INSOMNIA AND SUICIDE RISK

by

JULIE A. WOOSLEY

KENNETH L. LICHSTEIN, COMMITTEE CHAIR
REBECCA S. ALLEN
NATALIE D. DAUTOVICH
JAMES D. GEYER
ALEXANDRA M. TULLET

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

2015
ABSTRACT

A growing body of literature supports the notion that sleep disturbances, including insomnia, are related to suicidality. However, the mechanism through which insomnia correlates with suicide risk is unclear. The primary goal of the present research was to determine whether hopelessness, a robust predictor of suicidality, mediates the relation between insomnia and suicidal ideation (SI). Additionally, analyses were conducted to determine which demographic, health, sleep, and daytime functioning variables best predict hopelessness. Finally, this research will address gaps in the literature by determining which types of insomnia best predict suicide risk (i.e., hopelessness and SI), and whether a complaint of insomnia, poor sleep (as defined by quantitative criteria), or the combination of these factors best predicts suicide risk.

The present study used an existing data set consisting of self-report data from a community-dwelling epidemiological sample. Participants \( n = 766 \) completed a Health Survey, two weeks of daily sleep diaries, and five measures of daytime functioning, including the Beck Depression Inventory (BDI). BDI item 2 was used to assess hopelessness, and BDI item 9 was used to assess SI. Criteria from the Diagnostic and statistical manual of mental disorders (4th ed., text rev.) as well as quantitative criteria were used to identify participants with insomnia \( n = 135 \).

The analyses revealed that hopelessness is a significant mediator of the relation between insomnia and SI (Percentile 95% CI \([0.24, 0.71]\)). Additionally, stepwise logistic regression revealed that, of a large pool of candidate variables, depression, anxiety, mean sleep efficiency, and intra-individual variability in sleep quality ratings are the best predictors of hopelessness.
Finally, stepwise logistic regression revealed that a complaint of insomnia is a better predictor of suicide risk than quantitatively-defined poor sleep or the combination of these factors.

Recommendations for future research include determining whether cognitive behavioral therapy for insomnia decreases hopelessness, which could ultimately decrease suicide risk. Additionally, the present research suggests the need for clinicians to routinely screen clients who report insomnia for hopelessness and SI.
### LIST OF ABBREVIATIONS AND SYMBOLS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>$d$</td>
<td>Cohen’s d; a measure of effect size</td>
</tr>
<tr>
<td>$df$</td>
<td>Degrees of freedom</td>
</tr>
<tr>
<td>$F$</td>
<td>F ratio; ratio of variance between groups to variance within groups</td>
</tr>
<tr>
<td>$M$</td>
<td>Arithmetic mean</td>
</tr>
<tr>
<td>$OR$</td>
<td>Odds ratio</td>
</tr>
<tr>
<td>$n$</td>
<td>Number of participants</td>
</tr>
<tr>
<td>$p$</td>
<td>Probability</td>
</tr>
<tr>
<td>$r$</td>
<td>Pearson correlation coefficient</td>
</tr>
<tr>
<td>$R^2$</td>
<td>Explained variance; indicates the goodness-of-fit of a model</td>
</tr>
<tr>
<td>$SD$</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>Chi squared statistic</td>
</tr>
<tr>
<td>$=$</td>
<td>Equal to</td>
</tr>
</tbody>
</table>
ACKNOWLEDGMENTS

I would like to thank Kenneth Lichstein, the chair of this dissertation, for his mentorship and advice. I would also like to thank my other committee members, Rebecca Allen, Natalie Dautovich, James Geyer, and Alexa Tullet for their helpful feedback, suggestions, and support through the dissertation process. Finally, I would like to thank my husband, Kevin Woosley, my family, and my friends for their support and encouragement.
CONTENTS

ABSTRACT ........................................................................................................................................... ii

LIST OF ABBREVIATIONS AND SYMBOLS ..................................................................................... iv

ACKNOWLEDGMENTS .......................................................................................................................... v

LIST OF TABLES ................................................................................................................................... viii

LIST OF FIGURES ................................................................................................................................ x

1. INTRODUCTION .............................................................................................................................. 1
   a. RESEARCH QUESTIONS .................................................................................................................. 7

2. METHODOLOGY ............................................................................................................................. 10
   a. PARTICIPANTS .............................................................................................................................. 10
   b. MEASURES ................................................................................................................................. 12
   c. PROCEDURE ............................................................................................................................... 15

3. RESULTS ........................................................................................................................................... 18
   a. PARTICIPANT CHARACTERISTICS ............................................................................................. 18
   b. HOPELESSNESS AS A MEDIATOR ............................................................................................ 18
   c. EXPLORATION OF ALTERNATIVE MEDIATION MODELS ..................................................... 20
   d. EXPLORATION OF MODERATION MODELS ........................................................................... 21
   e. PREDICTORS OF HOPELESSNESS ............................................................................................ 21
   f. INSOMNIA TYPE AND SUICIDE RISK ....................................................................................... 23
   g. COMPLAINT OF INSOMNIA VS. POOR SLEEP ......................................................................... 24

4. DISCUSSION ...................................................................................................................................... 26
LIST OF TABLES

1. Participant demographic characteristics.................................................................39
2. Responses to BDI items 2 and 9..............................................................................40
3. Variable means (SD) or percentages by degree of hopelessness.........................41
4. Likelihood ratio tests for each predictor of hopelessness included in regression model........43
5. Coefficients and odds ratios for each predictor of hopelessness included in regression model.....................................................................................................................................44
6. Frequency of each type of insomnia by level of suicide risk..................................45
7. Mean SOL and WASO by level of suicide risk.........................................................46
8. Frequency of insomnia complaint and poor sleep by level of suicide risk...............47
9. Coefficients and odds ratios for insomnia complaint at each level of suicide risk........48
LIST OF FIGURES

1. Model with hopelessness mediating the relation between insomnia and suicidal ideation..... 38
CHAPTER 1: INTRODUCTION

Suicide rates in the United States have been rising steadily in recent years (CDC, 2012b). From 2000 to 2009, mortality rates for suicide increased by 15%, with suicide emerging as the leading cause of injury-related death in 2009 (Rockett et al., 2012). Among all causes of mortality, suicide was the 10th leading cause of death annually from 2008 to 2010 (Kochanek, Xu, Murphy, Miniño, & Kung, 2011), with approximately 105 deaths by suicide occurring per day in 2010 (CDC, 2012b). Additionally, in 2009 an estimated 1 million adults (aged 18 and older) made unsuccessful suicide attempts (SAMHSA, 2010). Clearly, suicide is a growing problem in the United States, and research is needed to improve the identification of individuals at risk for suicidal behavior.

In an effort to improve identification of such individuals, many researchers have focused on risk factors for suicide. Numerous factors have been associated with suicide risk. For example, demographic characteristics such as disrupted marital status and male gender have been associated with completed suicide (Moscicki, 1995), and female gender has been associated with suicide attempts (Kessler, Borges, & Walters, 1999). Additionally, major depression and alcohol abuse are the psychiatric disorders most commonly associated with completed suicide (Gliatto & Rai, 1999). A history of suicide attempts, a family history of suicide, impulsive or aggressive tendencies, social isolation, and physical illness are also predictive of suicide (CDC, 2012a).

Suicidal ideation (SI) has been defined as thoughts about engaging in suicide-related behavior (DHHS, 2001). The term “suicidal ideation” encompasses a wide range of thoughts, including passive wishes to be dead, thoughts about committing suicide, intent to commit
suicide, and specific plans about how to commit suicide (APA, 2000; McAuliffe, 2002). A few measures have been devised specifically to measure SI, such as the frequently used Beck Scale for Suicide Ideation (Beck, Kovacs, & Weissman, 1979) and the Geriatric Suicide Ideation Scale (Heisel & Flett, 2006). Items from broader measures are also used at times to assess SI.

Longitudinal research indicates that SI is a particularly important risk factor for future suicide attempts and completed suicides (e.g., Britton & Conner, 2010; Darke et al., 2007; Brown, Beck, Steer, & Grisham, 2000). Research from a nationally representative survey suggests that approximately 90% of unplanned first suicide attempts and 60% of planned first suicide attempts occur within one year of the onset of SI (Kessler, Borges, & Walters, 1999). Additionally, it is generally presumed that SI is a prerequisite for suicide attempts, with the exception being those atypical instances of impulsive suicidal behavior wherein the first instance of SI is contiguous with suicidal behavior. Consequently, assessment of risk among individuals endorsing SI is considered an important step in suicide prevention (Mann et al., 2005).

