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SLEEP SATISFACTION OF OLDER ADULTS LIVING IN THE COMMUNITY AND RELATED FACTORS

by

MARIE THÉRÈSE NICOLE OUELLET

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Frances Payne Bolton School of Nursing
CASE WESTERN RESERVE UNIVERSITY
May, 1995
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Abstract

by

MARIE THÉRÈSE NICOLE OUELLET

The purpose of this study was to explore different aspects of sleep found to be most important to understand sleep satisfaction and to identify behavioral and health factors associated with sleep satisfaction among older adults living in the community. The sleep satisfaction model used for this study was derived from Webb’s (1988) theoretical model on sleep and prior theoretical and empirical considerations in congruence with Henderson’s nursing perspective of human beings.

A descriptive correlational design was employed with a convenience sample of 130 elders who were members of a Golden Age Center of Greater Cleveland. The sample included 102 women and 24 men over 65 years of age who were functionally and socially active and who did not suffer from any particular acute illnesses.

Sleep satisfaction was measured with the Cantril self-anchoring ladder and the PSQI. Descriptive analyses indicated that only a small proportion of the participants were not satisfied with sleep. Sleep
patterns varied greatly from one individual to another one. Total sleep
time averaged 6 hours and 15 minutes, sleep latency averaged 25
minutes, and nocturnal awakenings averaged 1.96. Among the
participants, more than 40% were not usual nappers and the others were
occasional and frequent nappers. Most participants considered that their
overall sleep quality as fairly or very good. In addition, mean scores for
indicators of quality of wakefulness were above 6 on Likert scales.

Correlational analyses indicated that sleep patterns, quality of
sleep and quality of wakefulness were related to sleep satisfaction.
Sleep satisfaction was highly related to the total amount of sleep, the
number of awakenings, the depth of sleep, and the overall quality of
sleep. Sleep satisfaction was moderately related to sleep latency,
movement perceived during sleep, restfulness upon awakening, and
restfulness, alertness, and wakefulness during the day.

Several significant relationships between variables depicted in the
model of sleep satisfaction were found. Symptoms of depression,
anxiety, the number of illnesses, and the number of drugs used were
significantly related to sleep satisfaction. However, hierarchical
regression analyses indicated that only depression was significantly
associated with sleep satisfaction.
I would like to express my gratitude to the people who supported me throughout this endeavor. Special thanks are given to Dr. Diana Morris of the Frances Payne Bolton School of Nursing for chairing my dissertation committee and for her inspiration, encouragement, and guidance. I am grateful to the members of my dissertation committee, Drs. May Wykle, JoAnne Youngblut, and Kingman Strohl, for sharing their knowledge and helping me refine the study. Moreover, I want to thank Jeff Jacobson for his invaluable assistance in data collection.

I am very grateful to the participants for their time, effort, and interest in completing the interview. Without them the study would not have been possible to complete. I would like to thank the Golden Age Centers of Greater Cleveland for assisting in the recruitment of participants. I am especially grateful to the associate director, Carolyn Caldwell, and the managers for their support and assistance. I also want to acknowledge the Alumni Association of Frances Payne Bolton School of Nursing of CWRU and Alpha Mu Chapter of Sigma Theta Tau International for their financial support for this study. Finally, I want to extend my thanks to my parents, my sister, and my friends for their support and understanding.
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INTRODUCTION

**Purpose**

The purpose of this descriptive correlational study was (1) to explore different aspects of sleep found to be most important to understand sleep satisfaction and (2) to identify behavioral and health factors associated with sleep satisfaction among older adults living in the community. Whereas most researchers have previously studied quantitative aspects of sleep in laboratories, this study explored sleep satisfaction of older adults in natural settings. The sleep satisfaction model used for this study was constructed on the basis of Webb’s (1988) theoretical model on sleep and prior theoretical and empirical considerations in congruence with Henderson’s (1966) nursing perspective of human beings. This chapter introduces the problem, the significance for nursing, the conceptual framework, and the research questions.

**Statement of the Problem**

Sleep is a complex phenomenon in which every human being spends about one third of his/her life. Sleep is a basic and vital need for all individuals. Whereas the need to sleep is a requirement essential to a person’s health and well-being, sleep deprivation is associated with
fatigue, higher level of anxiety, irritability, sensitivity to pain, reduced protein synthesis, and immunosuppression (Chuman, 1983; Horne, 1985; Naitoh, 1976). Individuals who complain about their sleep at night often also complain of being drowsy during the day and being impaired in their ability to function (Addison, Thorpy, & Roth, 1987; Gottlieb, 1990). In addition, among older individuals living in the community, complaints about sleep (difficulty falling asleep, maintaining sleep or waking too early) are associated with a larger relative hazard for mortality and nursing home placement (Pollak, Perlack, Linsner, Wenston, & Hsieh, 1990).

Problems related to sleep are a concern among the older population. With advancing age, a larger proportion of subjects report insomnia, trouble getting to sleep and staying asleep, daytime drowsiness, and the use of sleeping pills (Bixler, Kales, Soldatos, Kales, & Healey, 1979; Gottlieb, 1990; Karacan et al., 1976; McGhie & Russell, 1962; Mellinger, Balter, & Uhlenhuth, 1985; Thornby et al., 1977). It is estimated that the prevalence of various types of sleep disturbances in the older population living in United States range from 20% to 48% (Bixler et al., 1979; Ford & Kamerow, 1989; Karacan, Thornby, & Williams, 1983; Klink & Quan, 1987; Morgan, Dallosso, Ebrahim, Arie, & Fentem, 1988a).
In addition to the higher prevalence of insomnia in aged people, the use and the misuse of benzodiazepines and other hypnotics cause considerable concern for the health of older individuals. While the risk factors associated with the use of hypnotic drugs are well known, they remain among the most commonly prescribed drugs for older adults (Nolan & O’Malley, 1987; Weedle, Poston, & Parish, 1990). Recent estimates suggested that between 9% to 18% of individuals aged 65 years and over, used hypnotic drugs (Karacan et al., 1976; May et al., 1982; Morgan, Dallosso, Ebrahim, Arie, & Fentem, 1988; Morgan, Healey, & Healey, 1989). Older individuals use hypnotics more than twice as much as younger individuals (Lugaresi et al., 1983). Although most hypnotic drugs are considered ineffective after two weeks of use (Committee of the Review of Medicines, 1980; Kales, Bixler, Tan, Scharf, & Kales, 1974), the prevalence of long term hypnotic use reaches 73% of the elderly users (Morgan et al., 1988b).

In addition to the unwanted behavioral effects known to be directly related to the pharmacological properties of hypnotics (residual sedation, rebound phenomena, dependence, and daytime withdrawal), the long term use of sleep medication compromises health status (Morgan, 1983). Guilleminault (1985) suggested that regular use of hypnotics results in depression of the central nervous system, which
adversely affects ventilation during sleep and may increase sleep disturbances. Furthermore, investigators (Kripke, Simons, Garfinkel, & Hammond, 1979; Kripke & Garfinkel, 1984) have suggested the existence of complex sleep, health, and drug interactions, which may result in higher mortality among sleep medication users.

To promote sleep satisfaction, reduce the overuse of hypnotics, increase daytime functioning and higher level of well-being, nurses need first to explore factors related to sleep satisfaction. While nursing authors (Ebersole & Hess, 1990; Johnson, 1985; Muncy, 1986) advocate the practice of exercise, relaxation, bedtime routines, and reduced use of caffeine to promote sleep, no systematic studies have been done to determine whether or not those strategies are associated with sleep satisfaction. Thus, little is known about the factors associated with sleep satisfaction.

**Significance to Nursing**

The most important concern of nursing is to "maintain and restore the client's independence in the satisfaction of his fundamental needs" (Adam, 1991, p.12). "The unique function of the nurse is to assist the individual, sick or well, in the performance of those activities contributing to health or its recovery (or peaceful death) that he would perform unaided if he had the necessary strength, will or knowledge. And to do
this in such a way as to help him gain independence as rapidly as possible." (Henderson, 1966, p.15). The client is considered independent when he/she has the necessary strength, will or knowledge to satisfy his/her own fundamental needs without relying on help from another. Each fundamental need, including the need to sleep, is a requirement or necessity essential to the person’s "completeness" or "wholeness" (Henderson, 1966). An individual is not complete unless he/she satisfies his/her fundamental needs or requirements. "A need that the client cannot himself satisfy calls for an intervention by the nurse who, concentrating her attention on complementing and supplementing strength, will, and knowledge, attempts to satisfy the need in order to maintain the client’s wholeness" (Adam, 1991, p.15).

Sleep has long been recognized in nursing as a fundamental and basic need for all human beings, young and old (Ebersole & Hess, 1990; Henderson, 1966; Nightingale, 1969). Moreover, sleep has been identified explicitly in several conceptual models as an important phenomenon of concern for nursing (Abdellah, 1957; Henderson, 1966; Orem, 1985; Roy, 1984). Whereas the need to sleep is universal, it can vary greatly among individuals and within the same individual during different periods of his/her life. Because the need to sleep is a personal and subjective experience to the individual, the degree to which this
need is satisfied is important to examine. Consequently, exploring aspects of sleep found to be the most important to understand sleep satisfaction is fundamental to the discussion.

In the literature, sleep satisfaction is expressed in terms of sleep patterns, quality of sleep, and quality of wakefulness. The evaluation of sleep satisfaction captures to what extent individuals perceive that their sleep is adequate for them. Sleep satisfaction is a cognitive and subjective experience resulting from a judgment about sleep. Several authors (Goldson, 1981; Regestein, 1980, Webb & Campbell, 1980), have suggested that both quantitative and qualitative aspects of sleep are important in evaluating sleep satisfaction.

Whereas sleep satisfaction is an overall subjective evaluation of sleep; sleep patterns, quality of sleep, and quality of wakefulness refer to more specific aspects of sleep. Sleep patterns refer to the individuals’ report of their time asleep during a 24 hour period. Quality of sleep and quality of wakefulness refer to more qualitative aspects of sleep and wakefulness. Sleep and wakefulness coexist in a circadian cycle and are dependent of one another. In this respect, the subjective quality of sleep cannot be assessed without considering the quality of wakefulness. In evaluating sleep, individuals evaluate the quality of their wakefulness period as an indicator of their quality of sleep.
Researchers have indicated that changes in patterns of sleep are part of the normal aging process and may contribute to higher risk of insomnia for older adults (Bliwise, 1993; Miles & Dement, 1980). While knowledge of changes in sleep patterns for the aged are important, the critical issue is whether or not sleep patterns are important in understanding sleep satisfaction. It is taken for granted that changes in sleep patterns are associated with sleep satisfaction. However, previous research have focused on sleep patterns with little consideration for sleep satisfaction.

In spite of the recognized nursing concern about sleep, theoretical knowledge has not been developed and tested to identify factors contributing to sleep satisfaction. Views on the factors promoting or disturbing sleep are largely based on assumptions and beliefs rather than research. While nursing authors (Clark, 1985; Ebersole & Hess, 1990; Hoch & Reynolds, 1986; Lerner, 1982; Muncy, 1986; Schirmer, 1983) have suggested interventions to promote sleep, no systematic studies have been done to determine whether or not these strategies are associated with sleep satisfaction. As a result, it is not known with any degree of certainty which factors are actually associated with sleep satisfaction and which strategies are effective in helping individual’s sleep satisfaction.
It is clinically important to establish what factors contribute to sleep satisfaction and thus enhance the experience of sleep. The field of nursing faces serious gaps in theoretical knowledge needed for sound clinical practice. A better comprehension of perceived satisfaction with sleep in older adults can provide a basis for nursing actions that will support and enhance sleep satisfaction. Furthermore, identifying sleep promoting behaviors that help older adults increase sleep satisfaction may eventually reduce the overuse of pharmacological interventions, increase the quality of daytime functioning, and ultimately promote health and enhance well-being.

Studies of sleep have been done using mainly physiological perspectives, with little consideration for sleep satisfaction and factors that might influence sleep satisfaction. Over the years, investigators (Adam & Oswald, 1977; Moruzzi, 1973; Oswald, 1970; Webb, 1988) have proposed many theories of sleep function that explained sleep as a restorative or adaptive process. However, none of these perspectives on sleep have provided an adequate description of sleep as a subjective experience. Whereas functional theories contribute to understanding sleep as a physiological process characterized by different stages during which different biological mechanisms occur, the usefulness of these theories is limited for the purposes of nursing.
A theoretical conceptualization of sleep should be consistent with the basic philosophical stance reflected in contemporary nursing thoughts. To be useful to nursing, sleep has to be understood not only as a biological process but also as a personal and subjective experience. Therefore, research is needed to develop specific theories about sleep and sleep satisfaction, which can guide nursing theory development for nursing practice. In this study, sleep is conceptualized more specifically within Henderson’s perspective. However, Henderson’s model for nursing does not suggest specific relationships between sleep and other concepts. Therefore, a theoretical framework was synthesized from the literature on sleep in agreement with Henderson’s philosophical assumptions.

**Organizing Framework**

Several theories of sleep are presented in the literature with varying degrees of overlap and contradictions. Recently, Webb (1988) proposed an objective behavioral model of sleep, which is compatible with the restorative and adaptive views of sleep. Webb’s model includes behavioral, adaptive, and restorative components. Webb’s new theory of sleep takes into consideration three intervening variables: sleep demand, circadian rhythms, and behavioral facilitators and inhibitors. In addition to the three intervening variables, Webb’s objective behavioral
model of sleep includes four modulators that consist of species
differences, developmental stages, organismic states, and individual
differences. Webb argued that in measuring the three intervening
variables and knowing the modulators, it could be possible to predict
with some accuracy sleep onset, sleep structure, sleep termination, and
subjective responses of sleep.

Although Webb’s theoretical model is a meaningful contribution to
the sleep literature, its usefulness for nursing is limited. Indeed, the
degree of specificity in which the relationships are explained gives little
guidance to the explanation of sleep satisfaction. Moreover, the sleep
variables are not clearly defined and the way in which the concepts are
linked is not specified. Therefore, the theoretical model of sleep
satisfaction for this study was constructed not only on the basis of
Webb’s model but also on prior theoretical and empirical work in
congruence with Henderson’s philosophical assumptions. One issue that
is important is the lack of a comprehensive framework to conceptualize
and measure sleep satisfaction. The model for this study represents a
tentative explanation of sleep satisfaction. Major concepts embodied
within this model are health, behavioral factors, and sleep satisfaction.
The model is depicted in figure 1.
Figure 1. Sleep Satisfaction Model
Conceptual Definitions of terms

Sleep is defined as a period of altered state of consciousness and diminished responsiveness to external stimuli occurring during a 24 hour period and usually characterized by eyes closed, slowed respiration, and reduced body mobility. Moreover, sleep is a multidimensional process that is part of the continuous cyclical change in level of consciousness. Sleep occurs when the subject considers himself/herself to be unaware of his/her surroundings.

Wakefulness is defined as a period of higher level of consciousness and vigilance occurring during a 24 hour period; when the individual considers himself/herself to be aware of his/her thought, sensation and movement. Wakefulness is the period of the day in which the individual carries out activities of daily living and assumes an active posture with eyes open.

Sleep satisfaction is the degree to which the need to sleep, as perceived, is fulfilled. Sleep satisfaction is a global concept, which represents an overall evaluation of the experience of sleep.

Sleep patterns refer to the time spent asleep during a 24 hour period. In this study, sleep patterns are reported as perceived by the individual in terms of time for going to bed; time required to fall asleep;
total sleep time; numbers of awakenings; time of morning awakening; and daytime sleep.

Quality of sleep is the essential character of sleep perceived by the individual. Quality of sleep is a cognitive, judgmental experience about a person’s perception of sleep (soundness of sleep, perception of movement during sleep and general assessment of quality of sleep).

Quality of wakefulness is the essential character of wakefulness perceived by the individual. Quality of wakefulness is a cognitive, judgmental experience about a person’s perception of wakefulness (feeling of being rested and refreshed upon awakening and during the day, perception of alertness and wakefulness versus sleepiness and drowsiness during the day).

Research Questions

If nurses are to effectively intervene with elders experiencing insomnia, it is critical that nursing research be conducted to explore the respective dimensions of sleep satisfaction and to identify behavioral and health factors associated with sleep satisfaction among older adults living in the community. The following research questions will be addressed:

1. What are the older adult’s perception of sleep satisfaction, sleep patterns, quality of sleep, and quality of wakefulness?
2. What are the relationships between sleep satisfaction and sleep patterns, quality of sleep and quality of wakefulness?

3. What behavioral and health factors are associated with perceived sleep satisfaction in older adults living in the community?

4. What behavioral and health factors are associated with perceived sleep satisfaction while controlling for age and gender in older adults living in the community?
CHAPTER II

REVIEW OF THE LITERATURE

The following review of the literature focuses on the concept of sleep satisfaction and related concepts such as sleep patterns, quality of sleep, and quality of wakefulness. Conceptual definitions and empirical investigations are reviewed for the concepts of interest. The different concepts of sleep are reviewed in relationship with health and behavioral factors. Additionally, the studies of sleep conducted in the nursing discipline are reviewed briefly.

Conceptualizations of Sleep

In common language, sleep is defined as "the natural periodically recurring physiological state of rest, characterized by relative physical and nervous inactivity, unconsciousness, and lessened responsiveness to external stimuli" (The American Heritage Dictionary, 1990). Anch, Browman, Mitler, and Walsh (1988) defined sleep as a recurring state of existence characterized by reduced interaction with the environment, lowered motility and muscular activity, and partial or complete suspension of voluntary behavior and consciousness. Investigators have addressed the concept of sleep mainly with a mechanistic and physiological perspective.
Within the physiological view, sleep is considered a complex biological rhythm characterized by cyclical changes in levels of brain activity associated with some physiological processes (Hoch & Reynolds, 1986; Horne, 1983; Lentz & Killien, 1991; Rechtschaffen & Kales, 1968). Sleep is considered to be a physically inactive part of the circadian sleep-wake-activity cycle, and is characterized by cyclical changes in the electroencephalogram (EEG) and other physiological parameters (Webb, 1983). Once considered as a passive phenomenon, sleep is now regarded as an active and complex process. Whereas Berger (1929) was the first to demonstrate the electrical activity of the human brain with EEG, Loomis, Harvey, and Hobart (1936) were the first to describe and classify five stages of sleep based on different EEG patterns. Consequently, Aserinsky, and Kleitman (1953) recorded rapid-eye-movement (REM) associated with the fifth stage of sleep. Sleep is now polygraphically defined according to the standardized criteria for sleep stages for human subjects provided by Rechtschaffen and Kales (1968). Sleep is characterized by two distinct stages: non-rapid-eye-movement (NREM) sleep, also called orthodox, quiet, or slow wave, and REM sleep, also called paradoxical sleep. NREM sleep is further divided into four stages.
Stage I is defined by a low voltage, mixed frequency EEG with a prominence of activity in the two to seven cycles per second occipital alpha rhythm and occurs most often as the transition from wakefulness and other sleep stages. Stage 2 is the first stage of sleep in which sleepers perceive themselves to be asleep and is defined by the presence of sleep spindles and K complexes. Stages 3 and 4 are defined as waves of greater amplitude, delta waves, and intervals of higher frequency and are considered deeper levels of sleep. REM sleep usually follows Stage 4 and is characterized by low voltage and mixed frequency EEG activity. REM sleep is characterized by rapid, jerky, and binocularly symmetrical eye movements, muscle tone changes, and the experience of vivid dreaming. During one cycle of sleep, an individual progresses through the NREM and REM stages. An individual spends about 90 minutes in each cycle and five to six cycles appear usually during an eight-hour period (Rechtschaffen & Kales, 1968).

Assessment of physiological and biochemical aspects of sleep have resulted in substantial knowledge about sleep stages and concomitant physiological mechanism. A major contribution in sleep research was the standardization of terminology, techniques, and scoring procedures for the assessment of sleep stages. The amount of sleep spent in each stage, the total sleep time, the number and the duration of
awakenings, and the quality of the brain waves are generally used to
describe sleep. Although the polysomnograph is the most accurate
instrument to measure sleep stages, this method offers few indications of
how individuals perceive their sleep and if they are satisfied with their
sleep. Polygraphic recording cannot be taken as the only criterion of
satisfying or not satisfying sleep; therefore additional indicators have to
be considered. Moreover, with polysomnograph records, the researcher
has no indication of whether an individual has fulfilled the need to sleep
and if the amount of sleep a person obtains is adequate.

More holistic conceptions have defined sleep as a
multidimensional process that is cyclical, reversible, and characterized by
a decline in the level of consciousness (Fontaine, 1989; Johnson, 1991a;
Lamb, 1982). Hayter (1983, p. 243) described sleep "as the period of
time in which the subject considered himself to be unaware of his
surroundings" (Hayter, 1983, p. 243). Periods of unawareness are,
however, only partial. It seems that awareness of external environmental
events is rather reduced than absent during sleep. Some environmental
interactions can be remembered only if the sleeper is immediately
awakened whereas specific stimulus can be remembered the next
morning. The common thread that prevails in defining sleep in the
scientific literature is the lowered level of consciousness experienced
during sleep. Indeed, an individual cannot experience sleep if he has a high level of cortical vigilance.

Sleep is an elusive, intangible phenomenon that we believe exists because we experience it through our senses. Sleep appears real to the senses, regardless of whether its underlying existence and basic mechanism are not understood. Until now, researchers have inferred the existence of the phenomenon through individual experiences and behavioral consequences. Subjective experience about one’s sleep is usually the basis on which clinical evaluations of sleep habits and sleep disorders are developed. Therefore, sleep satisfaction has to be considered as it is experienced by older individuals.

Sleep Concepts

Sleep patterns usually refer to the time structure surrounding sleep. Objectively, sleep patterns are described in terms of stages and measured with polysomnograph. Subjectively, sleep patterns are self reported and are described in terms of time for going to bed; time required to fall asleep; total sleep time during the night and during the day; total time in bed; number and duration of awakenings; time of morning awakening; and time out of bed.

Quality of sleep is not clearly defined in the literature. Quality of sleep varies widely and typically involves data from interviews or
nonspecific questions that are not always comparable across studies.
Characteristics defining quality of sleep usually include subjective
assessment of sleep depth and movement during sleep, dream recall, and
the general assessment of quality of sleep as considered good or poor by
the sleeper (Baekeland & Hoy, 1971; Buysse, Reynolds, Monk, Berman,
& Kupfer, 1989; Domino, Blair, & Bridges, 1984; Ellis et al., 1981;

Quality of wakefulness, which can affect sleep satisfaction, is a
cognitive experience about a person’s perception of wakefulness.
Whether or not physiologic sleep is considered as part of a universal
circadian rhythm, sleep and wakefulness coexist and are dependent upon
one another. In this respect, the subjective quality of sleep cannot be
judged without considering the quality of wakefulness. In evaluating
sleep, individuals do not only make a subjective evaluation of their sleep
but also evaluate the quality of their wakefulness period as a indicator of
their quality of sleep. Sleepiness and alertness are generally viewed as a
function of the circadian cycle and of prior sleep and wakefulness
(Dement & Carskadon, 1982). Therefore, the perception of sleep and
wakefulness are interdependent in evaluating sleep satisfaction; a good
night’s sleep is associated with a good day’s wakefulness. The
subjective feeling of whether individuals define themselves as good or
poor sleepers depends on the perception they have of their sleep and their wakefulness.

Consequences of interrupted sleep are daytime sleepiness and drowsiness, difficulty in waking up in the morning, not feeling rested by sleep, and daytime fatigue (Dinges, 1989; Domino et al., 1984; Liljenberg, Almqvist, Hetta, Roos, & Agren, 1988; Snyder-Halpern & Verran, 1987). Daytime symptoms that indicate poor sleep also include loss in the ability to stay alert, to resist fatigue, to maintain physical stamina, and to apply the rapid judgment needed in changing situations (Bahr, 1983). Quality of wakefulness is characterized by the perception of restfulness upon awakening and during the day, and the perception of alertness and wakefulness during the day.

Sleep satisfaction is a concept used in the literature but its meaning is inferred rather than verified. Examination of the meaning of sleep satisfaction of older persons is conspicuous by its absence in the literature. Sleep satisfaction has not been explored systematically in research as a global concept. There is a need for conceptual clarification of what exactly is meant by sleep satisfaction for the older population, and assessment of the appropriate domain of the concept. Sleep satisfaction is usually assessed by asking the question "How satisfied are
you with your sleep?” Dimensions of sleep satisfaction congruent with the individual’s meaning need to be assessed.

It is usually taken for granted that older adults’ sleep patterns are the best indicator of sleep satisfaction. Although investigators inferred that sleep patterns, quality of sleep, and quality of wakefulness are indicators of sleep satisfaction, this has not been explored systematically. Therefore, research is needed to enhance our comprehension of sleep as a subjective experience.

