EPIDEMIOLOGY OF NAPS: ASSOCIATION WITH SLEEP, ETHNICITY, AND AGE

by

JAMES PATRICK SOEFFING

A DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Psychology
in the Graduate School of
The University of Alabama

TUSCALOOSA, ALABAMA

2010

ABSTRACT

Common knowledge supports the belief that occasional napping is a ubiquitous human behavior, yet epidemiological reports on napping vary in methodological quality and tend to focus on specific sub-groups of the lifespan. A notable weakness in the napping literature is a lack of data on African Americans, and an ongoing question is whether daytime napping has a negative impact on nighttime sleep. Given these limitations in the literature another study seemed warranted.

The present study uses a high quality epidemiological data set collected via random digit dialing that includes 50 men and women in each age decade ranging from 20 to 80+, and a substantial proportion of African Americans, to answer the following questions. What is typical napping Behavior? Are there ethnic or gender differences in napping behavior? How does napping behavior change across the adult lifespan? Do persons with insomnia nap more than normal sleepers? Is there a relation between daytime napping and quality of nighttime sleep?

The results suggested that a majority of people nap and naps are more frequent in African Americans and persons with insomnia, with older adults napping more frequently, but taking briefer naps. A significant relation was also found between daytime napping and nighttime sleep with daytime napping relating to increased onset latency and decreased total sleep time on the following night but with daytime napping also relating to increased wake time in the middle of the night and decreased total sleep time on the previous night.

DEDICATION

This dissertation is dedicated to my father, without whose lifetime of support, this accomplishment would not have been possible.

LIST OF ABBREVIATIONS AND SYMBOLS

b	Fixed linear coefficient and standard error
F	Fisher's *F* ratio: A ration of two variances
M	Mean: the sum of a set of measurements divided by the number of measurements in the set
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
SD	Standard Deviation
t	Computed value of *t* test
X^2	Computed value of a chi-square test of independence
<	Less than
=	Equal to

ACKNOWLEDGEMENTS

I am pleased to have this opportunity to thank the many peers, colleagues, and faculty members who have helped me with this research project. I am most indebted to Kenny Lichstein, my mentor and chairman of this dissertation, for sharing his years of accumulated knowledge and wisdom relating to sleep research. I would also like to thank all of my committee members, Mellissa Kuhajda, Steve Prentice-Dunn, Lynn Snow, and Jamie DeCoster. I would like to give special thanks to Jamie Decoster, whose mentorship in the ways of the Linear Mixed Model was essential to the completion of this project. I can not forget the advice offered by Sid Nau that initially pointed me in the direction that led to this project. Thanks must also be directed toward the team of previous graduate students and volunteers that worked so hard to create the epidemiological data set at the core of this study. Finally, I have to thank my partner Anna Laurie who has been my main source of love and emotional support throughout the ever challenging path of graduate school.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

Epidemiology of Naps: Association with Sleep, Ethnicity, and Age

Common knowledge supports the belief that occasional daytime napping is a near ubiquitous behavior among humans. Statements made in peer-reviewed research papers appear to support the perspectives of the lay public, yet many of the general statements made in scientific articles about the prevalence of napping are not supported by a citation (e.g. Dhand & Sohal, 2006; Taub, Tanguay, & Clarkson, 1976). Perhaps this is the case because the belief is so common that even researchers do not question it, or it may be that there are a limited number of appropriately rigorous epidemiological reports regarding napping behavior.

Kleitman, Mullin, Cooperman, and Titelbaum (1937) were the first authors to publish data about napping behavior from a systemic study. Their results, derived from sleep logs, suggested that 33% of participants napped at least once per week, and approximately 11% napped more than four times per week. Approximately 39% of their sample did not report napping. Between the late 1930s and the late 1960s there was a dearth of new published research that included data on napping behavior. Then Tune (1969) published the results of an extensive study on sleep and wakefulness that included 509 participants ranging in age from age 20 to 80, with an average of 52 days of sleep log data from each participant. His results indicated a mean of .9 naps per week, and a mean duration of .58 hours. Increasing age was also found to be associated with increased incidence and duration of naps.

Arguably, the most thorough publication to date regarding the epidemiology of naps is a chapter by Dinges (1989) that includes a review of napping behavior. His review included 19 studies completed in 9 different countries.

He concluded that approximately 75% of adults nap, and length of naps range between roughly 30 to 90 minutes. A later chapter by the same author (1992) suggested that the duration of naps is regularly about 73 minutes, with very brief naps not occurring or not being reported in surveys.

More recent research (Pilcher, Michelowski, & Carrigan, 2001) presents somewhat contradictory findings. In their sample of 166 young and middle aged adults, approximately 74 percent reported that they had napped at least once during the 7 day data collection period, and about half reported an average nap of 20 minutes or less. The authors of the latter study suggested that one possible explanation for the difference in the results between their study and Dinges' reviews (1989, 1992) was a difference in methods. A majority of the studies reviewed by Dinges (1989, 1992) used one-time surveys whereas Pilcher et al. (2001) used a daily sleep log. Thus, they argued that participants filling out a one time, long-term, retrospective questionnaire were less likely to remember and report brief naps.

In addition to the lack of high-quality epidemiological information about naps, there is an ongoing debate amongst professionals who treat sleep disorders that revolves around the question, "Does daytime napping have a negative impact on nighttime sleep?" Practitioners of behavioral sleep medicine have used interventions for poor nighttime sleep such as sleep hygiene instructions (Stepanski & Wyatt, 2003), sleep restriction (Wohlgemuth & Edinger, 2000), and stimulus control (Bootzin & Epstein, 2000) that often include instructions to avoid or minimize daytime napping. These instructions are most likely influenced by research on the homeostatic mechanisms involved in sleep. Process S is a key construct relating to sleep homeostasis that suggests pressure to fall asleep will steadily increase the longer wakefulness is maintained (Bobely & Neuhaus, 1979). The validity of this construct is supported by the research literature.

In two studies, nighttime sleep was measured after participants were given a two-hour late afternoon (Feinberg et al., 1985) or early evening (Werth, Dijk, Achermann, & Borbely, 1996) nap opportunity. These data were then compared to that collected from participants in a no nap condition. In both studies, those participants in the nap condition experienced a longer sleep onset period and shorter total sleep time during the following nocturnal sleep period. There is also evidence that the depth of nighttime sleep can be affected by daytime naps. Karacan, Williams, Finley, and Hursch (1970) found that participants given a late afternoon or early evening 2-hour nap opportunity experienced a significant reduction in deep sleep at night. It can be argued that a decrease in deep sleep is a decrease in overall sleep quality.

Other research fails to support the hypothesis that daytime napping has a negative impact on nighttime sleep. Pilcher et al. (2001) instructed a sample of 79 young and middle-aged adults to fill out a 7 day sleep log to monitor their sleep habits. The average nap in each age group was 17.71 and 15.55 minutes respectively and there was no relationship between the duration of daytime naps and quantity or quality of nighttime sleep. Comparing these results to the results of the studies that found a negative relationship between napping and nighttime sleep it becomes apparent that duration of naps may be an important variable in whether the naps negatively impact nighttime sleep.

Expanding on the debate of whether naps negatively impact nighttime sleep, the possibility of naps serving a useful purpose should be considered. There is a growing literature to suggest the answer to this question is yes. Research on circadian rhythms suggests that there is a natural maxima in core body temperature that correlates to an increase in sleep propensity between 1:00 pm and 3:00 pm in most adults (Zulley & Campbell, 1985). This gives some support to the belief that a post-lunch nap might be a natural occurrence. Research has also

shown an increase in arousal and performance after a daytime nap of 20 minute duration (Hiyashi, Ito, & Hori, 1999; Hiyashi, Watanabe, & Hori, 1999). Other authors have argued that brief daytime naps can improve the napper's emotional state (Luo & Inoue, 2000). Finally, there is some evidence to indicate that naps can be utilized strategically to improve performance in soporific situations such as shift work (Arora, Dunphy, Chang, et al., 2006) and extended periods of driving (Home & Reyner, 1996).

An important issue in the napping literature is the discrepancy in quantity of data from Caucasian Americans (CA) and ethnic minorities. Published reports regarding napping behavior have been heavily dominated by data from CA populations. This is the case despite data suggesting that by 2030, nearly 40% of the U.S. population will be made up of ethnic minority groups (U.S. Department of Health and Human Services, 2000). According to the U.S. Census Bureau (2000), African-Americans (AA) are the largest ethnic minority group and make up 12.9 percent of the population. As with other minority groups, limited participation by AA in health care research has been a long standing problem (Larson, 1994). The literature on AA sleep has doubled in the last decade, yet published research still lags substantially behind that for CA (Durrence & Lichstein, 2006). According to those authors, this disparity arguably exists due to (a) convenient access, (b) willingness to participate in research, and (c) numerical advantage of the CA population. Although there are reports that suggest AA experience higher levels of daytime sleepiness (Ancoli-Israel et al., 1995; Kripke et al., 2001; O'Connor et al., 2003), and one report that indicates AA experience higher levels of daytime somnolence (Qureshi, Giles, Croft et al., 1997), there are no published epidemiological reports on napping behavior other than limited data from the present data set (Lichstein et al. 2004).

There are also certain populations in which napping behaviors may play a different role than in the typical healthy sleeper. One of these populations is older adults. Evidence suggests that their nighttime sleep is relatively more impaired than other age groups, with approximately half reporting nocturnal sleep difficulties (Buysse, et al., 1991; Foley, et al, 1995). Multiple reports indicate older adults sleep approximately an hour less than younger subjects (e.g. Campbell, Gillin, Kripke, Erikson, & Clopton, 1989; Foley, et al., 1995; Morin & Azrin, 1988; Webb, 1982), and some researchers have even suggested that there is a limit to the amount of sleep that older adults can obtain (Campbell, Dawson, & Anderson, 1993; Morin & Azrin, 1988). Given this natural tendency to disrupted nighttime sleep, it comes as little surprise that older adults take more daytime naps than younger adults (Buysse et al., 1992). One interpretation of this phenomenon is that older adults may be more likely to benefit from strategic daytime napping to compensate for normal age-related declines in nighttime sleep quality. An alternative explanation suggests that poor sleep hygiene, exemplified by a misguided attempt to compensate for milder nighttime sleep disturbances by napping during the day, actually worsens nocturnal sleep by reducing the natural pressure to initiate and maintain sleep at night. A majority of the literature appears to support the first interpretation with multiple studies (e.g. Bliwise, 1992; Hohagen et al., 1994; Morgan, Healey, & Healy, 1989) of older adults suggesting that there is no relationship between nocturnal sleep variables and daytime napping, whereas one contrasting study (Hays, Blazer, & Foley, 1996) found that older adults who take frequent naps are more likely to experience nighttime sleep complaints.

