarity in sleep patterns are in line with the other findings. One purpose for the investigation was to isolate a particular area as it related to the sleep pattern of children of different age categories.

The findings in this study were inconsistent with the results of the theoretically related EEG experiments of Coble et al., (1984). They concluded that chronological age had a strong effect on length of sleep which showed a steady decline with increasing age. Small cell size was a contributing factor for some inconsistency, and this will be discussed in the next paragraph addressing the interaction of gender and age.

The interaction of gender and age was also significant (F-value = 1.63). This must be interpreted with great caution because of cell size. Even though efforts were made to have sufficient numbers in each cell, materialization indicated otherwise. There was one 6-year old, sixteen 7-year olds, thirty-six 8-year olds, fifty-two 9-year olds, twenty-five 10-year olds, and three 11-year olds. Interaction results suggest that two 11-year-old boys were more poorly adjusted than one 6-year-old girl, one 9-year-old girl, and one 11-year-old girl. According to the findings stated above, girls were better adjusted than boys. In reference to the

poor adjustment of the two 11-year-old boys, it is advocated by some educational and psychological theorists, that 11-year olds (1) revert back to less stable behavior than they exhibited as 10-year olds, and (2) 11-year olds are just beginning to become interested in the opposite sex. This philosophy could easily account for some of the poor adjustment of the two 11-year-old boys. However, the single factor of small cell size with one, two, and three cell observations could easily account for the findings in gender and age relative to boy-girl adjustment. More realistic means were obtained in cells with greater numbers, therefore conclusions about gender and age in these have higher validity.

Descriptive Statistics

According to the summary comparison for means and age (Table 11), the sixteen 7-year olds are the best adjusted in all CBRS subscales except self in which the thirty-six 8-year olds excel. Thus, the 7-year olds are better adjusted in the areas of home, social, school, physical, and total adjustment. This age group awakens the least during the night and therefore enjoys more continuous sleep. They are second highest in length of sleep (9.84 hours nightly) in contrast to the longest sleepers, the three 11-year olds (10.24 hours nightly). Also, the length of time in bed for the 7-year-olds (10.11 hours nightly) trails the three 11-year olds (10.26 hours) by a very slim margin. Their ease of awakening (0.87) is second lowest after the 8-year olds (0.43). Finally, the 7-year-olds are in the mid-range regarding the lunch type subsidy.

Possible explanations for the successful adjustment of the 7-year olds may relate to their having responded adequately to the stress associated with starting first grade and entering the second part of the year

well adjusted for this investigation completed in late February reflects this. All of the students had this same opportunity therefore, certain aspects about 7-year olds may have given them a slight edge. They are known to be quiet in contrast to the rough-and-tumble 6-year olds and 7-year olds are beginning to be introspective. They are beginning to comprehend the concepts of categorization, conservation, and accomodation. Parents are still attentive to their schedules regarding bedtime. Supervision is more consistent at this early age and does not tend to lessen until the child is older, often until thirteen or fourteen.

In actuality, the sixteen 7-year olds, the thirty-six 8-year olds, and the fifty-two 9-year olds were competitive in the areas of self, social, school, and physical adjustment. The 9-year olds slipped ten or more points in home adjustment, otherwise their total adjustment would have been higher than all age groups for the best total adjustment. Unfortunately, the home adjustment area presented an unexpected problem that did not surface in preplanning orientation sessions. Some teachers admitted feeling somewhat intimidated about responding to the twenty questions in the home adjustment area, undoubtedly because they felt they did not know enough about the family unit and/or the sensitive nature of the questions. Failure to respond may have skewed the data. Why this surfaced so emphatically in the 9-year-old group is unexplainable since the principals and teachers received approximately identical orientation in the effort for standardization of data. The hours slept and the hours in bed for the 9-year olds were comparable to both the 7-year olds and the 8-year olds.

The thirty-six 8-year olds were the group that awakened the easiest (0.43) in contrast to the sixteen 7-year olds (0.87). The three 11-year

olds exhibited the greatest difficulty awakening (2.14). The thirty-six 8-year olds and the fifty-two 9-year olds slept on the average the same amount (9.74 and 9.72 respectively). As stated previously, the difference between the shortest and the longest sleeper on the summary comparison was 0.66 hours and the uniqueness of the individual could easily account for such a narrow range.