Theories of Sleep

A number of theories have been proposed to explain the nature and the function of sleep throughout the years. Many centuries ago, peculiar theories of sleep explained the phenomenon either as a kind of anemia and brain congestion, or as the result of evaporation of nutritive material and the ascendency of heated matter (Kleitman, 1939). Nowadays, several theories of sleep are presented with varying degrees of overlap and contradictions. However, common ideas regarding sleep lead to two major positions: the restorative and the adaptive theory. The restorative theory proposes that sleep promotes physiological processes, which rejuvenate the body and the mind (Hartmann, 1978; Moruzzi, 1973; Oswald, 1970). The restorative theory of sleep holds that wakefulness causes a depletion of some biochemical substances
that cause sleep to occur (Daan, Beersma, & Borbély, 1984). According to the restorative theory of sleep, NREM sleep is associated with body tissue restoration whereas REM is related to brain tissue restoration. Stages 3 and 4 are believed to be necessary for basic biological processes such as tissue repair, recovery from fatigue, and growth (Baekeland & Lasky, 1966; Shapiro, Griesel, Bartel, & Jooste, 1975; Takahashi, Kipnis, & Daughaday, 1968). REM sleep has been linked with thermoregulation and restorative functions of the brain (Hartmann, 1978; Horne, 1983, 1985).

In agreement with the restorative view of sleep, Daan and colleagues (1984) argued that the restorative process of sleep and circadian principles would be appropriate to explain sleep. The model for the timing of human sleep proposes that sleep is controlled by a "circadian pacemaker": an endogenous timing system that can determine sleep. The model is based on a sleep-regulating variable (S), possibly associated with a neurochemical substance, which increases during wakefulness and decreases during sleep. Sleep onset is initiated when S reaches an upper threshold (H) and awakening occurs when the lower threshold is reached (L).

The adaptive theory explains sleep as a behavior that enhances survival (Medis, 1977; Webb, 1974). The primary postulate of the
adaptive theory of sleep is that survival requires periods of "qualitatively minimal behavioral engagement with the surround" (Webb, 1974, p. 1023). Secondly, sleep is an active process controlling the behavior of the animal, resulting in minimal behavioral engagement or a state of nonresponding. The search for food and the position on the predatory hierarchy of the particular species are primary correlates of sleep behaviors. Supports for the adaptive theory come from observation of different species. For instance, animals with few natural predators and which have little need for activity, sleep as much as 15 hours a day.

Consequently, Webb (1988) developed the objective behavioral theory of sleep as an attempt to reconcile the differences between the two preceding theories. Webb's model includes behavioral, adaptive, and restorative components. The components of the objective behavioral theory of sleep consist of intervening, modulating, and dependent variables.

Webb's theory takes into consideration three intervening variables: sleep demand, circadian tendency, and behavioral facilitators and inhibitors. According to Webb, sleep demand is the amount of time the individual is awake preceding sleep. Sleep demand is a time variable and does not include activity or behavior within that time. The circadian tendency is the time of occurrence of sleep within a twenty-four hour
cycle. Behavioral facilitators and inhibitors are behaviors which make sleep more or less likely to occur. Behavioral facilitators and inhibitors are complex and include such things as environmental conditions and stress level. For instance, sleep responses may be facilitated by relaxation and may be inhibited by noises.

The intervening variables are modulated by four additional variables. These four modulating variables are species differences, developmental stages, organismic states, and individual differences. The modulating variables affect the intervening and dependent variables. The variables modulated by species differences are diurnal placement, intermittency, and total amount of sleep (Webb, 1974). Developmental stages also modulate sleep. Sleep behavior changes with different periods of life, for example, infants sleep a greater proportion of the 24 hour cycle than adults. Organismic states are the physiologic conditions related to sleep such as sleep apnea, nocturnal myoclonus, and pain. Individual differences are related to the specific need of each individual for sleep (Webb, 1988). Some individuals require as little as five hours of sleep to function well, while others require more than the average eight hours.

Sleep behavior is the dependent variable and consists of sleep onset, sleep termination, sleep structure (sleep stages and continuity of
sleep), and "subjective sleep-related responses subsequent to sleep (sleep evaluations) and within sleep (dream reports, cognitions, and thresholds)" (Webb, 1988, p.492). Webb argued that in measuring the three intervening variables and knowing the modulators, it is possible to predict with some accuracy sleep behavior. Even though the objective behavioral model could predict with some accuracy sleep behavior, the model provides little guidance to the explanation of sleep satisfaction.

**Sleep of Older Adults**

**Age Related Changes**

Age related changes in sleep patterns have been well documented in the literature. In adults, the first stage of NREM sleep, which is a transitional phase between wakefulness and sleep, usually represents 5% of the total sleep time (TST) (Agnew & Webb, 1968; Feinberg, Koresko, & Heller, 1967; Kales et al., 1967). According to most laboratory studies using electroencephalograph (EEG) apparatus to measure sleep, older persons tend to have an increase in the proportion of light sleep, Stage 1 (Agnew, Webb, & Williams, 1967; Hayashi & Endo, 1982; Kales et al., 1967; Reynolds et al., 1985). Researchers reported that older individuals usually spend as much as 8% to 16% of their TST in the first stage (Agnew et al., 1967; Hayashi & Endo, 1982; Reynolds et al., 1985).
The second stage of NREM sleep is the first distinct stage of sleep and represents usually 50% of the TST of an adult (Kales et al., 1967; Rechtschaffen & Kales, 1968). Although most investigators reported no change in the second stage of sleep with aging (Reynolds et al., 1985; Webb, 1982), some investigators reported increases (Hayashi & Endo, 1982).

The most easily recognized age related change in EEG sleep is the progressive reduction in slow wave sleep, Stage 3 and 4 (Bliwise, 1993). Whereas some researchers (Hayashi & Endo, 1982) reported a decrease in Stage 3 among healthy elders compared to younger adults, others (Kales et al., 1967) reported no change in the amount of Stage 3 with aging. However, most investigators agreed that Stage 4 is reduced and sometimes absent in aged subjects (Agnew et al., 1967; Hayashi & Endo, 1982; Webb, 1982).

In young adults, REM sleep represents 20% to 25% of TST and appears in greater proportion in the last period of the night (Agnew et al., 1967; Hayashi & Endo, 1982; Kales et al., 1967; Reynolds et al., 1985). In older adults, the duration of REM periods tends to increase during the first half of the night and decrease during the last part of the night (Hayashi & Endo, 1982; Reynolds et al., 1985). Disagreement exists regarding whether or not the proportion of nocturnal sleep spent in REM
sleep varies with aging. Many investigators have reported data indicating that REM percentage does not vary significantly with aging (Agnew et al., 1967; Reynolds et al., 1985; Webb, 1982), but other investigators have indicated a lower percentage of REM especially in adults older than 85 years of age (Hayashi & Endo, 1982; Kahn & Fisher, 1969; Kales et al., 1967; Prinz, 1977).

Whereas the measurement of different sleep stages relies solely on EEG apparatus, sleep patterns are measured by both polysomnograph and self-report. Changes in sleep patterns of older adults are described in terms of number and duration of awakenings, sleep latency, total sleep time (TST), total time in bed (TIB), sleep efficiency, and daytime sleep.

One well established age related change in sleep patterns is increased awakenings after sleep onset. Prospective studies (Karacan et al., 1976; McGhie & Russell, 1962), which are consistent with EEG studies (Hayashi & Endo, 1982; Kales et al., 1967; Webb, 1982), suggested that an increase in both the number and duration of awakenings was associated with aging. The number of awakenings reported by investigators in different studies range from 0 to 21 in the older adult population (Hayter, 1983; Hayashi & Endo, 1982; Reynolds et al., 1985; Webb, 1982). Older sleepers tend to awake more often and for longer periods of time during the last part of the night; the period
associated with lighter sleep (Feinberg et al., 1967; Kales et al., 1967). Older persons experience more awakenings than younger persons and this may affect their satisfaction with sleep.

Sleep latency is the time from the moment the sleeper first attempts sleep to the actual onset of sleep. Investigators reported increased or unchanged sleep latency associated with aging (Agnew & Webb, 1968; Bixler et al., 1979; Feinberg et al., 1967; Hayashi et al., 1982; Prinz, Obrist, & Wang, 1975). Hayter (1983) reported an average of 35 minutes of sleep latency perceived by older adults 65 years of age and older but no significant differences were found between younger and older cohorts.

According to researchers, total sleep time (TST) remains about the same with aging (Feinberg et al., 1967; Prinz et al., 1975). Kripke and colleagues (1979) suggested that the most commonly self reported sleep duration is 7 to 9 hours among all age groups (over 18 years of age). Few subjects reported less than 3.5 hours of TST, whereas some subjects reported as much as 10.5 hours of sleep a night. Studies have reported great differences in TST between individuals young and old and, as a result, no normative patterns can be established for either younger and older adults.
While TST remains about the same with aging, TIB is significantly greater in older subjects (Feinberg et al., 1967; Hayter, 1983; Kales et al., 1967). Because older individuals spend more time awake during their sleep, they spend considerably more time in bed trying to sleep compared to younger adults (Hayter, 1983; Kales et al., 1967). Therefore, sleep efficiency, which refers to the ratio of TST to nocturnal TIB, is reduced with aging (Kales et al., 1967; Prinz et al., 1975). Investigators (Bixler, Kales, Jacoby, Soldatos, & Vela-Bueno, 1984; Kahn & Fisher, 1969; Kales et al., 1967; Prinz et al., 1975) have reported that sleep efficiency ranges between 72% to 87% in older adults.

Age related changes in sleep patterns are not confined to the nighttime. Daytime napping also is considered to be part of the sleeping pattern of many older individuals (Hayter, 1983). Daytime napping appears to increase progressively with advancing age (McGhie & Russell, 1962; Gerard, Collins, Dore, & Exton-Smith, 1978). Hayter (1985) reported that subjects 65 to 74 years of age took significantly fewer naps than subjects 75 years of age and older. Further, 38% of the subjects took a nap at least every day and the average amount of sleep during daytime sleep was 30 minutes (Hayter, 1983). Daytime sleep and longer time in bed suggest a redistribution of sleep patterns across the 24 hour period for older individuals (Bliwise, 1993).
Some changes in sleep patterns are associated with aging. According to most investigators (Hayashi et al., 1982; Kales et al., 1967; Reynolds et al., 1985), older persons tend to have an increase in light sleep, Stage 1, and a decrease of deep sleep, Stage 4. Elders also awaken more often during the night, are awake longer during the night, take more time to fall asleep and have longer time in bed than younger persons. Consequently, the ability to sustain continuous sleep is reduced, sleep is more fragmented, and elders’ sleep distribution during a 24-hour period is changed. A major characteristic of sleep in older adults is the extreme variability among individuals of the same age group (Hayter, 1983; Kripke et al., 1979; McGhie & Russell, 1962; Tiller, 1964). Although there is a certain normative pattern for the aged, the great variability in sleep patterns among all individuals is a factor that makes normal sleep patterns difficult to establish.

Laboratory studies have provided a generous amount of information about the structure of sleep. However, methodological differences among studies make comparison of the results problematic and contribute to discrepant findings. First, most of the studies used small sample sizes making interpretation rather limited to specific groups of older adults probably not representative of the general older population, thus making generalization difficult. Second, most of the
studies mentioned that subjects were healthy physically and mentally but
give no description of criteria for mental and physical health. Third,
protocols for interpreting EEG results were not uniformed among studies.
The standardization of terminology, techniques, and scoring procedures
for the assessment of sleep stages were introduced by Rechtschaffen
and Kales and were not used before 1968. Fourth, epidemiologic reports
of sleep have focused on sleep disturbances and insomnia rather than
normal sleep patterns. As a result, little information is available on
subjective sleep experiences of healthy older adults.

Gender Differences

Most surveys comparing sleep patterns of males and females have
found that females have higher rates of insomnia than males across all
age ranges (Bixler et al., 1979; Hammond, 1964; Karacan et al., 1976;
Karacan et al., 1983; Liljenberg et al., 1988; McGhie & Russell, 1962;
Welstein, Dement, Redington, Guilleminault, & Mitler, 1983). Rediehs,
Reis, and Creason (1990) conducted a meta-analysis of 27 studies
addressing gender differences on 31 indices of sleeping behavior of
persons 58 years of age and older. They reported that older men spend
more TIB, had shorter objective sleep latencies, had fewer awakenings
but spent more time awake after initial sleep, and had less sleep
efficiency than older women. Whereas women tended to have more
disturbed sleep, men were more likely to suffer from sleep disorders such as sleep apnea and nocturnal myoclonus.

Campbell and colleagues (1989) reported also that older women were less satisfied with their sleep than men of the same age. In addition, older women exhibited greater disturbances in sleep, sought medical help, and used hypnotic drugs more often than men of the same age (Karacan et al., 1983; Welstein et al., 1983). Rediehs and colleagues (1990) suggested that both genders suffered increased insomnia with age but older women reported their sleep problems more accurately than older men. Theories of gender differences in sleep are various. Explanations imply biological differences, acquired risks related to gender differences in life-style and health practices, differences in perception and evaluation of sleep, and health care professionals' differential responses to males and females (Rediehs et al., 1990). Therefore, it is important to examine gender differences when studying sleep satisfaction of elders.

**Education and Socioeconomic Status**

In an epidemiologic study, Karacan and colleagues (1983) found that individuals with less than high school education reported having significantly greater sleeping difficulties and more frequent use of hypnotic medication than individuals with at least high school education.
According to some authors (Bixler et al., 1979; Karacan et al., 1976; McGhie & Russell, 1962), insomnia, especially difficulty falling asleep and staying asleep, was more prevalent among individuals of low educational and socioeconomic status. However, recent studies that controlled statistically for symptoms of anxiety and depression found no association between social class, educational level, and insomnia (Morgan et al., 1988a). Other researchers (Hanson & Ostergren, 1987; Partinen et al., 1983) also found no significant differences in insomnia among groups of different socioeconomic status. Higher prevalence of symptoms of depression and anxiety were found in lower educational and socioeconomic status groups (Bixler et al., 1979; Hollingshead & Redlich, 1958; Dohrenwend, 1970) and these symptoms might be associated with a higher prevalence of insomnia in these groups. Furthermore, the results of these studies are difficult to compare and differences in methodologies may explain discrepancies in results.

**Social and Cultural Aspects of Sleep**

If sleep now seems highly relevant to health professionals, until recently very few social scientists studied cultural aspects of sleep. Researchers have consistently viewed sleep as something completely individual, ignoring social aspects. Our knowledge of sleep customs in cultures around the world is limited for this reason.
Although sleep is considered mostly as a physiological process, it is surrounded by social rules (Gleichmann, 1980). Sleep habits are influenced by the sociocultural context in which a person lives. For example, in some European countries, napping in the afternoon is part of the social life and accepted as a normal pattern. In North America, it is rather unusual for working adults to nap in the afternoon. Napping is mostly considered as an activity for young children and older adults.

Luce and Segal (1966) suggested that attitudes and emotions toward sleep probably begin early in a person’s life and are inculcated by the social and cultural context. Among primitive cultures fear is reported to be dominant - fear of the night and its perils, but also fear of sleep itself. Some religious beliefs continue to perpetuate the view of sleep as severing of body and soul and departure from life (Luce & Segal, 1966).

Recently, Domino and colleagues (1985, 1986) investigated older adults sleep in different cultures. They found that elders from Venezuela and Mexico slept longer than the elders from United States. Older Mexicans reported more unpleasant dream motifs than the subjects from Venezuela, United States, and Spain; and older Americans reported more irregularities in their sleep than subjects from Venezuela, Mexico, and Spain (Domino et al., 1986). Although differences were found, Domino suggested that it was premature to consider cultural aspects as causative
factors to explain the obtained differences. Housing styles, differential sharing of sleeping quarters, socioeconomic status, weather factors, and behavioral factors were variables not controlled in Domino's study. These variables could have influenced the results and therefore make comparison among groups difficult. Moreover, the subjects of the study were contacted through educational settings and came from one specific urban area of the three respective countries limiting the generalizability of the findings.

Although these studies reported new information on sleep in different groups of older persons, the results are not sufficient to conclude that sleep is different as a result of cultural contexts. Cross-cultural assessment with a more in depth approach to the cultural and personal contexts that might be related to sleep needs to be addressed. Studies are needed before we can describe the habits, attitudes, and qualities of all mankind's sleep.

**Sleep Complaints**

Insomnia is usually considered to be a complaint rather than a disorder (Anch et al., 1988). Coates and Thoresen (1978) defined insomnia as a complaint denoting various experiences of poor sleep. Salin-Pascual and colleagues (1992) considered insomnia as a subjective evaluation of poor sleep with no polysomnographic evidence of sleep
disturbance. Transient insomnia is a sleep disturbance that lasts one to several nights; short term insomnia lasts several nights to a month and is usually associated with a more persistent stressful situation; and persistent insomnia lasts a month or more and may be associated with various disorders (Walsh, Hartman, & Kowall, 1994).

Estimates of the prevalence of sleep complaints in the general population living in United States vary from 5.5% to 38% (Bixler et al., 1979; Hartmann, 1978; Karacan et al., 1976, 1983; Kripke et al., 1979; Regestein, 1980). Epidemiological studies have documented that significantly more older adults report insomnia than younger adults (Bixler et al., 1979; Karacan et al., 1976, 1983; McGhie & Russell, 1962; Mellinger et al., 1985). The prevalence of at least one type of insomnia in the older population range from 20% to 48% (Bixler et al., 1979; Karacan et al., 1979; Karacan et al., 1983; McGhie & Russell, 1962; Mellinger et al., 1985).

Estimates of insomnia are somewhat disputable because of different formulations of questionnaires and various definitions of insomnia, ranging from the mention of one to several sleep difficulties. Although insomnia is considered as a subjective experience of poor sleep, different operational definitions of insomnia make interpretation of
the results difficult. Differences in the socioeconomic characteristics of samples may also contribute to inconsistent results.

Nevertheless most survey findings have indicated that with advancing age, larger proportions of subjects report insomnia, trouble getting to sleep and staying asleep, and sleeping pills consumption (Bixler et al., 1979; Karacan et al., 1976; McGhie & Russell, 1962; Mellinger et al., 1985; Thornby et al., 1977). When compared to younger adults, older adults reported longer sleep latencies, shorter TST, longer TIB, and greater daytime somnolence and drowsiness (Dement, Miles, & Carskadon, 1981; Morgan et al., 1989). Some of these sleep problems are reported to be associated with actual psychological and physiologic problems (Bixler et al., 1979; Karacan et al., 1983; Lugaresi et al., 1983; Morgan et al., 1988a, 1989). When older individuals are sleep deprived, they may exhibit symptoms of fatigue, headache, visual disturbances, poor concentration, apathy, and problems with musculoskeletal coordination (Anch et al., 1988).

Many changes occur in sleep as a function of aging, but it is not known if these changes are associated with lower satisfaction with sleep (Bonnet & Rosa, 1987). Older persons may or may not consider themselves to be insomniacs although their normal sleep patterns have changed over time. Moreover, the reasons why older individuals are
particularly prone to sleep complaints are complex and not easily understood. For instance, increases in sleep fragmentation and Stage 1 sleep, both of which usually indicate less restful sleep, are seen in sleep laboratory studies of older individuals without sleep complaints (Webb, 1982; Williams, Karacan, & Hursh, 1974).

There is a need for conceptual clarification of what exactly is meant by insomnia for older persons. Research is needed to enhance our comprehension of sleep satisfaction and when it is considered insomnia by older individuals. Moreover, factors related to insomnia and to sleep satisfaction in older persons must be sought. Physical illnesses, emotional stress, and sleep medications have been implicated as contributing to insomnia in the older individuals (Colling, 1983).

**Sleep and Health**

**Physical Health and Physical Symptoms**

Most of the sleep changes occurring with aging are a normal consequence of aging. An issue underlying studies on sleep changes is whether poor sleep represents a function of aging or the contribution of other age related diseases or chronic health conditions. The increased incidence of health problems associated with aging may predispose older adults to more frequent and severe insomnia (Morin & Gramling, 1989).
Gislason and Almqvist (1987) reported that when somatic diseases were controlled, some types of insomnia complaints showed no age related increase. Investigators (Bliwise, King, Harris, & Haskell, 1992; Prinz, Williams, & Vitiello, 1990) have suggested that only a small proportion of older healthy adults report sleep disturbances. Bliwise and colleagues (1992) found that the prevalence of self reported trouble falling asleep (below 3%), trouble awakening and returning to sleep (below 5%), and regular use of hypnotic medication (below 3%) were lower than earlier studies of individuals with comparable ages. Bliwise and colleagues argued that when overall physical health factors are taken into account, a higher prevalence of insomnia is not necessarily a component of the normal aging process.

It is estimated that two-thirds of those over 65 have one chronic disease, and approximately 50% have multiple chronic conditions (Colling, 1983). The increase incidence of health problems with aging increases the likelihood of insomnia. Several illnesses are known to be closely associated with sleep problems. However, the extent to which sleep disturbances are the result or cause of these problems is unclear. Among health problems associated with changes in insomnia are myocardial infarction (Partinen, Putkonen, Kaprio, Koskenvuo, & Hilakivi, 1982), congestive heart failure (Dark et al., 1987), multi-infarct dementia
(Erkinjuntti et al., 1987), chronic obstructive pulmonary disease (Klink & Quan, 1987), arthritis (Moldofsky, Lue, & Saskin, 1987), urinary incontinence (Swearengin, Drachman, O’Donnel, & Mitchell, 1988), and Alzheimer’s disease (Erkinjuntti et al., 1987; Mennuni, Petrella, & Masullo, 1991). Hypertension, obstructive pulmonary disease, diabetes, rheumatic disease, and obesity are also among common conditions that have been found to interfere with sleep in the elders (Gislon & Almqvist, 1987). The incidence of health problems in the aged population can substantially alter sleep satisfaction (Collings, 1983).

Bixler and colleagues (1979) reported that individuals complaining of insomnia were more prone to experience recurring health problems, reported more multiple health problems, and had been hospitalized more often during the previous year. Indices of physical health status using currently number of prescribed drugs as an indicator, showed that poor sleepers were significantly more likely to be receiving one or more prescribed drugs (Morgan et al., 1989).

In several studies, the severity of sleep problems was positively associated with perceived poor health (Morgan et al., 1988a, 1989; Rodin, McAvay, & Timko, 1988). Morgan and colleagues (1988a, 1989) reported that among old and very old, subjective insomnia was more likely to be reported by older individuals suffering from physical health
problems and those taking a higher number of prescribed medications. Furthermore, perceived poor health status and physical functional limitations were associated with increased sleep latency and decreased feeling of being rested in the morning (Habte-Gabr et al., 1991).

Physical symptoms associated with health problems are factors that might be implicated in insomnia. In an epidemiological study, the most important reasons given for complaints of insomnia among the adult subjects were aches, pain, and other physical symptoms (Lugaresi et al., 1983). Symptoms related to health such as nocturnal pain from arthritis and breathing problems could interfere with both sleep onset and sleep maintenance (Habte-Gabr et al., 1987).

Epidemiological studies used large representative sampling to derive population estimates for poor sleep; however, the vast majority of these studies did not assess physical health. Recently, more interest has been directed to the role of physical health in the complaint of insomnia but few studies have been conducted to evaluate to what degree physical health and sleep are associated. Although the interrelationship between sleep complaints and organic diseases seems to have been established, its significance and nature have not been investigated in depth. The possible contribution of the various psychological and social factors as well as the physical symptoms connected with acute and
chronic illnesses may be important for sleep disorders (Hyypa & Kronholm, 1989).

**Sleep-related Disorders**

Other types of medical conditions have a serious affect on sleep. Sleep apnea is probably one of the most common sleep disorders studied in the scientific literature. The prevalence of sleep breathing disorders is estimated to be between 20% and 37% among adults 65 years and older (Ancoli-Israel et al., 1991; Kripke & Ancoli-Israel, 1983). Problems associated with sleep apnea are more common among elders and particularly older men (Hoch et al., 1990; Kripke & Ancoli-Israel, 1983). Predictors of sleep-disordered breathing are age, sex, body mass index, complaints of insomnia, snoring, and daytime somnolence (Bliwise et al., 1987). Factors such as obesity (Ancoli-Israel, Kripke, & Mason, 1987), consumption of alcohol, and use of hypnotics (Guilleminault, Silvestri, Mondini, & Coburn, 1984; Kripke et al., 1979) appeared to increase the incidence and severity of apneas in older individuals who evidenced at least modest respiratory disturbance during sleep. In severe cases, multiple episodes of sleep-disordered breathing may be accompanied by serious deficits of health such as cardiac arrhythmias, congestive heart failure, depression, and neuropsychological deficits (Kales, Cadieux, et al., 1985; Kales, Caldwell, et al., 1985). Furthermore, in previous
studies, sleep apnea was associated with increased mortality in patients (Ancoli-Israel, Klauber, Kripke, Parker, & Cobarrubias, 1989; Partinen, Jamieson, & Guilleminault, 1988).