Another of these populations is persons with insomnia (PWI). PWI, by definition, experience deficits in nighttime sleep that co-occur with impairment in daytime functioning (American Psychiatric Association, 2000). Given the tendency of PWI to experience daytime

sequelae, it makes sense to assume that they would report increased daytime sleepiness, or fall asleep easier when given an opportunity. Surprisingly, research done with multiple sleep latency tests, a procedure in which participants are given multiple opportunities to nap during the day while in a laboratory setting, has consistently shown that PWI don't fall asleep during the day any easier than healthy sleepers (Bonnet & Arand, 1995; Lichstein, Wilson, Noe, Aguillard, & Bellur, 1994; Mendelson, Garnett, Gillin, & Weingartner, 1984; Seidel & Dement, 1982, Sugarman, Stern, & Walsh, 1985). A majority of research focusing on subjective level of sleepiness also suggests no difference between PWI and healthy sleepers (Johns, 1991; Lichstein & Johnson, 1993; Lichstein et al. 1994; Mendelson et al. 1984). The reason for this phenomenon may be found in an explanatory hypothesis about the pathophysiology of insomnia that states PWI experience chronic physiological arousal during all 24 hours of the sleep-wake cycle (Bonnet & Arand, 1995). The evidence described above suggests that PWI do not experience elevated sleepiness during the day, but does not address the question of whether they take more or less naps while in their natural daytime environment. Thus, a closer look at the napping behavior of PWI is warranted.

Considering the preceding brief review, it becomes apparent that a thorough epidemiological study could benefit the napping literature. The goal of the current study is to utilize a high quality epidemiological database to carefully explore the epidemiology of napping behavior and the relation between napping and nighttime sleep. The database for the current study includes some distinct methodological advantages relative to previous studies. Stratified sampling methods in combination with random digit dialing were chosen from the start in order to maximize random sampling while making sure there was not underrepresentation of hard to recruit subpopulations such as older adults. This method led to a broad representation of age and

gender in the sample. The recruited sample also consisted of a substantial proportion of AA that will allow for a valid assessment of ethnic differences in sleep-related behavior. Finally, sleep diaries filled out for two continuous weeks gave prospective (in this case referring to the previous nights sleep) data across multiple time points. These types of data have been shown to be more reliable than the one time point retrospective types.

The goal of this study is to use this data set to answer the following questions. What is typical napping behavior? This general question will address the following sub-questions: What percentage of people nap? How many naps do people take in a given week? What is the duration of the average nap taken? What percentage of people nap more than four times per week? Are brief naps (≤20 minutes) more common than longer naps? Other important questions include: Are there ethnic or gender differences in napping behavior? How does napping behavior change across the lifespan? Does the napping behavior of persons with insomnia differ from that of normal sleepers? Finally, is there a relationship between daytime napping and quality of nighttime sleep?

Methods

Participants

The data for the current study are from a larger epidemiological survey that utilized random digit dialing to recruit 772 people ranging in age from 20 to 98 years, from Shelby County, Tennessee (Lichstein, Durrence, Riedel, Taylor, & Bush, 2004). At least 50 men and 50 women were recruited in each of seven age decades across the adult lifespan. Age groups were delineated by decades with the youngest group ranging from 20-29 years, and the oldest group beginning at age 80.

Random-digit dialing was developed as an alternative to sampling from telephone directories and has the distinct advantage of reaching the substantial proportion of the population having unlisted numbers (Glasser & Metzger, 1972). The main challenge to the validity of random-digit dialing as a recruitment tool is the nonresponse bias (Rosenthal & Rosnow, 1991). Nonrespondents for this type of study are those potentially eligible participants who were not reached for whatever reason, and those that were reached but refused to take part in the study. Arguably, there may be characteristics that differentiate those who respond and those who do not. For example, someone who has slept fine their whole life may have little interest in taking part, while someone who has experienced years of poor sleep would be happy to share that experience with researchers. The best way to minimize this potential bias is to minimize the rate of nonresponse. Linsky (1975) recommended five methods for accomplishing this goal: (1) using one or more follow-ups or reminders such as telephone calls, postcards, and letters sent to initial nonresponders; (2) making contact with respondents before they receive the

questionnaires; (3) using “high powered” mailings such as special delivery and airmail; (4) offering cash rewards or premiums for participation; and (5) listing the name of the organization that sponsors the research and the title of the researcher signing the cover letter. The methods used to collect the present data included 4 of these 5 recommendations. Only the suggestion of “high powered” mailings was not followed.

Recruitment eligibility criteria were designed to be minimal. Participants were required to be at least 20 years of age, and able to speak and read English at an approximately seventh grade level. In a minority of cases, potential participants with poor reading skills were allowed to enter the study if their spouse/partner or adult child agreed to assist them during the data collection process. Persons who shared the same bed in the same household were not allowed due to the belief that there would be minimal variability in their sleep data. However, persons in the same household who did not share the same bed were eligible if they met all of the requirements listed above.

Shelby County is composed mainly of the City of Memphis and at the time the data were collected had a population of 897,472 (U.S. Census Bureau, 2000). The population was divided nearly equally between men (428,645 or 47.8%) and women (468,827 or 52.2%). The ethnic distribution is dominated by Caucasians and AA, at 47.3% and 48.6% respectively. Near to the time of data collection, per-capita income for Shelby County listed as $28,828, which is similar to the national average of $28,546 (U.S. Census Bureau, 2000).

The participants in the overall sample may be divided into three different categories based on quality of nighttime sleep. The first category is the whole sample, including all participants regardless of sleep disorder status, the second is persons with insomnia (PWI), and the third is normal sleepers (NS).

PWI is a category based on DSM-IV criteria for insomnia, that in addition to a complaint of difficulty initiating or maintaining sleep or nonrestorative sleep, requires duration of 1 month or longer, with significant distress or impaired function (American Psychiatric Association, 2000). The present definition will also require nighttime impairment criteria such that SOL or WASO must be greater than or equal to 31 minutes at least three times per week. This criterion is more rigorous that DSM-IV and was empirically derived in Lichstein et al. (2003). We also required that the symptoms be present for at least 6 months. Cut-offs on daytime function questionnaires were used to operationalize the requirement for significant distress or impaired function. Cut-off scores were as follows: Epworth Sleepiness Scale (ESS; Johns, 1991;see Appendix A) ≥ 7.4; Fatigue Severity Scale (FSS; Krupp et al., 1989; see Appendix B) ≥ 5.5; Insomnia Impact Scale (IIS; Hoelscher et al., 1993; see Appendix C) ≥ 125; (Beck Depression Inventory (BDI; Beck et al., 1988; see Appendix D) ≥ 10; State-Trait Anxiety Inventory, Trait-Form Y (STAI; Spielberger et al., 1983; see Appendix E) ≥ 37.

Cut-off scores were established in Lichstein et al. (2003) using the following rationales. The cutoff for the ESS is based on data from a study by Johns and Hocking (1997), where self-reported normal sleepers scored $M = 4.6$, $SD = 2.8$, and complaints of insomnia were positively correlated with ESS scores. A cutoff score of 7.4 was chosen because it was 1 SD above the mean.

Hoelscher et al. (1993) did not report SDs with the participants they sampled. Therefore, the cutoff was established as the midway point between the mean IIS scores of a subset of persons with insomnia seeking treatment and a subset of college students who reported insomnia.

Normative data for the FSS are limited. Therefore, data collected from persons seeking insomnia treatment at a sleep disorders center during a study by Lichstein, Means, Noe, and

Aguillard (1997) were used to establish a cutoff. These participants averaged 6.0, *SD* = 0.5. The cutoff was set at 1 SD below the mean.

The BDI is a commonly used survey with 21-items spanning the domain of depressive symptoms including negative cognitions, affect, and behavior (Beck & Steer, 1987). The low-end boundary score for mild depression is 10. Scores at this level or higher were chosen as the cutoff.

The STAI is a commonly used anxiety inventory with 20 self-descriptive statements rated on a four-point scale signifying how often the statement is true (Spielberger et al., 1983). The cutoff was established as 1 SD below the mean of psychiatric inpatients with a diagnosis of anxiety (Spielberger et al., 1983).

NS is a category defined as those who do not fit the definition of PWI, and also have no reported history of other sleep disorders such as sleep apnea or periodic limb movements.

Measures

The sleep diary (see appendix F) is the part of the survey packet that is most relevant to the current study. The diary provides a subjective assessment of the time each participant entered bed at night, how long it took him or her to fall asleep, number of nocturnal awakenings, the time spent awake during those awakenings, the time he or she woke up and rose from bed in the morning, and rated sleep quality. From this information the following six sleep continuity and quality variables were computed: SOL, number of awakenings (NWAK), WASO, total sleep time (TST), sleep efficiency percent (SE) and sleep quality rating (SQR). SE is the amount of time spent asleep divided by the amount of time spent in bed x 100. The SQR is a five-point rating of sleep quality ranging from poor (1) to excellent (5). The diary is arranged in nine rows

of requested information and seven columns where information is entered for each day of the week.

In addition to the sleep variables described above, respondents are also asked to provide the number of minutes they napped on the day previous to each night's sleep and the type and dose of any soporific medications they took around bed time. To help participants complete the diary correctly, a column of sample responses was included with descriptions of each diary item.

Sleep diaries are a form of sleep assessment that are presently considered a standard of practice in the field of behavioral sleep medicine (Bootzin & Nicassio, 1978; Smith et al. 2003). They have an advantage over more long term retrospective sleep questionnaires because they focus on one time point (e.g. last night) and thus don't require participants to understand the concept of average or to use heuristics to form and communicate their impressions of important sleep variables. Another advantage of sleep diaries is their ease of use. After minimal training, participants usually have to invest approximately one minute each morning to fill them out. This ease of use is exemplified by the fact that several major intervention trials with older adults with insomnia (a population with whom questionnaire burden is particularly salient) have used sleep diaries as the principal outcome measure (Davies, Lacks, Storandt, & Bertelson, 1986; Engle-Friedman, Bootzin, Hazlewood, & Tsao, 1992; Friedman, Bliwise, Yesavage, & Salom, 1991; Morin, Kowatch, Barry, & Walton, 1993). Finally, sleep diaries are cost effective as they cost no more than the paper they are printed on.