In addition to the aforementioned risk factors, there is research indicating that hopelessness contributes to suicidality (e.g., Brown, Beck, Steer, & Grisham, 2000; Beck, Brown, Berchick, Stewart, & Steer, 1990). Hopelessness has been defined by Beck (1974) as pessimism or “a system of negative expectancies” concerning oneself and one’s future life. It is commonly measured using the Beck Hopelessness Scale (Beck, Weissman, Lester, & Trexler, 1974).

There is cross-sectional and longitudinal evidence to suggest that hopelessness outperforms depression as a predictor of SI (Wetzel, Margulies, Davis, & Karam, 1980; Beck, Steer, Beck, & Newman, 1993). Longitudinal research also suggests that hopelessness is predictive of suicide attempts after controlling for a history of attempts (Klonsky, Kotov, Bakst, Rabinowitz,
& Bromet, 2012). Additionally, hopelessness, along with rumination, predicts the duration of SI, suggesting that hopelessness plays a role in maintaining SI (Smith, Alloy, & Abramson, 2006). Hopelessness has also been shown to mediate the relation between other suicide risk factors (e.g., rumination, past childhood maltreatment, stress, depression) and suicidality (Smith et al., 2006; Gibb et al., 2001; Dixon, Rumford, Heppner, & Lips, 1992; Dieserud, Røysamb, Ekeberg, & Kraft, 2001). Thus, it is clear that hopelessness is an important predictor of suicidality.

Additionally, a growing body of research indicates that various sleep disturbances are associated with heightened suicide risk. A 20-year follow-up to the population-based Nord-Trøndelag Health Study (HUNT I Study) conducted in Norway in the 1980’s revealed that sleeping problems at baseline (i.e., self-reported difficulty initiating sleep or other sleep disorders) predicted completed suicide, even after controlling for other predictors of completed suicide, such as sex, physical/psychological impairment of functioning, alcohol use, and anxiety/depression (Bjørngaard, Bjerkeset, Romundstad, & Gunnell, 2011). Further, research with sleep center patients indicated that those experiencing SI were more likely than those not experiencing SI to report symptoms of parasomnias (e.g., “acting out dreams”), poorer subjective sleep quality, longer sleep onset latencies, more awakenings, longer time in bed, worse sleep efficiency, and lighter sleep (Krakow, Ribeiro, Ulibarri, Krakow, Joiner, 2011). The relation between subjective sleep quality and SI remained significant after controlling for depression.

With regard to more specific sleep problems, research has demonstrated an association between insufficient sleep and suicide risk. Behaviorally-induced insufficient sleep (defined as a sleep duration no more than 7 hours on weekdays, an “oversleep” on the weekend of at least two hours, and absence of insomnia) in adolescents predicted SI after controlling for a number of variables, including depression severity (Lee, Cho, Cho, & Kim, 2012). Further, symptoms of
insufficient sleep (i.e., typical sleep duration less than 7 hours or endorsement of daytime
impairment resulting from lack of sleep) or “very short sleep” (defined as typical sleep duration
less than 6 hours) among redeployed Operation Iraqi Freedom soldiers were predictive of
increased suicide risk (i.e., current SI or history of a suicide attempt; Luxton et al., 2011).

There is also evidence that nightmares/disturbing dreams are an important risk factor for
suicidality. Among patients at an outpatient psychological clinic, nightmares predicted degree of
SI after controlling for depression and sex (the association between nightmares and SI was
stronger in women than in men; Bernert, Joiner, Cukrowicz, Schmidt, & Krakow, 2005). Similar
results were found among college students: nightmares predicted SI after controlling for
symptoms of insomnia, depression, anxiety, and post-traumatic stress disorder (Nadorff, Nazem,
& Fiske, 2011). In a comparison of medical center patients who endorsed SI and those who did
not, nightmares were found to be more severe among those with SI (Krakow et al., 2011).
Further, those who endorsed SI were more likely to report having bad dreams/nightmares that
disrupted sleep (Krakow et al., 2011). Longitudinal research on a sample of Chinese psychiatric
outpatients also revealed that the presence of recurrent nightmares at baseline was predictive of
the incidence of suicide attempts in the year following baseline assessment (Li, Lam, Yu, Zhang,
& Wing, 2010).

Of particular interest for the present research is the relation between insomnia and
suicidality. Prior cross-sectional research indicates that the presence and severity of insomnia
symptoms are associated with increased SI (e.g., Bernert et al., 2005; Krakow et al., 2011;
McCall, Blocker, D’Agostino, Kimball, Boggs, & Lasater, 2010; Nadorff et al., 2011; Nadorff,
Fiske, Sperry, Petts, & Gregg, 2013). Further, symptoms of insomnia have been correlated with
suicidal behavior (Carli et al., 2011; Wojnar et al., 2009). In some instances, the relation
between symptoms of insomnia and suicidality has remained significant after controlling for such factors as nightmares (Nadorff et al., 2011), chronic health problems, and demographic factors (Wojnar et al., 2009).

Recent longitudinal research indicates that insomnia may have a causal influence on suicidality. Among young adults in the military, self-reported insomnia symptoms at baseline predicted suicide attempts at one-month follow-up after controlling for baseline levels of depression and hopelessness (Ribeiro et al., 2012). The predictive relation between insomnia and suicide attempts was attenuated to a non-significant trend ($p = .10$) after baseline SI, posttraumatic stress disorder, anxiety, and substance abuse were added to the model. Additional research with adolescents has shown that difficulty initiating or maintaining sleep is associated with subsequent suicidal thoughts and attempts after controlling for depression, alcohol problems, drug use, gender, age, and chronic health conditions (Wong & Brower, 2012).

Research with psychiatric outpatients has also shown that frequent (i.e., occurring at least 3 nights per week) insomnia at baseline is associated with suicide attempts in the subsequent year after controlling for gender, age, marital status, employment status, duration of mental illness, and psychiatric diagnosis (Li, Lam, Yu, Zhang, & Wing, 2010).

One recent study investigated the influence of cognitive-behavioral therapy for insomnia (CBT-I; Manber et al., 2011) on SI. In this research, 45% of participants who endorsed SI at baseline (using item 9 from the Beck Depression Inventory – II; BDI-II) no longer endorsed it following treatment. Further, among the 65 participants who endorsed SI at baseline, the mean score on BDI-II item 9 at baseline was 1.10 at baseline and 0.45 at post-treatment. Thus, CBT-I produced a decrease in SI with a large effect size ($d = 1.83$). This finding lends further support to the notion that insomnia contributes to SI.
In addition to the aforementioned findings, there is evidence that certain aspects of insomnia predict suicidality after controlling for other suicide risk factors. Recent research indicates that insomnia duration is also a significant predictor of suicide risk after controlling for depressive symptoms, anxiety symptoms, post-traumatic symptoms, current insomnia severity, and current nightmare severity (Nadorff, Nazem, & Fiske, 2013). Another recent study found that after controlling for the effects of depression, individuals who endorsed SI experienced more chronic sleep problems (including insomnia) than those without SI (Krakow, Ribeiro, Ulibarri, Krakow, & Joiner, 2011). Further, longitudinal research has shown that after controlling for baseline depression severity, age, sex, education level, employment status, marital status, physical health, smoking status, and heavy drinking, individuals having persistent insomnia (defined as the report of at least one insomnia symptom occurring at least three nights per week at two or more of the four time points assessed over the course of six years) were more likely to report SI at the last time point when compared with individuals without insomnia or those having insomnia at only one time point (Suh et al., 2013).

One aspect of sleep commonly associated with insomnia that has not been widely researched in conjunction with suicidality is night-to-night variability in sleep (Frankel, Coursey, Buchbinder, & Snyder, 1976; Buysse et al., 2010; Vallières, Ivers, Bastien, Beaulieu-Bonneau, & Morin CM, 2005; Vallières, Ivers, Beaulieu-Bonneau, & Morin, 2011). Recent research has found that variability in sleep schedule (i.e., a composite of sleep variables under participants’ control: bedtime, lights out, wake time, rising time, and time in bed) and total sleep time were directly related to depression severity (Suh et al., 2012). Given that depression is a risk factor for completed suicide (Gliatto & Rai, 1999), it is plausible that night-to-night variability in sleep could contribute to suicidality. The only study that has examined this hypothesis found that
variability in time of sleep onset and offset (as measured by actigraphy) was longitudinally associated with increased levels of SI after controlling for depression and baseline suicidality (Bernert, 2009). Further research is needed to reinforce these findings and to determine whether variability in other sleep parameters (e.g., TST) is related to SI.