Study Findings Support Original CBRS Typical Children Normative Data

One purpose of the CBRS is to compare ratings of children with the normative data of both typical children and emotionally handicapped children. Normative data have been obtained through the standardization studies of the CBRS. Normative group data for 2000 typical children and 200 maladjusted children is depicted in Table 3. Summary comparisons of means by age for this study are displayed in Table 11.

The means reported in this study refer to the mean for the 132 subjects and compared with the typical children only for ease of reporting. The emotionally handicapped data is similar to the typical data. Scores falling within the normative data range indicate adjustment comparable to the typical child. Any score above the band means excellent adjustment.

The study mean for self adjustment is 104.41, in the upper range of the normative data band of 85-to-105, indicating these subjects as adapting well. The study mean for home adjustment is 93.38, in the mid range of the band of 84-to-105 (some teachers admitted discomfort rating this area and chose not to respond to items in this section). The investigation mean for social adjustment is 102.88 in the typical children's band of 85-to-105, indicating above average adjustment. This survey mean for school adjust-

ment is 62.43 in the band of 53-to-62, slightly excelling the typical normative data. The research mean for physical adjustment is 34.02 in the band range of 27-to-32 which indicates excellent physical adjustment.

Findings Support Other Studies

The results of this investigation that the average amount of sleep had no impact on a child's adjustment are supportive of the findings of the Carskadon group (1982) reporting on a study of preadolescents. They found them to have no physiological sleepiness whatsoever. The group reported that the preadolescents slept well at night, were alert and energetic all day long, never napped, and never fell asleep during MSLT testing. In addition, they felt that it was tempting to conclude that these children were also functioning at peak levels in other ways: learning, remembering, initiative, creativity, and enthusiasm. However, they did not report on the impact of night awakenings.

Further support for these findings are presented by Keenan and colleagues (1987) who comment on a study of second-, third-, and fourth-graders who took part in a sleep survey and concluded that their findings of optimal pattern of deep, sound nocturnal sleep and alert waking function supported data described by Feinberg (1974), Coble and colleagues (1984), Williams and colleagues (1974), and Ross and coworkers (1968).

Comparison of Types of Lunch Subsidies

The types of lunch subsidies were divided into three levels such as free, reduced, and neither free nor reduced. The Chi-square findings in the neither classification revealed a higher socioeconomic level for the sample (75.94 percent) than for the children of any of the five schools participating. Percentages ran from 28.31 to 70.54 with a mean of 45.61

percentage. The complete data are included in tables 14 and 15. This surprising outcome suggests selectivity of participation response.

First, each of the five schools received 125 letters to send to parents, resulting in a total of 625 letters. Two of the schools requested an additional 675 letters between them. With 133 children meeting the criteria for entry into the study, this could imply a 10 percent response rate if based on the 1300 letters provided or a 21 percent response rate if based on the original 625 letters. This investigator feels that conclusions can probably not be drawn suggesting this to be a representative group on this particular issue. Therefore, generalizations are improbable.

This selective response indicates that the respondees are from more affluent homes whose occupants do not qualify nor need lunch subsidy assistance. There might be a relationship between better organized homes and the return of the required documents essential for meeting the criteria to qualify for entrance into the study. These families may expose their children to better role models, be more research oriented, be more eager to volunteer and possibly exhibit better sleep hygiene practices and fewer sleep problems.

When considering the households that offered no respondees, the possibility exists that disoriented households are less likely to receive the letters and less inclined to return them. This group could consist of parents that have sleep disturbances that definitely impacted this investigation and reflected on their children because the parents were not sufficiently motivated to enter their children in the study, monitor their children's sleep, document requested information appropriately and return documents in a timely manner. Relationships between failure to respond

issues such as questionable lifestyles, one-parent families, physical and/or substance abuse, inadequate housing, and even literacy could be responsible for the lack of response.

Despite the contrast between the two groups just discussed, there are no well researched instruments designed to help examine the significance of sleep disturbances in children as a consequence of family lifestyles.