The main disadvantage of sleep diaries is that they are not considered an objective measure of sleep. Polysomnography and actigraphy are two examples of technologies that allow for the objective measurement of sleep. However, the cost of these technologies is beyond the budgetary constraints of the present large scale epidemiologic study, as actigraphic monitors cost

approximately $1000 each and a polysomnographic assessment costs approximately $2000 per night and several nights of recording are needed to obtain the appropriate amount of data. In addition to cost related issues, it should also be noted that DSM-IV-TR criteria for a diagnosis of insomnia requires a subjective report of difficulty sleeping, but does not require objective measurement of sleep (American Psychiatric Association, 2000).

Daytime function questionnaires included the BDI, STAI, IIS, ESS, Stanford Sleepiness Scale (SSS; Hoddes, Zarcone, Smythe, Phillips, & Dement, 1973), FSS, and a health survey (Lichstein et al. 2004).

Another variable of interest in the present study is socioeconomic status (SES). The questionnaire packet sent to participants included a brief demographic questionnaire that included a participant reported level of highest household education level. This variable has been used effectively in a previous publication (Gellis et al., 2005) as a proxy measure for SES and is used similarly in the present study.

Procedure

The three-digit phone number prefixes used in Shelby County were combined with randomly generated four digit numbers. These telephone numbers were then incorporated into lists distributed to research assistants. All numbers on the list were contacted. Those that were businesses or organizations were disqualified and so were non-working numbers. Numbers that did not fall into these categories were attempted until someone was reached or the number was called five times unsuccessfully. Callers were instructed to call each number at multiple time periods throughout the day to maximize the possibility of making contact. When a household was reached, the caller delivered a one minute script based on recommendations in Groves et al. (1988). The script included a greeting, introduction to the study, its requirements, and associated

compensation. Compensation was initially set as $15 after the completed packet was returned. However, recruitment lagged with older adults so compensation as high as $200 was allowed to fill the last few positions in that cohort. A raffle of $250 was also added at the end of the study to increase incentive for all participants.

When a potential participant was both eligible and interested, he/she was sent a survey packet that contained the 14 day sleep diary, seven daytime functioning questionnaires, two consent forms (one to return and one for the participant's records), a demographic questionnaire, a cover sheet with instructions, and a postage-paid, preaddressed envelope for returning the packet.

Analytic Approach

A main goal if this paper is to present relevant data in a variety of forms that may be of interest to researchers and that will also allow the present data to be compared to previous publications in the field. Thus, it was decided to present data that included the mean duration of naps taken (not including non-nap days), the mean number of naps taken per week, the ratio of participants falling into the category of napper (napping at least one time in the two weeks sampled), the ratio of participants falling into the category of frequent napper (those who took more than 4 naps per week), and finally the rate of brief naps (naps ≤ 20 minutes in duration). Differences between groups of interest on these variables were explored using the General Linear Model and Chi Square tests of independence. In the case of the General Linear Model, group differences were explored while controlling for the influence of theoretically relevant variables (ANCOVA). For example, when comparing ethnic differences in napping behavior, age and SES were entered into the model as covariates as they are to variables that differed between the groups. The Chi-Square analyses were used to explore between group differences in

proportions of each group falling into the napping categories of interest. The Chi-Square analyses were computed by hand using the method described in Gravetter and Wallnau (1996).

Linear Mixed Model (LMM) analyses were used to explore the relation between daytime napping and nighttime sleep quality. The LMM is a form of statistic that is similar to, but also has advantages over, traditional general linear models when working with data sets comparable to the present one. Most relevant to the present analysis, is the LMM's ability to test relations between time-varying covariates in longitudinal data sets. This ability is particularly important as it allows for the exploration of the relationship between napping and nighttime sleep variables during the 14 days sampled. In such an exploration, the nighttime sleep variables are entered into the model and tested for a significant influence on time spent napping, and the LMM also generates a linear coefficient that gives more information regarding the relationship between the variables of interest.

Variables being analyzed with LMM

Separate analyses were done using the LMM, with the first exploring the relation between daytime napping and the following night's sleep and the second exploring the relation between nighttime sleep variables and the following day's napping. Within this framework, separate analyses were run for each nighttime sleep variable of interest (SOL, WASO, and TST). For example, to explore the relation between daytime napping and the following night's SOL, SOL was entered in the LMM as a dependant variable, with the napping variable as a covariate, and the participant as a random effect. If a significant relation was found between the dependant variable and the covariate and there was a significant random effect of participant, further analyses were run, exploring the interaction between the relation of napping to nighttime sleep

and the demographic and sleep groups of interest in this paper. This analysis was then repeated for the other two nighttime sleep variables of interest (WASO, TST).

When exploring the relation between nighttime sleep variables and the following days napping, the following days nap was entered as the dependant variable, with the nighttime sleep variable entered as a covariate and the participant as a random effect. Again, if a significant relation was found between the dependant variable and the covariate and there was a significant random effect of participant, further analyses were run, exploring the interaction between the relation of napping to nighttime sleep and the demographic and sleep groups of interest in this paper.

Results

Typical Napping Behavior

A majority of the full sample (*N*=772) napped at least once during the two weeks sampled (77%), and the mean duration of naps taken was 57.33 minutes (*SD* = 38.98). The mean number of naps taken per week was 2.34 (*SD* = 2.30). The rate of persons who did not nap at all was 22.8% and 22% napped at least 4 times per week (frequent nappers). Of all naps taken, only 20% were less than or equal to 20 minutes in duration (brief naps).

Gender and Napping Behavior

Independent samples *t*-tests revealed no significant difference between gender on the mean number of naps taken per week or mean duration of naps taken. Gender differences in the proportion of participants falling into the categories of napper (napped at lease once) and frequent napper were explored along with the proportion of brief naps, using Chi-Square test of independence. No significant differences were found between gender for these variables. Napping behavior variables are presented for gender within the full sample in Table 1.

Table 1

Napping Behavior Variables Across Gender in the Whole Sample

Group	Group n	# of naps per week	Mean minutes of naps taken	% napping	% napping frequently	% of naps ≤20 min.
Whole Sample	772	2.3	57.3	77%	22%	20%
Women	391	2.3	56.8	78%	23%	21%
Men	381	2.3	57.8	77%	22%	20%

Ethnicity and Napping Behavior

There were 223 AA in the full sample (29%). The mean duration of naps taken by AA was 61.69 minutes (*SD* = 35.04). The mean number of naps taken per week was 2.98 (*SD* = 2.49). The majority of the AA sample napped at least one time during the two weeks sampled (82%), 18% did not nap at all, and 34% were frequent nappers. Of all naps taken by AA, 18% were of 20 minutes or less in duration. There were no significant differences between these variables across gender in the AA sample.

In analyses comparing the number of naps taken per week and duration of naps taken across ethnicity, there was a concern that age and SES may be significant covariates affecting the outcome of the analyses. Therefore, ANCOVA was used to explore differences in the number of naps taken and duration of naps taken while controlling for age and SES. ANCOVA revealed no significant difference between AA and CA in the duration of naps taken, but AA took significantly more naps per week than CA (F [1,644] = 24.82, $p < .01$). Adjusted means and standard error for AA and CA were $M = 3.18$, standard error = .16, and $M = 2.20$, standard error = .10, respectively. There was a significant effect of age (F [1,644] = 107.81, $p < .01$) with AA being significantly younger. SES was not significant.

Chi-Square test of independence revealed that the proportion of AA who napped at least once during the data collection period was significantly higher than the proportion of CA, X^2 (1, $n = 762$) = 4.49, $p < .05$. There was also a significantly higher proportion of AA that fell into the category of frequent napper, X^2 (1, $n = 762$) = 39.66, $p < .01$. AA also reported a significantly lower proportion of brief naps, X^2 (1, $n = 3587$) = 6.28, $p < .05$. Napping variables across ethnicity and gender are presented in Table 2.

Table 2

Napping Behavior Variables Across Ethnicity

Group	Group n	# of naps per week	Mean minutes of naps taken	% napping	% napping frequently	% of naps ≤20 min.
African Americans	223	3.0**	61.7	82%*	34%**	18%*
Women	130	3.1	63.7	81%	35%	18%
Men	93	2.8	59.0	83%	32%	20%
Caucasians	539	2.1**	54.8	76%*	18%**	21%*
Women	260.0	2.0	53.3	76%	17%	20%
Men	279.0	2.2	56.2	75%	18%	23%

*$p < .05$ **$p < .01$ between groups noted.

Napping Behavior Across the Lifespan

Analysis with polynomial regression (with age as a continuous variable) revealed a significant linear trend toward decreasing mean nap duration across the adult lifespan. There was also a significant quadratic trend for mean number of naps per week with this variable remaining fairly stable at approximately 1.5 naps across age decades 20 – 50, then steadily increasing beginning with decade 60 and peaking at 4.14 in decade 80+. These trends were also consistent across gender, except for a lack of significant trend in number of naps per week in men (although not significant, a quadratic trend appeared to be the best fit to the data).

To further delineate patterns in napping behavior across the adult lifespan, the full sample was broken into 7 groups based on age decade (starting at decade 20 – 39 and ending with decade 80 and up). Percentages of persons falling into the categories of napper, frequent napper, and percentage of brief naps remained fairly stable between age 20 and 59. The rate of persons falling into the category of frequent napper doubled after age 60 and then doubled again after age 80. The rate of brief naps climbed across decades 60 and 70 and then decreased in decade 80+. These data are presented graphically in Figure 1. Mean nap duration across gender, by age

decade is presented in Figure 2, and mean number of naps across gender, by age decade is presented in Figure 3.