Dickel and Mosko (1990) reported that well over 50% of community resident seniors can be expected to have some degree of polygraphically identified sleep apnea or periodic leg movements, or both. Although sleep apnea and periodic leg movements are considered as sleep disorders by sleep specialists, they are not always associated with sleep complaints and excessive daytime somnolence. Despite widespread use in clinical and research settings, the validity of five sleep apnea episodes and five periodic leg movements per hour cut-off in predicting sleep-wake complaints is not supported in Dickel and Mosko (1990) study.

Periodic leg movements is a disturbance in which people experience periodic leg jerks throughout the night. Symptoms include leg kicks, sleep complaints, and excessive daytime sleepiness (Ancoli-Israel, Seifert, & Lemon, 1986; Ancoli-Israel et al., 1991). The prevalence of periodic leg movements has been estimated at 5% to 18% in the adult population (Coleman et al., 1983) and 25% to 45% in the older adult population (Ancoli et al., 1991; Bliwise, Petta, Seidel, & Dement, 1985; Dickel, Sassin, & Mosko, 1986). Among older adults, periodic leg
movements are associated with dissatisfaction with sleep (Ancoli-Israel et al., 1991).

**Depression and Anxiety**

Numerous studies suggested that the sleep of depressed patients differs from the sleep of nondepressed healthy subjects. The differences found were less sleep continuity, slow wave sleep reduction and early onset of REM sleep (Dubé et al., 1986; Hawkins, Taub, & Van de Castle, 1985; Hoch, Reynolds, & Houck, 1988; Kerkhofs, Linkowski, Lucas, & Mendelwicz, 1991; Kupfer et al., 1985, 1988; Reynolds et al., 1985, 1990; Riemann, Lauer, Hohagen, & Berger, 1991). The sleep of depressed elders is characterized by altered REM sleep temporal distribution and marked sleep maintenance difficulty (Reynolds et al., 1985). Depressed older individuals experience sleep maintenance difficulties, reduced sleep continuity, increased early awakening, and prolonged sleep onset compared to normal older individuals (Hoch et al., 1988).

Kerkhofs and colleagues (1991) found no difference in amount of daytime sleep among depressed subjects and normal subjects but the pattern of daytime sleep was different. The napping episodes of depressed subjects were distributed throughout the day, whereas the napping episodes of controls occurred mainly in early afternoon.
Napping showed no negative effects on sleep during the following night in either depressed or normal subjects. Other sleep characteristics of depressed subjects compared to the control group were longer periods of stage 1 and shorter periods of stages 2 and 3.

In a meta-analysis, Knowles and MacLean (1990) reviewed 27 studies that compared EEG sleep of depressed patients and age-matched healthy controls. All depressed patients in the 27 studies were diagnosed for depression and withdrew from drugs prior to sleep recordings. Sleep stages were measured and defined uniformly. Knowles and MacLean (1990) found that total sleep time was shorter, sleep was less efficient, sleep latency and time awake was longer in depressed patients compared to control subjects. Thus, as a function of age and depression, sleep was significantly more disturbed. The results of the meta-analysis were consistent with earlier reports of age related changes in sleep of healthy and depressed elders.

Depression and anxiety are among the most common factors reported to be associated with sleep problems in the scientific literature. Symptoms of depression and anxiety are associated with complaints of insomnia in the older population (Adam, Tomeny, & Oswald, 1986; Kales et al., 1984; Karacan et al., 1983; Morgan et al., 1988a, 1989; Rodin et al., 1988). Elders suffering from symptoms of anxiety and depression
are more likely to report insomnia particularly early morning awakening (Rodin et al., 1988). Morgan and colleagues (1989) found that older individuals who were poor sleepers showed higher neuroticism scores and higher levels of state and trait anxiety than older individuals who were good sleepers. Morgan and colleagues (1988a) also reported that symptoms of anxiety rather than symptoms of depression were more important to predict poor sleep quality.

Anxiety and factors precipitating anxiety are known to have an influence on sleep. A number of investigators (Feinberg, Braun, Koreski, & Gottlieb, 1969; Greenberg, Pearlman, & Campbell, 1972; Paulsen & Shaver, 1991; Waters, Adams, Binks, & Vernado, 1993) have suggested that environmental and psychological stress might affect sleeping patterns. The stressors are presumed to precipitate physiologic and cognitive events, which in turn increase alertness and decrease the likelihood of sleep. Indirect evidence that stress might affect sleep has come from several studies (Baekeland & Hoy, 1971; Browman & Tepas, 1976; De Koninck & Koulack, 1975; Hauri, 1969). According to these studies, a positive association existed between the occurrence of presleep stress and longer sleep latency in normal sleepers.

Healey and colleagues (1981) reported that chronic insomniacs experienced more stressful life events during the year in which their
insomnia began compared to good sleepers. Thus, emotional factors, especially crisis events, appeared to have a precipitating role in the onset of insomnia for some individuals (Anch et al., 1988; Bixler et al., 1979). However, Cernovsky (1984) reported that the relationship between negative events and sleep disorders was weak and did not present any evidence for causal relationship. The author attributed the weak results mostly to the inaccuracy of self-reported instruments, intervening social support and personality variables. Paulsen and Shaver (1991) found similar results and suggested that it is primarily perceived emotional support that buffers the effect of life events on sleep. Before a relationship between stressful life events and reported sleep problems can be determined, it is necessary to know whether exposure to undesirable negative events generates psychological distress (Paulsen & Shaver, 1991).

Several large surveys have revealed that people reporting sleep difficulties are significantly more lonely, tense, depressed, and unhappy than people without sleep problems (Bixler et al., 1979; Karacan et al., 1983). Insomniacs scored higher on state and trait anxiety indexes and exhibited more fearful, anxious, and worrisome presleep cognitions compared to noninsomniacs (Adam et al., 1986; Coursey, Buchsbaum, & Frankel, 1975; Haynes, Follingstad, & McGowan, 1974). Individuals
experiencing anxiety and emotional stress also experienced difficulty falling asleep, poor quality of sleep, and somatic tension prior to sleep (Water et al., 1993). Furthermore, according to Lugaresi et al., (1983), worry was the most common reason reported by insomniacs for disturbed sleep. In spite of methodological differences in studies, it is relatively well establish that depression and anxiety contribute to various sleep problems. Therefore, it is important to control for depressive symptomatology and anxiety.

**Behavioral Factors and Sleep**

Many studies supported the association between healthy lifestyle and positive health outcomes in the general population (Belloc & Breslow, 1972; Reed, 1983). Healthy behaviors have been described in various ways in the literature. For this study, behavioral factors which may be positively or negatively related to sleep satisfaction are examined.

**Physical Exercise**

The practice of physical exercise have been recommended by many nursing authors to promote sleep in the older population (Clark, 1985; Ebersole & Hess, 1990; Hoch & Reynolds, 1986). Exercise of low and moderate intensity practice during the day is usually suggested to promote sleep. Men and women of a group of adults in Finland reported exercise such as outing, jogging or evening walks, to be the most
important factor to promote falling asleep and to improve the quality of sleep (Urponen, Vuori, Hasan, & Partinen, 1988). In addition, several investigators (Baekeland & Lasky, 1966; Baekeland, 1970; Browman, 1980; Bunnell, Bevier, & Horvath, 1983; Griffin & Trinder, 1978; Montgomery, Trinder, & Paxton, 1982; Shapiro et al., 1975; Zloty, Burdick, & Adamson, 1973) reported an increase in deep sleep Stage 3 and 4 following an increase in daytime exercise.

The practice of exercise and physical activity also contributed to other beneficial sleep outcomes. Shapiro and colleagues (1975) reported larger amounts of total sleep time after exercise in young subjects. Other investigators (Browman, 1980; Buguet, Roussel, Angus, Sabiston, & Randomski, 1980) reported reduced sleep latencies after daytime exercise in young athletic men. Whereas exercise improved some sleep characteristics, exercise deprivation among young athletes increased sleep latencies and awakenings, and decreased the total amount of SWS (Baekeland, 1970).

Few studies have been conducted in older subjects. Although none of these studies have reported changes in the total amount of SWS, other sleep characteristics such as sleep quality have been improved in older adults following an exercise program (Bevier, Bliwise, Bliwise, Bunnell, & Horvath, 1992; Stevenson & Topp, 1990; Vitiello et al.,
Physical fitness, which is closely related to the practice of regular exercise, has been suggested to play a role in sleep. Edinger and colleagues (1992) reported that the fit and sedentary aged subjects differed significantly on a variety of sleep measures obtained. The fit older subjects displayed shorter sleep latencies, shorter periods of light sleep, and shorter amount of wake after sleep onset compared to sedentary older subjects. Similarly, Vitiello and colleagues (1990) examined the effect of physical fitness on subjective sleep quality of healthy older males. Following an aerobic program resulting in a significant increase in aerobic fitness, the older subjects reported significantly increased sleep quality, soundness of sleep, sleep duration, and sense of morning refreshment. The older subjects also reported a significant decreased sleep latency, duration of nighttime awakenings, and daytime sleepiness.

Although some investigators found a significant increase in stage 3 and 4 following the practice of exercise, other investigators (Bonnet, 1980; Buguet et al., 1980; Edinger et al., 1991, 1992; Hauri, 1968; Horne & Porter, 1975; Zir, Smith, & Parker, 1971) observed little to no significant alteration in deep sleep following exercise. The different results found in these studies might be affected by use of different exercise protocols. Indeed, the studies varied in terms of the level of
physical fitness before the exercise program, the type of activity, duration, intensity, and the period of the day in which the exercise was conducted. For instance, the fact that physical activity is a presleep stressor when performed in the evening was not considered in some studies (Browman & Tepas, 1976; Haynes, Adams, & Franzen, 1981). Moreover, because laboratory studies are very expensive, the results of those studies were based upon very few subjects, raising problems of generalizability. Although there were conflicting results, many studies findings supported the hypothesis that daytime exercise may enhance deep sleep and improve sleep quality.

Even though there is a common belief among scientists that physical exercise has an effect on stages of sleep, no study of exercise and sleep has considered in depth the subjective characteristics of sleep and sleep satisfaction. In addition, most investigators did their research with young athletes so as a result, few data is available for older subjects.

**Bedtime Routines**

Many older persons perform some rituals before going to bed and without these rituals it is difficult for them to sleep. For example, rituals may include the ceremony of bedtime washing, bathing, brushing teeth, reading, and watching television. Under normal circumstances
individuals comfortably follow rituals and habits that permit them to sleep however fussy the arrangements.

Evening or pre-bedtime routines may play a role in enhancing sleep satisfaction. Johnson (1986, 1991b) reported that subjects who did not have bedtime routines had the most disturbed sleep patterns, awakened more often, and slept fewer hours compared to those with a bedtime routine. As part of the bedtime routine, avoiding strenuous physical or mental activity within the hours preceding bedtime is considered important to reduce stressors and promote sleep (Morgan et al., 1988a).

Relaxation, which can be part of the bedtime routine, has been suggested by many nursing authors to promote sleep. The most recognized relaxation techniques are progressive muscle relaxation, meditation, biofeedback, self-hypnosis, and autogenic training. Relaxation therapy attempts to establish a deeply relaxed state to induce sleep. The assumption is that patients will fall asleep naturally once they have learned how to relax. A wide variety of relaxation interventions are reflected in the nursing literature including the traditional relaxation techniques listed above and variations such as visual imagery, music therapy (Frank, 1985), and physical relaxation through therapeutic massage (Longworth, 1982). Few papers were found in nursing specifically linking relaxation methods with the improvement of older
adult sleep. However, numerous nursing authors (Ceccio, 1984; Flaherty & Fitzpatrick, 1978; Wilson, 1981) have documented the positive effect of relaxation techniques in reducing pain and anxiety which indirectly might improve sleep in older patients.

In psychology, several studies have shown that progressive relaxation helped to improve sleep parameters (Bootzin & Nicassio, 1978; Borkovec, Grayson, O’Brien, & Weerts, 1979; Kahn, Baker, & Weiss, 1968; Nicassio, Boylan & McCabe, 1982; Paul, 1969). Whereas some investigators (Paul, 1969; Kahn et al., 1968) reported a reduction of awakenings following presleep progressive relaxation, others (Borkovec et al., 1979) reported only a reduction of sleep latency. Other methods of relaxation such as meditation, autogenic training and biofeedback are known to reduce sleep latency (Carr-Kaffashan & Woolfolk, 1979; Nicassio & Bootzin, 1974; Stanton, 1975; Steinmark & Borkovec, 1974). Whereas the studies found some improvement in sleep following the practice of different relaxation techniques, none of the studies were conducted with older subjects.

Recently, Johnson (1991a) studied the effect of progressive relaxation on sleep patterns of older noninstitutionalized women. After practicing progressive relaxation for two days, aged women reported shorter sleep onset, fewer nocturnal arousals, sounder sleep, greater
sleep satisfaction, and were more refreshed in the morning. These subjective findings were confirmed with objective polygraphic measurements. The polygraphic results showed an increased amount of slow-wave sleep, a decreased amount of light sleep during the early part of the night coupled with shorter sleep latencies, and fewer arousals. Johnson (1991a) suggested that the improvement of the early part of sleep seem sufficient to explain the perception of sounder sleep and greater sleep satisfaction. Therefore, the practice of bedtime routines including relaxation needs to be explored further in combination with other factors related to sleep satisfaction.

**Caffeine**

There is a general presumption that certain individuals are particularly sensitive to caffeine. Caffeine is well known to have stimulant properties that interact with sleep. However, only a few studies of young populations have confirmed that caffeine interferes with sleep (Curatolo & Robertson, 1983). Golstein and colleagues (1965) reported that caffeine taken before going to bed resulted in longer sleep latency. The mean estimated time that sleep was postponed; however, varied greatly in 20 subjects from 2 to 54 minutes. Morgan and colleagues (1989) found that poor older sleepers reported significantly higher levels of tea consumption. Because tea can affect sleep in at
least two distinct ways (through its diuretic and stimulant properties), its association with insomnia was to be expected (Morgan et al., 1989).

Recently, Curless, French, James, and Wynne (1993) studied the effect of caffeine on older adults living in the community and those who were hospitalized. Daily plasma caffeine concentration and estimated caffeine intake were measured. For the community-dwelling subjects, global scores of sleep quality showed a significant negative correlation with plasma caffeine concentration ($r = -0.24, p < 0.05$), meaning that subjects with poorer sleep quality had lower plasma caffeine concentration. The reported coffee consumption was also lower among the subjects with poorer sleep quality. In contrast, for the hospitalized subjects, caffeine concentration was higher in patients who reported sleep problems. Interestingly, caffeine did not have the detrimental effect on quality of sleep that Curless and colleagues (1993) expected. However, caffeine intake needs to be controlled in research examining subjective characteristics of sleep.

**Drugs**

As a result of insomnia, older persons are more prone to use or be prescribed hypnotic medication to resolve sleep problems. Sleep complaints tend to increase with age, while use of sleep medication shows a reciprocal increase (Karacan et al., 1978; Kripke et al., 1979;
McGhie & Russell, 1962). Over the past 30 years, hypnotics have remained among the most prescribed drugs for older people (Nolan & O’Malley, 1987). Lugaresi and colleagues (1983) reported that hypnotic drugs are used more than twice as much by the older persons compared to younger individuals. Recent estimates suggested that between 9% and 18% of persons over 65 years old take medication to promote sleep each night (Karacan et al., 1976; May et al., 1982; Morgan et al., 1988b; Morgan et al., 1989). Roth, Kramer, and Lutz (1976) estimated that 40% of insomniacs of all ages used hypnotics daily and 25% used hypnotics occasionally.

In spite of the elders’ use of sleeping pills, hypnotics do not provide physiologic sleep (Kales, Scharf, Soldatos, & Bixler, 1979; Oswald, 1968). The accumulation of these drugs within the body reduces the amount of stage 3 and 4, and alters REM sleep (Mendelson, 1980). The use of hypnotic medications can also lead to daytime drowsiness, confusion, and disorientation (Lerner, 1982; Roth et al., 1976). Johnson (1988) suggested that benzodiazepines, one of the most commonly used hypnotics, are disruptive to sleep patterns and daytime activities. Moreover, hypnotics are known to exacerbate the frequency and the duration of apnea episodes that also disrupt sleep (Mendelson, Garnett, & Gillin, 1981).
In addition, some investigators (Kales et al., 1974) suggested that most hypnotics are considered ineffective after two weeks of use. Hypnotics are potentially dangerous and may lead to a predictable cycle of dependence and tolerance (Kales, Scharf, & Kales, 1978; Coates & Thorensen, 1978). Coates and Thorensen (1978) suggested that 20% of all individuals receiving hypnotics becomes pharmacologically dependent. With advancing age, the toxic potential of hypnotic medication increases as metabolism and elimination rates decrease, and the potential for interaction with other drugs increases. As a result, older persons using hypnotics are more likely to report daytime residual effects of medications such as sleepiness, drowsiness, and lack of concentration.

Research has shown that discontinuation after repeated use of alcohol, barbiturates, and related hypnotics was associated with a rebound effect (Kales et al., 1978). After hypnotic withdrawal, sleep was more disturbed than before administration. Kales and colleagues (1974) reported that the insomnia occurring after withdrawal may be due to both psychological apprehension as well as an abstinence syndrome manifested by anxiety. When the hypnotic is abruptly withdrawn, there is a marked rebound in REM sleep and an increase intensity and frequency of dreaming and nightmares.
Poor sleep may account for the disproportionate prescription of sedative hypnotics for the older population. Hypnotic use can lead to additional disturbances of sleep patterns and sleep satisfaction, exacerbation of sleep apnea, daytime sleepiness, drowsiness, and confusion. Therefore, it is important in this study to control for hypnotic medications.

There can be little doubt that adverse drug reactions related to prescribed medications occur more frequently in older individuals. Drowsiness, sleepiness, confusional states, tiredness, fatigue, lack of attention, and insomnia are among the side effects reported in the literature. Studies have shown that some antihistamines produce sleepiness, disrupt performance, and sleep disturbances (Nicholson, 1985; Roehrs et al., 1984). Beta-blockers also are reported to produce side effects such as tiredness, fatigue, and lethargy (Roehrs & Roth, 1989). Whereas some medications produce sleepiness and drowsiness, other prescribed drugs have stimulant properties. The most widely studied medication known to induce vigilance is amphetamine. The side effects of amphetamines are sleep latency delay, reduced REM sleep, and reduced slow wave sleep (Kay et al., 1976). Other prescribed medications known to have stimulant properties are corticosteroids, bronchodilators, respiratory stimulants, stimulating antidepressants,
methylprenalin, central nervous system stimulants, and phenytoin (Walsh, Hartman, & Kowall, 1994). The nature and frequency of adverse drug reactions in older people is an area requiring considerably more investigation.

Morgan and colleagues (1989) reported that the number of prescribed drugs, used as an indicator of physical health, were significant predictors of sleep quality. Several drugs are known to have stimulant properties that interact with sleep. However, the extent to which sleep disturbances are the result of drug consumption remains difficult to determine. With advancing age, the consumption of prescribed and nonprescribed medications increases. It is therefore important to evaluate if the number of drugs taken by older adults is a behavioral factor associated with sleep satisfaction.

Nurses need to explore nonpharmacological interventions to improve sleep satisfaction in the older population. The practice of exercise, bedtime routine, and relaxation could be suitable nonpharmacological interventions for use with older persons who experience insomnia. These interventions can be studied alone and in combination with one another. Because nurses work closely with older persons in the community, they are in a position to identify sleep promoting interventions that can contribute to elders' sleep satisfaction.
Sleep of Older Adults and Nursing

Nursing studies related to sleep are sparse in the literature. Nursing investigators have provided a few descriptive studies of sleep patterns in hospitalized and nonhospitalized individuals across the life span. In the nursing literature, six studies described specifically sleep patterns of institutionalized and community dwelling elders (Bahr & Gress, 1985; Clapin-French, 1986; Gress & Bahr, 1981; Hayter, 1983; Pacini & Fitzpatrick, 1982). Bahr (1985) and Gress, and Gress and Bahr (1981) conducted observations of the 24 hour sleep periods of hospitalized elders. Observation reflected sleep during daytime and nighttime with the majority of sleep occurring during nighttime. No significant results were found in these studies.

Clapin-French (1986) studied sleep patterns of 102 older patients in three long-term care facilities. Based only on frequency statistics, Clapin-French (1986) found that patients had more sleep interruptions after admission, reported napping more often, and were going to bed earlier than at home. Pacini and Fitzpatrick (1982) compared sleep patterns of elders who lived at home with hospitalized elders. They found that although the amount of sleep obtained during a 24 hour period did not differ between hospitalized and nonhospitalized groups, patterns for attaining sleep were different. There was no empirical
evidence to support differences between groups concerning sleep latency, number of nocturnal awakenings, soundness of sleep, and total sleep time. One study was found in the nursing literature concerning sleep patterns of older persons living in the community (Hayter, 1983). Hayter reported sleep patterns of 212 healthy, community dwelling subjects aged 65 to 93 years of age. The results of the study are described in the second section of the literature review.

Descriptive studies of sleep patterns in older individuals done by nurse investigators have provided limited information about some aspects of sleep. In addition, sleep satisfaction was not investigated and no theoretical framework were provided for explaining sleep. Although recent studies (Johnson, 1986, 1991a, 1991b; Stevenson & Topp, 1990) suggested interventions to promote sleep, no specific theoretical framework was provided by the investigators to explain sleep. Much more work is needed to clarify the concepts used in the nursing literature. Subjective sleep characteristics need to be explored to provide clinical indicators of sleep satisfaction. Furthermore, behavioral and health factors associated with sleep satisfaction among older adults need to be identified. A better understanding of sleep satisfaction and factors related to sleep satisfaction will ultimately contribute to knowledge that promotes health and enhances well-being.
METHOD

The purpose of this descriptive correlational study was (1) to explore different aspects of sleep found to be most important to understand sleep satisfaction and (2) to identify behavioral and health factors associated with sleep satisfaction among older adults living in the community. This chapter describes the study design, the setting and the sample, the instruments used, the data collection procedures, and the data analysis.

Design

A descriptive correlational design was employed to explore dimensions of sleep satisfaction and to identify behavioral and health factors related to sleep satisfaction. Whereas many studies have been conducted on sleep over the years, few of them have focused on clarification of different dimensions involved in sleep and how they interact. Moreover, little is known in the literature about the factors involved in sleep satisfaction. Thus, a careful description of sleep satisfaction and exploration of factors involved in sleep satisfaction are important before one can begin to design intervention trials to promote sleep satisfaction.
"At this stage of our scientific development careful description of the phenomena of concern to nursing practice - human responses to health and health problems - is as important as is work designed to enhance our understanding of the factors that influence human health." (Woods & Catanzaro, 1988, p.130). The purpose of a descriptive correlational study is to describe the relationship among the variables, rather than to test theory (Brink & Wood, 1989). A descriptive correlational design was used to increase our understanding of sleep satisfaction and related behavioral and health factors.

This study examined sleep satisfaction in relation to variables that are not amenable to control and randomization such as physical health and psychological health. In addition, this study explored sleep satisfaction in relation to behavioral variables such as consumption of caffeine and medications which would have been ethically inappropriate to manipulate. Finally, this descriptive correlational study was designed to increase our understanding of sleep satisfaction in a naturalistic context and as it is experienced by older adults.

Setting

The setting for this research was the Golden Age Centers of the Cleveland metropolitan area. The area is composed of a total of 15 centers and 8363 members (Golden Age Centers of Greater Cleveland,
Twelve of the 15 centers that included a sampling frame of 7588 members were selected for data collection. In the sample frame selected, 7% of the members were under 60 years old and 93% were 60 years and older; 27% were males and 73% were females; less than 42% were African American, 58% were Anglo-Saxon, and less than 1% of other origin; and, 70% had low income while 30% had moderate income (Golden Age Centers of Greater Cleveland, 1993). The members of the Golden Age Centers lived in the community and had their own apartment or house.

Sample

A convenience sampling method was used to obtain a sample of 130 participants. The managers of the centers were asked to identified possible participants for the study according to the selection criteria. Among older adults contacted by the managers, approximately 5% refused to participate. The goal was to obtain a sample of participants with characteristics similar to the sampling frame described above.