Hypotheses

1. There is no statistically significant difference between sleep patterns and presenting classroom behaviors.

2. There is no statistically significant difference between length of sleep and self adjustment.

3. There is no statistically significant difference between length of sleep and home adjustment.

4. There is no statistically significant difference between length of sleep and social adjustment.

5. There is no statistically significant difference between length of sleep and self adjustment.

6. There is no statistically significant difference between length of sleep and school adjustment.

7. There is no statistically significant difference between length of sleep and total adjustment.

Null hypothesis 1 states that there is no statisitcally significant difference between sleep patterns and presenting behaviors in the classroom. Six stepwise regressions were performed with sleep variables of night awakenings, bedtime, time of awakening, hours slept, and hours in bed as predictor variables. Results showed that night awakenings was the single (and consistent) predictor of poor adjustment in self, home, social, school and total CBRS scales, but manifested no such impact on physical adjustment (see Table 13). No variables pertaining to physical adjustment

met the 0.15 significance level for entry into the regression model. Night awakenings accounted for 13 percent of the variance in total adjustment scores, 11 percent of the variance in self adjustment, 9 percent of the variance in home adjustment, 7 percent of the variance in social adjustment, and 6 percent of the variance in school adjustment. Therefore, since night awakenings make a statistically significant difference, the null hypothesis stating that there is no statistically significant difference between sleep patterns and presenting behaviors in the classroom is rejected.

Null hypothesis 2 states that there is no statistically significant difference between length of sleep and self adjustment. Null hypothesis 3 states that there is no statistically significant difference between length of sleep and home adjustment. Null hypothesis 4 states that there is no statistically significant difference between length of sleep and social adjustment. Null hypothesis 5 states that there is no statistically significant difference between length of sleep and school adjustment. Null hypothesis 6 states that there is no statistically significant difference between length of sleep and physical adjustment. Finally, null hypothesis 7 states that there is no statistically significant difference between length of sleep and total adjustment. Null hypotheses 2 through 7 are accepted.

The last six hypotheses deal with length of sleep in relation to five individual areas of adjustment and a sixth area of total adjustment. CBRS subscale scores were analyzed using a one-way MANOVA with average hours of sleep as the categorical variable. Hours of sleep were divided into three levels; (1) less than 9 hours, (2) 9-to-10.45 hours, and (3) 10.5 hours and

greater. The results of the MANOVA were nonsignificant, indicating that the average amount of sleep had no impact on a child's adjustment. Therefore, the last six null hypotheses relating length of sleep and each of the five areas of adjustment and the composite total adjustment are accepted since they are supported by the data.

Average sleep or length of sleep is a final outcome variable. Even though closely associated with the other variables such as bedtime, time of awakening, and hours in bed, it is completely dependent on them. If hours of sleep failed to impact adjustment, then it is understandable that the other variables, bedtime, time of awakening, and hours in bed would also fail to impact adjustment.

Summary

This chapter addressed the presentation and analysis of the data of the study regarding the relationship of sleep patterns of second-, third-, and fourth-grade public school boys and girls and their social, home, physical, school, self, and total adjustment. The CBRS subscales and demographic variables results for interrelations were discussed and depicted in table format. Next, descriptive statistics on the overall sample and for each year of age for the subjects were reviewed and tables were included regarding the breakdown by age. Following this, a summary comparison table displayed the means for self, home, social, school, physical, and total adjustment areas as well as for night awakenings, ease of awakening, hours slept, hours in bed, and lunch subsidy type by age.

The results of the CBRS subscale scores in the relationship to three levels of sleep indicating that the average amount of sleep had no impact on a child's adjustment were reported. The chapter also cited multivar-

iate analysis of variance findings regarding both the main effects and the interaction effects of gender by age with hours of sleep as a covariate. The stepwise regressions with sleep variables of night awakenings, bedtime, time of awakening, hours slept, and hours in bed as predictor variables of adjustment were described, after which the comparison of types of lunch subsidies are introduced and tables display results regarding the sample, the five individual participating schools, and the collapsed summary statistics for the five schools.

Analysis of the data was offered for consideration. The unexpected finding that night awakenings impacted heavily on adjustment was explored in the areas of self, social, school, home, and total adjustment. Physical adjustment was not impacted by night awakenings and possible reasons were pursued. Next, discussions focused on the sleep group findings with three levels of length of sleep, MANOVA application for gender and age, descriptive statistics, support for the original CBRS typical children, normative data, and consistency with other studies. Selected theoretically related investigations were reviewed regarding their relationship to the findings in the current experimentation.