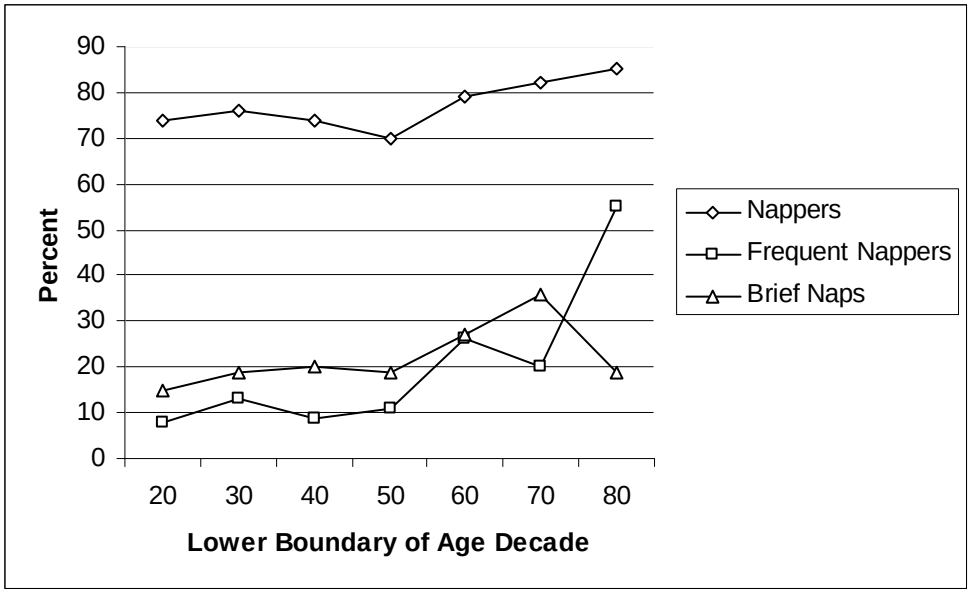

Figure 1. Rate of Nappers (persons napping at least 1 time in the 2 weeks sampled), Frequent Nappers (persons napping >4 times/week), and Brief Naps (naps that were ≤20 minutes in duration), Across Age Decade.

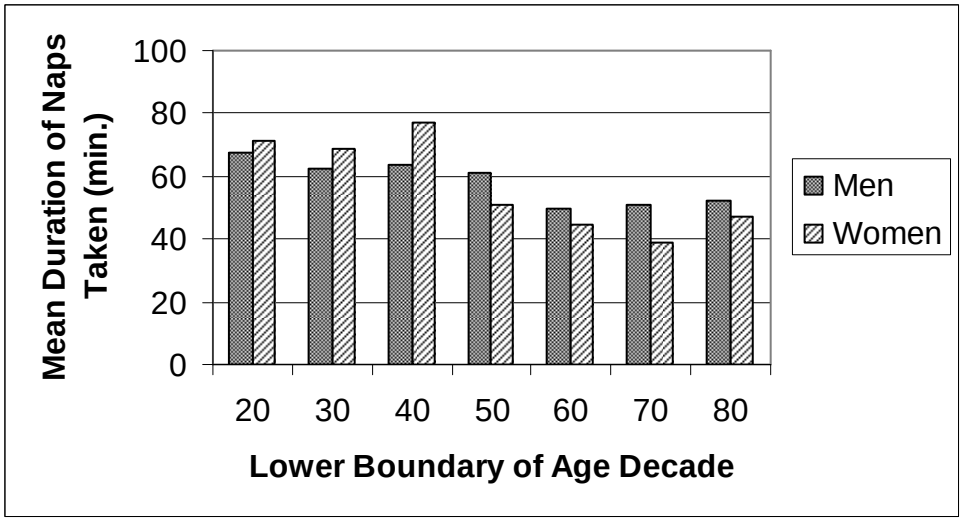

Figure 2. Mean Duration of Nap Taken by Gender and Age Decade.

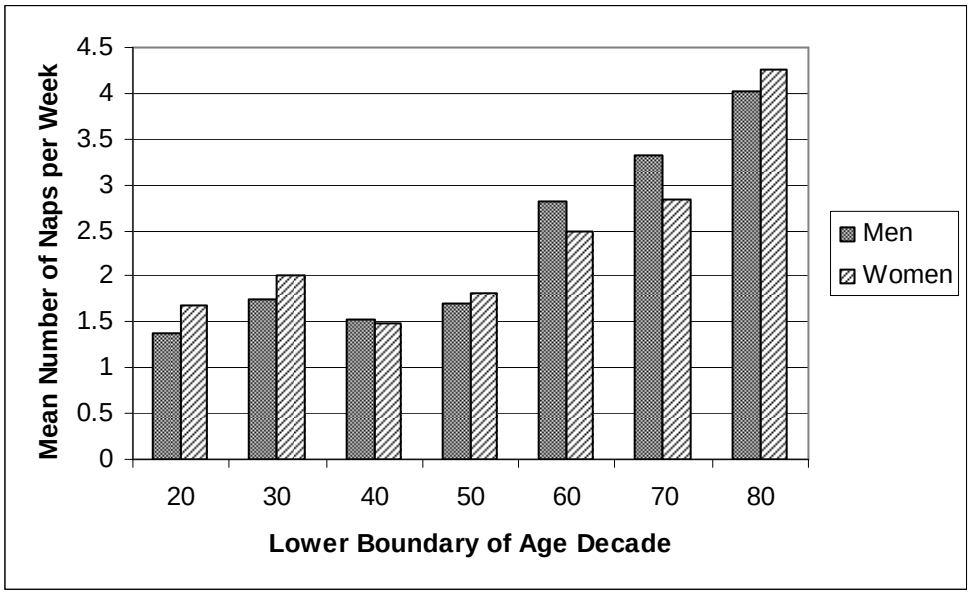

Figure 3. Mean Number of Naps Per Week by Gender and Age Decade.

Differences between Young to Middle Aged Adults and Older Adults

The majority of previous epidemiological reports described in this paper rely on samples that emphasize young and middle-aged adults over older adults. To better compare the present data to previous reports, the present data set was split into a group of young to middle-aged adults ranging in age from 20 to 59 years (n = 450) and a group of older adults ranging in age from 60 to 98 (n = 322). Independent samples t-test revealed that the older adult group napped significantly more times per week (M = 3.27, SD = 2.58) than the young to middle-age group (M = 1.68, SD = 1.82), $t(770) = -10.07$, $p < .01$, two-tailed. However, the young to middle-aged group took longer naps (M = 65.38, SD = 44.25) than the older group (M = 47.21, SD = 28.10) when naps were taken, $t(770) = -5.81$, $p < .01$, two-tailed.

Age group differences in the proportion of participants falling into the categories of napper and frequent napper were explored along with the proportion of brief naps, using Chi-Square test of independence. The proportion of older adults who napped at least once during the

data collection period was significantly higher (82%) than the proportion of young to middle-aged adults (74%), X^2 (1, N = 772) = 11.19, p < .05. There was also a significantly higher proportion of older adults (39% compared to 10%) that fell into the category of frequent napper, X^2 (1, N = 772) = 288.56, p < .05. Older adults also reported a significantly higher proportion (22% compared to 18%) of brief naps, X^2 (1, N = 3620) = 28.48, p < .05. Napping variables across young-middle aged adults and older adults is presented in Table 3.

Table 3

Napping Behavior Variables Between Age Groups in the Whole Sample

Group	Group n	# of naps per week	Mean minutes of naps taken	% napping	% napping frequently	% of naps ≤20 min.
Young - Middle Age	450	1.7**	65.4**	74%**	10%**	18%**
Older adults	322	3.3**	47.2**	82%**	39%**	22%**

*p < .05 **p < .01 between groups noted.

Insomnia and Napping Behavior

There were 137 participants in the sample that met the criteria for insomnia (18%, PWI). The mean duration of naps taken by PWI was 57.89 minutes (SD = 34.80). The mean number of naps taken per week was 3.11 (SD = 2.56). The majority of PWI napped at least one time during the two weeks sampled (83%), 17% did not nap at all, and 36% were frequent nappers. Of all naps taken, 17% were of 20 minutes or less in duration.

In analyses comparing the number of naps taken per week and duration of naps taken across sleeper type groups, there was a concern that age may be a significant covariate affecting the outcome of the analyses. Therefore, ANCOVA was used to explore differences in the number of naps taken and duration of naps taken while controlling for age. ANCOVA revealed no significant difference between these groups in the duration of naps taken, but PWI took significantly more naps per week than NS (F [1,731] = 10.46, p < .01). Adjusted means and

standard error for the PWI and NS groups were M = 2.86, standard error = .19, and M = 2.20, standard error = .09, respectively.

Chi-Square test of independence revealed that the proportion of PWI who napped at least once during the data collection period was significantly higher than the proportion of NS, X^2 (1, n = 734) = 3.91, $p < .05$. There was also a significantly higher proportion of PWI that fell into the category of frequent napper, X^2 (1, n = 734) = 26.67, $p < .05$. PWI also reported a significantly lower proportion of brief naps, X^2 (1, n = 3409) = 14.63, $p < .05$. Napping variables across sleeper type and gender are presented in Table 4.

Table 4
Napping Behavior Variables in PWI and Normal Sleepers

Group	Group n	# of naps per week	Mean minutes of naps taken	% napping	% napping frequently	% of naps ≤20 min.
Insomnia	137	3.1*	57.9	83%*	36%*	17%*
Women	81	3.0	63.1	80%	37%	14%
Men	56	3.2	51.0	88%	34%	22%
Normal Sleepers	597	2.1*	55.9	76%*	19%*	22%*
Women	296	2.2	54.4	77%	19%	24%
Men	301	2.1	57.3	75%	18%	21%

*$p < .05$ **$p < .01$ between groups noted.

Relation between daytime napping and the following night's sleep

Using the LMM, there was a significant effect of time spent napping on the following night's SOL (F[1, 412] = 11.71, $p < .01$) The fixed linear coefficient for SOL and time spent napping was significant (b = .04, standard error of b = .01), indicating that SOL tended to be higher when time spent napping was higher. There were no significant interactions between demographic and sleeper type groups and the relation between SOL and time spent napping. There was also a significant relation between time spent napping and the following night's TST (F[1, 333] = 6.58, $p < .05$). The fixed linear coefficient for TST and time spent napping was

significant (b = .09, standard error of b = .04), indicating that TST tended to be lower when time spent napping was higher. No relation was found between daytime napping and the following night's WASO. In these analyses there were no interactions found between the demographic/sleep groups of interest and the relation between napping and nighttime sleep.

Relation between daytime napping and the previous night's sleep

In the exploration of the relationship between time spent napping and nighttime sleep in the previous paragraph, the analysis was set up such that time spent napping was related to the following night's sleep variables. A second set of LMM analyses were run to explore the relationship between time spent napping and the previous night's sleep. In this analysis, all variables entered into the model were the same, except for the time spent napping which was shifted one day forward so that each nap opportunity was then related to the previous night's sleep variables.