Criteria for Selection

The participants for this study were older adults living in the community who were functionally and socially active and who did not suffer from any particular acute illnesses. Four inclusion criteria were used for this study. First, the sample included men and women who
were 65 and over, so that the experience of sleep in terms of sleep patterns, quality of sleep, quality of wakefulness, and sleep satisfaction can be studied across several older age cohorts. Second, older adults had to be able to understand and speak English. Third, to reduce the possibility of confounding affect of acute diseases and related consequences, the sample included older adults who had no significant acute physical and mental health problems. The investigator selected older adults who during the preceding year were not diagnosed by a physician with cancer or leukemia; were not diagnosed with any degenerative disorders such as Parkinson’s disease and muscular dystrophy; and, were not hospitalized for heart problems or any major surgery. Older adults with no history of depression and psychiatric disorders were included in the sample. Older adults who were considered mentally competent according to the Short Portable Mental Status Questionnaire were selected. Fourth, because the chronic use of sleeping pills and psychoactive medications are known to have an effect on psychological health and influence some aspects of sleep, this study included only individuals who did not use hypnotics and psychoactive medications every day.
Sample Size

To determine the sample size, Cohen's (1988) technique for power analysis was used. Considering that the purpose of the study was to explore the relationships among sleep variables and identify factors related to the sleep variables, the sample size was computed using the product moment correlation and multiple regression analyses.

Since data on the effect size of relationship between the sleep concepts used in this study were not available, a medium effect size was considered. According to Cohen (1988), a medium effect size is $\eta^2 = 0.15$ (compared to $\eta = 0.30$). In terms of proportion of variance accounted for the independent variables, $E^2 = 0.15/(1 + 0.15) = 0.13$, hence $R = 0.36$.

Using Cohen's technique for power analysis, a sample size for correlation and multiple regression analyses was computed for an alpha of 0.05, a power of 0.80, an effect size of 0.15, and 12 independent variables. On the basis of the following formula: $N = \Lambda(1 - R^2_{Y,a})/R^2_{Y,b}$ (Cohen, 1988), a sample size of 126 was obtained.

Participants were recruited into the study until a complete set of usable data were obtained from a convenience sample of 130 older adults.

Sample Recruitment

Older adults were recruited from the Golden Age Centers of the Cleveland metropolitan area. Approval to recruit older adults was sought
from the directors of the Golden Age Centers of Greater Cleveland. Once approval was obtained, the directors identified twelve possible sites to achieve the sample size. The investigator worked through the managers of the twelve Golden Age centers to identify potential participants according to the selection criteria. Each manager was informed of the purpose of the study and given the selection criteria. The first step was for the manager to ask older adults to participate in the study. The manager of each center assisted with the introduction of the investigator (or the interviewer) to potential participants.

Human Subjects

Approval to conduct this study was obtained from the Research Review Committee of the Frances Payne Bolton School of Nursing and the Research Review Committee for Human Services at Case Western Reserve University. Older individuals who were members of the Golden Age Centers of Greater Cleveland were identified by the manager of each center. When an older adult was eligible to participate, the investigator met with the older adult, explained the study’s purpose, and described the content of the consent letter (see Appendix A). A copy of the consent letter was provided to every participant in the study. All participants were notified that the information they provided during the study would be kept confidential and would not be revealed to anybody
including the manager and members of the Golden Age Center. They were informed that they could withdraw from the study at any time. Moreover, the investigator or the interviewer informed each participant that his/her decision to participate or not participate in the study would not have any consequences on the services she/he received at the Golden Age center. A written consent was obtained from the participant before data collection was initiated.

Confidentiality of the participants was safeguarded through coding mechanisms. Each questionnaire was coded and a list of codes and names were kept in investigator’s office, in a locked file accessible only to the investigator. Identifying information was destroyed after data collection was completed. Data were analyzed with no possibility of identifying participants.

There were no known potential medical, legal or social risks for participants who were interviewed. The questionnaires and interviews did not cause the participant stress or anxiety. When an older adult needed assistance during or after the interview, the investigator referred them to the appropriate service. Participants had the opportunity to withdraw at any time during the process of the study.

Although the participants did not get any personal benefits from participating in the study, their participation provided information about
older adults' experience with sleep and factors related. The participants had the opportunity to share information about their sleep with the interviewer and could ask questions or advise after the interview. Thus, elders' participation was beneficial in providing data to generate knowledge which should help health care providers to assess more effectively the sleep needs of older adults.

There was a possibility that participants, because of their age may become fatigued during the course of the interview. Although such a matter may not be expressed by any of participants, the interviewer asked participants in the middle of the interview if they were tired or fatigued, and if they wanted to continue the interview. Only one participant requested to terminate the interview. Before closure, the interviewer answered participants' questions concerning the interview or a related matter. Appreciation was expressed to participants for their time and effort. Furthermore, thank you notes were sent to each participant to acknowledge everyone's contribution to the study.

**Description of Sample**

The 130 participants of the study ranged in age from 65 to 90 with a mean age of 76.2 (SD = 6.5) (see Table 1). One hundred and six (81.5%) participants were female and 24 (18.5%) were male. The cultural affiliation of the participants included 75 (57.7%) African
Americans, 35 (26.9%) Anglo-Saxons, and 20 (15.4%) of European origin. The African American participants did not differ from the Caucasian participants on most of the variables. The African American participants reported using significantly more prescribed and nonprescribed drugs and less caffeine than the Caucasian participants ($p < .01$). Moreover, the African American participants reported being significantly less awake during the day and going to bed at night earlier than the Caucasian participants ($p < .01$).

Eighty-four (64.6%) participants were widowed, 20 (15.4%) were separated or divorced, 8 (6.2%) were single, and 18 (13.8%) were married. A majority of 102 (78.5%) participants lived alone in a house or apartment, and 28 (21.5%) participants lived with their spouse, children, sibling, or relatives. The majority (93.1%) of the participants were retired, 6 (4.6%) participants were part-time workers, and 3 (2.3%) were full-time workers.
Table 1

Sample Characteristics for Sociodemographic Variables

<table>
<thead>
<tr>
<th>Variable</th>
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<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65 to 69</td>
<td>23</td>
<td>17.7</td>
</tr>
<tr>
<td>70 to 74</td>
<td>31</td>
<td>23.8</td>
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<tr>
<td>75 to 79</td>
<td>31</td>
<td>23.8</td>
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<tr>
<td>80 to 84</td>
<td>28</td>
<td>21.5</td>
</tr>
<tr>
<td>85 to 90</td>
<td>17</td>
<td>13.1</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>106</td>
<td>81.5</td>
</tr>
<tr>
<td>Male</td>
<td>24</td>
<td>18.5</td>
</tr>
<tr>
<td>Cultural affiliation</td>
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<td></td>
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<tr>
<td>African American</td>
<td>75</td>
<td>57.7</td>
</tr>
<tr>
<td>Anglo-Saxon</td>
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</tr>
<tr>
<td>European</td>
<td>20</td>
<td>15.4</td>
</tr>
<tr>
<td>Marital Status</td>
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<tr>
<td>Single</td>
<td>8</td>
<td>6.2</td>
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<tr>
<td>Married</td>
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</tr>
<tr>
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<td>4.6</td>
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<tr>
<td>Widowed</td>
<td>84</td>
<td>64.6</td>
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<tr>
<td>Living situation</td>
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<tr>
<td>Alone</td>
<td>102</td>
<td>78.5</td>
</tr>
<tr>
<td>With spouse</td>
<td>16</td>
<td>12.3</td>
</tr>
<tr>
<td>With children</td>
<td>10</td>
<td>7.7</td>
</tr>
<tr>
<td>With relatives</td>
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<td>0.8</td>
</tr>
<tr>
<td>With sibling</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Retirement</td>
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</tr>
<tr>
<td>Retired</td>
<td>121</td>
<td>93.1</td>
</tr>
<tr>
<td>Working full-time</td>
<td>3</td>
<td>2.3</td>
</tr>
<tr>
<td>Working part-time</td>
<td>6</td>
<td>4.6</td>
</tr>
</tbody>
</table>
A majority of the participants had at least some degree of junior high school (see Table 2). Only one participant reported having no formal education. Fifteen (11.5%) participants reported having some grade school education. Fifty-three (40.8%) participants had completed at least junior high school and 50 (38.5%) had completed 11 or 12 years of education. Nine (6.9%) participants had a college degree and 2 (1.5%) participants had completed a graduate level degree.

Table 2

Sample Characteristics for Education and Income

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
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</tr>
<tr>
<td>Grade school</td>
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</tr>
<tr>
<td>Junior-high</td>
<td>53</td>
<td>40.8</td>
</tr>
<tr>
<td>High-school</td>
<td>50</td>
<td>38.5</td>
</tr>
<tr>
<td>College</td>
<td>9</td>
<td>6.9</td>
</tr>
<tr>
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<table>
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Seventeen (13.1%) participants did not know their income level or did not want to answer the income question. Seven (5.4%) participants reported an income lower than $5,000 a year. Seventy-two (55.4%)
participants estimated their income to be between $5,000 and $9,999 a year. Sixteen participants (12.3%) reported their income between $10,000 and $14,999; 12 (9.2%) reported their income between $15,000 and $19,000; and, 6 (4.6%) participants reported an income of $20,000 a year and above.

Instrumentation

A number of instruments were employed to measure demographic information; mental status; sleep patterns, quality of sleep, quality of wakefulness, and sleep satisfaction; physical and psychological health; and behavioral factors including physical activity practice, practice of bedtime routines, consumption of caffeine, and consumption of prescribed and non prescribed drugs.

Demographic Information

The demographic data sheet. The demographic data sheet (see Appendix B) consisted of questions pertaining to age, marital status, cultural affiliation, living situation, education, employment status, and gross annual income. The information were used to describe the sample and identify variables that might be associated with sleep.

Mental Status

The Short Portable Mental Status Questionnaire (SPMSQ). The SPMSQ was developed by Pfeiffer (1975) to detect the presence of
intellectual impairment and to determine the degree of impairment (see Appendix C). The SPMSQ is a 10-item questionnaire that is easy to administer. The standardization and validation procedure included administering the test to 997 older persons residing in the community. On the basis of the large community population, standards of performance were established for: 1) intact intellectual functioning, 2) mild intellectual impairment, 3) moderate intellectual impairment, and 4) severe intellectual impairment. This instrument allows adjustment for education and culture. In this study, the SPMSQ was used only for the purpose of screening for intellectual impairment. Older adults scoring in the range of intact intellectual functioning or mild intellectual impairment (four mistakes or less on the test) were included in this study. Only one participant was excluded from the study because the performance did not comply with the selection criteria.

Measures of Sleep

The Cantril self-anchoring ladder. The Cantril self-anchoring ladder (Cantril, 1965) was used to obtain an individual’s perception of overall sleep satisfaction (see Appendix D). The Cantril self-anchoring ladder was developed as a measure of life satisfaction; however, the scale can be used to measure a variety of variables such as sleep satisfaction (McKeehan, Cowling, & Wykle, 1986). The measure allowed the
participant to define the concept of sleep satisfaction in a way that is personally meaningful. Thus, the self-anchoring ladder measures people’s value systems and perceptions concerning their own reality. As described by Cantril (1965), the self-anchoring ladder scale starts with the premise that:

Each individual creates for himself his own world of reality, in which he assigns significance to what he perceives in terms of his life’s purpose ... The self-anchoring scale allows an individual’s expression of his concerns, values and perceptions to establish the top and bottom points of a self-defined measurement continuum (p. 41).

The administration of the scale followed the general form of the method as described by Kilpatrick and Cantril (1960, p. 159). First, participants were asked to describe their best possible sleep. Next, participants were asked to describe their worst possible sleep. Then, a drawing of a ladder with 10 rungs was presented. The top anchoring point is conceived as the best possible sleep. At the other extreme, the bottom anchoring point is the worst possible sleep. The top rung (10) denoted the best possible sleep as defined by the participant; below the bottom rung (0), the worst possible sleep. Participants indicated by pointing to a numbered rung where they stood on the ladder at the time of the interview. According to Kilpatrick and Cantril, a ten-interval scale provides a satisfactory degree of discrimination. The mean score of one
group can be meaningfully said to be higher, lower, or equal to the mean score of some other group, because the frames of reference of the replies are in fact similar (Kilpatrick & Cantril, 1960).

No measure of reliability and validity were available because the Cantril self-anchoring ladder was not previously used to measure sleep satisfaction. Measures of stability have been reported for life satisfaction using test-retest reliability coefficient. Palmore and Kivett (1977) reported a test-retest coefficient of .65. It is expected that sleep satisfaction would yield similar results of stability over time. Measures of convergent validity have been reported by Andrews and Withey (1976) ranging from .46 to .49.

The Pittsburgh Sleep Quality Index (PSQI). The PSQI (see Appendix E) developed by Buysse, Reynolds, Monk, Berman, and Kupfer (1989) was used to measure different aspects of sleep. The global score was used as a measure of sleep satisfaction and individual items were used to measured sleep patterns, quality of sleep, and quality of wakefulness. The components of the PSQI were derived from three sources: clinical intuition and experience with sleep disorder patients; a review of previous sleep quality questionnaires reported in the literature; and clinical experience with the instrument during 18 months of field testing (Buysse et al., 1989).
The PSQI consists of 19 self-rated questions that are grouped into seven component scores identified by Buysse and colleagues as subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. Each component score is weighted equally on a 0-3 scale. The seven component scores are then summed to yield a global PSQI score, which has a range of 0-21. Higher scores indicate worse sleep quality.

In the development of the instrument, the intent of the authors was to develop an instrument that could discriminate between "good" and "poor" sleepers. The standard for good and poor sleepers was based on a combination of clinical interviews, structured interviews, and polysomnographic data. The instrument was administered to two groups of poor sleepers and one group of good sleepers aged from 20 to 80 years old. The PSQI assesses sleep patterns, quality of sleep, and quality of wakefulness during the previous month. The time frame of a month can provide information about the frequency or duration of specific sleep problems and was considered clinically useful by Buysse and colleagues in identifying persistent sleep-wake disorders.

Construct validity was assessed by the degree to which the index detected differences between groups recognized clinically as distinct.
Good sleepers and poor sleepers differed significantly on the global PSQI score and all component scores. Furthermore, the results indicated that the instrument could discriminate between different sleep disorders. Patients with disorders in maintaining sleep and depressed patients scored significantly higher on the PSQI than patients with disorders of excessive somnolence as it was expected by the Buysse and colleagues. According to Buysse et al. (1989), a PSQI global score larger than five indicated that a subject was having difficulties in at least two areas.

Construct validity was also assessed by comparing PSQI scores with polysomnographic results from several nights. PSQI estimates of sleep latency, sleep duration, and sleep efficiency were compared to homologous polysomnographic measures. Global PSQI scores were compared to polysomnographic variables selected a priori as being likely to correlate with overall sleep quality. T-tests showed no significant differences between PSQI estimates and laboratory results for sleep latency. However, Buysse and colleagues reported significant differences between other PSQI estimates of sleep and polysomnography results. It is not surprising that most PSQI estimates differed from the EEG results since the PSQI is a global evaluation of sleep during the past month and the EEG is sensitive to daily variability. Postsleep questionnaires sensitive to daily variability yield more accurate subjective
estimates that are more strongly correlated with polysomnographic findings (Webb, 1989).

Buysse and colleagues (1989) assessed internal consistency using Cronbach’s alpha. An overall reliability coefficient of .83 for the seven component scores of the PSQI indicated a high degree of internal consistency. In this study, alpha coefficients for the seven component scores of the PSQI were .75 for African Americans; .69 for Caucasians; and .73 for all participants. Moreover, the authors employed Pearson product-moment correlations to assess the relationships between the PSQI global score and the seven component scores. The largest correlation coefficient was 0.85 for habitual sleep efficiency and the smallest correlation coefficient was 0.46 for sleep disturbances. High correlations of the habitual sleep efficiency and subjective sleep quality components with the global score supported the overall construct.

Test-retest reliability was assessed with paired t-test and Pearson product-moment correlations for the global score, component scores, and individual items. The interval time period between the two administrations of the test was about 28 days. Paired t-test for the global PSQI score and the seven individual component scores indicated no significant differences between the Time 1 and Time 2. The correlation coefficient for the global scores and the component scores
between Time 1 and Time 2 were statistically significant ($p < 0.05$). Thus, the global score and the components scores were relatively stable over a month period.

**Additional questions on sleep.** Additional questions were asked of participants to capture dimensions of sleep satisfaction that were not captured in the PSQI. Single-item indicators were used to explore participant's perception of particular dimensions of sleep satisfaction. Questions about sleep patterns included number of awakenings, total sleep time needed, and frequency and duration of napping (see Appendix F). Questions on the quality of sleep and the quality of wakefulness were assessed using a Likert type format (see Appendix G). A vertical line with anchors was presented to the participants who indicated where they would place themselves on the line. Questions on the quality of sleep included the depth of sleep, movement during sleep, and the quality of sleep last night. For most items, the highest score (10) indicated the best quality of sleep and the lower score (0) indicated the worst quality of sleep. Concerning movement perceived during sleep, higher scores indicated more movement, and lower scores indicated less movement. Participants were also asked about the quality of wakefulness in terms of restfulness upon awakening and during the day, and alertness and wakefulness during the day versus drowsiness.
and sleepiness. The highest score (10) indicated the best quality of wakefulness and the lowest score (0) indicated the worst quality of wakefulness.

Health

The OARS Multidimensional Functional Assessment Questionnaire (OARS/MFAQ). The Multidimensional Functional assessment Questionnaire (OARS/MFAQ, see Appendix H) was developed as an integral part of the Older Americans Resources and Services Program at Duke University (Fillenbaum, 1978, 1988). The OARS/MFAQ was constructed to assess functioning in five domains including physical health, mental health, social resources, economic resources, and activities of daily living. The OARS/MFAQ was developed for use with adults aged 55 and over living in the community and is an instrument widely used to assess health status in community-dwelling samples of older adults (Fillenbaum, 1978). George and Fillenbaum (1985) reported that the OARS/MFAQ has been used in more than 150 research and clinical settings.

The physical health index was used to measure physical health. The physical health index contains 12 questions and attempts to identify various physical conditions and clinical symptoms as well as information about the use of medication. Items included in the physical health index
are recent health problems, hospitalizations, doctors visits, medications prescribed, the presence or absence of a variety of significant illnesses and the extent to which the subject finds these disabling, and the overall assessment of the individual’s physical health (Fillenbaum, 1978). The response to items in each area are usually summarized on a six point scale. However, Bowling (1991) argued that it is possible to examine the responses to each individual question and treat them as separate units.

For the purpose of this study, the responses have been treated as separate units. The physical health index of recent health problems was used to record the number of illnesses experienced by the participants and medications index was used to record the number of medications prescribed.

Reliability and validity testing have been done by many researchers for the different scales. Fillenbaum and Smyer (1981) presented criterion validity results for the MFAQ on 33 patients. Criterion ratings were established for each section in the questionnaire. Spearman correlation between the physical health index and these ratings was 0.82. In the earlier version of the MFAQ, physical health scores were compared with ratings of physicians’ assistants for 82 patients (Fillenbaum, 1978). Spearman rank order correlation between independent physicians’ assistants ratings and the physical health items was 0.70 (p<0.001).
OARS has been extensively tested for reliability. Fillenbaum and Smyer (1981) reported inter-rater agreement for the MFAQ for 11 raters who evaluated 30 patients. Intraclass correlation was 0.66 for physical health. Fillenbaum (1978) conducted test retest reliability coefficients five weeks apart for older subjects. Test retest correlation was .58 ($p<0.001$) on ratings of the physical health index.

**The Symptom-Bother Scale (SBS).** The SBS (Heidrich, 1991) measured the symptoms commonly experienced by older adults due to aging or age-related illnesses. The SBS is a 13-item scale assessing symptoms such as aching, pain, stiffness, shortness of breath, and hearing problems. Each symptom is scored on a scale from 0 (do not have this symptom) to 5 (bothered a great deal). A total score is computed with high score indicating worse symptom experiences.

Heidrich (1991) reported that, in a pilot study ($N=43$), the SBS was positively related to difficulty with ADLs and depression and negatively related to subjective health, giving preliminary support to the validity of the scale. Cronbach’s alpha coefficient was .78 in the pilot study (Heidrich, 1991); .58 in a sample of 37 very old individuals (Heidrich & D’Amico, 1993); and .85 in a sample of 240 older women aged 65 and over living in the community (Heidrich, 1993; Heidrich &
Ward, 1992). In this study (N = 130), alpha coefficients were .67 for African Americans, Caucasians, and the aggregate.

**The Center for Epidemiologic Studies Depression Scale (CES-D).**

Radloff (1977) developed the CES-D scale to assess depressive symptoms (see Appendix I). The CES-D scale was constructed to assess current frequency of depressive symptoms, with an emphasis on depressed affect or mood, and was intended for use with cross-sectional samples. Moreover, the CES-D was developed for use with older adults and has been frequently used in gerontological research.

The CES-D is a 20-item scale with a Likert format. Higher scores indicate greater depression. Each response is scored from zero to three on a scale of frequency of occurrence of the symptom from (0) indicating "rarely or none of the time" to (3) indicating the "most or all of the time". The scoring of four positive items is reversed. The total score is the sum of the ratings ranging from 0 to 60 with higher scores indicating greater occurrence of depressive symptomatology.

The CES-D has demonstrated reliability and validity (Radloff, 1977). Radloff (1977) reported test-retest reliability estimates of .67 at four weeks intervals and .54 at 6 month interval. Cronbach’s alpha ranged from .84 to .90 for both healthy individuals and patients (Radloff, 1977). Nursing investigators reported alpha coefficients ranging from .88 to .94
with older adult subjects (Heidrich & D’Amico, 1993; Heidrich & Ward, 1992). In this study, alpha coefficients were .79 for African Americans; .82 for Caucasians; and .80 for all participants.

Construct validity was assessed using convergent and discriminant validity. Convergent validity was assessed in comparing the CES-D scores with clinicians’ ratings based on the Hamilton and Raskin scales indicating moderate convergent validity with correlation coefficients ranging from .44 to .56 (Radloff, 1977). Weissman and colleagues (1975) found correlation coefficients of .81 to .90 with the Beck Depression Inventory and the Self-Rating Depression Scale respectively. Moreover, Radloff (1977) reported that the CES-D could discriminate between psychiatric inpatient and general population, and among levels of severity within patients groups.

**State-Trait Anxiety Inventory (STAI).** Anxiety was measured using the State-Trait Anxiety Inventory developed by Spielberger, Gorsuch, Lushene, Vagg, and Jacobs (1983). The STAI (Form Y) is the revised version of the original STAI (Form X). The STAI (Form Y-2) used for this study measures trait anxiety which "refers to relatively stable individual differences in anxiety-proneness, that is, to differences between people in the tendency to perceive stressful situations as
dangerous or threatening" (Spielberger et al., 1983; p. 1). The STAI is a self evaluation questionnaire which has been widely used in research and clinical practice. The STAI (Form Y-2) consists of 20 self descriptive statements to which participants respond how they generally feel. The subjects rate each item for (1) "almost never; (2) "sometimes"; (3) "often"; and (4) "almost always". The global score is the sum of ratings ranging from a minimum of 20 for low anxiety to a maximum of 80 for high trait anxiety.

Test-retest correlations for the T-anxiety scale ranged from .73 to .86 among college students for 20 and 104 days interval (Spielberger et al., 1983). Cronbach’s alpha ranged from .89 to .91 for adults and .89 to .96 for older adults between 50 and 69 years old. Reliability coefficients for this study were .87 for African Americans; .88 for Caucasians; and .88 for all participants.

Evidence of construct validity of the T-Anxiety scale was performed by comparing the mean scores of neuropsychiatric patients with those of the normal subjects. The neuropsychiatric patients had substantially higher T-Anxiety scores than the normal subjects providing evidence that the STAI discriminated between different groups (Spielberger et al., 1983). The STAI has been used to measure anxiety levels in sleep studies of older individuals (Morgan et al., 1989).
Behavioral Factors

The Physical Activity Questionnaire (PAQ). Physical activity was assessed using the Physical Activity Questionnaire (PAQ) developed by Voorrips, Ravelli, Dongelmans, Deurenberg, and van Staveren (1991, see Appendix J). The PAQ is an adaptation of an activity questionnaire (Baecke, Burema, & Frijters, 1982) which was validated in young adults. The questionnaire was modified to make the questionnaire applicable for use with older adults. The questionnaire includes items on household activities, sporting activities, and other physically leisure time activities which are summed to obtain one activity score. Items on household activities are questions with four to five possible ratings, ranging from very active to inactive. Sports and other activities are asked as type of activity, hours per week spent on it, and period of the year in which the activity is normally performed. All activities are classified according to work posture and movements. Each activity is coded for intensity according to Bink and colleagues (1966) classification on net energetic costs of activities.