Additionally, it seems that hopelessness about one’s sleep could also contribute to suicidality. It is possible that hopelessness may have contributed to the aforementioned finding that people with persistent insomnia were more likely to report SI than people having less chronic insomnia and people without insomnia (Suh et al., 2013). People with insomnia may presumably become more hopeless about improving their sleep the longer their insomnia persists. However, despite recent interest in the relation between insomnia and suicidality, the relation between insomnia and hopelessness has yet to be explored in great depth. The only study that included hopelessness as a potential mediator of the relation between insomnia and SI found that hopelessness was significantly related to SI, but not to Insomnia Severity Index score ($r = 0.19$; McCall et al., 2013). However, this research was conducted using psychiatric patients with depressive disorders, which may have limited variability in measures of hopelessness and insomnia severity. Further, the participants were taking a variety of psychotropic medications (e.g., antidepressants, antipsychotics, mood stabilizers, hypnotics) that may have influenced their sleep, and thereby influenced the relation between hopelessness and insomnia. In light of these limitations, further research is warranted.

Unfortunately, much of the past research showing an association between insomnia and suicidality has not controlled for hypnotic use. Research indicates that use of benzodiazepine receptor agonists (e.g., zolpidem) predicts SI, plans to commit suicide, and attempted suicide after controlling for demographic factors, chronic health problems, anxiety disorders, mood
disorders, and insomnia (Brower et al., 2011). Further, when hypnotics were added to the model for suicide attempts, insomnia was no longer a significant predictor. Additionally, research has found that individuals who reported regular hypnotic use were more likely to commit suicide during a 20-year follow-up period (Mallon, Broman, & Hetta, 2009). Among older adults (age 65 years and older) in Sweden, use of sedatives (diazepam, alprazolam, buspirone, hydroxyzine, and dixyrazine) and hypnotics (flunitrazepam, nitrazepam, zopiclone, zolpidem, oxazepam, levomepromazine, propiomazine, and alimemazine) were associated with a four-fold increase in completed suicide after controlling for DSM-IV Axis I disorders (Carlsten & Waern, 2009). Given these findings and the large quantities of hypnotics being prescribed (e.g., in 2011, approximately 39 million prescriptions for zolpidem were dispensed; FDA, 2013), it is important to consider the potential influence that hypnotic use may have on the relation between insomnia and suicidality.

Although there is a large amount of previous research supporting the link between insomnia and suicidality, very little research has examined the relation between various aspects of insomnia (e.g., sleep diary variables, insomnia duration, type of insomnia) and suicidality. To date, most of the research linking insomnia to suicidality has utilized self-reported insomnia symptoms or scores on the Insomnia Severity Index (Morin, 1993) but has not incorporated sleep diary data. The present study addressed these gaps in the literature using a pre-existing data set.

**Research Questions**

Prior research with the sample used in this study found that, of a large group of candidate variables (including presence of various medical conditions, sleep diary measures, age, BMI, and daytime impairment) insomnia was a robust predictor of SI (Pigeon, Woosley, & Lichstein, in press). The present research will seek to address the following questions: (a) Does hopelessness
mediate the relation between insomnia and SI? (b) Is the relation between insomnia and SI moderated by hopelessness? (c) Which demographic, sleep, and daytime functioning variables best predict hopelessness? (d) Which type(s) of insomnia (e.g., onset, maintenance) is most strongly associated with suicide risk (defined in this study as hopelessness and SI)? (e) Which of the following best predicts suicide risk: a global complaint of insomnia, poor sleep (as determined by quantitative criteria for insomnia), or the interaction of these two factors?
CHAPTER 2: METHOD

The present study used archival data gathered from a community-dwelling sample of participants in an epidemiological study of sleep (Lichstein, Durrence, Riedel, Taylor, & Bush, 2004). The purposes of that study were to establish sleep norms; elucidate age, gender, and ethnic differences in sleep; obtain detailed data on insomnia; and to ascertain daytime correlates of sleep.

Participants

Participants were recruited via random-digit dialing in the Memphis area. The list of phone numbers included all valid three-digit prefixes in use in the Memphis area paired with randomly generated four-digit numbers. This list included business, home, cellular, and unissued numbers. Recruiters called each random number until they had made a “successful” call or called a particular number five times unsuccessfully. A successful phone call was defined as one having one of the following outcomes: non-working numbers, business numbers, individuals that agreed to participate, individuals that did not agree to participate, and individuals that did not meet study criteria. Phone calls were made only during the following hours: 10 a.m. to 11:30 a.m., 1:30 p.m. to 4:30 p.m., and 6:30 p.m. to 8 p.m. These particular time periods were used in order to avoid calling potential participants at inconvenient times (i.e., the early morning, lunchtime, and the late evening hours).

To be eligible for the study, participants had to be at least 20 years old and able to speak and read English at a seventh grade level. In situations in which cohabiting partners expressed an interest in the study, only one of the partners was allowed to participate due to the concern that
there would be constrained variability in bed-partners’ sleep habits. However, other members of the same household were allowed to participate. There were no screening criteria related to sleep schedules, health status, or presence/absence of a sleep complaint. The goal was to recruit 50 men and 50 women in each of the following age groups: 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80+. After an age group was filled, potential participants in that age group were excluded.

Of the 19,893 households contacted, 1,769 participants were recruited. Eight hundred fifty-eight of these recruits returned their packets. Because 87 of these participants had a large amount of missing or ambiguous data, the number of participants was reduced to 771. These individuals participated in an epidemiological study conducted by Lichstein and colleagues (2004). Five of the aforementioned 771 participants were excluded from the present study due to missing responses on item 2 of the BDI. Three of the excluded participants were also missing responses to item 9 of the BDI.

Of the 766 participants included in this study, 135 were determined to have insomnia using *DSM-IV* diagnostic criteria as well as quantitative criteria (Lichstein et al., 2003). The *DSM-IV* criteria for Primary Insomnia and Insomnia Related to Another Mental Disorder insomnia both include the following: (a) a complaint of difficulty initiating or maintaining sleep and (b) clinically significant distress or impaired daytime functioning resulting from the sleep disturbance (APA, 2000). The quantitative criteria included: (a) a subjective complaint of insomnia with a duration of at least 6 months, (b) impaired daytime functioning (score of at least 7.4 on the Epworth Sleepiness Scale, at least 5.5 on the Fatigue Severity Scale, at least 125 on the Insomnia Impact Scale, at least 10 on the Beck Depression Inventory, or at least 37 on the
State-Trait Anxiety Inventory), and (c) SOL of > 30 minutes or WASO totaling > 30 minutes at least three nights per week as assessed by sleep diary.

Measures

**Health Survey.** The health survey (see Lichstein et al., 2004, or Appendix A) included 13 items regarding demographic information (height, weight, and race); sleep disorder symptoms (e.g., endorsement of a sleep problem, type of sleep problem endorsed, snoring, sleep attacks); physical health (current illnesses, medications, and vitamins); mental health (e.g., self-reported mental health problems, diagnoses); consumption of alcohol, caffeine, and nicotine; and household education level. One additional question asked participants to list any illnesses they had, or medications they used, that affected their sleep.

**Sleep Diary.** Sleep diaries (see Lichstein et al., 2004, or Appendix B) included the following measures: bedtime (the time the individual entered bed with the intent of going to sleep), SOL (the interval between bedtime and sleep onset), NWAK (the number of awakenings that occurred between sleep onset and the final awakening), WASO (the total time spent awake after sleep onset and before the final awakening), time of final wake-up (the time at which the individual awoke for the last time), rising time (the time at which the individual got out of the bed), bedtime medication/alcohol (any sleep medication taken near bedtime with the amount taken and the time at which it was taken), and nap (total time spent napping the previous day). From this information, we calculated time in bed (TIB), terminal wake time (TWAK; the interval between time of final wake-up and rising time), total sleep time (TST), and sleep efficiency percentage (SE). TIB was determined by the interval between bedtime and rising time. We calculated the total amount of wake time during the sleep period by adding SOL, WASO, and
TWAK. We subtracted the total wake time from TIB to yield TST (TIB = TST + total wake time). Finally, SE was calculated by dividing TST by TIB and multiplying by 100.