The LMM revealed a significant relation between WASO and the following day's napping behavior ($F[1, 279] = 12.78$, $p < .01$) The fixed linear coefficient for WASO and time spent napping was significant (b = .05, standard error of b = .01), indicating that napping behavior increased as WASO increased. There were also significant interaction effects between this relationship and the grouping variables ethnicity ($F[1, 211] = 4.88$, $p < .05$) and age group ($F[1, 238] = 3.97$, $p < .05$). The interactions were as follows. Napping of AA increased more than that of CA as the previous night's WASO increased. Napping of younger adults increased more than that of older adults as the previous night's WASO increased.

There was a significant relation between TST and the following days napping behavior ($F[1, 4394] = 11.16$, $p < .01$). The fixed linear coefficient for WASO and time spent napping was significant (b = -.01, standard error of b = <.01), indicating that napping behavior decreased as

the previous night's TST increased. No relation was found between SOL and the following day's napping behavior.

Discussion

The present results suggest that a majority of people nap (77%), and naps are more frequent in African Americans (AA) and persons with insomnia (PWI), with older adults (OA) napping more frequently but taking briefer naps. The average duration of naps taken was 57.3 minutes, and the average number of naps taken per week was 2.3. About 22% were frequent nappers, napping more than four times per week. There were no statistically significant differences between men and women for these variables. Much of the present data appear consistent with data reported by Dinges in his 1989 review chapter, which included data indicating that 75% of adults nap and the length of naps ranges between 30 and 90 minutes. Dinges (1992) suggested that the duration of naps is regularly about 73 minutes. Our data suggest the average nap is somewhat briefer, but this may be due to the fact that our sample over-sampled older adults who tend to take briefer naps. It is also possible that there is a temporo-cultural trend toward the popularity and acceptability of the brief "power nap," as suggested by Pilcher et al. (2001). In regards to brief naps (those ≤20 min in duration), our data are in contrast to that of Pilcher et al. (2001), suggesting a rate of brief naps around 22% as compared to their result of 46% of young and middle-aged adults reporting an average nap time of less than 20 minutes.

Gender and napping behavior

A majority of previous studies has suggested that there is no difference between genders in either the incidence or duration of naps (Spiegel, 1981; Taub, 1971; Tune, 1969; Webb, 1981). The present results are consistent with those findings. There were no differences between gender

on variables such as number of naps per week, duration of typical nap, rate of nappers and frequent nappers, and the rate of brief naps taken.

Age and napping behavior

Age appears to be an important variable in regards to napping behavior. Many previous publications indicate a pattern of increased napping behavior in older adults (e.g. Beh, 1994; Ohayon & Zulley, 1999; Soldatos, Madianos, & Vlachonikolis (1983), Taub, 1971, Tune, 1969). One of the most comprehensive studies (Tune1969) described increases in both duration and frequency of napping between the third and eighth decade of life. The present results were consistent with the general trend of increased napping across the adult lifespan, but contradict Tune (1969) in regards to nap duration, and offer more detail to the overall picture. We found a linear trend toward briefer naps across the adult age span, but with a quadratic trend toward more naps taken beginning between age 50 and 60 and peaking in age decade 80+. Overall, older adults in our sample engaged in more napping behavior than younger to middle-aged adults. Although their naps tended to be briefer in duration, OA took nearly twice as many naps per week, and a significantly higher proportion of OA fell into the categories of napper and frequent napper.

Ethnicity and napping behavior

There is presently a relative void in the literature in regards to napping behavior in AA. The present study included a good sample of AA (n = 223), and ethnicity turned out to be a potent variable in relation to napping behavior. Significant differences were found between AA and CA on most variables tested, with AA engaging in more napping behavior. AA took more naps per week and fell into the categories of napper and frequent napper at higher proportions than CA. Ethnic differences in actual time spent napping across the two weeks sampled

remained significant even after we attempted to control for the influence of SES by entering it as a covariate in our analysis. There was not a significant effect of SES. However, we used a proxy measure of SES in the form of highest education level of an individual within the household. This measure of SES is relatively new (Krieger, Williams, & Moss, 1997) and has been used successfully in the past to show a dose response relationship between education level and insomnia (Gellis et al., 2005), but there are potential weaknesses with this measure. Previous research on common indicators of SES including aggregate measures of income, education, occupation, and poverty level has found modest correlations between them (Geronimus & Bound, 1998). It is possible that other indicators of SES not available to us would have played a more powerful role in the analysis.

There are a variety of reasons that may contribute to increased napping in AA. A prime candidate is differences in quality of nighttime sleep. Research has revealed that in samples of normal sleepers AA experience more shallow sleep (stages 1 and 2) and less deep sleep (stages 3 and 4) than their CA counterparts (Profant, Ancoli-Israel, & Dimsdale, 2002; Rao et al., 1999, Stepnowsky, Moore, & Dimsdale, 2003). These relative deficits in nighttime sleep quality may contribute to increased napping behavior during the day. Previous research has also suggested higher rates of sleep apnea (Kripke et al., 1997; Redline et al., 1997) and more severe apnea symptoms in AA (Ancoli-Israel et al., 1995). These findings in combination with evidence suggesting that AA have access to less and lower quality healthcare hint that occult sleep apnea may be contributing to increased daytime sleepiness in AA. Decreased access to quality healthcare also likely plays a role in the poor nighttime sleep via decreased opportunity to learn about good sleep hygiene and less management of health and psychiatric conditions that negatively impact nighttime sleep and lead to more daytime sleepiness. Another relevant issue

is the rate of psychiatric comorbitities that have been tied to poor nighttime sleep. One study based on the present data set found that AA had higher levels of depression and anxiety than CA (Taylor, Lichstein, Durrence, Reidel, & Bush, 2005). It is possible that the increased levels of depression and anxiety lead to decrements in nighttime sleep which in turn lead to more daytime napping.

Insomnia and napping behavior

Previous research has explored the relationship between poor sleep and napping behavior in specific groups. For example, Morin and Gramling (1989) reported no difference in napping behavior between OA poor sleepers and OA good sleepers, and Johnston et al. (2001), reported that the nighttime sleep of midlife women nappers did not vary between participants with insomnia and those without. However, to the best of our knowledge there are no other epidemiological reports that use both sleep diary data and a rigorous definition of insomnia to delineate the difference between PWI and NS. In the present sample (PWI = 137) significant differences were found between PWI and NS on a majority of variables tested. Although PWI did not take longer naps, they took naps more frequently, and fell in to the categories of napper, and frequent napper at a higher rate than NS. The most notable difference between groups was the rate of each falling into the category of frequent napper, with PWI doing so at nearly twice the rate of NS.

These may seem somewhat surprising considering published reports suggesting that PWI do not experience higher levels of subjective daytime sleepiness (Johns, 1991; Lichstein & Johnson, 1993; Lichstein et al. 1994; Mendelson et al. 1984) or fall asleep any faster in a laboratory setting when given the opportunity (Bonnet & Arand, 1995; Lichstein, Wilson, Noe, Aguillard, & Bellur, 1994; Mendelson, Garnett, Gillin, & Weingartner, 1984; Seidel & Dement,

1982, Sugarman, Stern, & Walsh, 1985). The difference between the present results and the literature regarding subjective daytime sleepiness and onset latencies in daytime laboratory settings may be explained by the following factors. First, subjective reports of daytime sleepiness and sleep onset latency in a tightly-controlled laboratory setting are distinctly different variables than actual nap data collected from participants in their natural environment. Second, it should be noted that many of the statistically significant differences between PWI and NS described in the present study were not necessarily clinically significant.

Relation between daytime napping and nighttime sleep.

The present results suggested a significant relation between daytime napping and the following night's sleep for 2 of 3 variables tested. As daytime napping increased, the following night's sleep onset latency increased and total sleep time decreased. In a separate analysis exploring the relation between nighttime sleep and the following day's napping, we found that increased wake time after sleep onset and decreased total sleep time related to increased napping on the following day. While total sleep time appears to be affected by the previous day's nap and influences the following day's nap, the pattern of findings with sleep onset latency and wake time after sleep onset is particularly interesting because it suggests a temporal proximity effect. Daytime napping affected the following night's sleep onset latency, which is closer in time to that nap, while wake time after sleep onset was not affected by the previous day's nap but influenced the following day's napping.

Arguably, the most relevant question regarding the relation between napping and nighttime sleep is whether taking a nap during the day negatively affects the following night's sleep. Our analyses generated a linear coefficient and it may be worthwhile to consider the clinical impact of the relation between daytime napping and nighttime sleep considering a typical

nap of about 57 minutes. For example, the linear coefficient generated for the relation between time spent napping and the following night's sleep onset latency was .04. Thus with a typical nap of 57 minutes, a person can expect an increase in SOL of just over 2.5 minutes. It appears open to debate whether this is a clinically relevant relationship in a typical napper, but those who engage in longer naps may experience more clinically relevant increases in SOL.

These results clarify the relation between napping and nighttime sleep, but do not contradict previous publications regarding the topic. In cases where longer naps are taken later in the day, it is likely that that decrements in nighttime sleep will occur as suggested by Feinberg et al., (1985) and Werth, et al. (1996). It is also likely that briefer naps, taken earlier in the day, are not likely to have a clinically meaningful effect on the following night's sleep as suggested by Pilcher et al. (2001).

Clinical Implications

It is debatable whether the average nap results in a clinically meaningful decrement in nighttime sleep. However, considering the steadily increasing literature suggesting that taking a brief nap of 20 minutes or less may maximize potential benefits and minimize negative consequences (Luo & Inoue, 2000; Hiyashi, Ito, & Hori, 1999; Hiyashi, Watanabe, & Hori, 1999), there are aspects of the present results that may be clinically relevant. The present results suggest that the average nap taken is about 57 minutes and brief naps account for only about 20% of the naps taken. Clinicians working with persons where napping may play some role in their mental or physical health, may choose to educate them about the potential advantages of brief naps. A discussion of the negative effects of sleep inertia and how brief naps limit those effects may be particularly helpful.