The questionnaire was validated with healthy individuals aged 63 to 80 years old. Reliability of the questionnaire was assessed using test-retest correlation within a interval of twenty days. Spearman’s correlation coefficient between first and second interviews for 29 older
subjects was 0.89. To determine the relative validity, the questionnaire was completed by 31 subjects. Spearman’s correlation coefficient of activity recall versus questionnaire scores was 0.78. Spearman’s correlation coefficient between pedometer scores and questionnaire scores was 0.72. The group was divided into tertiles of activity score. Seventy-one percent of the subjects were classified correctly in the same tertile based on activity recall and questionnaire results and 67% were classified correctly into the same tertile based on pedometer scores and questionnaire results. Voorrips et al. (1991) concluded that the PAQ for the elders provides a reliable and valid method for classifying older subjects into categories of physical activity.

The Bedtime Routine Questionnaire (BRQ). Bedtime routine was assessed using the Bedtime Routine Questionnaire developed by Johnson (1986, see Appendix K). The BRQ was developed to assess the habitual ritual that older adults practice before going to bed. The BRQ consists of four questions about bedtime routines for older people living in their home. Bedtime routines include bathing; brushing of teeth; combing, curling, or washing of hair; watching television; listening to the radio; reading; writing; eating; drinking; talking to someone; praying; having a backrub; doing relaxation exercises; and taking bedtime medication.
Johnson (1991b) reported concurrent validity and test-retest reliability for the BRQ. To determine concurrent validity of the instrument, Pearson's product-moment correlation was used to determine the relationship between the observations and the reported data. The correlation coefficient was .81 (p < .01) indicating adequate concurrent validity. Test-retest reliability was performed one month apart using the Pearson's product-moment correlation coefficient. The correlation coefficient of .83 (p < .001) was found indicating adequate test-retest reliability for the study.

**Caffeine.** Open-ended questions were asked to evaluate daily consumption of caffeine (see Appendix L). Participants were questioned about their average daily caffeine consumption during the previous month. Caffeine beverages included coffee, tea, cocoa, cola, and chocolate containing foods. Estimation of total daily caffeine intake was expressed in milligrams (mg) per person per day. Brewed coffee was estimated to contain 85 mg per cup; instant coffee was estimated to contain 60 mg per cup; tea 40 mg per cup; cola 40 mg per can and 20 mg per glass; hot chocolate 5 mg per cup; and decaffeinated coffee 3 mg per cup (James & Crosbie, 1987).

**Prescribed, nonprescribed, and social drugs.** The number of prescribed, nonprescribed, and social drugs were assessed using (1) the
list of prescribed drugs from the physical health scale of the OARS/MFAQ instrument (see Appendix M), and (2) a list of nonprescription drugs and social drugs derived from the Ellor and Kurz (1982) drug questionnaire (see Appendix N). The OARS/MFAQ list of prescribed drugs contains 18 items concerning common medications that older adults consume. Other drugs were recorded with the list of nonprescription and social drugs. The number of drugs used once a week and more was recorded and a total score was used for the analysis.

Data Collection Procedures

Pilot

A pilot study was conducted to test if the procedure for data collection, order of the questionnaires, and wording of questions were adequate. Thirteen participants were asked to complete an interview with the investigator. Participants were asked to describe any difficulties they had with the questions or any comments they might have had. Methodological problems encountered in conducting the pilot study were corrected before the main study began. The format of the scale for individual sleep questions was transformed to Likert type items to increase comprehension. Moreover, wording of a few questions were
modified for clarification purposes. The maximum amount of time for the completion of each interview was between 60 and 90 minutes.

Procedure

After older adults were approached by the manager of a specific Center and agreed to participate, the interviewer met participants at the respective Golden Age Center. The interviewer explained the purpose of the study and asked participants to sign the consent form. Following their consent and the initial mental status assessment, the participants were asked to answer questions about sleep, behaviors, health, and sociodemographic information.

Face to face interviews were conducted by the investigator and a skilled interviewer. The other interviewer, a Ph.D student in medical anthropology, had prior experience as an interviewer for studies of adults. The interviewer was trained and supervised by the investigator. Daily follow-up meetings were used to identify problems and concerns.

The interviewers read the questions to the participant and marked the answers to facilitate the process of completing the questionnaires. First, participants were asked to describe their best and worst possible sleep. Because the description needed to be as subjective as possible, the Cantril ladder was chosen to be the first item to be asked. Then, participants were asked to rate sleep satisfaction on the Cantril self-
anchoring ladder. Questions about elders’ sleep and health were
distributed throughout the interview to avoid patterns in answers.
Following the Cantril ladder, questionnaires were completed in the
following order: demographic questions; physical health index of recent
illnesses from the OARS/MFAQ; caffeine consumption index; the PAQ;
the PSQI; the CES-D; the STAI; the drug consumption index; the bedtime
routine questionnaire; and finally more questions about their sleep and
demographic characteristics. Questions about sleep, general health, and
physical activity were asked first during the interview because they were
considered less threatening and less intimate. Once the participants
were more comfortable with the interviewer, questions concerning their
mental health as well as consumption of drugs and some demographic
data were expected to be easier to answer. A period of three months
(February, March, and April) was necessary to recruit participants and
collect data.

Data Analyses

All univariate descriptive statistics were computed on the
microcomputer using the SPSS-PC software statistical package (Norusis,
1990). Preliminary data analysis included descriptive statistics to
describe the study sample. Frequency distributions and univariate
descriptive statistics (mean and standard deviations) were computed for
the continuous sleep variables and frequency distributions were computed for the categorical sleep variables. Additional exploratory analyses using independent t-tests with separate variance estimate were performed to compare poor sleepers with good sleepers on different sleep variables.

Prior to conducting any statistical analyses, assumptions underlying the statistical treatment were tested (normality, linearity, homoscedasticity), and any violation were corrected. Through inspection of the frequency distribution, distribution anomalies (i.e. outliers, skewness) distorting the univariate statistics became apparent and were resolved through investigation of outliers. Also, intercorrelations among a set of outcome variables were obtained to examine the possibility of multicollinearity and understand the interrelatedness among a set of common sleep variables.

Pearson product moment correlations were computed between most sleep variables: sleep satisfaction; sleep latency, numbers awakenings, total sleep time, and total sleep time needed; depth of sleep, movement during sleep and quality of sleep last night; restfulness upon awakening, restfulness during the day, alertness, and wakefulness. Spearman correlation coefficient was computed for sleep satisfaction and overall quality of sleep. Pearson product moment correlations were
computed for sleep satisfaction and the following independent variables: number of illnesses; physical symptoms experienced; symptoms of depression; anxiety; physical activity; caffeine use; and number of prescribed and nonprescribed drugs used. Moreover, product moment correlation was computed between sleep satisfaction and age and a point biserial correlation between sleep satisfaction and gender.

In addition to test the theoretical framework of sleep satisfaction, multiple regression was used to identify behavioral and health factors associated with sleep satisfaction. Multiple regression was used to (a) examine the contribution of behavioral and health factors in explaining sleep satisfaction as measured by the Cantril ladder and the PSQI; and (b) examine the contribution of behavioral and health factors in explaining sleep satisfaction as measured by the Cantril ladder and the PSQI while controlling for age and gender.

Simultaneous or standard multiple regression was used to test the association between sleep satisfaction and a set of independent variables. Sleep satisfaction was regressed on number of illnesses, physical symptoms, symptoms of depression, anxiety, physical activity, caffeine used, and the number of prescribed and nonprescribed drugs used. Hierarchical multiple regression was use to test the association between sleep satisfaction and a set of independent variables after
controlling for age and gender. All the variables were continuous except for gender which was be coded as dummy variables. The exogenous variables as controlled variables were entered first in the equation. Then, the independent variables were entered simultaneously.
RESULTS AND DISCUSSION

The purpose of this descriptive correlational study was (1) to explore different aspects of sleep found to be most important to understand sleep satisfaction and (2) to identify behavioral and health factors associated with sleep satisfaction among older adults living in the community. A descriptive correlational design was employed to explore dimensions of sleep satisfaction and to identify behavioral and health factors related to sleep satisfaction. One hundred and thirty older adults were interviewed to answer the following questions:

1) What are the older adult’s perception of sleep satisfaction, sleep patterns, quality of sleep and quality of wakefulness?

2) What are the relationships between sleep satisfaction and sleep patterns, quality of sleep, and quality of wakefulness?

3) What behavioral and health factors are associated with perceived sleep satisfaction in older adults living in the community?

4) What behavioral and health factors are associated with perceived sleep satisfaction while controlling for age and gender in older adults living in the community?

The first question was answered using scores on Cantril Self-Anchoring ladder (Cantril, 1965), the PSQI global score, and scores
obtained on sleep data collected by the PSQI and additional questions. The second question was answered by using Pearson product moment correlation analyses. The third question was answered by using simultaneous multiple regression analyses and the fourth question was answered by hierarchical multiple regression analyses. This chapter presents a description of different dimensions of sleep satisfaction among older adults living in the community; the association between sleep satisfaction and behavioral and health factors; and a discussion of the findings relevant to the research questions.

**Description of Sleep Satisfaction**

**Question 1: What are older adult’s perception of sleep?**

Findings are reported within the framework and definitions used for this research. Sleep satisfaction referred to the overall evaluation of sleep as experienced by the individual. Sleep patterns were self reported and referred to the time spent asleep during a 24 hour period. Quality of sleep referred to the qualitative aspect of sleep in terms of depth of sleep, perception of movement during sleep and overall quality of sleep. Quality of wakefulness referred to perception of the awaken period in terms of restfulness in the morning and during the day, wakefulness, and alertness.
Sleep satisfaction was examined with a single-item instrument, the Cantril Self-Anchoring ladder and a multi-item instrument, the Pittsburgh Sleep Quality Index (PSQI). The Cantril ladder is a ten point visual scale used to measure the individual’s perception of overall sleep satisfaction. Participants were asked to rate their sleep after describing the best (10) and worst (0) possible sleep they can have. Scores obtained on the Cantril ladder ranged from one, indicating low satisfaction with sleep, to 10 indicating high satisfaction with sleep. The mean score obtained was 6.7 and the standard deviation was 2.4 (see Table 3). When asked to rate their sleep satisfaction, 14 (10.8%) participants assigned a score below 4; 41 (31.5%) participants assigned a score between 4 and 6; and 75 (57.7%) assigned a score above 6 on the Cantril ladder. The results indicated that almost a third of the participants were moderately satisfied and more than half of the participants were highly satisfied with their overall sleep.

The PSQI was developed to assess different aspects of sleep and to identify specific sleep-wake disorders. The global score of the PSQI was used as an indicator of sleep satisfaction. The global score of the PSQI has a potential score ranging from 0 to 21, higher scores indicate worse sleep quality. The global scores obtained on the PSQI ranged from 0 to 16. The mean score obtained was 5.7 and the standard deviation
was 3.7. According to the Buysse and colleagues (1989), a score below 
6 was considered within the normal range for good sleepers. When 
asked to rate their sleep satisfaction, 20 (15.4%) participants assigned a 
score above 10; 36 (27.7%) participants assigned a score between 6 
and 10; and 74 (56.9%) assigned a score below 6 on the PSQI. 
Participants who expressed concerns about their sleep on the Cantril 
ladder also scored high on the PSQI. The reliability coefficient between 
the Cantril ladder for sleep satisfaction and global scores on the PSQI 
was -.78.

Table 3

Sleep Satisfaction

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<th>Variable</th>
<th>Range</th>
<th>Mean (SD)</th>
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<td>Sleep Satisfaction (with the Cantril)</td>
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<tr>
<td>Global evaluation of sleep with the PSQI</td>
<td>0-16</td>
<td>5.7 (3.7)</td>
</tr>
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</table>

The participants were also asked to compare their sleep to when 
they were younger and to compare their sleep to other adults their own 
age. When asked to compare their sleep to when they were younger, 48 
(36.9%) participants answered that their sleep was now worse than 
when they were younger, 55 (42.3%) answered that their sleep was
about the same, and 27 (20.8%) said their sleep was better than when they were younger. When asked to compare their sleep to other people their own age, 12 (9.2%) participants reported their sleep to be worse than other elders, 52 (40.0%) reported their sleep to be about the same, and 52 (40.0%) reported their sleep to be better than other elders their own age. Fourteen (10.8%) participants indicated that they were not able to compare their sleep with sleep of others because they did not know about sleep of other elders.

Sleep patterns were assessed using the PSQI and individual questions about nocturnal awakenings and daytime napping. Participants’ responses to questions about their usual sleep patterns are summarized in Table 4. In addressing the concept of sleep patterns the participants were asked about time for going to bed and time of morning awakening; total sleep time estimated and needed; time required to fall asleep; numbers of awakenings; and daytime sleep.

The average time reported for going to bed was 22.60 (SD = 1.51) or 10:36 p.m. and the average time reported for waking up in the morning was 6.60 (SD = 1.41) or 6:36 a.m. Most participants (65.4%) reported a bedtime between 10:00 and 12:00 at night whereas 30 (23%) participants reported a usual bedtime earlier than 10:00, and 14 (10.8%) reported a usual bedtime later than midnight. A majority of 88 (67.7%)
participants reported waking up in the morning between 6:00 and 8:00, 30 (23.1%) participants usually awakened before 6:00, and 12 (9.2%) usually awakened after 8:00 in the morning. Three participants reported time for going to bed as early as 6:00 p.m. and one participant reported waking up as early as 2:00 in the morning.

Table 4
Sleep patterns

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<td>18.00 - 2.00*</td>
<td>22.60 (1.51)</td>
</tr>
<tr>
<td>Time for morning awakening</td>
<td>2.00 - 10.80*</td>
<td>6.60 (1.41)</td>
</tr>
<tr>
<td>Total nocturnal sleep time estimated</td>
<td>1.00 - 12.00</td>
<td>6.26 (1.74)</td>
</tr>
<tr>
<td>Estimation of sleep time needed</td>
<td>2.00 - 11.00</td>
<td>6.33 (1.52)</td>
</tr>
<tr>
<td>Sleep latency (hours)</td>
<td>0.00 - 6.00</td>
<td>0.41 (0.68)</td>
</tr>
<tr>
<td>Number of awakenings</td>
<td>0.00 - 10.00</td>
<td>1.96 (1.86)</td>
</tr>
<tr>
<td>Estimation of sleep time during nap among nappers ((n=76))</td>
<td>0.10 - 3.50</td>
<td>0.84 (0.63)</td>
</tr>
</tbody>
</table>

* International time

The average total amount of nocturnal sleep estimated by the older adults was 6.26 (SD = 1.74) or 6:15. One participant estimated the total amount of sleep as little as one hour and one participant estimated the total amount of sleep as much as 12 hours. The number of hours of
sleep perceived as needed ranged from 2 to 11 hours. The average number of hours of sleep perceived as needed was 6.33 (SD = 1.52). A paired t-test indicated that the amount of sleep perceived as needed was not significantly different from the total amount of sleep estimated.

In response to the item regarding sleep latency, participants reported an average length of time required to fall asleep as 0.41 hour (SD = 0.68) or 25 minutes. Most participants reported their sleep latency in the range of 0 to 90 minutes except for four participants who reported their sleep latency to be above 2 hours. Additionally, participants were asked the frequency of awakenings within nocturnal sleep. Participants reported awakening 0 to 10 times per night with an average of 1.96 and a standard deviation of 1.86.

The participants were asked about the frequency (see Table 5) and length of naps (see Table 4). Data showed that 53 (40.8%) participants were not usual nappers; 39 (30%) participants usually napped one to three times a week; 14 (10.8%) participants napped more than three times a week and less than daily; and 24 (18.4%) participants were daily nappers (see Table 5). Among the nappers (n = 77), the average amount of time spent during a nap was .84 hour (SD = 0.63) or 50 minutes.
Table 5

Frequency of Napping

<table>
<thead>
<tr>
<th>Frequency</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not napping</td>
<td>53</td>
<td>40.8</td>
</tr>
<tr>
<td>Napping three times and less a week</td>
<td>39</td>
<td>30.0</td>
</tr>
<tr>
<td>Napping more than three and less than 7 times a week</td>
<td>14</td>
<td>10.8</td>
</tr>
<tr>
<td>Napping every day</td>
<td>24</td>
<td>18.4</td>
</tr>
</tbody>
</table>

Quality of sleep was examined with different questions on a Likert scale with scores ranging from 0 to 10. Participants were asked to rate the depth of their sleep, movements during sleep, and how well they slept the night before (see Table 6). Furthermore, one item on the PSQI was oriented to capture the overall aspect of quality of sleep. The scores obtained about the depth of sleep ranged from 0, indicating very light sleep, to 10 indicating very deep sleep. The mean score was 5.3 and the standard deviation was 2.8. When asked to rate the depth of sleep, 35 (26.9%) participants assigned a score below 4; 52 (40.0%) participants assigned a score between 4 and 6; and 43 (33.1%) assigned a score above 6 on the Likert scale. Although the majority of the participants scored moderate or high on the scale for depth of sleep, a
great proportion of the participants perceived the depth of sleep to be low.

Scores obtained about the perception of movement during sleep ranged from 0, indicating no movement during sleep, to 10 tossing and turning all night. The mean score was 4.0 and the standard deviation was 2.7. When asked to rate movement during sleep, 26 (20.0%) participants attributed a score above 6; 35 (26.9%) attributed a score between 4 and 6; 67 (51.5%) attributed a score below 4 on the Likert scale; and two participants did not answer the question. More than half the participants scored lower than 4 on the Likert scale indicating that they did not move much during their sleep.

Sleep quality the night before was examined asking the question "how well did you sleep last night?". This question explored sleep quality only for one night, whereas the other questions on sleep were explored with a time frame of a month. The range of scores for this question varied from 0, indicating very bad sleep, to 10, indicating very good sleep. The mean score for sleep quality during the night before was 7.5 and the standard deviation was 2.5. A paired t-test indicated that the score of the quality of sleep the night before was significantly higher than the score of sleep satisfaction for the past month as measured by the Cantril ladder (p < .001).
Table 6

Quality of Sleep

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of sleep</td>
<td>0-10</td>
<td>5.3 (2.8)</td>
</tr>
<tr>
<td>Movement during sleep</td>
<td>0-10</td>
<td>4.0 (2.7)</td>
</tr>
<tr>
<td>Quality of sleep the last night</td>
<td>0-10</td>
<td>7.5 (2.5)</td>
</tr>
</tbody>
</table>

The quality of sleep was also assessed with the PSQI by asking the participants to evaluate their sleep quality overall. Forty-two (32.3%) participants indicated that their sleep was very good, 74 (56.9%) reported that their sleep was fairly good, 11 (8.5%) said their sleep was fairly bad, and only three (2.3%) participants qualified their sleep as very bad.

Quality of wakefulness was examined with different questions on a Likert scale that ranged from 0 to 10 (see Table 7). Participants were asked to rate their perception of restfulness upon awakening and during the day. Participants were also asked to rate their perception of alertness and wakefulness during the day. The scores obtained on restfulness upon awakening ranged from 0, indicating not rested at all, to 10, very rested. The mean score was 6.5 and the standard deviation was 2.7. When asked to rate how rested and refreshed they were upon
awakening, 21 (16.2%) participants assigned a score below 4; 32
(24.6%) participants assigned a score between 4 and 6; and 77 (59.2%) assigned a score above 6 on the Likert scale. The scores obtained on restfulness during the day ranged from 1 to 10 with a mean of 6.5 and a standard deviation of 2.4. Fourteen (10.8%) participants scored below 4; 47 (36.1%) participants scored between 4 and 6; and 69 (53.1%) scored above 6 on the Likert scale. Perceived restfulness during the day was not statistically different from the perceived restfulness in the morning.

Table 7

Quality of Wakefulness

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restfulness upon awakening</td>
<td>0-10</td>
<td>6.5 (2.7)</td>
</tr>
<tr>
<td>Restfulness during the day</td>
<td>1-10</td>
<td>6.5 (2.4)</td>
</tr>
<tr>
<td>Alertness during the day</td>
<td>0-10</td>
<td>6.9 (2.4)</td>
</tr>
<tr>
<td>Wakefulness during the day</td>
<td>0-10</td>
<td>6.8 (2.6)</td>
</tr>
</tbody>
</table>

Scores obtained on the alertness scale ranged from 0, indicating being very drowsy during the day, to 10, being very alert during the day.
The mean score was 6.9 with a standard deviation of 2.4. Nine (6.9%) participants scored below 4; 46 (35.4%) scored between 4 and 6; and 75 (57.7%) scored above 6 on the Likert scale. The range of scores for wakefulness during the day varied from 0, feeling very sleepy, to 10, indicating feeling very awake during the day. The average score was 6.8 with a standard deviation of 2.6. Sixteen (12.3%) participants scored below 4; 37 (28.5%) scored between 4 and 6; and 77 (59.2%) scored above 6 on the Likert scale. The mean scores of the four indicators of wakefulness were not statistically different from each other.

**Additional Exploratory Analyses**

Additional exploratory analyses were computed to compare poor sleepers with good sleepers on different sleep variables. Independent t-test were performed to described further the differences between poor sleepers and good sleepers. Because standards were not previously established to classify the good from the poor sleepers, the participants were categorized based on sleep satisfaction responses and prior theoretical knowledge. Participants who scored on the lower third (below 4) of the Cantril ladder were defined as poor sleepers for the purpose of the analysis. Participants who scored 4 and above on the Cantril ladder were defined as good sleepers. The poor sleepers were compared to the good sleepers using independent t-tests with separate
variance estimate as suggested by Ott (1988) when the sample sizes are different (see Table 8).

An independent t-test indicated that the total amount of nocturnal sleep estimated was significantly \( (p < .001) \) greater among good sleepers compared to poor sleepers. However, the total sleep time needed was not significantly different between poor and good sleepers. Among poor sleepers, a paired t-test indicated that the amount of sleep perceived as needed \((M = 5.64, SD = 1.87)\) was significantly greater than the amount of sleep estimated \((M = 3.68, SD = 1.64, p = .004)\). Participants who were classified as poor sleepers perceived that they did not obtain the amount of sleep they needed.

In addition, poor sleepers reported significantly \( (p = .01) \) more nocturnal awakenings, less depth in their sleep \( (p < .001) \), and more body movements during sleep \( (p < .001) \) than good sleepers. Poor sleepers did not significantly differ from good sleepers in their perception of restfulness during the day, but scored significantly \( (p = .05) \) lower on restfulness upon awakening. Although poor sleepers did not differ significantly from good sleepers on alertness during the day, they scored significantly lower on their perception of wakefulness \( (p = .05) \).
### Means and Standard Deviations of Poor and Good Sleepers

<table>
<thead>
<tr>
<th>Sleep Pattern</th>
<th>Poor Sleepers</th>
<th>Good Sleepers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total nocturnal sleep time estimated</td>
<td>3.68 (1.64)</td>
<td>6.57 (1.48)**</td>
</tr>
<tr>
<td>Estimation of sleep time needed</td>
<td>5.64 (1.87)</td>
<td>6.41 (1.45)</td>
</tr>
<tr>
<td>Sleep latency (hours)</td>
<td>0.85 (0.88)</td>
<td>0.35 (0.64)</td>
</tr>
<tr>
<td>Number of awakenings</td>
<td>4.75 (3.22)</td>
<td>1.62 (1.28)**</td>
</tr>
<tr>
<td>Depth of sleep</td>
<td>2.64 (2.41)</td>
<td>5.64 (2.65)**</td>
</tr>
<tr>
<td>Movement during sleep</td>
<td>6.93 (2.95)</td>
<td>3.65 (2.44)**</td>
</tr>
<tr>
<td>Restfulness upon awakening</td>
<td>5.21 (3.49)</td>
<td>6.61 (2.15)</td>
</tr>
<tr>
<td>Restfulness during the day</td>
<td>4.71 (3.02)</td>
<td>6.67 (2.63)*</td>
</tr>
<tr>
<td>Alertness during the day</td>
<td>5.71 (3.17)</td>
<td>6.99 (2.25)</td>
</tr>
<tr>
<td>Wakefulness during the day</td>
<td>4.64 (3.34)</td>
<td>7.04 (2.33)</td>
</tr>
</tbody>
</table>

* \( p < .05 \), ** \( p < .01 \), *** \( p < .001 \)

Moreover, additional analyses were computed to compare participants who considered their sleep to be worse now than when they were younger and participants who considered their sleep to be about the same or better. The participants who reported their sleep to be worse now had a mean score of 5.3 (SD = 2.4) on the Cantril ladder and
a mean score of 8.0 (SD = 3.6) on the PSQI. The participants who reported their sleep to be about the same or better had a mean score of 7.5 (SD = 2.1) on the Cantril ladder and a mean score of 4.4 (SD = 3.2) on the PSQI. Independent t-test with separate variance estimate indicated that the participants who reported their sleep to be the same or better now than when they were younger scored significantly higher on the Cantril (p < .001) and lower on the PSQI (p < .001) indicating more satisfaction with their sleep than the participants who reported their sleep to be worse.