In addition to these measures, sleep quality was rated on a Likert scale ranging from 1 (poor sleep) to 5 (excellent sleep). A similar item is included on the Pittsburgh Sleep Quality Index, which asks the respondent to rate their sleep quality for the past month as “very good,” “fairly good,” “fairly bad,” or “very bad.” This item comprises one of the component scores that contribute to the global score (Buysse, Reynolds, Monk, et al., 1989).

**Epworth Sleepiness Scale (ESS).** The ESS measures daytime sleepiness in various quiescent situations (Johns, 1991). Respondents are instructed to rate their likelihood of falling asleep in a variety of everyday circumstances (e.g., sitting and reading, sitting inactive in a public place). In terms of validity, the ESS has been found to correlate significantly with the multiple sleep latency test (Johns, 1991). Furthermore, research indicates that the ESS has strong test-retest reliability ($r = .82$) and high internal consistency (Cronbach’s alpha = .88) (Johns, 1992).

**Fatigue Severity Scale (FSS).** The FSS is a brief questionnaire that measures subjective severity of fatigue (Krupp, LaRocca, Muir-Nash, & Steinberg, 1989). Respondents read nine short statements (e.g., “fatigue interferes with carrying out certain duties and responsibilities”) and to rate their agreement with each one. In a study comparing patients having multiple sclerosis or systemic lupus erythematosus to healthy controls (Krupp, LaRocca, Muir-Nash, & Steinberg, 1989), the FSS was able to distinguish between the healthy controls and patients. Furthermore, the FSS exhibited good internal consistency (Cronbach’s alpha = .88).

**Insomnia Impact Scale (IIS).** The IIS is a measure of daytime functioning for people with insomnia (Hoelscher, Ware, & Bond, 1993). It instructs respondents to rate their agreement
with 40 statements about the impact of poor sleep (e.g., “Poor sleep prevents career advancement”). It has been found to discriminate between people seeking treatment for insomnia and normal sleepers (Hoelscher et al., 1993).

**Beck Depression Inventory (BDI).** The BDI is a measure of depression severity, with 21 items, each of which addresses a different symptom of depression (Beck & Steer, 1987), such as lack of satisfaction, suicidal wishes, and crying. Respondents choose one of four responses that best reflects how they feel, with the lower-numbered responses corresponding to low symptom severity and the higher-numbered responses corresponding to greater symptom severity. A meta-analysis of psychometric research on the BDI determined that its mean coefficient alphas for internal consistency among psychiatric patients and non-psychiatric participants were .86 and .81, respectively (Beck, Steer, & Garbin, 1988). The BDI also has good concurrent validity with other established measures of depression (e.g., Hamilton Rating Scale for Depression, Minnesota Multiphasic Personality Inventory – Depression Scale) (Beck, Steer, & Garbin, 1988). In the present study, the three items pertaining to sleep, hopelessness, and SI were subtracted from the total score to prevent spurious correlations with outcome variables. This yielded a score for 18 items of the BDI (i.e., BDI-18).

Item 2 on the BDI was used to measure hopelessness. Respondents choose one of the four following statements on Item 2 that best describe how they feel: “I am not particularly discouraged about the future,” “I feel discouraged about the future,” “I feel I have nothing to look forward to,” “I feel the future is hopeless and that things cannot improve.” These items are scored on a scale of 0 to 3 to indicate severity. Item 2 has been found to correlate significantly with scores on the Beck Hopelessness Scale ($r = .67, p < .001$; Steer, Rissmiller, Ranieri, & Beck, 1994).
Item 9 on the BDI was used as a measure of SI. Respondents choose one of the following statements on Item 9 that best describes how they feel: “I don’t have any thoughts of killing myself,” “I have thoughts of killing myself, but I would not carry them out,” “I would like to kill myself,” “I would kill myself if I had the chance.” These items are scored on a scale of 0 to 3 to indicate severity. There is evidence to suggest that Item 9 can provide a valid measure of SI; item 9 has shown a significant correlation with the first five items of Beck’s Scale for Suicidal Ideation, which screen for attitudes about living and dying (only individuals who indicate a desire to make a suicide attempt on the first five items complete the remainder of the measure; Desseilles et al., 2012).

**State-Trait Anxiety Inventory, Trait Scale, Form Y (STAI).** The trait scale of the STAI is a 20-item measure used to assess trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Respondents rate each statement with regard to how often that statement is true. In a sample of older adults, the trait scale was shown to have good internal consistency (coefficient alpha = .90) and discriminant validity (between individuals with an anxiety disorder and individuals without an anxiety disorder) (Kabacoff, Segal, Hersen, & van Hasselt, 1997).

**Procedure**

Fifty-five research assistants (undergraduate- and graduate-level students at the University of Memphis) underwent four hours of training to recruit participants. When a recruiter reached a household, they delivered a one-minute script (from Lichstein et al., 2004; see Appendix C) that identified them as students from the University of Memphis who were researching people’s sleep habits and daytime functioning. Individuals who met study criteria (i.e., age 20 years or older and able to speak/read English at the seventh-grade level) were invited to complete a packet of questionnaires that would require approximately one hour of their time.
over the course of two weeks. They were told that the questionnaires would inquire about their sleep habits and daytime functioning and that they would be compensated for their participation. Those who agreed to participate were asked to provide their name and mailing address.

After agreeing to participate in the study on the phone, participants were mailed a packet containing sleep diaries for 14 days, the health survey, daytime functioning questionnaires (ESS, FSS, IIS, BDI, STAI), a cover sheet with instructions, and two informed consent forms (one to sign and return and one to keep). The packet also contained a compensation form and a pre-addressed, stamped envelope for return of the packet. Participants completed sleep diaries each morning for two weeks. They also completed each of the daytime impairment measures on the last day (14th day) of completing sleep diaries. Participants were instructed to complete these measures with regard to their functioning over the previous two weeks (i.e., the same period of time as they were completing sleep diaries).

Initially, participants were contacted at one month intervals after the packet was mailed (with a maximum of 3 calls). Subsequently, this was changed so that participants were contacted 2 weeks after the packet was mailed. In this call, the initial recruiter verified that the participant had received the packet and if he/she had any questions. The purpose of this call was to ensure that the participant had received the packet and to be a subtle reminder to the participant to begin the questionnaires (had he/she not already). If the packet was not received within 3 months after the mailing date, the initial recruiter or a graduate student assistant made a second reminder call. In this call, the participant was asked if he/she was having any difficulties completing the packet and was reminded about the compensation. If the completed questionnaires were not received within another month, or if a participant was unreachable by phone at any point, a reminder letter was mailed.
After returning the completed measures, participants received financial compensation. Initially, participants received $15 after returning the packet. However, due to difficulty in recruiting men and older adults, the compensation amount was raised incrementally up to $200 in order to facilitate recruitment of these groups. Forty-three percent of the sample received $15, 1% received $30, 31% received $50, 5% received $75, 1% received $100, 3% received $125, 12% received $150, 2% received $175, and less than 1% received $200. Additionally, all participants were entered into a raffle for $250.

All questionnaires were scored twice independently by research assistants. The scored questionnaires were reviewed by a supervisor, who resolved any discrepancies. Research assistants entered data, and these entries were checked by a second research assistant, who made note of any discrepancies. Discrepancies were then resolved by a supervisor. Subsequently, the data were checked for outliers and implausible values. Dubious values were checked against the raw data and corrected as needed.
CHAPTER 3: RESULTS

Participant Characteristics

These analyses included 766 participants ranging in age from 20 to 98 ($M = 53.78$, $SD = 19.85$). Participants’ demographic characteristics are presented in Table 1. Forty-nine percent of the participants were male, and 51% were female. Approximately 70% of participants were White, and 29% were Black. The remaining 1% of participants were of other races (1 Hispanic, 7 Asian) or chose not to disclose their race. Scores on BDI item 2 ranged from 0 to 3 ($M = 0.22$, $SD = 0.53$), and scores on BDI item 9 ranged from 0 to 3 ($M = 0.10$, $SD = 0.32$). Scores on the BDI-18 ranged from 0 to 38 ($M = 7.47$, $SD = 6.53$).