Next, the chapter contains a discussion of the comparison data regarding the three levels of lunch subsidy in relation to the sample, the individual data of the five participating schools and the collapsed data of the five schools. Finally, the seven null hypotheses are restated and analytical remarks were presented regarding their rejection and/or acceptance as supported by the findings of this investigation. This summary concludes the chapter.

ENDNOTES

[1]Robert L. Williams, Ismet Karacan, and Carolyn J. Hursch, Electroencephalography (EEG) of Human Sleep: Clinical Applications, (New York: John Wiley and Sons, 1974), 37, 41, 72.

[2]J. Catesby Ware, "Monitoring Erections During Sleep," Principles and Practice of Sleep Medicine, ed., Meir H. Kryger, Thomas Roth and William C. Dement, (Philadelphia, PA: W.B. Saunders Co., 1979), 690.

[3]Williams, 38.

[4]Michael H. Bonnet, "Performance and Sleepiness as a Funtion and Placement of Sleep Disruption," Psychophysiology 23, no. 3 (May 1986): 263.

[5]William C. Dement and Mary A. Carskadon, "Current Perspectives on Daytime Sleepiness: The Issues," Sleep 5, Suppl. 2 (1982): 556, 560.

[6]Mary A. Carskadon, Sharon Keenan, and William C. Dement, "Nighttime Sleep and Daytime Sleep Tendency in Preadolescents," ed. Christian Guilliminault, Sleep and its Disorders in Children, (New York: Raven Press, 1987), 43-52.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The fifth and final chapter will present a brief summary of this investigation. Next, conclusions will be addressed and results will be discussed from both a theoretical and a practical perspective. Finally, recommendations will be offered for further research.

Summary

This research examined the relationship between the length of nocturnal sleep and behaviors in the classroom of seventy-four-girls and fifty-nine-boys from second-, third-, and fourth-grades attending five urban public schools. All subjects, their parents, and their teachers participated maximally and followed the prescribed protocols (outlined prior to the study) throughout the entire process of inquiry.

The parents observed and recorded data on a sleep log listing independent variables such as length of daytime naps, time to bed, number of night awakenings, arising time, number of hours slept, length of hours in bed, age, and gender. The parents recorded on the sleep log for seven nights. The subjective documentation by the parents was their perception of times and numbers but they had been encouraged to be as accurate as possible. Other independent variables were grade ranking and type of lunch subsidy such as free, reduced, or neither free nor reduced. The school administrators supplied the information for the last two variables.

The dependent variables were the classroom behaviors of the 133 subjects. These behaviors were classified into five personality areas for objective assessment of the students' adjustment areas labelled self, social, school, home, and physical. The objective assessment was observed and documented on a seventy-eight-item questionnaire by their classroom teachers who were familiar with the subject's behaviors. The sixth dependent variable was the total adjustment score which was calculated by this investigator from the questionnaire data.

Pearson correlations were calculated for the CBRS scores to examine the interrelations among subscales and demographic data. Pearson correlation coefficients revealed that all CBRS subscales were significantly correlated with each other (r values ranging from 0.32 to 0.87). Descriptive statistics were computed on the overall sample and for each year of age of the subjects. CBRS subscale scores were analyzed in a one-way MANOVA with average hours of sleep as the categorical variable. A two-way MANOVA was performed with age and gender as factors and hours of sleep as a covariate. MANOVA procedure computes a Wilks' Lambda, for determining overall significance. ANCOVA was used to answer certain research questions. Tukey's HSD test was performed on all significant effects in relation to MANOVAs and ANCOVA. Stepwise regressions were calculated to determine the proportion of variance accounted for with each single predictor variable such as night awakenings, time of awakening, hours slept, and hours in bed. The application of Chi-square was used to determine frequencies and percentages relating to the type of lunch subsidy.

Conclusions

Stepwise regressions revealed that night awakenings have a definite impact on home, social, self, school, and total adjustment. Night awakenings accounted for 13 percent of the variance in total adjustment scores, 11 percent of the variance in self adjustment, 9 percent of home adjustment, 7 percent of social adjustment, and 6 percent of school adjustment. This possibly means that awakening at night perhaps creates sleep deprivation that perchance results in daytime sleepiness that interferes with daytime routines and activities. Does this mean that continuous and uninterrupted sleep is essential for well-being and proper functioning? An alternative interpretation is that daytime problems, stresses, and inability to cope, create feelings of inadequacy and frustration that contribute to night awakenings. Total sleep time did not differentiate the groups. This finding could lead to the conclusion that the homogeneity of the sleep times confounded significant findings. Physical adjustment was not impacted by night awakenings.