Limitations

There are limitations to any interpretations made from the present data set. Although the retention rate was consistent with other epidemiological studies using similar methods, the rate was low and data may not reflect the general population. The demographics of the study sample do not match the general population of the area sampled. AA were under-sampled. Thus, the generalizability to all AA is limited. It is not clear whether AA were less likely to be called, less willing to participate, or more likely to drop out. There is a possibility that the nature of the random digit dialing procedure did not allow for the reaching of persons in the least advantaged neighborhoods, as those persons may be less likely to have a phone. The actual number of AA participants was adequate for most analyses, but the number of AA in certain age decades was limited, making statistical tests of the interaction between age, gender, and ethnicity not feasible.

The age and ethnic characteristics of the present sample are also not consistent with the U.S. population. Efforts made to obtain enough data from adults in each age decade to thoroughly analyze the impact of age, have led to a sample that over-represents OA relative to the U.S. population, and the proportion of AA that is higher than exists in the U.S. population. These characteristics have the most impact on the descriptive statistics obtained from the full sample. As both AA and OA engage in more napping behavior than other age and ethnic groups in the sample, their overrepresentation likely results in present reports of typical napping behavior that will be higher than in the U.S. population. Although age has been statistically controlled for in many of the present analyses, the high proportion of AA may still contribute to decreased generalizability to the U.S. population.

Daily sleep diary data were the main source of nap and nighttime sleep variables. Although they arguably offer advantages over long-term retrospective questionnaires, there is

still the possibility that they were not filled out on a daily basis as instructed. There was no method in place to ensure daily monitoring, and this may have lead to a decrease in data quality. A final issue with the diary data, is that participants were asked to report the time spent napping each day, but the number of naps taken in that day was not collected. Thus, it is possible that the present results underestimate the number of naps taken.

Future Research

Future research in this area should include some form of objective measure of nighttime sleep and napping to supplement and potentially maximize quality of sleep diary data. Diaries in future studies should also include a measure of the number of naps taken each day. Finally, efforts should be made to address the relative deficits in the recruitment of AA via the random-digit dialing method, with the goal of creating a more representative sample and allowing for more a more complete sample of AA across the adult lifespan.

References

American Psychiatric Association (2000). *Diagnostic and statistical manual for mental disorders* (4th ed. text revision). Washington, DC: Author.

Ancoli-Israel, S., Klauber, M. R., Stepnowski, C., Estline, E., Chinn, A., & Fell, R. (1995). Sleep-disordered breathing in African –American elderly. *American Journal of Respiratory and Critical Care Medicine, 152*, 1946-1949.

Arora, V., Dunphy, C., Chang, V. Y., Ahmad, F., Humphrey, H. J., & Meltzer, D. (2006). The effects of on-duty napping on intern sleep time and fatigue. *Annals of Internal Medicine, 144*, 792-798

Beck, A. T., Steer, R.A., & Garbin, M. G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review, 8*, 77-100.

Beh, H. C. (1994). A survey of daytime napping in an elderly Australian population. *Australian Journal of Psychology, 46*, 100-106.

Bliwise, N. G. (1992). Factors related to sleep quality in healthy elderly women. *Psychology and Aging, 7*, 83-88.

Bonnet, M. H., & Arand, D. L. (1995). 24-Hour metabolic rate in insomniacs and matched normal sleepers. *Sleep, 18*, 581-588.

Bootzin, R. R., & Epstein, D. R. (2000). Stimulus control. In K. L. Lichstein & C. M. Morin (Eds.), *Treatment of late-life insomnia* (pp.167-184). Thousand Oaks, CA: Sage.

Bootzin, R. R., & Nicassio, P.M. (1978). Behavioural treatments for insomnia. In M. Hersen, R.M. Eisler, & P.M. Miller (Eds.), *Progress in behaviour modification* (Vol. 6, pp. 1-45). New York: Academic Press.

Borbely, A. A., & Neuhaus, H. U. (1979). Sleep deprivation: Effects on sleep and EEG in the rat. *Journal of Comparative Physiology A*, 133, 71-87.

Buysse, D. J., Browman, K. E., Monk, T. H., Reynolds, C. F., III, Fasiczka, A. L., & Kupfer, D. J. (1992). Napping and 24-hour sleep/wake patterns in healthy elderly and young adults. *Journal of the American Geriatrics Society, 40*, 779-786.

Buysse, D. J., Reynolds, C. F. III, Monk, T. H., Hoch, C.C., Yeager, A. L., & Kupfer, D. J. (1991). Quantification of subjective sleep quality in healthy elderly men and women using the Pittsburgh Sleep Quality Index (PSQI). *Sleep, 14*, 331-338.

Campbell, S. S., Dawson, D., & Anderson, M. (1993). Alleviation of sleep maintenance insomnia with timed exposure to bright light. *Journal of the American GeriatricSociety, 41*, 829-836.

Campbell, S. S., Gillin, J. C., Kripke, D. F., Erikson, P., & Clopton, P. (1989). Gender differences in the circadian temperature rhythms of healthy elderly subjects: Relationships to sleep quality. *Sleep, 12*, 529-536.

Davies, R., Lacks, P., Storandt, M., & Bertelson, A.D. (1986). Countercontrol treatment of sleep-maintenance insomnia in relation to age. *Psychology and Aging*, *1*, 233-238.

Dhand, R., & Sohal, H. (2006). Good sleep, bad sleep! The role of daytime naps in healthy adults. *Current Opinion in Pulmonary Medicine, 12*, 379 -382.

Dinges, D. F. (1989). Napping patterns and effects in human adults. In D. F. Dinges & R. J. Broughton (Eds.), *Sleep and alertness: Chronobiological, behavioral, and medical aspects of nappings* (pp. 171-204). New York: Raven.

Dinges, D. F. (1989). Adult napping and its effects on ability to function. In C. Stampi (Ed.), *Evolution, chronobiology, and functions of polyphasic and ultrashort sleep* (pp. 118-134). Boston: Birkhauser.

Durrence, H. H., & Lichstein, K. L. (2006). The sleep of African Americans: A comparative review. *Behavioral Sleep Medicine, 4*, 29-44.

Engle-Friedman, M., Bootzin, R. R., Hazlewood, L., & Tsao, C. (1992). An evaluation of behavioral treatments for insomnia in the older adult. *Journal of Clinical Psychology, 48*, 77-90.

Feinberg, I., March, J. D., Floyd, T. C., Jimison, R., Bossom-Demitrack, L., & Katz, P. H. (1985). Homeostatic changes during post-nap sleep maintain baseline levels of delta EEG. *Electroencephalography and Clinical Neurophysiology, 61*, 134-137.

Foley, D. J., Monjan, A. A., Brown, S. L., Simonsick, E. M., Wallace, R. B., & Blazer, D. G. (1995). Sleep complaints among elderly persons: An epidemiologic study of three communities. *Sleep, 18*, 425-432.

Friedman, L., Bliwise, D.L., Yesavage, J. A., & Salom, S.R. (1991). A preliminary study comparing sleep restriction and relaxation treatments for insomnia in older adults. *Journal of Gerontology, 46*, 1-8.

Gellis, L. A., Lichstein, K. L., Scarinci, I. C., Durrence, H. H., Taylor, D. J., Bush, A. J., & Riedel, B. W. (2005). Socioeconomic status and insomnia. *Journal of Abnormal Psychology, 114*, 111-118.

Geronimus, T., & Bound, J. (1998). Use of census-based aggregate variables to proxy for socioeconomic groups: Evidence from national samples. *American Journal of Epidemiology, 148*, 475-486.

Glasser, G. J., & Metzger, G. D. (1972). Random-digit dialing as a method of telephone sampling. *Journal of Marketing Research, 9*, 59-64.

Gravetter, F. J. & Wallnau, L. B. (1996). *Statistics for the Behavioral Sciences* (4th ed.). Minneapolis: West.

Groves, R. M., Biemer, P. P., Lyberg, L. E., Massey, J.T., Nicholls, W. L. II, & Waksberg, J. (Eds.). (1988). *Telephone survey methodology*. New York: Wiley.

Hays, J. C., Blazer, D. G., & Foley, D. J. (1996). Risk of napping: Excessive daytime sleepiness and mortality in an older community population. *Journal of the American Geriatrics Society, 44*, 693-698.

Hiyashi, M., Ito, S., & Hori, T. (1999). The effects of a 20-minute nap in the mid-afternoon on sleepiness, performance and EEG activity. *International Journal of Psychophysiology, 32*, 173-180.

Hiyashi, M., Watanabe, M., & Hori, T. (1999). The effects of a 20-minute nap in the mid-afternoon on mood, performance and EEG activity. *Clinical Neurophysiology, 110, 272-279*.

Hoddes, E., Zarcone, V., Smythe, H., Phillips, R., & Dement, W. C. (1973). Quantification of sleepiness: A new approach. *Psychophysiology, 10*, 431-436.

Hoelscher, T. J., Ware, J. C., & Bond, T. (1993). Initial validation of the insomnia impact scale. *Sleep Research, 22*, 149.

Hohagen, F., Kappler, C., Schramm, E., Rink, K., Weyerer, S., Riemann, D., & Berger, M. (1994). Prevalence of insomnia in elderly general practice attenders and the current treatment modalities. *Acta Psychiatrica Scandinavica, 90*, 102-108.

Horne, J. A., & Reyner, L. A. (1996). Counteracting driver sleepiness: Effects of napping, caffeine, and placebo. *Psychophysiology, 33*, 306-309.

Johns, M. W. (1991). A new method for measuring daytime sleepiness: The Epworth Sleepiness Scale. *Sleep, 14*, 540-545.

Johns, M. W. (1994). Sleepiness in different situations measured by the Epworth Sleepiness Scale. *Sleep, 17*, 703-710.

Johns, M. W. & Hocking, B. (1997). Daytime sleepiness and sleep habits of Australian workers. *Sleep, 20*, 844-849.

Johnston, S. K., Landis, C. A., Lentz, M. J., & Shaver, J. L. F. (2001). Self reported nap behavior and polysomnography at home in midlife women with and without insomnia. *Sleep, 24*, 913-919.

Karacan, I., Williams, R. L., Finley, W. W., & Hursch, C. J. (1970). The effects of naps on nocturnal sleep: Influence on the need for Stage-1 and Stage 4 sleep. *Biological Psychiatry, 2*, 393-399.

Klietman, N., Mullin, F. J., Cooperman, N. R., & Titelbaum, S. (1937). *Sleep characteristics*. Oxford, England: University of Chicago Press.