Hopelessness as a Mediator

In order to determine whether hopelessness mediates the relation between insomnia and SI, mediation analyses (Baron & Kenny, 1986; Preacher & Hayes, 2004) were conducted. Baron and Kenny (1986) recommended using the following steps to assess mediation: (1) regress the outcome on the predictor (path c in Figure 1), (2) regress the mediator on the predictor (path a in Figure 1), (3) regress the outcome on the mediator (path b in Figure 1), and (4) regress the outcome on the predictor after controlling for the mediator on Step 1 (path c’ in Figure 1). According to Baron and Kenny (1986), if the variance explained by the predictor decreases after controlling for the mediator, there is evidence of mediation.

Baron and Kenny (1986) also discuss using the Sobel test to determine whether the indirect effect (the influence of the predictor on the outcome through the mediator) is significant. However, one of the assumptions of the Sobel test is a normal distribution of the indirect effect,
but such distributions are frequently skewed (Preacher & Hayes, 2004). Therefore, Preacher and Hayes (2004) developed SPSS macros (see Preacher & Hayes, 2004; Preacher & Hayes, 2008) that use a nonparametric bootstrapping procedure to determine whether the coefficient of the indirect path is significant. The bootstrapping procedure treats the sample data as a population and draws multiple samples with replacement (called bootstrap samples) from this “population.” For each bootstrap sample, the indirect effect and standard deviation are calculated. The indirect effect is calculated using the product of the coefficients of paths a and b (i.e., the relations between the predictor and the mediator and between the mediator and the outcome). The final estimate of the indirect effect is represented by the mean indirect effect computed over 1,000 bootstrap samples, and the estimated standard error is the standard deviation of the 1,000 indirect effect estimates. The 95% confidence interval is determined by ordering the 1,000 estimates of the indirect effect from low to high. The lower limit of the confidence interval is the 25th score in the distribution, and the upper limit is the 976th score in the distribution (Preacher & Hayes, 2004).

For this analysis and those following, responses to BDI item 9 were dichotomized into absence/presence of SI due to the low frequency of scores of 2 or 3 on this item (see Table 2 for frequencies). Thus, there were 695 participants for whom SI was absent, and 71 participants for whom it was present. Additionally, because of the low frequency of scores of 3 on BDI item 2 (see Table 2), participants scoring 2 or 3 on this item were combined. As such, there were 634 participants who obtained a score of 0 on this item, 106 who obtained a score of 1, and 26 who obtained a score of 2 or 3.

Notably, the relation between insomnia and SI (path c in Figure 1) was significant (Likelihood Ratio $\chi^2[1] = 5.35, p = .021$, McFadden’s $R^2 = .011$). Additionally, the relations
between insomnia and hopelessness (Likelihood Ratio $\chi^2[2] = 30.42, p < .001$, McFadden’s $R^2 = .036$) and between hopelessness and SI (Likelihood Ratio $\chi^2[2] = 75.15, p < .001$, McFadden’s $R^2 = .159$) were both significant (paths a and b in Figure 1, respectively). As expected, after controlling for hopelessness, insomnia no longer predicted SI (Likelihood Ratio $\chi^2[1] = 0.001, p = .974$; path c’ in Figure 1). Additionally, the confidence intervals for the estimate of the indirect effect did not include zero (Percentile 95% CI [0.24, 0.71]), indicating that hopelessness is a significant mediator of the relation between insomnia and SI.

**Exploration of Alternative Mediation Models.**

To determine whether alternative models might better fit the data, other mediation models were tested. One such model investigated whether SI acts as a mediator between hopelessness and insomnia. The relation between hopelessness and insomnia (Likelihood Ratio $\chi^2[2] = 30.42, p < .001$, McFadden’s $R^2 = .036$) was not significantly diminished after controlling for SI (Likelihood Ratio $\chi^2[1] = 24.15, p < .001$), and the confidence intervals for the estimate of the indirect effect included zero (Percentile 95% CI [-0.14, 0.15]). This indicates that SI does not significantly mediate the relation between hopelessness and insomnia.

Another mediation model was tested wherein insomnia was entered as the mediator between hopelessness and SI. The relation between hopelessness and SI (Likelihood Ratio $\chi^2[2] = 75.15, p < .001$, McFadden’s $R^2 = .159$) was not significantly diminished after controlling for insomnia (Likelihood Ratio $\chi^2[1] = 68.56, p < .001$), and the confidence intervals for the estimate of the indirect effect estimate included zero (Percentile 95% CI [-0.13, 0.11]). These findings indicate that insomnia does not mediate the relation between hopelessness and SI.
Exploration of Moderation Models.

Several moderation models were tested using logistic regression. In the first, hopelessness was tested as a moderator of the relation between insomnia and SI. The interaction term (hopelessness × insomnia) was not significant (Likelihood Ratio $\chi^2[1] = 0.40, p = .842$). Thus, the relation between insomnia and SI does not vary at different levels of hopelessness.

In a second model, depression was considered as a moderator of the relation between insomnia and SI. The interaction term (depression × insomnia) was not significant (Likelihood Ratio $\chi^2[1] = 0.50, p = .478$). Depression was also considered as a moderator of the relation between insomnia and hopelessness. The interaction between depression and insomnia was not significant (Likelihood Ratio $\chi^2[2] = 0.06, p = .969$). Finally, depression was considered as a moderator of the relation between hopelessness and SI. Again, the interaction term was not significant in this analysis (Likelihood Ratio $\chi^2[1] = 0.00, p = .998$). These findings suggest that the associations between insomnia and SI, between insomnia and hopelessness, and between hopelessness and SI do not vary at different levels of depression.

Predictors of Hopelessness.

Participants were compared on a number of sleep, daytime functioning, demographic, and health variables based on their responses to BDI item 2. Participants were not compared on evening use of potentially stimulating antidepressant medication (e.g., bupropion, SSRIs) due to the low frequency of participants using such medications in general (i.e., n=11) and across each level of hopelessness. As in the previous set of analyses, responses 2 (“I feel I have nothing to look forward to”) and 3 (“I feel the future is hopeless and that things cannot improve”) on item 2 of the BDI were collapsed together for these comparisons and the subsequent regression analysis. Thus, there were three levels for BDI item 2: no discouragement (score of 0), discouragement
(score of 1), and hopelessness (score of 2 or 3). One way ANOVAs were used for continuous outcome variables, and chi-squares were used for categorical outcome variables.

The results of these analyses, presented in Table 3, were used to identify candidate predictor variables for a stepwise logistic regression analysis. This analysis was used to determine which demographic, health, sleep, and daytime functioning variables best predict hopelessness. The following predictor variables differed significantly between levels of hopelessness and were entered into the regression model: age, race, BMI, mental health problem, chronic pain, insomnia, insomnia duration, mean SOL, mean NWAK, mean SE, mean SQR, intra-individual standard deviation (SD) of night-to-night WASO, SD TST, SD SE, SD SQR, BDI-18, STAI, IIS, FSS, and ESS.

The following variables were selected by the stepwise regression model (with $p < .05$ for entry into the model), in this order: BDI-18, STAI, mean SE, and SD SQR. The overall model was significant ($\chi^2[8] = 292.62, p < .001$) and explained between 32.4% (Cox and Snell $R^2$) and 49.0% (Nagelkerke $R^2$) of the variance. Likelihood Ratio tests for each predictor variable are shown in Table 4.

Compared to participants who reported no discouragement about the future, participants who endorsed discouragement about the future and those who endorsed hopelessness were more likely to obtain higher scores on the BDI-18 and the STAI. Additionally, participants who reported discouragement about the future were more likely to have increased mean SE and variability in SQR relative to participants who reported no discouragement about the future. The strengths of these associations and the odds ratios are presented in Table 5.
Insomnia Type and Suicide Risk

To determine which types of insomnia are most strongly related to suicide risk, participants’ type of insomnia was categorized as onset, maintenance, combined, or mixed using the following criteria (Lichstein et al., 2004): (a) onset insomnia if the participant satisfied criteria for onset insomnia only (i.e., SOL > 30 minutes occurring at least three nights per week), (b) maintenance insomnia if the participant satisfied criteria for maintenance insomnia only (WASO > 30 minutes occurring at least three nights per week), (c) combined insomnia if the participant satisfied criteria for both onset and maintenance insomnia (SOL > 30 minutes occurring at least three nights per week and WASO > 30 minutes occurring at least three nights per week), and (d) mixed insomnia if the participant did not satisfy quantitative criteria for onset or maintenance insomnia but had at least three insomnia nights per week (one or two nights with SOL > 30 minutes and one or two nights with WASO > 30 minutes).