A one-way MANOVA with hours of sleep as the categorical variable with three levels indicated that the length of sleep had no impact on a child's adjustment. Table 11 indicates the difference between the longest sleepers (10.24 hours mean) and the shortest sleepers (9.58 hours mean) was 0.66 hours. Individualized needs could account for so small a difference and small sample size could also confound findings. However, continuous and uninterrupted sleep seems to be more critical than length of sleep according to this research. These findings would lend support to Bonnet's hypothesis. He claims that continuity of sleep rather than stage amounts (including SWS and REM) or total sleep times determines restoration.

A two-way MANOVA and Tukey's HSD test revealed gender effects (self, social, school and physical but not home) indicating possibly better adjustment for girls than boys. These findings were inconsistent with the results reported by Coble and colleagues (1984). They concluded that effects of gender were overwhelmingly nonsignificant which was, according to them, in agreement with other investigators.

A two-way MANOVA suggests that age did not have an effect. The interaction of gender and age indicates that two 11-year-old boys were more poorly adjusted than one 6-year-old girl, one 9-year-old girl, and one 11-year-old girl. The single factor of small cell size could easily and reasonably account for these outcomes.

The sixteen 7-year olds were the best adjusted in areas involving social, school, home, physical, and total adjustment. They were surpassed only by thirty-six 8-year olds in self adjustment. The 7-year olds awaken the least during the night, are second highest in length of sleep (9.84 hours nightly) in contrast to the longest sleepers (10.24 hours nightly), are second lowest in ease of awakening (0.43), and are in the mid-range regarding lunch type subsidy. Some of these findings are consistent with Williams, Karacan, and Hursch (1972). They concluded that in the six-to-nine-year-old children, the mean sleep time for girls was 9.81 hours and 9.54 hours for boys, thus indicating an overall mean of 9.68 hours. Parents in this study reported a mean of 9.73 hours for hours slept (see table 11).

Self, home, social, school, and physical were positively correlated with each other (Pearson r values ranging from 0.32 to 0.87). Well adjusted children in one area could perchance be interpreted to indicate

appropriate adjustment in other areas. Also of note was the finding that as a child increases in age, his/her adjustment decreases indicating that younger school-age children possibly follow more routinized schedules. The theory that parents supervise younger children's bedtimes more closely are consistent with the findings of Carskadon (1990) stating that over half of the 10-year-old children reported that their parents set their bedtimes on school nights and by age 13, only 19 percent of parents set school-night bedtimes. These findings also support the data that states older children require more sleep because protein synthesis occurs most readily during sleep because growth spurt during this time demands the formation of so many new cells that add increased stress. The type of lunch subsidy with home adjustment ($r = 0.20$, $df = 128$, $p < 0.05$), school adjustment ($r = 0.18$, $df = 133$, $p < 0.05$), and total adjustment ($r = 0.21$, $df = 133$, $p < 0.05$) indicate the the better the socioeconomic status of the child, the better his/her adjustment.

The results of this study are supportive of the findings by the Carskadon group (1982) reporting preadolescents slept well all night, were alert and energetic all day long, never napped, and never fell asleep during MLST testing. In addition, they felt that it was tempting to conclude that these children were also functioning at peak levels in other ways: learning, remembering, initiative, creativity, and enthusiasm. They did not report specifically on night awakenings.

Further support for these findings are presented by Keenan and colleagues (1987) in their study of second-, third-, and fourth-graders. They conclude their findings of optimal pattern of deep, sound nocturnal sleep and alert waking function were in agreement with data described by

Feinberg (1974), Coble and colleagues (1984), Williams and colleagues (1974), and Ross and coworkers (1968).

In recent years, there has been a renewed interest in what is happening in the American public school systems with a special focus on urban public schools. This investigation allows the reader the opportunity to examine the results of five urban Norfolk public schools regarding sleep patterns and classroom behaviors of second-, third-, and fourth-graders with the experiences of similar urban public schools throughout the United States of America.