Among the participants who considered their sleep to be worse than other people their own age, the mean score for the Cantril was 3.8 (SD = 1.8) and the mean score for the PSQI was 11.0 (SD = 1.3). The participants who considered their sleep to be the same or better than other people their own age had a mean score of 7.1 (SD = 2.3) on the Cantril and a mean score of 5.1 (SD = 3.3) on the PSQI. An independent t-test indicated that the participants who reported their sleep to be the same or better than other people their own age scored significantly higher (p < .001) on the Cantril and lower (p < .001) on the PSQI indicating more satisfaction with sleep than participants who perceived to be worse than other people their own age.
Question 2: What are the relationships between sleep satisfaction and sleep variables?

The Pearson product-moment correlation test was used to examine the relationships among sleep satisfaction and sleep variables. First, sleep satisfaction measured with the Cantril ladder and sleep satisfaction measured with the PSQI was examined. Second, the relationships between the Cantril sleep satisfaction scores and the scores for sleep patterns (total amount of sleep, sleep latency and numbers of awakenings), quality of sleep (depth of sleep, movement during sleep and quality of sleep last night), and quality of wakefulness (restfulness upon awakening and during the day, alertness and wakefulness) were investigated. This was followed by analyzing the relationships between the PSQI global scores and the different scores on sleep patterns, quality of sleep and quality of wakefulness (see Table 9).

Correlation analysis indicated that there was a significant negative relationship of -.78 (p < .001) between the Cantril ladder for sleep satisfaction and the PSQI global scores. Thus, high values on the Cantril ladder for sleep satisfaction were associated with low values on the global PSQI. High scores on the Cantril indicated high satisfaction with sleep whereas high scores on the PSQI indicated low satisfaction with sleep.
Table 9

**Relationship Between Sleep Satisfaction and Sleep Variables**

<table>
<thead>
<tr>
<th>Evaluation of sleep</th>
<th>Cantril Pearson r</th>
<th>PSQI Pearson r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep Satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSQI</td>
<td>-.78***</td>
<td></td>
</tr>
<tr>
<td>Sleep Patterns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total amount of sleep</td>
<td>.56***</td>
<td>-.69***</td>
</tr>
<tr>
<td>Sleep latency</td>
<td>-.34***</td>
<td>.49***</td>
</tr>
<tr>
<td>Awakenings</td>
<td>-.47***</td>
<td>.54***</td>
</tr>
<tr>
<td>Quality of sleep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of sleep</td>
<td>.51***</td>
<td>-.44***</td>
</tr>
<tr>
<td>Quality of sleep last night</td>
<td>.62***</td>
<td>-.52***</td>
</tr>
<tr>
<td>Movement during sleep</td>
<td>-.27**</td>
<td>.30***</td>
</tr>
<tr>
<td>Overall quality of sleep</td>
<td>-.67(Rho)***</td>
<td>.70(Rho)***</td>
</tr>
<tr>
<td>Quality of wakefulness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restfulness upon awakening</td>
<td>.38***</td>
<td>-.37***</td>
</tr>
<tr>
<td>Restfulness during the day</td>
<td>.40***</td>
<td>-.36***</td>
</tr>
<tr>
<td>Alertness during the day</td>
<td>.24**</td>
<td>-.23**</td>
</tr>
<tr>
<td>Wakefulness during the day</td>
<td>.35***</td>
<td>-.26**</td>
</tr>
</tbody>
</table>

** ** p < .01, *** p < .001

Cantril sleep satisfaction scores had a significant positive relationship with the amount of sleep estimated (r = .56, p < .001) and negative relationships with sleep latency (r = -.34, p < .001) and numbers
of awakenings ($r = -0.47, p < 0.001$). The association between the variables indicated that greater sleep satisfaction was related to more hours of estimated time of sleep, shorter periods of sleep latency, and fewer awakenings.

Cantril sleep satisfaction scores had a significant positive relationship with the depth of sleep ($r = 0.51, p < 0.001$) and the quality of sleep last night ($r = 0.62, p < 0.001$) and a negative relationship with movements perceived at night ($r = -0.27, p < 0.01$). The association between the variables indicated that greater sleep satisfaction was related to greater depth of sleep, greater quality of sleep last night, and fewer movements perceived. A Spearman Rho correlation coefficient was calculated for the association between the overall sleep quality and sleep satisfaction. The correlation analysis indicated a significant negative relationship ($\rho = -0.67, p = 0.001$) between perceived overall quality of sleep and sleep satisfaction as measured with the Cantril ladder. The association between the variables showed that as sleep satisfaction increased (high scores on the Cantril ladder), the quality of sleep also increased (low scores indicated better overall quality of sleep).

Cantril sleep satisfaction scores had a significant positive relationship with feeling rested and refreshed upon awakening ($r = 0.38, p < 0.001$) and during the day ($r = 0.40, p < 0.001$), alertness ($r = 0.24, p < 0.01$)
and wakefulness ($r = .35, p < .001$). Greater levels of sleep satisfaction were related to higher levels of restfulness upon awakening and during the day, as well as more alertness and wakefulness.

PSQI global scores had a significant negative relationship with the amount of sleep estimated ($r = -.69, p < .001$) and positive relationships with sleep latency ($r = .49, p < .001$) and numbers of awakenings ($r = .54, p < .001$). Low scores on the PSQI were related to higher numbers of hours of sleep, shorter sleep latency periods, and fewer awakenings.

PSQI scores had a significant negative relationship with the depth of sleep ($r = -.44, p < .001$), the quality of sleep last night ($r = -.52, p < .001$), and a positive relationship with movements perceived at night ($r = .30, p < .001$). The association between the variables indicated that greater sleep satisfaction with the PSQI was related to greater depth of sleep, quality of sleep last night, and fewer perceived body movements during sleep. A Spearman Rho correlation coefficient was calculated for the association between the overall quality of sleep and sleep satisfaction. There was a significant negative relationship (rho = .70, $p = .001$) between quality of sleep and sleep satisfaction as measured with the PSQI. The association between the variables indicated that as sleep satisfaction increased (low scores on the PSQI), quality of sleep also increased (low score indicated better overall quality of sleep).
In addition, PSQI scores had a significant negative relationship with feeling rested and refreshed upon awakening ($r = -0.37$, $p < .001$) and during the day ($r = -0.36$, $p < .001$), alertness ($r = -0.23$, $p < .01$), and wakefulness ($r = -0.26$, $p < .01$). Thus, lower values on sleep satisfaction were related to higher levels of restfulness upon awakening and during the day, greater alertness, and greater wakefulness. In summary, data suggested that the more satisfied the participants were with their sleep, the better they scored on sleep patterns, quality of sleep, and quality of wakefulness.

The Sleep Satisfaction Model

The following two questions concerning the association between behavioral and health factors, and perceived sleep satisfaction in older adult living in the community were answered with simultaneous and hierarchical multiple regression analyses. However, prior to multiple regression analyses, data were screened to detect violation of regression assumptions, multicollinearity, missing data, and outlier cases. In addition, correlation coefficients were used to examine relationships between sleep satisfaction and the independent, and between sleep satisfaction and control variables.
Data Screening

Regression assumptions. Examination of residuals scatterplots provided a test of assumptions of normality, linearity, and homoscedasticity between predicted dependent scores and errors of prediction. Histogram and frequency tables were also examined showing that most variables were slightly skewed. Three variables were moderately skewed. The degree of skewness was 1.6 for physical activity, 2.0 for depression, and 2.3 for anxiety. Transformation did not change the results of the regression analyses and because of the difficulties of interpretation with transformed variables, the regression analyses were performed with the original data. Other assumptions concerning the error term (Verran & Ferketich, 1984) were also tested. The expected value of the mean of the residuals was equal to zero. The assumption concerning the possible correlation between error terms was investigated with a Durbin-Watson test showing a value between 1.5 and 2.5 indicating that the error terms were uncorrelated (Ott, 1988). The independent variables were plotted against the residuals to test if the independent variables were correlated with the error term. The scatter plots showed no pattern indicating no relationship between the independent variables and the error term.
**Multicollinearity.** Multicollinearity which is a major source of error in the multiple regression (Schroeder, 1986) refers to the absence of orthogonality in a set of independent variables (Pedhazur, 1982). Multicollinearity is a problem referring to correlated independent variables in a specific sample of data, and not the overall population (Berry & Feldman, 1985). Multicollinearity was examined using Schroeder’s criteria. Each independent variable in the equation was regressed on all other independent variables showing $R^2$ relatively far from 1.00. Further diagnosis through calculation of the determinant indicated that the determinant (.07) for the correlation matrix was relatively far from zero. Moreover, high tolerance and small eigen values indicated that multicollinearity was not really a problem according to Schroeder’s criteria (1990). Although a diagnostic of multicollinearity cannot be made according to Schroeder (1986), Tabachnick & Fidell (1989) mentioned that when two variables with a bivariate correlation of .70 or more are used in the same analysis it weakens the analysis. In the present analysis, a visual inspection of the correlation matrix indicated that the correlation of anxiety and depression were closely related ($r = .78$). Correlation among independent variables may lead to difficulties in the situation of regression statistics. High correlation between two independent variables, such as it was the case with
depression and anxiety, leads not only to a reduction in the magnitudes of their Beta's, but also to an increase in their standard errors (Pedhazur, 1982). Under such circumstances, either one of the variables, but not both, could be used in a regression analysis. A first regression analysis was performed using both symptoms of depression and symptoms of anxiety followed by a second regression analysis using only depression. Depression rather than anxiety was selected in the second regression analysis because of its higher correlation with sleep satisfaction. Furthermore, in the regression analysis using both symptoms of depression and anxiety, only depression was significantly associated with sleep satisfaction as measured by the Cantril ladder.

**Missing Data.** Five missing values on depression and one missing value on anxiety were replaced by the respective mean of individual scores. Tabachnick and Fidell (1989) mentioned that it is reasonable to replace single missing values with the mean of their individual score.

Thirteen participants (about 10% of the sample) did not wish to answer the item concerning income. Moreover, the participants of the study were mainly from the same socioeconomical status limiting the variance of this variable. Because income was not critical to the present analyses, the decision was made not to consider this variable in the analysis.
Although the bedtime routine was originally considered in the sleep satisfaction model, the decision was undertaken to exclude the variable in the statistical analyses on the basis of some theoretical and practical considerations. For instance, bedtime routine as used in Johnson studies was not clearly defined. Subjects were classified according to their perception of having a bedtime routine or not having a bedtime routine. Particular activities considered as bedtime routine by the subjects could be stressful rather than relaxing, thus contributing to sleep disturbances instead of enhancing sleep satisfaction.

In the present study, difficulties occurred when asking the participants about the practice of a bedtime routine. Many participants answered that they did not have a bedtime routine; however, most of them reported activities that they performed every night. The fact that some regular activities performed every night were not reported by older adults as bedtime routine was confusing. Therefore, a classification of participants on the basis of their perception of bedtime routine was not considered adequately explicit to perform statistical analysis.

**Outlier cases.** Regression diagnostics using histogram of standardized residuals, Cook’s distance and leverage points were performed to identify possible outliers (Weissfeld & Butler, 1988). Two most influential outliers were flagged. One outlier had low scores on
sleep satisfaction, and high scores on the CES-D scale, the STAI scale, and on the PAQ scale. The other outlier had high scores on sleep satisfaction, the PAQ, and the number of drugs used; and low score on the CES-D scale and the STAI. In each case inferences drawn from the model changed when either of these observations were deleted from the analyses of regression. Different conclusions can be drawn solely on the basis of a single observation. The approach chosen was to report both sets of analyses, with the outliers and with the outliers removed from the analyses.

Zero-Order Correlations

A Pearson's zero-order correlation was computed for every bivariate relationship in the model for sleep satisfaction (see Table 10). Correlation coefficients were used to measure the strength of the relationship between sleep satisfaction, the dependent variable, and the following independent variables: number of illnesses, physical symptoms experienced, anxiety, symptoms of depression, physical activity, caffeine, number of drugs used. Moreover, correlation coefficients were also used to examine the relationship between sleep satisfaction and the control variables: age and gender. Relationships were considered statistically significant at a probability level of .05.
Four relationships were consistent with the sleep satisfaction model in that, there was (a) a moderate negative relationship between sleep satisfaction measured with the Cantril ladder and depression ($r = -0.43, p < .001$), (b) a moderate negative relationship between sleep satisfaction and anxiety ($r = -0.42; p < .001$), (c) a weak negative relationship between sleep satisfaction and the number of illnesses ($r = -0.18, p < .05$), and (d) a weak negative relationship between sleep satisfaction and the number of drugs used ($r = -0.18, p < .05$).

Table 10

Relationships Between Sleep Satisfaction and Explanatory Variables

<table>
<thead>
<tr>
<th>Sleep Satisfaction</th>
<th>Cantril $r$</th>
<th>PSQI $r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.10</td>
<td>.06</td>
</tr>
<tr>
<td>Number of illnesses</td>
<td>-.18*</td>
<td>.30***</td>
</tr>
<tr>
<td>Symptoms bother</td>
<td>-.14</td>
<td>.31***</td>
</tr>
<tr>
<td>Anxiety</td>
<td>-.42***</td>
<td>.44***</td>
</tr>
<tr>
<td>Depression</td>
<td>-.43***</td>
<td>.47***</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>-.02</td>
<td>.02</td>
</tr>
<tr>
<td>Caffeine</td>
<td>.13</td>
<td>-.17*</td>
</tr>
<tr>
<td>Number of drugs used</td>
<td>-.18*</td>
<td>.23**</td>
</tr>
</tbody>
</table>

* $p < .05$, ** $p < .01$, *** $p < .001$
Sleep satisfaction measured with the PSQI was positively related to (a) depression ($r = .47, p < .001$), (b) anxiety ($r = .44, p < .001$), (c) the number of illnesses ($r = .30, p < .001$), (d) the number of symptoms ($r = .31, p < .001$), and (e) the number of drugs used ($r = .23, p < .01$). Moreover, sleep satisfaction measured with the PSQI was negatively related to caffeine consumption ($r = -.17, p < .05$).

The findings indicated that sleep satisfaction was significantly related to symptoms of depression, anxiety, number of illnesses, and number of drugs used. Moreover, sleep satisfaction as measured by the PSQI was significantly related to the number of symptoms experienced and caffeine, whereas sleep satisfaction as measured by the Cantril did not significantly related to caffeine or the number of symptoms experienced.

**Question 3:** What behavioral and health factors are associated with sleep satisfaction in older adults living in the community?

This study was specifically concerned with examining the relationship between the independent variables that included the number of illnesses, physical symptoms experienced, anxiety, symptoms of depression, physical activity, caffeine, and number of drugs used, and the dependent variable, sleep satisfaction. To obtain a more precise picture of the relative influence of each independent variable when others
Table 11

Regression Estimates for Sleep Satisfaction Measured by the Cantril Ladder

<table>
<thead>
<tr>
<th></th>
<th>Regression with outliers</th>
<th>Regression without outliers</th>
<th>Regression without outliers &amp; anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$R^2 = .234$</td>
<td>$R^2 = .212$</td>
<td>$R^2 = .193$</td>
</tr>
<tr>
<td></td>
<td>Adjusted $R^2 = .191$</td>
<td>Adjusted $R^2 = .166$</td>
<td>Adjusted $R^2 = .153$</td>
</tr>
<tr>
<td></td>
<td>$F = 5.337; p &lt; .0001$</td>
<td>$F = 4.646; p &lt; .0001$</td>
<td>$F = 4.865; p &lt; .0002$</td>
</tr>
<tr>
<td>Beta</td>
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<td>h</td>
</tr>
<tr>
<td><strong>Number of illnesses</strong></td>
<td>-.11</td>
<td>-.12</td>
<td>-.11</td>
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<tr>
<td></td>
<td>-.14</td>
<td>-.15</td>
<td>-.14</td>
</tr>
<tr>
<td><strong>Symptoms bothered</strong></td>
<td>.17</td>
<td>.18</td>
<td>.17</td>
</tr>
<tr>
<td></td>
<td>.05</td>
<td>.05</td>
<td>.05</td>
</tr>
<tr>
<td><strong>Symptoms of depression</strong></td>
<td>-.27*</td>
<td>-.26*</td>
<td>-.42***</td>
</tr>
<tr>
<td></td>
<td>-.10*</td>
<td>-.10*</td>
<td>-.17***</td>
</tr>
<tr>
<td><strong>Trait of Anxiety</strong></td>
<td>-.22</td>
<td>-.21</td>
<td>-.22</td>
</tr>
<tr>
<td></td>
<td>-.06</td>
<td>-.06</td>
<td>-.06</td>
</tr>
<tr>
<td><strong>Physical activity</strong></td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td></td>
<td>.00</td>
<td>.00</td>
<td>.03</td>
</tr>
<tr>
<td><strong>Caffeine use</strong></td>
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<td>.08</td>
<td>.06</td>
</tr>
<tr>
<td></td>
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<td>.05</td>
</tr>
<tr>
<td><strong>Number of drugs used</strong></td>
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<td>-.11</td>
<td>-.11</td>
</tr>
<tr>
<td></td>
<td>-.11</td>
<td>-.11</td>
<td>-.12</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .001$
were statistically held constant, standard or simultaneous multiple regression was undertaken. In the first regression analysis, the dependent variable was sleep satisfaction as measured by a Cantril self-anchoring ladder (see Table 11). For the second regression analysis, the dependent variable was sleep satisfaction measured by the PSQI (see Table 12). Standard regression analyses were performed with and without outlier observations. The results of the regression analyses also are presented with and without the variable anxiety which was highly correlated with depression. The relationships were examined with ordinary least squares regression (OLS) using the SPSS/PC statistical software package (Norusis, 1988).

Analyses indicated that 19.05% of the variance in sleep satisfaction measured with the Cantril ladder was explained by the independent variables taken together (see Table 11). When outliers were deleted from the analysis, 16.63% of the variance in sleep satisfaction was explained by the independent variables. If anxiety was deleted from the analysis because of its high correlation with depression and without outliers, 15.34% of the variance in sleep satisfaction was explained by the independent variables.

The beta coefficients estimated in the regression analysis represented the expected change in sleep satisfaction, expressed in
<table>
<thead>
<tr>
<th></th>
<th>Regression with outliers</th>
<th>Regression without outliers</th>
<th>Regression without outliers &amp; anxiety</th>
</tr>
</thead>
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<td>$R^2$</td>
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<td>.230</td>
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<tr>
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<td>.198</td>
<td>.192</td>
</tr>
<tr>
<td>$F$</td>
<td>6.920; $p &lt; .0001$</td>
<td>5.503; $p &lt; .0001$</td>
<td>6.085; $p &lt; .0001$</td>
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<tr>
<th></th>
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<tr>
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<td>.15</td>
<td>.28</td>
<td>.14</td>
<td>.27</td>
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<tr>
<td>Symptoms bothered</td>
<td>.03</td>
<td>.01</td>
<td>.04</td>
<td>.02</td>
<td>.05</td>
<td>.02</td>
</tr>
<tr>
<td>Symptoms of depression</td>
<td>.24</td>
<td>.14</td>
<td>.22</td>
<td>.13</td>
<td>.34***</td>
<td>.21***</td>
</tr>
<tr>
<td>Trait of Anxiety</td>
<td>.19</td>
<td>.08</td>
<td>.16</td>
<td>.07</td>
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<tr>
<td>Physical activity</td>
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<td>.06</td>
<td>.05</td>
<td>.05</td>
<td>.07</td>
<td>.07</td>
</tr>
<tr>
<td>Caffeine use</td>
<td>-.10</td>
<td>-.14</td>
<td>-.09</td>
<td>-.13</td>
<td>-.07</td>
<td>-.10</td>
</tr>
<tr>
<td>Number of drugs used</td>
<td>.06</td>
<td>.11</td>
<td>.08</td>
<td>.13</td>
<td>.09</td>
<td>.15</td>
</tr>
</tbody>
</table>

* $p < .05$; *** $p < .001$
standard score, associated with a one standard deviation change in an
independent variable, while holding the remaining variables constant.
Beta coefficients for sleep satisfaction measured with the Cantril ladder
were considered significant at a probability level of at least 0.05. The
respective beta coefficient for the relationship between depression and
sleep satisfaction was -.27 in the initial regression equation; -.26 in the
regression equation without the outliers; and -.42 when anxiety was
deleted from the regression equation. None of the other variables
reached significant levels.

Regression analyses indicated that 24.31% of the variance in sleep
satisfaction measured with the PSQI was explained by the independent
variables (see Table 12). When outliers were deleted from the analysis,
19.76% of the variance in sleep satisfaction was explained by the
independent variables. When anxiety and outliers were removed from
the analysis, 19.25% of the variance in sleep satisfaction was explained
by the independent variables.

Beta coefficients for sleep satisfaction measured with the PSQI
were considered significant at a probability level of at least 0.05. The
only significant beta coefficient was .34 for the relationship between
depression and sleep satisfaction when anxiety was deleted from the
regression equation. None of the other variables reached significant levels.

**Question 4:** What behavioral and health factors are associated with sleep satisfaction while controlling for age and gender in older adults living in the community?

To better understand linkages among phenomena that affect sleep satisfaction, hierarchical multiple regression analyses were performed to examine the relative influence of each independent variable on the dependent variable, while controlling for two exogenous variables, age and gender. In the first regression, sleep satisfaction was regressed on age and gender. Gender was treated as a dummy variable with a score of one for the female group and a score of zero for the male group. In the second regression, sleep satisfaction was regressed on the control and all independent variables. Results are reported for sleep satisfaction when measured with the Cantril ladder and when measured with the PSQI. Hierarchical regression analyses were performed with and without outlier observations. The result of the regression analyses also are presented without the variable anxiety that was highly correlated with depression. The relationships were examined with OLS regression using the SPSS/PC statistical software package (Norusis, 1988). Results of these regression procedures are presented.
Regression analyses indicated that the independent and control variables explained 17.99% of the variance in sleep satisfaction measured with the Cantril ladder (see Table 13). The independent variables alone explained 17.20% of the variance in sleep satisfaction when age and gender were controlled for. When the outliers were deleted from the analysis, 15.48% of the variance in sleep satisfaction was explained by the independent variables while 13.90% of the variance in sleep satisfaction was explained by the independent variables after controlling for age and gender. When anxiety was removed from the analysis because of its high correlation with depression and without the outliers, 14.31% of the variance in sleep satisfaction was explained by the independent variables, and 12.73% of the variance in sleep satisfaction was explained after controlling for age and gender.

The beta coefficients estimated in the regression analysis represented the expected change in sleep satisfaction as measured by the Cantril ladder, expressed in standard score, associated with a one standard deviation change in an independent (or control) variable, while holding the remaining variables constant. Beta coefficients were considered significant at a probability level of at least .05. The respective beta coefficient (see Table 14) for the association between depression and sleep satisfaction in the initial regression equation and in
Table 13

Coefficients of Determination for Sleep Satisfaction Measured by the Cantril

<table>
<thead>
<tr>
<th>Regression equation</th>
<th>Regression with outliers</th>
<th>Regression without outliers</th>
<th>Regression without outliers &amp; anxiety</th>
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<tr>
<td>Sleep satisfaction on age &amp; gender</td>
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<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>.023</td>
<td>.031</td>
<td>.031</td>
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<tr>
<td>Adjusted $R^2$</td>
<td>.008</td>
<td>.016</td>
<td>.016</td>
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<tr>
<td>$F$</td>
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<td>.136</td>
<td>.136</td>
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<tr>
<td>Sleep satisfaction on all independent variables</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>.237</td>
<td>.214</td>
<td>.197</td>
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<td>.001</td>
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<td>Increment in $R^2$</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>in $R^2$</td>
<td>.214</td>
<td>.183</td>
<td>.166</td>
</tr>
<tr>
<td>in Adjusted $R^2$</td>
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<td>$p$</td>
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</tbody>
</table>
Table 14

Regression Estimates for Sleep Satisfaction Measured by the Cantril Ladder

<table>
<thead>
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<th>Regression without outliers</th>
<th>Regression without outliers &amp; anxiety</th>
</tr>
</thead>
<tbody>
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<td>Beta</td>
</tr>
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<td>-.01</td>
<td>-.02</td>
</tr>
<tr>
<td>Gender</td>
<td>.05</td>
<td>.31</td>
<td>.05</td>
</tr>
<tr>
<td>Number of illnesses</td>
<td>-.12</td>
<td>-.15</td>
<td>-.12</td>
</tr>
<tr>
<td>Symptoms bothered</td>
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<td>.05</td>
<td>.18</td>
</tr>
<tr>
<td>Symptoms of depression</td>
<td>-.27</td>
<td>-.10</td>
<td>-.25</td>
</tr>
<tr>
<td>Trait of Anxiety</td>
<td>-.22</td>
<td>-.06</td>
<td>-.21</td>
</tr>
<tr>
<td>Physical activity</td>
<td>-.01</td>
<td>-.01</td>
<td>.01</td>
</tr>
<tr>
<td>Caffeine use</td>
<td>.07</td>
<td>.06</td>
<td>.07</td>
</tr>
<tr>
<td>Number of drugs used</td>
<td>-.09</td>
<td>-.10</td>
<td>-.09</td>
</tr>
</tbody>
</table>

*** $p < .001$
the regression equation without the outliers were not significant at a probability level of .05. When anxiety and the outlier cases were removed from the equation, the beta coefficient (-.40) for depression reached statistical significance. None of the other variables reached significant levels.