Kripke, D. F., Ancoli-Israel, S., Klauber, M. R., Wingard, D. L., Mason, W. J., & Mullaney, D.J. (1997). Prevalence of sleep-disordered breathing in ages 40-64 years: A population-based survey. *Sleep, 20*, 65-76.

Kripke, D. F., Brunner, R., Freeman, R., Hendrix, S. L., Jackson, R. D., Masaki, K., & Carter, R. A. (2001). Sleep complaints of postmenopausal women. *Clinical Journal of Women's Health, 1*, 244-252.

Krieger, N., Williams, D. R., & Moss, N. E. (1997). Measuring social class in U.S. public health research. *Annual Review of Public Health, 18*, 341-378.

Krupp, L. B., LaRocca, N. G., Muir-Nash, J., & Steinberg, A. D. (1989). The Fatigue Severity Scale: Application to patients with multiple sclerosis and systemic lupuserythematosus. *Archives of Neurology, 46*, 1121-1123.

Larson, E. (1994). Exclusion of certain groups from clinical research. *Image, the journal of Nursing Scholarship, 26*, 185-190.

Lichstein, K. L., Durrence, H. H., Riedel, B. W., Taylor, D. J., & Bush, A. J. (2004). *Epidemiology of sleep: Age, gender, and ethnicity*. Mahwah, NJ: Lawrence Erlbaum Associates.

Lichstein, K. L., Durrence, H. H., Taylor, D. J., & Bush, A. J., & Riedel, B. W. (2003). Quantitative criteria for insomnia. *Behaviour Research and Therapy, 41*, 427-455.

Lichstein, K. L., & Johnson, R. S. (1993). Relaxation for insomnia and hypnotic medication use in older women. *Psychology of Aging, 8*, 103-111.

Lichstein, K. L., Means, M. K., Noe, S. L., & Aguillard, R. N. (1997). Fatigue and sleep disorders. *Behavior Research and Therapy, 35*, 733-740.

Lichstein, K. L., Wilson, N. M., Noe, S. L., Aguillard, R. N., & Bellur, S. N. (1994). Daytime sleepiness in insomnia: Behavioral, biological and subjective indices. *Sleep, 17*, 693-702.

Linsky, A. S. (1975). Stimulating responses to mailed questionnaires: A review. *Public Opinion Quarterly, 39*, 83-101.

Luo, Z., & Inoue, S. (2000). A short daytime nap modulates levels of emotions objectively evaluated by the emotion spectrum analysis method. *Psychiatry and Clinical Neuroscience, 54*, 207-212.

Mendelson, W. B., Garnett, D., Gillin, J. C., & Weingartner, H. (1984). The experience of insomnia and daytime and nighttime functioning. *Psychiatry Research, 12*, 235-250.

Morgan, K., Healey, D. W., & Healey, P.J. (1989). Factors influencing persistent subjective insomnia in old age: A follow-up study of good and poor sleepers aged 65-74. *Age and Aging, 18*, 117-122.

Morin, C. M., & Azrin, N. H. (1988). Behavioral and cognitive treatments of geriatric insomnia. *Journal of Consulting and Clinical Psychology, 56*, 748-753.

Morin, C. M. & Gramling, S. E. (1989). Sleep patterns and aging: Comparison of older adults with and without insomnia complaints. *Psychology and Aging, 4*, 290-294.

Morin, C. M., Kowatch, R. A., Barry, T., & Walton, E. (1993). Cognitive-behavior therapy for lat-life insomnia. *Journal of Consulting and Clinical Psychology, 61*, 137-146.

O'Connor, G. T, Lind, B. K., Lee, E. T., Nieto, F.J., Redline, S., Samet, J.M., et al. (2003). Variation in symptoms of sleep-disordered breathing with race and ethnicity: The sleep heart health study. *Sleep, 26*, 74-79.

Ohayon, M. M. & Zulley, J. (1999). Prevalence of naps in the general population. *Sleep and Hypnosis. 1*, 88-97.

Pilcher, J. J., Michalowski, K. R., & Carrigan, R. D. (2001). The prevalence of daytime napping and its relationship to nighttime sleep. *Behavioral medicine, 27*, 71-76.

Profant, J., Ancoli-Israel, S., & Dimsdale, J. E. (2002). Are there ethnic differences in sleep architecture? *American Journal of Human Biology, 14*, 321-326.

Qureshi, A.I., Giles, W.H., Croft, J. B., & Bliwise, D.L, (1997). Habitual sleep patterns and risk for stroke and coronary heart disease: A 10-year follow –up from NHANES I. *Neurology, 48*, 904-911.

Rao, U., Poland, R. E., Lutchmansingh, P., Ott, G. E., McCracken, J. T., & Keh-Ming, L. (1999). Relationship between ethnicity and sleep patterns in normal controls: Implications for the psycholpathology and treatment. *Journal of Psychiatric Research, 33*, 419-426.

Redline, S., Tishler, P. V., Hans, M. G., Tosteson, T. D., Strohl, K. P., & Spry, K. (1997) Racial differences in sleep-disordered breathing in African Americans and Caucasians. *American Journal of Respiratory and Critical Care Medicine, 155*, 186-192.

Rosenthal, R., & Rosnow, R. L. (1991). *Essentials of behavioral research: Methods and data analysis* (2nd ed.). Boston: McGraw-Hill.

Seidel, W. F., & Dement, W. C. (1982). Sleepiness in insomnia: evaluation and treatment. *Sleep, 5 (suppl 2)*, 182-190.

Smith, L. J., Nowakowski, S.**,** Soeffing, J.P., Orff, H.J., & Perlis, M.L. (2003) The Measurement of Sleep. In M.L. Perlis, & K. L. Lichstein (Eds.). *Treating Sleep Disorders: Principles and Practice of Behavioral Sleep Medicine*. (pp. 29 – 73) Hoboken NJ: John Wiley & Sons.

Soldatos, C. R., Madianos, M. G., & Vlachonikolis, I. G. (1983). Early afternoon napping: A fading Greek habit. In W.P. Koella (Ed.). *Sleep*. (pp. 202-205) Basel: Karger.

Spiegel, R. (1981). *Sleep and sleepiness in advanced age*. New York: SP Medical and Scientific Books.

Spielberger, C. D., Gorsuch, R. L, Lushene, R., Vagg, P.R., & Jacobs, G. A. (1983). *State-Trait Anxiety Inventory* (Form Y). Palo Alto, CA: Consulting Psychologists Press.

Stepanski, E. J., & Wyatt, J. K. (2003). Use of sleep hygiene in the treatment of insomnia. *Sleep Medicine Reviews, 7*, 215-225.

Stepnowsky, C. J., Jr., Moore, P.J., & Dimsdale, J. E. (2003). Effect of ethnicity on sleep: Complexities for epidemiologic research. *Sleep, 26*, 329-332.

Sugarman, J. L., Stern, J. A., & Walsh, J. K. (1985). Daytime alertness in subjective and objective insomnia: some preliminary findings. *Biological Psychiatry, 20*, 741-750.

Taub, J. (1971). The sleep-wakefulness cycle in Mexican adults. *Journal of Cross-Cultural Psychology, 44*, 353-362.

Taub, J. M., Tanguay, P. E., & Clarkson, D. (1976). Effects of daytime naps on performance and mood in a college student population. *Journal of Abnormal Psychology, 85*, 210-217.

Taylor, D. J., Lichstein, K. L., Durrence, H. H., Reidel, B. W., & Bush, A. J., (2005). Epidemiology of insomnia, depression, and anxiety. *Sleep, 28*, 1457-1464.

Tune, G. S. (1969). The influence of age and temperament on the adult human sleep-wakefulness pattern. *British Journal of Psychology, 60*, 431-441.

Tune, G. S. (1969). Sleep and wakefulness in 509 normal human adults. *British Journal of Medical Psychology, 42*, 75-80.

U.S. Census Bureau. (2000). Census 2000. http://www.census.gov.

U.S. Department of Health and Human Services. (2000). *NIH strategic plan to reduce and ultimately eliminate health disparities*. Rockville, MD: U.S. Department of Health and Human Services, National Institutes of Health, Office of Minority Health.

Webb, W. B. (1981). Patterns of sleep in healthy 50-60 year old males and females. *Research Communications in Psychology, Psychiatry & Behavior, 6*, 133-140.

Webb, W. B. (1982). Sleep in older persons: Sleep structures of 50- to 60-year-old men and women. *Journal of Gerontology, 3,* 581-586.

Webb, W. B. & Aber, W. R. (1984). Relationships between sleep and retirement-nonretirement status. *International Journal of Aging and Human Development, 20,* 13-19.

Werth, E., Dijk, D. J., Achermann, P., & Borbely, A. A. (1996). Dynamics of the sleep EEG after an early evening nap: Experimental data and simulations. *The American Journal of Physiology, 271,* 501-510.

Wohlgemuth, W., & Edinger, J. (2000). Sleep restriction therapy. In K. L. Lichstein & C. M. Morin (Eds.), *Treatment of late-life insomnia* (pp. 147-166). Thousand Oaks, CA: Sage.

Zulley, J., & Campbell, S. S. (1985). Napping behavior during 'spontaneous internal desynchronization': Sleep remains in synchrony with body temperature. *Human Neurobiology, 4,* 123-126.

Appendix A

THE EPWORTH SLEEPINESS SCALE

ID# : _____ Date: _____

How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life *during the past 2 weeks*. Even if you have not done some of these things recently, imagine how they would have affected you. Use the following scale to choose the *most appropriate number* for each situation:

0 = would *never* doze
1 = *slight* chance of dozing
2 = *moderate* chance of dozing
3 = *high* chance of dozing

Situation	**Chance of dozing**
1. Sitting and reading	_____
2. Watching TV	_____
3. Sitting, inactive in a public place (such as a theater or a meeting)	_____
4. As a passenger in a car for an hour without a break	_____
5. Lying down to rest in the afternoon when circumstances permit	_____
6. Sitting and talking to someone	_____
7. Sitting quietly after a lunch without alcohol	_____
8. In a car, while stopped for a few minutes in the traffic	_____

Appendix B

Fatigue Severity Scale

ID #: _____

Date: _____

INSTRUCTIONS:

Below are a series of statements regarding fatigue. By fatigue we mean a sense of tiredness, lack of energy, or total body give-out. Please read each statement and circle a number from 1 to 7 that indicates your degree of agreement with each statement where 1 indicates you *strongly disagree* and 7 indicates you *strongly agree*.