This study indicates a need for planning and implementation to minimize night awakenings in an effort to reduce daytime sleepiness. This researcher speculates that by this effort, classroom learning will be enhanced. The outcome of less daytime sleepiness could increase attention span. Findings reinforce the premise that decreased night awakenings in second-, third-, and fourth-grade public school children are essential in order to achieve social and economic benefits in the most effective way. Schools might benefit from increased awareness of students' nocturnal sleep patterns because of the possibility of enhanced productivity of students in all areas of the curriculum.

A need exists for further research that will describe and interpret the political dynamics of the decision making process that are involved in urban public schools. Local government officials and school administrators should be encouraged to search for the best combination of programs and actions. Succinctly, those programs and actions should be undertaken to allow urban schools to achieve maximum development and provide optimal community services at a time of diminishing federal and state fiscal funds.

In conclusion, the findings of the current investigation suggest practical applications to the urban environment. In this study length of sleep did not make a difference. Interruption of sleep at night did make a difference. Better adjusted children had more continuous nocturnal sleep. Parents can be educated to direct attention to their children's sleep practices, schedules, and daily stresses in order to enhance continuous and uninterrupted sleep. One hopes that, students would be more attentive, achieve better academically, create fewer classroom disturbances, distract others less often and better utilize funds allocated to schools. Better educated students should be more self sufficient in the urban environment. Policy makers can be prevailed upon to locate schools strategically and set school schedules with travel times in mind. Educators can be supported in their efforts as potential instrument users to examine the tools carefully and be adept as to their meaning in relation to academic achievement and intellectual growth. Additionally, the educators should also be encouraged to create anew or perfect existing instruments for precision measurements tailored to the specific needs of their students. Finally, the identification of problematic classroom behaviors of early childhood may suggest measures for the prevention of later difficulties.

Recommendations

As a result of this investigation, various implications and observations were noted that warrant further research regarding the relationship of sleep patterns of school-age children and their behavior in or out of the classroom. Since night awakenings turned out to be one of the most memorable issues of this study, it should certainly be explored more fully. The weighty impact of night awakenings was not discovered in the

review of the literature. Although it was included in this study, this researcher did not target this as a primary focus.

Therefore, future studies may consider the investigation of the following:

1. the effects that stress in a school-age child's life has on nocturnal wakefulness,

2. the effects that parental supervision have on the sleep/wake behavior,

3. the effects that parental lifestyles contribute to the sleep/wake behavior,

4. the role self-concept plays in the sleep/wake cycle,

5. replication of the present study regarding the relationship of length of sleep and behaviors in the classroom but with equal cell size and adequate subjects in each cell,

6. creation of an instrument for measuring more precisely the overt behaviors of children in the classroom in relation to adaptation for academic achievement and intellectual growth,

7. a broadened study which will include all socioeconomic status levels to ascertain differences in sleep patterns of differing socioeconomic status students, and

8. utilization of a greater population in an effort to increase the sample size to allow for greater generalizability.

APPENDICES

APPENDIX 1

THE CHILD BEHAVIOR RATING SCALE

APPENDIX 2

SLEEP LOG

STUDENT SLEEP LOG FOR PARENTS AND OR GUARDIANS

by Yolanda Cardelli Hampel

Student's Name_____
Student's Age _____
Gender Male ___ Female ___

DATE Begun _____	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
LENGTH OF DAYTIME NAPS (If any, in minutes)							
TIME TO BED							
NUMBER OF NIGHT AWAKENINGS							
LENGTH OF NIGHT AWAKENINGS							
TIME YOUR CHILD GETS UP IN THE MORNING							
NUMBER OF HOURS SLEPT							
NUMBER HOURS IN BED							

APPENDIX 3

RANKING DATA FORM

RANKING DATA FORM

This Student _____
ranks as follows:

Lunch category

_____ 1 = FREE

_____ 2 = Reduced fee

_____ 3 = Neither free or reduced

Academic Ranking

_____ 1 = A - B Student

_____ 2 = B - C Student

_____ 3 = Below average Student

_____ 4 = Failing Student

APPENDIX 4

INFORMED CONSENT

INFORMED CONSENT

I understand that I am agreeing for my child to participate in a research study that seeks to understand the relationship of length of sleep of my child and classroom behavior. I realize that my child will not be singled out, nor receive special attention but will be observed as usual by the classroom teacher. I also understand that I am under no obligation to participate and that I can terminate my child's participation at any time.