Regression analyses indicated that all the independent variables explained 23.91% of the variance in sleep satisfaction measured with the PSQI (see Table 15). The independent variables explained 23.02% of the variance in sleep satisfaction when age and gender were controlled for. When the outliers were deleted from the analysis, 19.57% of the variance in sleep satisfaction was explained by all independent variables and 16.89% of the variance in sleep satisfaction was explained by the independent variables when controlling for age and gender. Without the outliers, 19.14% of the variance in sleep satisfaction was explained by the independent variables when anxiety was removed from the analysis, and 16.47% of the variance in sleep satisfaction was explained when age and gender were controlled for.

The beta coefficients (see Table 16) estimated in the regression analysis represented the expected change in sleep satisfaction as measured by the PSQI, expressed in standard score, associated with a one standard deviation change in an independent variable, while holding
<table>
<thead>
<tr>
<th>Regression equation</th>
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<th>Regression without outliers</th>
<th>Regression without outliers &amp; anxiety</th>
</tr>
</thead>
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<tr>
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</tr>
<tr>
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<td>2.760</td>
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<tr>
<td>Sleep satisfaction on all independent variables</td>
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</tr>
<tr>
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<td>.242</td>
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<tr>
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Table 16

Regression Estimates for Sleep Satisfaction Measured by the PSQI

<table>
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<tr>
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<th>Regression without outliers</th>
<th>Regression without outliers &amp; anxiety</th>
</tr>
</thead>
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<td>Beta</td>
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<td>-.02</td>
<td>-.04</td>
</tr>
<tr>
<td>Gender</td>
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<tr>
<td>Number of illnesses</td>
<td>.17</td>
<td>.33</td>
<td>.15</td>
</tr>
<tr>
<td>Symptoms bothered</td>
<td>.03</td>
<td>.02</td>
<td>.05</td>
</tr>
<tr>
<td>Symptoms of depression</td>
<td>.23</td>
<td>.14</td>
<td>.20</td>
</tr>
<tr>
<td>Trait of Anxiety</td>
<td>.19</td>
<td>.08</td>
<td>.16</td>
</tr>
<tr>
<td>Physical activity</td>
<td>.09</td>
<td>.09</td>
<td>.08</td>
</tr>
<tr>
<td>Caffeine use</td>
<td>-.08</td>
<td>-.11</td>
<td>-.07</td>
</tr>
<tr>
<td>Number of drugs used</td>
<td>.06</td>
<td>.10</td>
<td>.08</td>
</tr>
</tbody>
</table>

*** p < .001
the remaining variables constant. Beta coefficients were considered significant at a probability level of at least .05. The beta coefficients for depression (see Table 16) were not significant to explain sleep satisfaction as measured by the PSQI when all the variables were entered in the equation. When anxiety and the outlier cases were removed from the equation, the beta coefficient (.32, p < .01) for depression was significant. None of the other variables reached significant levels.

In summary, findings from ordinary least squares regression analysis showed that when outliers were deleted from the analysis, the number of illnesses, physical symptoms experienced, symptoms of depression, physical activity, caffeine, and the number of drugs used explained more than 14% of the variation in sleep satisfaction measured by the Cantril and more than 19% of the variation in sleep satisfaction measured by the PSQI. When age and gender were controlled, number of illnesses, physical symptoms experienced, symptoms of depression, physical activity, caffeine, and the number of drugs used explained close to 13% of the variation in sleep satisfaction measured with the Cantril and close to 17% of the variation in sleep satisfaction measured with the PSQI. When anxiety was included in the analysis of regression, not much more variance in sleep satisfaction was explained. Although relationships existed between sleep satisfaction and the independent
variables, only symptoms of depression was significantly associated with sleep satisfaction while other variables were held constant.

Discussion of Findings

What are older adult's perception of sleep?

The Cantril ladder and the PSQI were employed to measure sleep satisfaction. A great majority of respondents (89.2%) indicated on the Cantril ladder that they were moderately or highly satisfied with their overall sleep. In this study, the participants (10.8%) who scored on the lower third of the Cantril ladder were considered as poor sleepers. The prevalence of poor sleep in this study is below figures usually reported for subjects of the same age range. The most likely explanation for low prevalence of poor sleep in this sample is the relatively good health of the participants. The participants included in the study did not suffer for any acute physical and mental health problems and they did not use hypnotics and psychoactive drugs daily. Other factors that might have been involved in the low prevalence of poor sleep are specific wording or questionnaire format used, a more restrictive definition of poor sleep based on sleep satisfaction, and response bias due to social desirability.

The majority of the respondents indicated that they were highly or moderately satisfied with their sleep on the PSQI. The mean global score for the PSQI in this study was similar of what Buysse et al. (1991) found
in healthy elders in their research. The high reliability coefficient ($r = - .78$) between the score on the Cantril and the PSQI indicated that the two measures of sleep satisfaction were closely related. It was expected that the two measures of sleep satisfaction would yield similar results because they both measured sleep satisfaction. The Cantril ladder is a global single-item that allowed the participant to define the concept of sleep satisfaction in a way that was personally meaningful. The PSQI is a global multi-item that represented the multidimensional concept of sleep in a way that was meaningful to the authors (Buysse et al., 1989). Buysse and colleagues (1989) included in the PSQI not only components of sleep satisfaction such as subjective sleep quality, sleep latency, and sleep duration, but also components of sleep dysfunction such as sleep disturbances, and use of sleeping medications.

Participants who considered their sleep to be worse than when they were younger scored lower on sleep satisfaction than participants who considered their sleep to be the same or better as when they were younger. This finding indicated that participants who reported an overall sleep change in the negative direction were less satisfied with their sleep than other participants. In addition, participants who reported their sleep to be worse than other people their own age scored lower on sleep satisfaction than participants who considered their sleep to be the same
or better as other people their own age. This finding indicated that
participants who considered their sleep to be worse than others their
own age were less satisfied with their sleep than other participants.
Although some age related changes in sleep patterns are reported in the
literature (Hayter, 1983; Kripke et al., 1979; McGhie & Russell, 1962;
Reynolds et al., 1985), the majority of older adults in this study did not
define their overall sleep as worse as when they were younger.

In this study as in other studies (Hayter, 1983; Hayashi & Endo,
1982; Reynolds et al., 1985), sleep patterns varied greatly from one
individual to another one. Many of the findings regarding sleep patterns,
quality of sleep, and quality of wakefulness supported previous findings.
Concerning the sleep schedule of older adults, the results of this study
suggested that most participants (65.8%) have a usual bedtime between
10:00 and 12:00 and most participants (67.7%) usually wake up
between 6:00 and 8:00 in the morning. These findings were similar to
results of other researchers (Hayter, 1983; Mooney, 1988) and
supported the fact that older adults do not necessarily go to bed and get
up very early.

Estimation of total sleep time averaged 6 hours and 15 minutes.
This finding was similar to some other studies of sleep in older adults
(Hock et al., 1987; Reynolds et al., 1985). The participants who
reported getting 6 hours or less of sleep a night had lower scores on
sleep satisfaction than participants who obtained more than 6 hours of
sleep per night. This finding agrees with Kripke and colleagues (1979)
who explained that insomnia was reported as occurring "often" more
frequently among those who reported a regular pattern of shorter sleep
duration.

Among all participants, the average amount of sleep perceived as
needed was not significantly different from the average amount of sleep
estimated. Other researchers found similar results. Hayter (1983)
reported that most older adults perceived getting the right amount of
sleep they needed. In addition, according to Mooney (1988), more than
88% of older adults reported getting enough sleep. Nevertheless, poor
sleepers of this study did not perceive getting as many hours of sleep as
they expected to be needed. Morin and Gramling (1989) indicated that
discrepancies between current sleep patterns and sleep requirement
expectations were more pronounced in poor sleepers.

The participants' estimation of sleep latency averaged 25 minutes
and nocturnal awakenings averaged 1.96. Other studies with older
adults report similar findings of sleep latency ranging from 20 to 25
minutes (Bixler et al., 1984; Hock et al., 1987; Knab & Engel, 1988;
Mooney, 1988) and nocturnal awakenings ranging from 1.2 to 2.1
Although the older participants report multiple awakenings at night, the majority of them consider their sleep as being moderately or very satisfactory.

Among the participants of the study, more than 40% were not usual nappers whereas the others were occasional and frequent nappers. Hayter (1983) reports a greater proportion of non nappers while Mooney (1988) reports a smaller proportion of non nappers than reported in this study. The proportion of nappers and non nappers can vary greatly from sample to sample. In these studies, samples were similar for age and gender, but not enough information was available to compare the participants on other characteristics. The fact that most participants in this study were active members of the Golden Age centers might have contributed to lower frequency of napping.

Quality of sleep and quality of wakefulness were explored in this study. In summary, the majority of the participants (89.2%) considered their overall sleep quality to be fairly good or very good whereas 10.8% of the participants considered their overall sleep quality as fairly bad or very bad. The participants who perceived overall sleep quality to be fairly good or very good also were more satisfied with their sleep. No particular demographic characteristics distinguished the participants who
considered their overall sleep quality to be good from those who considered their overall sleep quality to be rather bad.

Mean scores for indicators of quality of wakefulness (rested and refreshed in the morning and during the day, alertness and wakefulness) were above 6 on Likert scales. The dimensions of quality of wakefulness were closely related to each other and very similar results were found for the four indicators. It was expected that participants who scored high on restfulness during the day would also scored high on alertness and wakefulness.

Investigators (Bliwise, 1992; Lugaresi et al., 1983) suggested that poor sleepers reported greater sleep complaints and daytime sleepiness compared to good sleepers. To add knowledge to the literature and understand further the differences between poor sleepers and good sleepers, analyses were performed in this study to compare poor and good sleepers on many aspects of sleep. The findings demonstrated that poor sleepers who scored low on sleep satisfaction reported less total sleep time, more nocturnal awakenings, less depth in sleep, more movements during sleep, less restfulness in the morning, and less wakefulness during the day than good sleepers who scored moderate or high on sleep satisfaction. There was a tendency in poor sleepers to
score lower not only on sleep patterns but also on the quality of sleep and quality of wakefulness.

**What are the relationships between sleep satisfaction and sleep variables?**

In this study, sleep was considered to be a multidimensional phenomenon that occurred when participants considered themselves to be unaware of their surroundings. Sleep satisfaction was a multidimensional construct that represented an overall evaluation of the experience of sleep. Sleep patterns referred to the quantitative aspects of sleep. Contrary to other studies, quality of sleep was not an overall evaluation of the experience of sleep, but rather defined as the qualitative attributes characterizing sleep. Quality of wakefulness was defined as the qualitative attributes characterizing wakefulness. Conceptually, this study proposed that not only sleep patterns, but also quality of sleep and quality of wakefulness were components of sleep satisfaction. Therefore, the discussion in this section will be confined to the relationships between sleep satisfaction, sleep patterns, quality of sleep and quality of wakefulness.

As expected, sleep satisfaction as measured by the Cantril Self-Anchoring ladder was highly related to sleep satisfaction as measured by the PSQI. Sleep satisfaction measured by the Cantril ladder was also
highly related to the total amount of sleep, the number of awakenings, the depth of sleep, and the overall quality of sleep. Sleep satisfaction measured by the PSQI was highly related to the total amount of sleep, the number of awakenings, sleep latency, the depth of sleep, and the overall quality of sleep. Sleep satisfaction measured by the Cantril ladder and the PSQI was moderately related to quality of wakefulness (restfulness upon awakening, restfulness during the day, alertness during the day and wakefulness during the day). Findings suggested that the higher participants scored on sleep patterns, quality of sleep, and quality of wakefulness the higher they scored on sleep satisfaction. Therefore, not only sleep patterns, but also quality of sleep and quality of wakefulness were meaningful to describe sleep satisfaction.

Nevertheless, the magnitude of the relationships between sleep satisfaction and specific sleep parameters varied. According to these study findings, the most sensitive sleep variables for examining the nature of sleep satisfaction were sleep duration, number of awakenings, depth of sleep and the overall quality of sleep.

Although no research has investigated the relationship between sleep satisfaction and different aspects of sleep, most researchers have used only sleep duration, sleep latency and awakenings as indicators of sleep satisfaction. Many researchers have reported that sleep latency
was the most consistent characteristic that differentiated insomniacs from control subjects of all ages (Carskadon et al., 1976; Kales et al., 1984; Morgan et al., 1988; Williams et al., 1974). Another characteristic that distinguished insomniacs from controls was an increased number of nocturnal awakenings (Carskadon et al., 1976; Kales et al., 1984). However, other researchers (Beutler et al., 1978; Coates et al., 1982) found no difference in awakenings between poor sleepers and good sleepers.

In this study, the perception of sleep duration was certainly a factor strongly related to sleep satisfaction. Longer sleepers were more satisfied with their sleep than shorter sleepers. Previous investigators (Friedman et al., 1991) have documented a relationship between the experience of too little sleep and dissatisfaction with sleep. However, Morin and Gramling (1989) claimed that sleep duration was not a good index for discriminating poor and good sleepers. The perception of total sleep time should not be considered as the only indicator for sleep satisfaction but should be investigated as one of many other indicators of sleep satisfaction. Some researchers (Adam et al., 1986; Hauri & Fisher, 1986) suggested that poor sleepers underestimated sleep duration whereas Buysse et al. (1991) reported that older adults overestimated their sleep duration. Considering that many older sleepers do not give
precise estimates of their sleep duration (Adam et al., 1986; Buysse et al., 1991), it is meaningful to obtain additional indicators when measuring sleep satisfaction.

Sleep pattern was certainly one of the meaningful indicators of sleep satisfaction, but a more comprehensive picture should considered all aspects involved in sleep satisfaction as a global concept. Quality of sleep and quality of wakefulness were statistically related to sleep satisfaction and probably influential in the evaluation of sleep satisfaction in older persons. Sleepers do not necessarily attach the same meaning and importance to each dimension of sleep, which supports the relevance of examining all aspects of sleep satisfaction. The results suggest the pertinence of considering all aspects of sleep and wakefulness when measuring sleep satisfaction.

What behavioral and health factors are associated with sleep satisfaction in older adults living in the community?

The theoretical model used for this study represented a tentative explanation of sleep satisfaction. The relationships between variables depicted in the model of sleep satisfaction were deduced from theoretical considerations. Previous investigators did not test these relationships in order to explain sleep satisfaction. Thus, specification errors in the model were likely to appear because the model was a
beginning attempt at theory construction. Major concepts embodied within the model were behavioral factors, health status, individual differences, and sleep satisfaction. According to this perspective, sleep satisfaction is likely to increase with favorable behavioral and health factors. Some findings from the current research were consistent with the proposed theoretical model of sleep satisfaction.

Sleep satisfaction measured with the Cantril was negatively related to depression, anxiety, number of illnesses, and number of drugs used. Sleep satisfaction measured with the PSQI was positively related to depression, anxiety, number of illnesses, symptoms experienced, and number of drugs used and negatively related to caffeine consumption. Depression and anxiety were by far the variables most strongly related to sleep satisfaction. Zero-order correlations of depression and anxiety with sleep satisfaction measured by the Cantril ladder was more than twice that of any other variable. As symptoms of depression and symptoms of anxiety increased, sleep satisfaction decreased.

These findings were consistent with other research (Adam et al., 1986; Bliwise et al., 1992; Morgan et al., 1988; Morgan et al., 1989; McAvay & Timko, 1988; Morin & Gramling, 1989; Rodin et al., 1988) in which complaints of insomnia were associated with psychological distress such as symptoms of depression and anxiety in older persons.
living in the community. According to Morin and Gramling (1989), differences in sleep patterns between poor and good sleepers were partially accounted for by higher levels of depressive symptomatology and anxiety. Adam et al. (1986) reported that poor sleepers had significantly higher scores on trait anxiety, neuroticism, and somatic and obsessional anxiety.

Close to 13% of the variation in sleep satisfaction measured by the Cantril and close to 17% of the variation in sleep satisfaction measured by the PSQI was explained by the number of illnesses, physical symptoms experienced, symptoms of depression, physical activity, caffeine, and the number of drugs used when age and gender were controlled for. However, more than 80% of the variance in sleep satisfaction remains unexplained. Although relationships existed between sleep satisfaction and other independent variables, only depression was significantly associated with sleep satisfaction while the other variables were held constant.

The relationship between sleep satisfaction and depression was greater than the relationship between sleep satisfaction and anxiety. Moreover, anxiety and depression were highly related. Thus, when the multiple regression analysis was performed with both symptoms of depression and anxiety, only depression was significantly associated with
sleep satisfaction. Paulson and Shaver (1991) reported similar findings in which depression accounted for more variation in sleep satisfaction than anxiety. However, Morgan et al. (1988) found that symptoms of anxiety rather than symptoms of depression were more important predictors of poor sleep quality. Because symptoms of depression and symptoms of anxiety were highly related, results should be interpreted with caution. Although the CES-D is a measure of depressive symptomatology, it also measures emotional distress which includes symptoms of anxiety and other neurotic and psychotic conditions (Devins & Orme, 1985). The STAI trait anxiety developed to assess the tendency to perceive stressful events as dangerous or threatening also assesses emotional distress. The strong correlation between the CES-D and the STAI contraindicates interpretation of the instruments as solely depressive or solely anxious in nature. It is not particularly surprising, therefore, that when controlling for the interrelationship between anxiety and depression, one of the variables did not reach significance.

Although the relationships between the number of illnesses, symptoms experienced, and medication usage were moderately correlated with sleep satisfaction measured by the PSQI, when the interrelationships were controlled for, the findings failed to reach significance. According to previous research (Habte-Gabr et al., 1991;
Morgan et al., 1988; 1989), complaints of insomnia in older persons were associated with perceived health status and the number of medications use. Habte-Gabr et al. (1991) reported that health problems such as emphysema, joint pain, and morning stiffness were associated with decreased likelihood of feeling rested in the morning. Breathing problems and pain may interfere with sleep and thus decrease its quality. However, Morin and Gramling (1989) argued that the increased number of physical illnesses and medication usage do not reliably differentiate poor from good sleepers. Although the prevalence of certain medical conditions correlated with increased sleep disturbances, the current data suggested that lower sleep satisfaction in older adults cannot be accounted for by medical factors alone. The relationship between self-perceived health status and sleep satisfaction may be a function of both physical problems and psychological factors. Older participants who scored low on sleep satisfaction tended to have more health problems and to report higher levels of depressive symptoms, either of which might contribute to sleep problems.

Study findings failed to support an association between sleep satisfaction and behavioral factors. Neither physical activity, the consumption of caffeine, nor the use of drugs were associated with sleep satisfaction when the interrelationships were taken into account. Factors
that may explain the absence of significant relationship between sleep satisfaction and behavioral factors are numerous.

Several investigators (Baekeland & Lasky, 1966; Baekeland, 1970; Browman, 1980; Bunnell et al., 1983; Griffin & Trinder, 1978; Montgomery et al., 1982; Shapiro et al., 1975) have reported an increase in deep sleep of Stage 3 and 4 following an acute increase of daytime exercise. However, other investigators (Bonnet, 1980; Buguet et al., 1980; Edinger et al., 1991; 1992; Horne & Porter, 1975; Zir et al., 1971) observed little or no significant alteration in deep sleep following the practice of exercise. Besides the effect of physical activity on deep sleep, investigators (Bevier et al., 1992; Vitiello et al., 1990) have suggested that the practice of exercise contributes to improvement of subjective sleep parameters. The findings of this study failed to demonstrate a significant relationship between sleep satisfaction and the level of physical activity measured by the Physical Activity Questionnaire (Voorrips et al., 1991). Explanations for this absence of relationship between sleep satisfaction and physical activity may be related to the difficulty in obtaining a precise estimate of activity by self-report. Thus, the absence of relationship may also be related to the difficulty for individuals to recall the precise duration and the type of physical activity that were performed.
In a comprehensive review of studies examining the effect of exercise on sleep, Horne (1981) suggested that performance of high intensity exercise was required to alter sleep patterns. However, it is unclear as to what the required level of exercise is to produce a positive effect on sleep is. Physical fitness rather than exercises performed could be more important in determining the quality of sleep. Edinger et al. (1992) obtained different scores on a variety of sleep measures between fit and sedentary older men. These researchers suggested that fitness may have an effect on the sleep patterns of older men. Vitiello et al. (1990) suggested that increased aerobic fitness could attenuate sleep disturbances that accompany healthy normal aging. However, neither intensity level of exercise nor the physical fitness of participants was examined in this study. More precise estimates of physical activity including intensity level and physical fitness might be necessary to observe a relationship between physical activity and sleep.

There is a general presumption that caffeine has a negative affect on sleep. However, systematic studies of caffeine consumption in association with sleep are rare and inconclusive statistically regarding its negative affect on sleep (Morgan et al., 1989). Curless et al. (1993) reported lower plasma caffeine concentrations in older adults reporting the poorest sleep quality. It is possible that people with poor sleep
satisfaction are aware of the stimulatory effects of caffeine and therefore lower their intake accordingly. Another reason why caffeine may not correlate with sleep could be that self reported beverage consumption is an imprecise index of actual caffeine intake because of variations such as the type and amount of product used and the volume of water added.

In this study, the number of drugs was utilized as a behavioral factor that was a clinically relevant aspect of lifestyle. Because the chronic use of sleeping pills and psychoactive medications were known to have detrimental effect on psychological health, participants using hypnotics and psychoactive drugs were excluded from this study. All prescribed and nonprescribed medications were included in the number of drugs used.

Morgan and colleagues (1989) reported that the number of prescribed drugs emerged as a significant predictor of sleep quality. In this study, a weak relationship was observed between the number of drugs used and sleep satisfaction as measured by the PSQI. However, the analysis failed to find a significant association between the number of drugs used and sleep satisfaction. Factors that may explain the absence a significant association between sleep satisfaction and the number of drugs used may be related to the difficulty of measuring the exact number of drugs used by older adults. It was not possible for the
investigator to record objectively the exact medication taken by the older participants. Additionally, it was difficult for many participants to recall the name of the medication being taken. It is reasonable to assume also that many older adults did not report the exact numbers of drugs used. Given the fact that the type of medication was not always recorded and the number of drugs used was not precise, it is not surprising that no significant results were found.

Many investigators have reported that the prevalence of self-reported poor sleep increases with age (Bixler et al., 1979; Hayter, 1983; Kripke et al., 1979; Lugaresi et al., 1983; McGhie & Russell, 1962). An issue underlying nearly all of these studies was whether the complaint of poor sleep was related to the aging process or to the consequences of other age-related health problems. Results of this study did not support previous findings. Indeed, no significant relationship between age and subjective aspects of sleep was observed. Moreover, in this group of older individuals, no significant relationship was found between age and behavioral or health factors. Contrary to other studies, the sample included only older adults who had no significant acute physical and mental health problems. The purpose of this exclusion criteria was to reduce the possibility of confounding affects of acute disease and related consequences on sleep. There is a possibility that age related changes in
subjective sleep could be explained by the concurrent conditions related to aging, such as medical illnesses and psychiatric disorders, rather than the normal aging process. Hyypa and Kronholm (1989) suggested that physical and psychological conditions rather than age may contribute to poor sleep.