A chi square was used to determine which type of insomnia best predicts suicide risk, defined here as the sum of scores on BDI items 2 and 9. There were four categories of suicide risk (0, 1, 2, and 3 or 4). Due to the low frequency of participants with a sum of 4 on these two items in the full sample (n = 6), this group of participants was combined with the group of participants who obtained a sum of 3. The chi square revealed that there was not a significant relation between type of insomnia and level of suicide risk ($\chi^2[9] = 12.09, p = .208$). This outcome was expected given the small frequencies of participants in many of the suicide risk × insomnia type cells. In an attempt to increase statistical power, participants having each type of insomnia were dichotomized into two groups: those with a suicide risk score of 0 (no suicide risk) and those having a suicide risk score ranging from 1 to 4 (presence of suicide risk; see
Table 6 for frequencies). The subsequent chi square again revealed that there was no association between type of insomnia and presence/absence of suicide risk ($\chi^2[3] = 5.00, p = .172$).

An alternative parametric approach was explored to address the relation between insomnia type and suicide risk. Using only the participants who met criteria for insomnia, mean SOL and mean WASO were considered as predictors of suicide risk in a stepwise logistic regression analysis. However, neither variable was selected for entry into the model (with $p < .05$). Subsequently, a more powerful parametric approach was attempted; two one-way ANOVAs were conducted, with suicide risk as the predictor and mean SOL and mean WASO as the outcomes. However, these tests were also not significant (see Table 7 for group means).

**Complaint of Insomnia vs. Poor Sleep**

Stepwise logistic regression was used to determine whether a complaint of insomnia (presence or absence of a complaint of poor sleep as reported in item 1 of the Health Survey; see Appendix A), quantitatively-defined poor sleep (present or absent), and/or the interaction of these two variables best predicts suicide risk (i.e., the sum of BDI items 2 and 9). The quantitative criteria were: (a) a reported insomnia duration of at least 6 months, and (b) SOL of > 30 minutes or WASO totaling > 30 minutes at least three nights per week as assessed by sleep diary. Frequencies of participants who reported insomnia and participants who met quantitative criteria for poor sleep are presented in Table 8.

Of the three candidate variables (insomnia complaint, poor sleep, and insomnia complaint × poor sleep), only insomnia complaint was selected for entry into the stepwise model (with $p < .05$ for entry into the model). The model was significant (Likelihood Ratio $\chi^2[3] = 29.48, p < .001$) and explained between 3.0% (McFadden $R^2$) and 5.3% (Nagelkerke $R^2$) of the variance. Compared to participants with a suicide risk score of 0, participants with a score of 1 were nearly
2 times more likely to complain of insomnia, participants with a score of 2 were nearly 4 times more likely to complain of insomnia, and participants with a score of 3 or 4 were more than 5 times more likely to complain of insomnia. The strengths of these associations and the odds ratios are presented in Table 9.
CHAPTER 4: DISCUSSION

Hopelessness is a significant mediator, but not a moderator, of the relation between insomnia and SI. The investigator also found that depression severity, anxiety severity, SE, and intra-individual variability in SQR are the best predictors of hopelessness out of a large pool of candidate variables. Additionally, there is no indication that suicide risk varies among the different types of insomnia. Finally, a complaint of insomnia, more so than quantitatively-defined poor sleep, predicts suicide risk.

The finding that hopelessness mediates the relation between insomnia and SI has not been previously reported. Although this finding is at odds with the one previous study testing this model (McCall et al., 2013), the following quote indicates that McCall, despite his findings, continues to hold the opinion that hopelessness mediates the relation between insomnia and suicide risk: “Insomnia can lead to a very specific type of hopelessness, and hopelessness by itself is a powerful predictor of suicide” (Rettner, 2013). Further, McCall and his colleagues (2013) suggested that the “classic conceptualization of hopelessness” may not be the same construct as the type of distress experienced by individuals with insomnia. It may be that the hopeless cognitions of people with insomnia are focused specifically on sleep rather than on life in general. Further, the fact that the measures used in the present study (e.g., BDI item 2) differed from those used in McCall’s study (2013; e.g., the Beck Hopelessness Scale) may explain the difference in the findings.

One implication of this finding is that clinicians who treat individuals having insomnia should assess their clients’ degree of discouragement and hopelessness. Based on the present
findings, as well as previous research that has established hopelessness as a robust predictor of suicidality (e.g., Klonsky et al., 2012; Beck et al., 1990), those clients who endorse these feelings are likely to be at greater risk for SI, and ultimately, suicidal behavior. Such clients may require routine risk assessment, particularly if their insomnia persists.

Given that depression, anxiety, and hopelessness tend to be correlated (e.g., MacLeod & Byrne, 1996), the finding that depression severity and anxiety severity were the two best predictors of hopelessness was expected. Strangely, in the logistic regression model controlling for depression, anxiety, and intra-individual variability in SQR, individuals who reported discouragement about the future were more likely to have increased SE compared with individuals who did not report discouragement about the future. This conflicts with the results from the Tukey post hoc testing, which indicated that individuals who reported discouragement about the future and those who reported no discouragement about the future had roughly equivalent SE (see Table 3). This conflict, in addition to the small regression coefficient for SE and odds ratio approaching 1, suggests that the finding from the logistic regression model – increased SE among individuals who reported discouragement about the future relative to individuals who did not report discouragement about the future – may not be clinically meaningful.

The finding that increased intra-individual variability in SQR was of particular interest to the author, as this parameter has been associated with insomnia. Previous research has shown that people with insomnia tend to have greater variability in their sleep from night to night when compared with normal sleepers (e.g., Buysse et al., 2010; Vallières, Ivers, Bastien, Beaulieu-Bonneau, & Morin CM, 2005; Vallières, Ivers, Beaulieu-Bonneau, & Morin, 2011). In the present sample, participants with insomnia had significantly greater variability in SQRs ($M = \ldots$)
0.82) than participants not having insomnia ($M = 0.66; F = 28.49, p < .001$). Thus, increased variability in SQR may be functioning as an indicator of insomnia in the logistic regression model.

In light of these results, clinicians specializing in the treatment of sleep disorders may wish to give depression, anxiety, and intra-individual variability in sleep extra consideration when assessing their clients. Clients with more severe depression and anxiety, and highly variable SQRs may be at greater risk for hopelessness, and consequently, suicide. Further, it is helpful for clinicians to know that insomnia type did not significantly predict suicide risk. The present findings suggest that the general experience of insomnia, rather than a particular type of insomnia, is most salient in predicting suicide risk. Indeed, difficulty sleeping could understandably result in stress, anxiety, depressed mood, hopelessness, and frustration regardless of when it occurs during the night.

The finding that a complaint of insomnia is a better predictor of suicide risk than quantitatively-defined poor sleep is consistent with prior research suggesting that a complaint of poor sleep is more strongly associated to measures of psychological distress than is quantitatively-defined poor sleep. In one study, individuals who complained of insomnia but whose sleep was quantitatively characterized as normal endorsed higher levels of anxiety and depression than did individuals who slept poorly but did not complain of insomnia (Edinger et al., 2000). Additionally, prior research with the present sample indicates that a complaint of insomnia significantly predicts depression and anxiety after controlling for demographic, health problems, and sleep parameters (e.g., SOL, WASO). Further, the amount of variance predicted was larger for a complaint of insomnia than for sleep parameters (Ustinov et al., 2010). Thus,
self-perception of insomnia appears to be independent of sleep parameters in its relation to psychological distress.

This research lends support to previous research on the link between insomnia and suicidality that has relied on less rigorous criteria for insomnia (e.g., Insomnia Severity Index score in the absence of sleep diary parameters; e.g., McCall et al., 2013; Nadorff, Fiske, Sperry, Petts, & Gregg, 2013). Additionally, these findings suggest that clients who complain of insomnia, regardless of their sleep diary responses, may be at greater risk for suicide than those who do not endorse insomnia. Consequently, such individuals who present for treatment for their sleep problem (e.g., individuals who have paradoxical insomnia) are likely to be at as great of a risk for SI as individuals who complain of insomnia and sleep poorly.