I realize that as part of this research I will be asked to complete a sleep log for seven (7) days on my child. I am aware that the researcher and a Committee for the protection of human subjects of Old Dominion University have determined this sleep log to be non-threatening and will pose no risk to my child's physical nor psychological health. I further understand that completing this sleep log is the only task required of myself or of my child.

I agree to have my child participate with the knowledge that this information will be kept strictly confidential and will be used in group form only for educational and research purposes.

_____
Signature of parent/guardian

_____
Child's name

_____
Date

APPENDIX 5

REQUEST TO HUMAN SUBJECTS REVIEW COMMITTEE

4110 North Witchduck Road
Virginia Beach, Virginia, 23455
June 15, 1989

Human Subject's Review Committee
Old Dominion University
Norfolk, Virginia, 23508

Dear Committee Members;

I am interested in seeking approval according to the guidelines established by the University's Institutional Review Board for the Protection of Human Subjects (IRB) for my dissertation research involving human subjects. Therefore, I submit my proposal to you for review hoping to gain your approval.

As a doctoral candidate at Old Dominion University, I work with Dissertation Advisor Dr. Franklin Ross Jones. Dr. Vincent Rose of the Norfolk Public School System and formerly of the Sentara Norfolk General Hospital Sleep Disorders Center is assisting me with the preliminary discussions with Dr. Gene Carter, Norfolk School System Superintendent, and Dr. Anna G. Dodson, Director of Research, Testing and Statistics.

Approximately 300 boys and girls between the ages of nine and eleven will be selected from the Norfolk Public School System and grade levels third, fourth, and fifth will be invited to participate. I want to explore the nature of the relationship between length of sleep and behaviors presented in the classroom as observed by the teachers.

The Parents/Guardians will be sent a letter (copy enclosed) explaining the research and requesting their assistance by completing a sleep log (copy enclosed) for seven nights. Data requested will include sleep habit information such as length of daytime naps, time to bed, number of night awakenings, length of night awakenings, arising time, and length of sleep in an effort to categorize the children as short sleepers or long sleepers.

The teachers will observe the children in the classroom and document subjects' behaviors on the 78-item The Child Behavior Rating Scale (copy enclosed) devised by Russell N. Cassel and published by Western Psychological Services. Dr. Dodson, and Dr. Rose both agree the ideal time for the project is the last week of September or the first week in October.

I wish to thank the committee members for their cooperation and assistance in this endeavor.

Sincerely,

Yolanda C. Hampel

APPENDIX 6

PERMISSION FROM RESEARCH, TESTING AND STATISTICS

January 7, 1988

Dr. Vince Rose
Sentara Norfolk General Hospital
600 Gresham Drive
Norfolk, VA 23507

Dear Dr. Rose:

Your request to conduct a research study in Norfolk Public Schools to determine the relationships between children's sleep patterns and their behavior in school is granted contingent upon the final approval of the selected building principals. As per our conversation, you must solicit the cooperation of the principals and teachers and the participation of parents and students. The suggested schools are Calcott Elementary School, Lindenwood Elementary School, and Northside Middle School.

Please send me a copy of the results of your study for my files. Best wishes to you in this endeavor.

Sincerely,

Anna G. Dodson

Anna G. Dodson
Director
Research, Testing ard Statistics

jas

cc: Dr. Margaret B. Saunders, Assistant Superintendent, Region I
Dr. Shirley B. Wilson, Assistant Superintendent, Region II
Mr. Watkins L. Davenport, Principal, Calcott Elementary School
Mrs. Mamie L. Ratliff, Principal, Lindenwood Elementary School
Mr. Frank L. Steadman, Principal, Northside Middle School

APPENDIX 7

PERMISSION FROM HUMAN SUBJECTS REVIEW COMMITTEE

OLD DOMINION UNIVERSITY

Office of the Vice President for Academic Affairs
Norfolk, Virginia 23529-0011
804-440-3260

[155]