Several surveys comparing sleep patterns of males and females have found that females have higher rates of insomnia than males across all age groups (Bixler et al., 1979; Hammond, 1964; Karacan et al., 1976; Karacan et al., 1983; Liljenberg et al., 1988; Welstein et al., 1983). Campbell and colleagues (1989) reported that older women were less satisfied with their sleep than men of the same age. However, in this study no significant differences were found between males and females for sleep satisfaction, sleep patterns, quality of sleep and quality of wakefulness. As mentioned earlier, participants with no acute illnesses or current mental health problems were selected for this study, reducing the possibility of confounding effects. Therefore, it is difficult to compare the results of this study with the results of other studies of different samples. Rediehs et al. (1990) indicated that social and psychological factors contribute to the tendency for women to report more subjective sleep disturbances than men. Although many investigators reported sleep differences between males and females,
other factors associated with gender such as lifestyle, physical health, and psychological health rather than gender alone should be considered. Contrary to other studies, the participants of this study were active members of a Golden Age Center and were involved socially in the organization. This might have contributed to the results indicating no difference in sleep satisfaction between males and females participants.
SUMMARY, LIMITATIONS, AND IMPLICATIONS

The purpose of this descriptive correlational study was (1) to explore different aspects of sleep found to be most important to understand sleep satisfaction and (2) to identify behavioral and health factors associated with sleep satisfaction among older adults living in the community. Sleep satisfaction was defined conceptually and operationally, as a personal and subjective experience. Sleep satisfaction was explored using the Cantril self-anchoring ladder (Cantril, 1965) and the global score of the PSQI (Buysse et al., 1989). Other aspects of sleep (sleep patterns, quality of sleep, quality of wakefulness) were examined using questions of the PSQI and additional questions on sleep. Furthermore, analyses of the relationships among sleep satisfaction and other aspects of sleep such as sleep patterns, quality of sleep, and quality of wakefulness were performed. The relative influence of different behavioral and health factors on sleep satisfaction was also investigated. Participants were asked to answer questions about their illnesses, physical symptoms, anxiety, symptoms of depression, physical activity, caffeine, and the number of drugs used.

A convenience sampling method was used to obtain a sample of 130 participants. The participants for this study were older adults living
in the community who were functionally and socially active and who did not suffer from any particular acute illnesses. The participants ranged in age from 65 to 90 with a mean age of 76.2 years. The sample included 106 females and 24 males; 75 African Americans and 55 Caucasians; and 102 participants living alone in a house or apartment and 28 living with a significant other. A majority of the participants had at least some degree of junior high school and the majority of the participants had an income lower than $15,000 a year.

Summary of Findings

Sleep satisfaction using the Cantril self-anchoring ladder as a global measure of the concept had not been explored in preceding research. This study contributes to a new perspective on sleep by investigating sleep satisfaction in the older population living in the community. The results of this study indicated that only a small proportion of the participants were not satisfied with sleep. The majority of the participants reported their sleep to be the same or better as when they were younger and reported their sleep to be the same of better than other adults their age. Sleep patterns varied greatly from one individual to another one. Total sleep time averaged 6 hours and 15 minutes, sleep latency averaged 25 minutes, and nocturnal awakenings averaged 1.96. Among the participants, more than 40% were not usual nappers whereas
the others were occasional and frequent nappers. Most participants considered that their overall sleep quality as fairly or very good. In addition, mean scores for indicators of quality of wakefulness were above 6 on Likert scales.

Sleep patterns, quality of sleep, and quality of wakefulness were moderately to highly related to sleep satisfaction. Aspects of sleep highly related to sleep satisfaction were the total amount of sleep, the number of awakenings, the depth of sleep, and the overall quality of sleep. Aspects of sleep moderately related to sleep satisfaction were sleep latency and movement perceived during sleep. Aspects of wakefulness moderately related to sleep satisfaction were restfulness upon awakening and during the day, alertness during the day, and wakefulness during the day.

Several significant relationships between variables depicted in the model of sleep satisfaction were found. Symptoms of depression, anxiety, the number of illnesses, and the number of drugs used were significantly related to sleep satisfaction as measured by the Cantril ladder and the PSQI. However, only depression was significantly associated with sleep satisfaction when interrelationships among variables were taken into account.
Limitations of the Study

The major limitation usually encountered in a descriptive correlational study design involves issues of control over the variables being studied (Kerlinger, 1973). Control usually refers to manipulation, randomization, inclusion or exclusion criteria and statistical control. In a crossectional study, the possibility of faulty interpretation is greater because of lack of manipulation and randomization. Moreover, data were collected at only one point in time providing no direct, time ordered evidence of causality. Directionality between symptoms of depression and sleep satisfaction remains to be resolved.

In a nonexperimental study, the researcher is faced with the impossible task of identifying and controlling numerous confounding variables (Pedhazur & Schmelkin, 1991). The fact is that in the real world, variables are interrelated in very complex ways making difficult the interpretation of a single cause and effect relationship. In general, descriptive correlational studies are aimed to gaining understanding of the phenomenon in a larger context. The purpose of this study was to enhance understanding of sleep satisfaction and to identify behavioral and health factors associated with sleep satisfaction.

The convenience sample from which these data were obtained limits generalization of the results to older adults who possess the same
characteristics as older adults in this study. The results are limited to older adults living in the community with no significant acute physical and mental health problems. The participants were members of a Golden Age Center of the Cleveland metropolitan area. Consequently, the sample overrepresented older adults living alone and of lower socioeconomic status. The sample was also limited to the older adults who were willing to participate in the study. Moreover, the first identification of participants was performed by the managers of the Golden Age Centers bringing certain selection limits.

Data obtained in this study must be interpreted with caution because participants were asked to recall and evaluate their sleep, health, and behaviors for the past month. Cautious interpretations should be made when the data are subjective and retrospective in nature. The recall of past events can be affected by many factors including memory and intervening experiences. As suggested in Adam et al. (1986), poor sleepers tend to underestimate sleep duration and overestimate sleep latency. Differences have been reported between objective and subjective estimates of sleep patterns in other studies (Adam et al., 1986; Buysse et al., 1991; Hauri & Fisher, 1986). Although the present findings are based on self-report measures, subjective data is particularly relevant to health care providers, who must
rely almost exclusively on patients’ report for clinical assessment and
treatment of older insomniacs. It is also the subjective complaint of poor
sleep that leads to the frequent use and abuse of sleeping medication,
and in this regard the present data are clinically relevant.

Much more work is necessary in order to understand the complex
contribution of behavioral and health factors to sleep satisfaction, given
that health variables are multidimensional and interdependent constructs.
Although the main purpose of the study was descriptive, the results may
provide beginning support for theoretical explanations of variable
relationships. The sleep satisfaction model should not be prematurely
rejected since the theory holds promise for understanding sleep
satisfaction as well as for developing intervention strategies for those
who complain of poor sleep.

Implications for Nursing

Sleep has long been recognized in nursing as a fundamental and
basic need for all human beings, young and old (Ebersole & Hess, 1990;
Henderson, 1966; Nightingale, 1969). To be useful to nursing, sleep has
to be understood not only as a biological process but also as a personal
and subjective experience. Thus, the results of this study provide
additional information about older adults’ sleep satisfaction for practicing
nurses, nurse educators and nurse researchers.
In all age groups, a complaint of insomnia or poor sleep is usually based upon the patient's subjective report of sleep. Findings of this study can therefore provide clinically relevant information on the sleep perception of older people. In this study, the results showed that 89% of the participants were moderately or highly satisfied with their sleep. If in the population, the same proportion of older adults are satisfied with their sleep, health care providers should be careful in considering insomnia as a problem of old age. Although sleep pattern changes occur frequently with aging, the majority of elders in this study did not define their sleep as worse as when they were younger. Changes in sleep patterns are not necessarily perceived as more disturbing as before by older adults who are good sleepers. Nurses as health care providers must avoid defining sleep changes as problems. Nevertheless, changes in sleep patterns are perceived more disturbing than before by older adults who are poor sleepers.

Among poor sleepers, there is a discrepancy between current sleep duration and sleep-requirement expectations. The main clinical implication of this finding is that nurses should use educational approaches to inform clients about variability in sleep requirements. By providing information about appropriate age-related norms and diversity in sleep requirements, the therapist may alter unrealistic expectations
regarding duration of sleep and reduce the fear that changes in sleep are necessarily pathological.

Nurses can contribute positively to the older adults’ perception of sleep satisfaction by evaluating more carefully aspects involved in sleep satisfaction. An accurate assessment must include not only assessment of the typical sleep patterns of the individual, but should also include the client’s perception about the quality of sleep and wakefulness. The perception of the cause of the sleep disturbance and their affective response to any reported disturbance should also be evaluated. Depressive and anxious symptoms as well as physical health problems should be part of a complete assessment of sleep satisfaction.

Nurses play a pivotal role in the identification of sleep problems and their management. Nurses should keep in mind when planning nursing care that older individuals vary in their needs and perceptions of sleep. Management of sleep should include many alternative interventions which may help to improve sleep satisfaction. Moreover, nurses play a vital role in educating other members of the health care team regarding normal sleep patterns of older persons. This is important not only in identifying sleep disturbances that should be treated, for example sleep apnea, but also in avoiding intervention that is not only unnecessary but potentially harmful.
Community health nurses have long been committed to the promotion of health and well-being. Insomnia is not a trivial complaint, and chronic poor sleep can have a detrimental impact on both psychological and physical well-being. Innovative community health programs should include identification of people with sleep problems based on knowledge of what is normal sleep in older adults, such as interruption of sleep or increase awakenings during nocturnal sleep. Older adults need to learn about sleep changes and behavioral facilitators of sleep.

Nurse educators can use the findings relative to older adults’ perception of sleep satisfaction to add to students’ understanding of the older population and aging. Because the need to sleep is a personal and subjective experience to the individual, nurse educators can sensitize students about the diversity found in older adults. The results suggest the pertinence of considering all aspects of sleep and wakefulness when planning care to enhance sleep satisfaction. The results also suggest that depression is an important factor related to sleep satisfaction. Therefore, it is fundamental for the educator to assist students in developing assessment skills about dimensions of sleep satisfaction in older adults and depression. Furthermore, students should be informed about behavioral factors associated with sleep satisfaction.
One challenge for nurse researchers is to refine the taxonomic structure of sleep satisfaction. This study indicated that sleep satisfaction was related to sleep patterns, quality of sleep, and quality of wakefulness. Because the need to sleep has long been recognized in nursing as a basic need for older individuals, exploring aspects of sleep found to be most important to understand sleep satisfaction is fundamental to nursing knowledge development.

Another challenge for nurse researchers is to develop theoretical knowledge of sleep and identify factors contributing to sleep satisfaction. This study suggests that symptoms of depression are associated with sleep satisfaction. Depression is a multidimensional concept associated with other health factors such as anxiety, the number of illnesses, and physical symptoms. Therefore, it is important for nurse researchers to understand the association between depression and sleep satisfaction in a more global context. While nurse authors suggest interventions to promote sleep, few studies have been conducted in older adults to determine whether or not these strategies are associated with sleep satisfaction. To promote sleep satisfaction, reduce the overuse of hypnotics, increase daytime functioning, and higher level of well-being, nurses researchers need to explore further factors related to sleep satisfaction.
Future Directions

The findings of this study suggest directions for further research regarding sleep satisfaction. Further research is needed to clarify the relationships between sleep satisfaction and other sleep variables. Not all older adults experience problems with all the dimensions of sleep satisfaction, nor do they report having a problem with sleep whether or not their sleep has changed over the years. An overall examination of sleep satisfaction should consider all aspects of sleep with more emphasis on dimensions which are strongly related to sleep satisfaction such as the total amount of sleep, the number of awakenings, and the soundness of sleep. Further research is needed to refine the conceptual structure of sleep satisfaction and to develop an instrument that capture sleep satisfaction as a global concept.

More research is needed to determine the most effective strategies to promote sleep satisfaction as well as those that have been found helpful by older individuals in previous research. Research with quasi-experimental and experimental designs are recommended to explore behavioral factors related to sleep disturbances experienced by older adults. For instance, experimental research is needed to determine if the practice of exercise and physical fitness can improve sleep of older individuals. Additional research using all night sleep recording would be
useful to explore the affects of behavioral factors such as physical activity and relaxation on sleep patterns.

Much more work is necessary in order to understand the complex contribution of behavioral factors and health factors to sleep satisfaction, given that health variables are multidimensional and interdependent constructs. For instance, the relationship between drug consumption and sleep is complex, involving both the pharmacological action of drugs and the clinical condition underlying their use. Future studies should attempt to clarify this relationship and delineate variations within drug categories in order to identify drugs which are more likely to decrease sleep satisfaction. In addition, factors that could improve not only sleep but the overall health, should be studied in future research.

Additional investigations using longitudinal designs and assessing sleep satisfaction using daily sleep reports as well as assessing physical and psychological health variables will further enhance understanding of the natural history and therapeutic implications of sleep problems among the elders. Moreover, future studies should consider using a random sample to allow greater generalization of the results to the older population. Both healthy and nonhealthy older adults could be examined. Finally, investigators should study the characteristics of older adults who
are self-defined poor sleepers and identify strategies that might help their sleep.


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Dear Participant,

My name is Nicole Ouellet. I am a nurse and a Ph.D student at the School of Nursing at Case Western Reserve University. I would like to interview you as part of a study of older adult’s health and lifestyle. Your participation in the study will help nurses to learn more about health needs of older adults. Although participating in this interview will not be of immediate benefit to you, the information is expected to contribute to knowledge that nurses can use to help older adults maintain healthy lives.

If you choose to participate in the study, you will be asked to answer questions concerning your health and your lifestyle. I (or my research assistant) will meet with you one time for approximately one hour. If you need to take a break during the interview, please feel free to do so. The interview should not cause you any discomfort or harm. However, if some of the questions make you feel anxious and seem of a personal nature, you are free to refuse to answer those questions.

Your participation in the study is completely voluntary and you may stop the interview at any time. Whether you participate or not, it will not
affect any of the services you receive at the center. Your answers to the questionnaire are strictly confidential. An ID number will be given to you and your name will not appear on the questionnaire. Your name, address and phone number will be kept in a separate locked file in my office and will be destroyed once the study is completed. Your name will not appear anywhere on any report. Only the investigator will have access to the questionnaires and the information will be destroyed when reports of the study are completed.

You have a right to full and complete information regarding this study. Please feel free to ask any questions you have concerning the study. Thank you for your time and willingness to participate in this study.

Sincerely,

Nicole Ouellet
Case Western Reserve University
Cleveland, Ohio
44106
Phone number: 321-4693

I __________________________________________ understand the content of this letter concerning the study on health and lifestyle conducted by Nicole Ouellet. I also understand that I will never be identified by name and that all of my answers will be strictly anonymous and confidential. I accept to participate in this study. I understand that if I have any questions about the project, I can call Nicole Ouellet at any time and she will answer my questions.

____________________________________  _____________
Signature of Participant                Date
Appendix B

Demographic Data Sheet

1. How old are you? ________

2. Gender: 1. F 2. M

3. What is your marital status?
   1. Single
   2. Married
   3. Divorced
   4. Separated
   5. Widowed

4. What is your cultural affiliation?
   1. Anglo Saxon
   2. African American
   3. Latino American
   4. Native American
   5. Asian
   6. European
   7. Other: Specify ________

5a) What is your living situation?
   1. Alone
   2. With spouse
   3. With relatives: how many? _____
   4. With children: how many? _____
   5. With sibling: how many? _____
   6. With non relatives: how many? _____

5b) Total: ________

5c) Do you have to take care of a person at home? 1 Yes 0 No
    IF YES: Who is the person you are taking care of?

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6. What grade did you complete in school?
   1. Completed grade school
   2. Completed junior high school
   3. Completed high school
   4. Completed college
   5. Completed graduate school
   6. Completed professional school

7. What is your gross annual family income: ______________

8. During the past two years, did any of the following events happen to you?
   1. Death of a spouse
   2. Divorce or separation
   3. Death of a close friend
   4. Death of a family member
   5. Retirement

8b) Total of events: _______

   What was (is) your occupation: ______________

10. What is your weight now? _______

11. What is your height? _______

12. Blood Pressure: _______

13. Pulse: _______
1. Describe what, for you, would be the very best sleep you could get during a night.

2. Describe what you perceive as a very bad night of sleep.

On the ladder here, if the best sleep a person can get is at the top of the ladder and the worst night of sleep is at the bottom, for the past month where on this ladder would you say you are.

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Pittsburgh Sleep Quality Index (PSQI)

Instructions:
The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, when have you usually gone to bed at night?
   Usual Bed Time __________

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?
   Number of Minutes __________

3. During the past month, when have you usually gotten up in the morning?
   Usual Getting Up Time __________

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed).
   Hours of Sleep per Night __________

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you...

   (a) Cannot get to sleep within 30 minutes
      0. Not during the past month
      1. Less than once a week
      2. Once or twice a week
      3. Three or more times a week

   (b) Wake up in the middle of the night or early morning
      0. Not during the past month
      1. Less than once a week
      2. Once or twice a week
      3. Three or more times a week

   (c) Have to get up to use the bathroom
      0. Not during the past month
      1. Less than once a week
      2. Once or twice a week
      3. Three or more times a week

   (d) Cannot breathe comfortably
      0. Not during the past month
      1. Less than once a week
      2. Once or twice a week
      3. Three or more times a week

   (e) Cough or snore loudly
      0. Not during the past month
      1. Less than once a week
      2. Once or twice a week
      3. Three or more times a week

   (f) Feel too cold
      0. Not during the past month
      1. Less than once a week
      2. Once or twice a week
      3. Three or more times a week

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(g) Feel too hot

0. Not during the past month
1. Less than once a week
2. Once or twice a week
3. Three or more times a week

(h) Had bad dreams

0. Not during the past month
1. Less than once a week
2. Once or twice a week
3. Three or more times a week

(i) Have pain

0. Not during the past month
1. Less than once a week
2. Once or twice a week
3. Three or more times a week

(j) Other reason(s), please describe ________________________________

How often during the past month have you had trouble sleeping because of this?

0. Not during the past month
1. Less than once a week
2. Once or twice a week
3. Three or more times a week

6. During the past month, how would you rate your sleep quality overall?

0. Very good
1. Fairly good
2. Fairly bad
3. Very bad

7. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?

0. Not during the past month
1. Less than once a week
2. Once or twice a week
3. Three or more times a week

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

0. Not during the past month
1. Less than once a week
2. Once or twice a week
3. Three or more times a week

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

0. No problem at all
1. Only a very slight problem
2. Somewhat of a problem
3. A very big problem

10. Do you have a bed partner or roommate?

0. No bed partner or roommate
1. Partner/roommate in other room
2. Partner is same room, but not same bed
3. Partner in same bed
1. During the past month, how many times did you usually wake up at night?

2. How many hours of sleep a night do you need? 

3. During the past month, how often did you take a nap during the day? _____ per week

4. On the average, how long were your naps? _____ minutes

5. How often do you dream during a week? 

6. Do you remember your dreams? 1. Yes 0. No

7. Do you have nightmares? 1. Yes 0. No How often during a week?

8. Compared to when you were younger, how is your sleep now - better, about the same, or worse?

9. Compared to other people your own age, how is your sleep - better, about the same, or worse?
Quality of sleep and Wakefulness

1. During the past month, how was your sleep?
   - Very light
   - Very deep

2. How well did you sleep last night?
   - Very well
   - Very bad

3. During the past month, how much do you move around during your sleep?
   - No body movement
   - Tossed and turned all night

4. During the past month, how rested and refreshed did you feel during the day?
   - Not rested
   - Very rested

5. During the past month, how rested and refreshed did you feel when you woke up in the morning?
   - Not rested
   - Very rested

6. During the past month, how did you feel during the day?
   - Very alert
   - Very drowsy

7. During the past month, how did you feel during the day?
   - Very sleepy
   - Very awake
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Appendix H
pages 206-208

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Appendix I

CES-D Scale

Instructions for use by interviewer: Below is a list of the ways you might have felt. Please tell me how often you have felt this way during the past week. HAND CARD A.

<table>
<thead>
<tr>
<th>CARD A</th>
<th>Rarely or None of the Time (Less than 1 day)</th>
<th>Some or a Little of the Time (1-2 Days)</th>
<th>Occasionally or a Moderate Amount of Time (3-4 days)</th>
<th>Most or All of the Time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DURING THE PAST WEEK:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>I was bothered by things that usually don’t bother me</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>I did not feel like eating; my appetite was poor</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>I felt that I could not shake off the blues even with help from my family or friends</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>I felt that I was just as good as other people</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>I had trouble keeping my mind on what I was doing</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>I felt depressed</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>I felt that everything I did was an effort</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>I felt hopeful about the future</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>I thought my life had been a failure</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>I felt fearful</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11.</td>
<td>My sleep was restless</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12.</td>
<td>I was happy</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13.</td>
<td>I talked less than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14.</td>
<td>I felt lonely</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15.</td>
<td>People were unfriendly</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16.</td>
<td>I enjoyed life</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17.</td>
<td>I had crying spells</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18.</td>
<td>I felt sad</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19.</td>
<td>I felt that people disliked me</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>20.</td>
<td>I could not get &quot;going&quot;</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

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Physical Activity Questionnaire

Household activities

1) Do you do the light household work? (dusting, washing dishes, repairing clothes, etc.)?
   0. Never (<once a month)
   1. Sometimes (only when partner or help is not available)
   2. Mostly (sometimes assisted by partner or help)
   3. Always (alone or together with partner)

2) Do you do the heavy housework? (washing floors and windows, carrying trash disposal bags, etc.)
   0. Never (<once a month)
   1. Sometimes (only when partner or help is not available)
   2. Mostly (sometimes assisted by partner or help)
   3. Always (alone or together with partner)

3) For how many persons do you keep house? (including yourself; Fill in "0" if you answered "never" in Q1 and Q2.)

4) How many rooms do you keep clean, including kitchen, bedroom, garage, cellar, bathroom, ceiling, etc.? (fill in "0" if you answered "never" in Q1 and Q2.)
   0. Never do housekeeping
   1. 1 - 6 rooms
   2. 7 - 9 rooms
   3. 10 or more rooms

5) If any rooms, on how many floors? (fill in "0" if you answered "never" in Q4.)

6) Do you prepare warm meals yourself, or do you assist in preparing?
   0. Never
   1. Sometimes (once or twice a week)
   2. Mostly (3-5 times a week)
   3. Always (more than 5 times a week)

7) How many flights of stairs do you walk up per day? (one flight of stairs is 10 steps)
   0. I never walk stairs
   1. 1 - 5
   2. 6 - 10
   3. More than 10

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8) If you go somewhere in your hometown, what kind of transportation do you use?

0. I never go out
1. Car
2. Public transportation
3. Bicycle
4. Walking

9) How often do you go out for shopping?

0. Never or less than once a week
1. Once a week
2. Twice to four times a week
3. Every day

10) If you go out for shopping, what kind of transportation do you use?

0. I never go out for shopping
1. Car
2. Public transportation
3. Bicycle
4. Walking

Sport activities

Do you play a sport?

Sport 1

Name __________________________
Intensity ________________________
Hours per week __________
Period of the year __________

Sport 2

Name __________________________
Intensity ________________________
Hours per week __________
Period of the year __________

Leisure time activities

Do you have other physical (active) activities?

Activity 1

Name __________________________
Intensity ________________________
Hours per week __________
Period of the year __________

Activity 2

Name __________________________
Intensity ________________________
Hours per week __________
Period of the year __________
The Bedtime Routine Questionnaire

1. a. Do you have a usual time for going to sleep?
   1. Yes
   0. No

   b. If so, what is it? ________________________

2. a. Do you have a routine that you follow before going to bed?
   1. Yes
   0. No

   b. If yes, what, specifically, do you do before going to bed? (check all that apply).

   (1) Bathe ( )
   (2) Brush teeth ( )
   (3) Do hair ( )
   (4) Clean face ( )
   (5) Watch TV ( )
   (6) Read ( )
   (7) Write ( )
   (8) Listen to music ( )
   (9) Eat ( )
   (10) Drink ( )
   (11) Talk to someone ( )
   (12) Pray ( )
   (13) Do relaxation exercises ( )
   (14) Have a back rub ( )
   (15) Take medicine to help ( )

   c. Other routine (please specify) ________________________

3. How important is your bedtime routine to you?
   1. Not important
   2. Slightly important
   3. Fairly important
   4. Very important

4. What happens to you when you don’t get enough sleep?

   1. Become irritable or upset
   2. Feel sleepy or tired the next day
   3. Feel sick the next day
   4. Nothing
Caffeine Consumption

In the previous month,

1. In a regular day, how many cups of coffee do you drink?
   Brewed coffee: ________
   Instant coffee: ________
   Other: ________ Specify: ____________________________

2. How many cups of tea do you usually drink during a day? ________

3. How many glasses of cola do you drink during a day? ________

4. How many cups of hot chocolate do you drink during the day? ________
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Appendix M & N
Pages 214-216

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