Please answer these questions as they apply to the **past two weeks**.

	STRONGLY **DISAGREE**						STRONGLY **AGREE**
1. My motivation is lower when I am fatigued.....	1	2	3	4	5	6	7
2. Exercise brings on my fatigue.....	1	2	3	4	5	6	7
3. I am easily fatigued.....	1	2	3	4	5	6	7
4. Fatigue interferes with my physical functioning .	1	2	3	4	5	6	7
5. Fatigue causes frequent problems for me	1	2	3	4	5	6	7
6. My fatigue prevents sustained physical functioning	1	2	3	4	5	6	7
7. Fatigue interferes with carrying out certain duties and responsibilities	1	2	3	4	5	6	7
8. Fatigue is among my three most disabling symptoms	1	2	3	4	5	6	7
9. Fatigue interferes with my work, family, or social life.....	1	2	3	4	5	6	7

Appendix C

INSOMNIA IMPACT SCALE

ID #_____ Date_____

For each statement, circle the number that best describes your experience or your belief during the **past 2 weeks**.

1 = strongly disagree
2 = disagree
3 = neutral
4 = agree
5 = strongly agree

1.	I am more likely to catch colds and other illnesses when my sleep is disturbed.	12345
2.	It is impossible for me to function the next day if I get less than seven hours of sleep.	12345
3.	I am less coordinated on days following poor nights of sleep.	12345
4.	I am afraid I may die if I don't get enough sleep.	12345
5.	Others can tell by looking at me when I'm not sleeping well.	12345
6.	Poor sleepers age faster than good sleepers.	12345
7.	Sleep disturbance causes me to experience nausea and headaches.	12345
8.	Poor sleep causes me to feel very tired and fatigued.	12345
9.	I can't think clearly if I don't sleep well.	12345
10.	The most important thing to me today is that I get a good night's rest tonight.	12345
11.	My sleep pattern is out of control.	12345
12.	I am very skeptical that insomnia can be effectively treated.	12345
13.	My memory is greatly affected by poor sleep.	12345
14.	Most people underestimate the importance of sleeping well at night.	12345
15.	I try to "catch" some sleep whenever I can.	12345
16.	I'll try anything to improve my sleep.	12345
17.	My mind often races at night.	12345
18.	I wish I could nap during the day.	12345
19.	Poor sleep can greatly disturb family/personal relationships.	12345
20.	Poor sleep prevents career advancement.	12345
21.	Following a night of poor sleep, I am likely to cancel my social activities.	12345
22.	I call in sick or go in late if I slept poorly the night before.	12345
23.	I avoid trips if I'm not sleeping well.	12345
24.	I can't help feeling grouchy and irritable following a poor night of sleep.	12345
25.	Poor sleep can make me feel depressed.	12345
26.	Almost all of my current problems in life are due to my sleep pattern.	12345
27.	If I have problems sleeping during the night, I become very angry.	12345
28.	I have developed a fear of not sleeping well.	12345
29.	I worry about sleep during much of the day.	12345
30.	I start to become anxious and tense in the evening because I might not sleep well at night.	12345
31.	I get so upset when I can't sleep during the night that I sometimes start crying.	12345
32.	I'm afraid I may kill myself if I don't start getting more sleep.	12345
33.	I eat more when I can't sleep.	12345
34.	I have problems concentrating and I make foolish errors after a poor night of sleep.	12345
35.	I am fidgety and restless during the day if I sleep poorly at night.	12345
36.	I have body aches due to poor sleep.	12345
37.	I feel very sleepy during the day.	12345
38.	Poor sleep causes my eyes to feel very heavy during the day.	12345
39.	Poor sleep causes me to feel lazy during the day.	12345
40.	Poor sleep causes me to be more socially withdrawn.	12345

Appendix D1

BDI™

Date: _____

Name: _____ Marital Status: _____ Age: _____ Sex: _____

Occupation: _____ Education: _____

This questionnaire consists of 21 groups of statements. After reading each group of statements carefully, circle the number (0, 1, 2 or 3) next to the one statement in each group which **best** describes the way you have been feeling the **past week, including today.** If several statements within a group seem to apply equally well, circle each one. **Be sure to read all the statements in each group before making your choice.**

1
- 0 I do not feel sad.
- 1 I feel sad.
- 2 I am sad all the time and I can't snap out of it.
- 3 I am so sad or unhappy that I can't stand it.

2
- 0 I am not particularly discouraged about the future.
- 1 I feel discouraged about the future.
- 2 I feel I have nothing to look forward to.
- 3 I feel that the future is hopeless and that things cannot improve.

3
- 0 I do not feel like a failure.
- 1 I feel I have failed more than the average person.
- 2 As I look back on my life, all I can see is a lot of failures.
- 3 I feel I am a complete failure as a person.

4
- 0 I get as much satisfaction out of things as I used to.
- 1 I don't enjoy things the way I used to.
- 2 I don't get real satisfaction out of anything anymore.
- 3 I am dissatisfied or bored with everything.

5
- 0 I don't feel particularly guilty.
- 1 I feel guilty a good part of the time.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6
- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7
- 0 I don't feel disappointed in myself.
- 1 I am disappointed in myself.
- 2 I am disgusted with myself.
- 3 I hate myself.

8
- 0 I don't feel I am any worse than anybody else.
- 1 I am critical of myself for my weaknesses or mistakes.
- 2 I blame myself all the time for my faults.
- 3 I blame myself for everything bad that happens.

9
- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

10
- 0 I don't cry any more than usual.
- 1 I cry more now than I used to.
- 2 I cry all the time now.
- 3 I used to be able to cry, but now I can't cry even though I want to.

11
- 0 I am no more irritated now than I ever am.
- 1 I get annoyed or irritated more easily than I used to.
- 2 I feel irritated all the time now.
- 3 I don't get irritated at all by the things that used to irritate me.

12
- 0 I have not lost interest in other people.
- 1 I am less interested in other people than I used to be.
- 2 I have lost most of my interest in other people.
- 3 I have lost all of my interest in other people.

13
- 0 I make decisions about as well as I ever could.
- 1 I put off making decisions more than I used to.
- 2 I have greater difficulty in making decisions than before.
- 3 I can't make decisions at all anymore.

_____ Subtotal Page 1

CONTINUED ON BACK

14
- 0 I don't feel I look any worse than I used to.
- 1 I am worried that I am looking old or unattractive.
- 2 I feel that there are permanent changes in my appearance that make me look unattractive.
- 3 I believe that I look ugly.

15
- 0 I can work about as well as before.
- 1 It takes an extra effort to get started at doing something.
- 2 I have to push myself very hard to do anything.
- 3 I can't do any work at all.

16
- 0 I can sleep as well as usual.
- 1 I don't sleep as well as I used to.
- 2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
- 3 I wake up several hours earlier than I used to and cannot get back to sleep.

17
- 0 I don't get more tired than usual.
- 1 I get tired more easily than I used to.
- 2 I get tired from doing almost anything.
- 3 I am too tired to do anything.

18
- 0 My appetite is no worse than usual.
- 1 My appetite is not as good as it used to be.
- 2 My appetite is much worse now.
- 3 I have no appetite at all anymore.

19
- 0 I haven't lost much weight, if any, lately.
- 1 I have lost more than 5 pounds.
- 2 I have lost more than 10 pounds.
- 3 I have lost more than 15 pounds.

I am purposely trying to lose weight by eating less. Yes _____ No _____

20
- 0 I am no more worried about my health than usual.
- 1 I am worried about physical problems such as aches and pains; or upset stomach; or constipation.
- 2 I am very worried about physical problems and it's hard to think of much else.
- 3 I am so worried about my physical problems that I cannot think about anything else.

21
- 0 I have not noticed any recent change in my interest in sex.
- 1 I am less interested in sex than I used to be.
- 2 I am much less interested in sex now.
- 3 I have lost interest in sex completely.

_____ Subtotal Page 2

_____ Subtotal Page 1

_____ Total Score

TPC 0528-002 21 22 23 24 25 26 27 28 29 30 B C D E

Appendix E

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

ID _____ Date_____

DIRECTIONS

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally have felt during the past two weeks*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	1	2	3	4
22. I feel nervous and restless	1	2	3	4
23. I feel satisfied with myself	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I feel like a failure	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected"	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that really doesn't matter	1	2	3	4
30. I am happy	1	2	3	4
31. I have disturbing thoughts	1	2	3	4
32. I lack self-confidence	1	2	3	4
33. I feel secure	1	2	3	4
34. I make decisions easily	1	2	3	4
35. I feel inadequate	1	2	3	4
36. I am content	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39. I am a steady person	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

Appendix F: SLEEP QUESTIONNAIRE

NAME _____ **WEEK 1**

Please answer the following questionnaire **WHEN YOU AWAKE IN THE MORNING**. Enter yesterday's day and date and provide the information to describe your sleep the night before. Definitions explaining each line of the questionnaire are given below.

ITEM DEFINITIONS

1. If you napped yesterday, enter total time napping in **minutes**.
2. What time did you enter bed for the purpose of going to sleep (not for reading or other activities)?
3. Counting from the time you wished to fall asleep, how many **minutes** did it take you to fall asleep?
4. How many times did you awaken during the night?
5. What is the total **minutes** you were awake during the middle of the night? This does not include time to fall asleep at the beginning of the night. It also does not include awake time in bed before the final morning arising.
6. What time did you wake up for the last time this morning?
7. What time did you actually get out of bed this morning?
8. Pick one number below to indicate your overall QUALITY RATING or satisfaction with your sleep.
   1. very poor, **2.** poor, **3.** fair, **4.** good, **5.** excellent
9. List any sleep medication or alcohol taken at or near bedtime, and give the amount and time taken.

	EXAMPLE							
yesterday's day ⇒ yesterday's date ⇒	TUES 10/14/97	day 1	day 2	day 3	day 4	day 5	day 6	day 7
1. NAP (yesterday)	70 min.							
2. BEDTIME (last night)	10:55 pm							
3. TIME TO FALL ASLEEP	65 min.							
4. # AWAKENINGS	4							
5. WAKE TIME (middle of night)	110 min.							
6. FINAL WAKE-UP	6:05 am							
7. OUT OF BED	7:10 am							
8. QUALITY RATING	2							
9. BEDTIME MEDICATION (include amount & time)	Halcion 0.25 mg 10:40 pm							