June 27, 1989

TO: Dr. Franklin Ross Jones
Eminent Professor, ELS

FROM: J.R.K. Heinen
Chair, Protection of Human Subjects Committee

SUBJECT: Research Proposal

Please be advised that I have carefully reviewed the research proposal of Ms. Yolanda Hampel and find it congruent with the canons germane to the protection of human subjects.

cc: Dr. Robert Lucking

APPENDIX 8

LETTER TO PARENTS AND GUARDIANS

February, 1990

Dear Parents or Guardians,

I am interested in obtaining your assistance on the sleep patterns of your second-, third-, and fourth-grade boys and girls. You can help by giving us some information on your child's or childrens' sleep for one week. As a doctoral candidate at Old Dominion University, I have the approval of Old Dominion University's Institutional Review Board for my sleep research. As an outcome of this research I am trying to isolate ways to assist your child or children learn more effectively in the classroom.

Sleep habits such as the usual bedtime, arising time, number of arousals during the night, and length of day time naps can classify your child as a long sleeper or a short sleeper. The number of hours slept may affect your child's ability to pay attention in the classroom. Disturbed sleep may cause tiredness, lack of vitality, inability to concentrate, poor school performance, more susceptibility to minor illnesses, daytime drowsiness and more absentiism.

I want to know if sleep habits affect what students do and how they feel during the day. This information can help other students who have sleeping difficulties that affect their learning. You can help by providing facts about how your child sleeps. Please complete this sleep log for seven nights with as much accuracy as you can. After the study is completed, information regarding the overall outcome will be available to the school administrators.

This information will be kept **strictly confidential.**

Thank you for your cooperation.

Sincerely,

Yolanda C. Hampel

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BIOGRAPHICAL STATEMENT

Yolanda Cardelli Casale Hampel, the daughter of the late Santa Matone and Guiseppi Cardelli of Teramo, Italy was born in Danville, Virginia.

Education:

1982	C.	ANA Gerontological Nurse Certification.
1987		Recertification as a Gerontological Nurse.
1975	MSEd.	Old Dominion University.
1950	BSN	Georgetown University, Washington, D.C.
1948	RN	Georgetown University, Washington, D.C.
1945	Diploma	George Washington High School, Danville, Virginia.

Work Experience:

1970-present	Sentara Norfolk General Hospital School of Nursing. Involved in intensive care nursing, Fundamentals of Nursing, pharmacology, medical-surgical, operating room, gerontological and rehabilitation nursing. Served as Lead Instructor and Course Coordinator.

Research Papers:

1. "Effects of Training on the attitudes of Freshman Professional Nursing Students toward Death and Dying." (Masters thesis)
2. "Crime and the Elderly."
3. "Evaluation of a Geriatric Nursing Aid Program."
4. "Field Evaluation of Home Health Nurses."

Presentations:

1. "Reading and Sleep Patterns Among Children", College Reading Association Conference, Arlington, Virginia, November 3, 1991.

2. "Sleep Patterns and the Behavior of School Children", American Psychological Society in Dallas, Texas, June 9, 1990.
3. "Sleep Patterns and the Behavior of Children and Adults and Implications for Family, Work, and School", Southeastern Psychological Association Conference, Atlanta, Georgia, April 5, 1990.
4. "Attitudes of Freshman Nursing Students toward Death and Dying", Southeastern Psychological Association Conference, New Orleans, Louisiana, 1976.

Community and State Service:

1. Mayors Committee on Aging, Virginia Beach, Chair - Past Secretary.
2. Advisory Board of Kimberly Quality Care of Norfolk and Viginia Beach.
3. American Cancer Society Board.
4. Altrusa International Inc. of Tidewater - Immediate Past President.
5. Associate Supervisor in the administration of the National Teacher Examination.
6. Senior Showcase, Innovative Living.
7. Task Force on Aging, Virginia Beach.
8. Long Term Care Committee, Virginia Beach.
9. Governor's White House Conference on Children and Youth. Implementation Committee Chair of Eastern Virginia, 1973 - 1975.

Organizations:

American Nurses Association.
Virginia Nurses Association.
National League for Nurses.
Virginia League of Nurses.
Virginia Association of Rehabilitation Nursing.
Association of Operating Room Nurses.
Southeastern Psychological Association.

Recognitions:

1. Sentara Norfolk General Hospital's Pioneer award for Community Service.
2. Who's Who in American Nursing.
3. International Who's Who of Professional and Business Women.