There were several limitations in the present research that should be noted. First, the frequencies of participants using benzodiazepine receptor agonists for their sleep and of participants using potentially stimulating antidepressant medications in the evening were low (n = 28 and n = 11, respectively). As such, there was insufficient power to determine whether these medications influenced the relation between sleep and hopelessness.

An additional limitation in this study is that statements about the direction of the relation between insomnia, hopelessness, and SI cannot be made because of the cross-sectional design. Based on the mediation model in this study, it seems likely that insomnia contributes to hopelessness, which then contributes to SI. Although it is possible that the reverse of this could be true, it seems unlikely given past research that indicates that hopelessness prospectively predicts SI (e.g., Smith, Alloy, & Abramson, 2006; Joiner & Rudd, 1996).

Other limitations in this study pertained to the measures that were used. Because single items were used to measure hopelessness and SI, it is likely that there were aspects of these
constructs that were not reflected in these measures. Additionally, single items cannot capture as much variability in a construct as can multiple item questionnaires.

A final limitation in this study is the positive skew of the outcome variables. Because this research used a community sample, it was uncommon for participants to endorse high levels of SI and hopelessness. As a result, groups of participants were combined for analyses (e.g., participants scoring 2 or 3 on BDI item 2). This reduced the variability in the outcome measures and reduced the amount of information the analyses could provide about participants experiencing more severe SI or hopelessness.

Because many of these findings are novel, replication in future research would be worthwhile. In the future, researchers should address the limitations in the present study by recruiting larger samples of people with insomnia, people using benzodiazepine receptor agonists for sleep, and people using potentially stimulating antidepressants in the evening. This might be accomplished by recruiting from a clinical setting, such as a sleep medicine clinic or an outpatient mental health clinic. Recruiting from a clinical setting, or a combination of settings including inpatient and outpatient facilities and the community, may also increase variability in scores on hopelessness and SI.

Future studies could also use multiple-item measures of hopelessness and suicidality to provide further support for these results. For instance, researchers could use the Beck Hopelessness Scale or the Helplessness/Hopelessness Scale of the MMPI-2-RF to measure hopelessness. Measures of suicidality that could be used in future research could include the Beck Scale for Suicidal Ideation, the Adult Suicidal Ideation Questionnaire, or the Suicide Intent Scale. It is probably that the use of such multiple-item questionnaires would allow for more variability in responses, which could lead to more robust results.
Additionally, future research should incorporate multiple time points of data collection. Such a design might allow researchers to examine the directionality of the relation between insomnia, hopelessness, and SI. This information could impact the evaluation and treatment of individuals with insomnia.

Further research is also needed to determine whether treating insomnia reduces hopelessness. As previously mentioned, it has been shown that people with insomnia who receive CBT-I have decreased SI (Manber et al., 2011). Similar research should be conducted in the future to determine whether people with insomnia who are treated with CBT-I experience a decrease in their level of hopelessness as well. If changes in hopelessness and SI were monitored throughout treatment, it would be possible for researchers to determine whether a decrease in hopelessness is responsible for the decrease in SI.

In the present study, the author attempted to determine if depression severity (i.e., BDI-18) was a better mediator than hopelessness of the relation between insomnia and SI. Unfortunately, due to the strong relation between insomnia and depression, including depression as a mediator resulted in distortion. Nonetheless, researchers conducting further research in this area should attempt to determine whether hopelessness or depression best mediates the relation between insomnia and suicidality. If depression is a better mediator of the relation, it would be useful to determine whether including hopelessness as a second mediator improves the model.

In conclusion, this research indicates that a relation exists between insomnia and hopelessness. Due to the important clinical implications of this finding, additional research in this area is warranted. It is the investigator’s hope that this line of research will lead to improvements in the identification and treatment of individuals who are at risk for suicide.
REFERENCES


McCall, W. V., Batson, N., Webster, M., Case, L. D., Joshi, I., Derreberry, T., … & Farris, S. R. (2013). Nightmares and dysfunctional beliefs about sleep mediate the effect of insomnia symptoms on suicidal ideation. *Journal of Clinical Sleep Medicine, 9*, 135-140.


Figure 1

*Model with hopelessness mediating the relation between insomnia and suicidal ideation.*

A. Total Effect

B. Mediation Model

*Figure 1.* Hypothesized mediation model. Path a represents the relation between the predictor (insomnia) and hopelessness, path b represents the relation between the mediator (hopelessness) and the outcome (suicidal ideation), path c represents the relation between the predictor (insomnia) and the outcome (suicidal ideation), and path c’ represents the relation between the predictor and the outcome after controlling for the mediator (hopelessness).
Table 1

*Participant demographic characteristics.*

<table>
<thead>
<tr>
<th>Demographic variable</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>105 (13.7)</td>
</tr>
<tr>
<td>30-39</td>
<td>122 (15.9)</td>
</tr>
<tr>
<td>40-49</td>
<td>104 (13.6)</td>
</tr>
<tr>
<td>50-59</td>
<td>115 (15.0)</td>
</tr>
<tr>
<td>60-69</td>
<td>106 (13.8)</td>
</tr>
<tr>
<td>70-79</td>
<td>111 (14.5)</td>
</tr>
<tr>
<td>80+</td>
<td>103 (13.4)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>537 (70.1)</td>
</tr>
<tr>
<td>Black</td>
<td>219 (28.6)</td>
</tr>
<tr>
<td>Other/undisclosed</td>
<td>10 (1.3)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>377 (49.2)</td>
</tr>
<tr>
<td>Female</td>
<td>389 (50.8)</td>
</tr>
<tr>
<td><strong>Household education level</strong></td>
<td></td>
</tr>
<tr>
<td>&lt; Grade 8</td>
<td>18 (2.3)</td>
</tr>
<tr>
<td>Grades 9-12</td>
<td>201 (26.2)</td>
</tr>
<tr>
<td>1-4 years of college</td>
<td>319 (41.6)</td>
</tr>
<tr>
<td>1+ years of graduate school</td>
<td>114 (14.9)</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>114 (14.9)</td>
</tr>
</tbody>
</table>
Table 2

*Responses to BDI items 2 and 9.*

<table>
<thead>
<tr>
<th>BDI item/response</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item 2</strong></td>
<td></td>
</tr>
<tr>
<td>0 – I am not particularly discouraged about the future.</td>
<td>634 (82.8)</td>
</tr>
<tr>
<td>1 – I feel discouraged about the future.</td>
<td>106 (13.8)</td>
</tr>
<tr>
<td>2 – I feel I have nothing to look forward to.</td>
<td>18 (2.3)</td>
</tr>
<tr>
<td>3 – I feel the future is hopeless and that things cannot improve.</td>
<td>8 (1.0)</td>
</tr>
<tr>
<td><strong>Item 9</strong></td>
<td></td>
</tr>
<tr>
<td>0 – I don’t have any thoughts of killing myself.</td>
<td>695 (90.7)</td>
</tr>
<tr>
<td>1 – I have thoughts of killing myself, but I would not carry them out.</td>
<td>68 (8.9)</td>
</tr>
<tr>
<td>2 – I would like to kill myself.</td>
<td>2 (0.3)</td>
</tr>
<tr>
<td>3 – I would kill myself if I had the chance.</td>
<td>1 (0.1)</td>
</tr>
</tbody>
</table>
Table 3

Variable means (SD) or percentages by degree of hopelessness.

<table>
<thead>
<tr>
<th>Measure</th>
<th>No discouragement (n=634)</th>
<th>Discouragement about future (n=106)</th>
<th>Hopelessness (n=26)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Demographic variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age **</td>
<td>54.90 (19.60)</td>
<td>48.35 (20.32)</td>
<td>48.69 (20.44)</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>50.0%</td>
<td>50.0%</td>
<td>26.9%</td>
</tr>
<tr>
<td>Race (% Caucasian) *</td>
<td>71.6% a</td>
<td>67.0%</td>
<td>46.2% b</td>
</tr>
<tr>
<td>Education (yrs)</td>
<td>14.40 (2.89)</td>
<td>14.15 (2.57)</td>
<td>13.03 (3.58)</td>
</tr>
<tr>
<td>Health variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI *</td>
<td>26.40 (5.24) a</td>
<td>27.37 (6.18)</td>
<td>29.11 (9.79) b</td>
</tr>
<tr>
<td>Number of medications</td>
<td>2.19 (2.27)</td>
<td>2.24 (2.70)</td>
<td>2.12 (2.03)</td>
</tr>
<tr>
<td>Mental health problem (%)</td>
<td>5.0% a</td>
<td>13.2% b</td>
<td>26.9% b</td>
</tr>
<tr>
<td>Chronic pain (% present) *</td>
<td>27.1%</td>
<td>37.7%</td>
<td>38.5%</td>
</tr>
<tr>
<td>Sleep variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insomnia (% present) **</td>
<td>14.5% a</td>
<td>26.4% b</td>
<td>57.7% c</td>
</tr>
<tr>
<td>Insomnia duration (yrs) **</td>
<td>1.31 (5.24) a</td>
<td>2.45 (6.55) a</td>
<td>5.69 (13.25) b</td>
</tr>
<tr>
<td>SOL **</td>
<td>22.04 (18.14) a</td>
<td>24.76 (17.65) a</td>
<td>37.64 (24.87) b</td>
</tr>
<tr>
<td>NWAK **</td>
<td>1.51 (1.06) a</td>
<td>1.51 (1.02) a</td>
<td>2.38 (1.49) b</td>
</tr>
<tr>
<td>WASO</td>
<td>23.72 (27.67)</td>
<td>28.32 (33.46)</td>
<td>34.42 (23.59)</td>
</tr>
<tr>
<td>TST</td>
<td>421.67 (66.25)</td>
<td>407.85 (68.91)</td>
<td>422.46 (128.38)</td>
</tr>
<tr>
<td>SE **</td>
<td>86.57 (8.90) a</td>
<td>84.71 (9.76) a</td>
<td>79.68 (9.19) b</td>
</tr>
<tr>
<td>SQR **</td>
<td>3.49 (.67) a</td>
<td>3.10 (.60) b</td>
<td>2.92 (.78) b</td>
</tr>
<tr>
<td>SD SOL</td>
<td>14.72 (17.45)</td>
<td>16.95 (18.18)</td>
<td>18.23 (15.07)</td>
</tr>
<tr>
<td>SD NWAK</td>
<td>0.86 (0.48)</td>
<td>0.93 (0.53)</td>
<td>0.96 (0.71)</td>
</tr>
</tbody>
</table>
Table 3 continued

<table>
<thead>
<tr>
<th>Measure</th>
<th>No discouragement (n=634)</th>
<th>Discouragement about future (n=106)</th>
<th>Hopelessness (n=26)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>SD WASO*</td>
<td>20.32 (19.47)</td>
<td>26.13 (23.60)</td>
<td>24.67 (19.54)</td>
</tr>
<tr>
<td>SD TST**</td>
<td>69.26 (32.76)</td>
<td>79.56 (40.83)</td>
<td>89.23 (49.82)</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>79.56 (40.83)</td>
<td>89.23 (49.82)</td>
</tr>
<tr>
<td>SD SE**</td>
<td>7.07 (4.81)</td>
<td>8.26 (5.24)</td>
<td>10.34 (6.46)</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>8.26 (5.24)</td>
<td>10.34 (6.46)</td>
</tr>
<tr>
<td>SD SQR**</td>
<td>0.67 (0.33)</td>
<td>0.81 (0.29)</td>
<td>0.78 (0.43)</td>
</tr>
<tr>
<td>Nights with BZRA</td>
<td>0.28 (1.78)</td>
<td>0.31 (1.70)</td>
<td>0.00 (0.00)</td>
</tr>
<tr>
<td>Nights with alcohol</td>
<td>0.68 (2.24)</td>
<td>0.82 (2.01)</td>
<td>0.76 (2.42)</td>
</tr>
<tr>
<td>Daytime functioning variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDI-18**</td>
<td>5.82 (4.62)</td>
<td>13.42 (7.21)</td>
<td>23.27 (8.08)</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>13.42 (7.21)</td>
<td>23.27 (8.08)</td>
</tr>
<tr>
<td>STAI**</td>
<td>33.67 (8.70)</td>
<td>46.75 (9.42)</td>
<td>56.80 (102)</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>46.75 (9.42)</td>
<td>56.80 (102)</td>
</tr>
<tr>
<td>IIS**</td>
<td>97.98 (22.43)</td>
<td>115.50 (24.45)</td>
<td>127.53 (26.03)</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>115.50 (24.45)</td>
<td>127.53 (26.03)</td>
</tr>
<tr>
<td>FSS**</td>
<td>3.45 (1.31)</td>
<td>4.16 (1.39)</td>
<td>4.66 (1.51)</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>4.16 (1.39)</td>
<td>4.66 (1.51)</td>
</tr>
<tr>
<td>ESS**</td>
<td>8.50 (4.28)</td>
<td>9.86 (3.91)</td>
<td>10.46 (4.28)</td>
</tr>
</tbody>
</table>

Note. *p < .05. **p < .01. Means with different superscripts differ at p < .05 using Tukey post hoc testing or Bonferroni adjusted z-tests. No discouragement = score of 0 on BDI item 2. Discouragement about future = score of 1 on BDI item 2. Hopelessness = score of 2 or 3 on BDI item 2. SOL = sleep onset latency. NWAK = number of awakenings. WASO = wake time after sleep onset. TST = total sleep time. SE = sleep efficiency. SQR = sleep quality rating. SD = within-person standard deviation in sleep variables. BZRA = benzodiazepine receptor agonist. BDI-18 = Beck Depression Inventory total score less scores on the three items measuring hopelessness, suicidal ideation, and sleep. STAI = State-Trait Anxiety Inventory. IIS = Insomnia Impact Scale. FSS = Fatigue Severity Scale. ESS = Epworth Sleepiness Scale.
Table 4
Likelihood ratio tests for each predictor of hopelessness included in regression model.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>$\chi^2$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI-18</td>
<td>51.95</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>STAI</td>
<td>38.76</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>SE</td>
<td>9.78</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>SD SQR</td>
<td>8.79</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>

*Note.* BDI-18 = Beck Depression Inventory total score less scores on the three items measuring hopelessness, suicidal ideation, and sleep. STAI = State-Trait Anxiety Inventory. SE = sleep efficiency. SD SQR = within-person variability in sleep quality ratings.
Table 5

*Coefficients and odds ratios for each predictor of hopelessness included in regression model.*

<table>
<thead>
<tr>
<th>BDI Item 2 Response</th>
<th>Predictor</th>
<th>B (SE)</th>
<th>Wald</th>
<th>p</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discouragement</td>
<td>Constant</td>
<td>-11.80 (1.75)</td>
<td>45.51</td>
<td>&lt;.001</td>
<td>1.16 (1.10-1.22)</td>
</tr>
<tr>
<td></td>
<td>BDI-18</td>
<td>0.15 (0.03)</td>
<td>27.51</td>
<td>&lt;.001</td>
<td>1.10 (1.06-1.14)</td>
</tr>
<tr>
<td></td>
<td>STAI</td>
<td>0.10 (0.02)</td>
<td>32.26</td>
<td>&lt;.001</td>
<td>1.05 (1.02-1.08)</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>0.05 (0.02)</td>
<td>8.81</td>
<td>.003</td>
<td>1.05 (1.02-1.08)</td>
</tr>
<tr>
<td></td>
<td>SD SQR</td>
<td>1.27 (0.45)</td>
<td>8.16</td>
<td>.004</td>
<td>3.57 (1.49-8.55)</td>
</tr>
<tr>
<td>Hopelessness</td>
<td>Constant</td>
<td>-16.27 (3.13)</td>
<td>27.11</td>
<td>&lt;.001</td>
<td>1.32 (1.20-1.46)</td>
</tr>
<tr>
<td></td>
<td>BDI-18</td>
<td>0.28 (0.05)</td>
<td>31.67</td>
<td>&lt;.001</td>
<td>1.13 (1.13-1.21)</td>
</tr>
<tr>
<td></td>
<td>STAI</td>
<td>0.12 (0.04)</td>
<td>11.46</td>
<td>.001</td>
<td>1.13 (1.13-1.21)</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>0.04 (0.03)</td>
<td>2.18</td>
<td>.140</td>
<td>1.04 (0.99-1.09)</td>
</tr>
<tr>
<td></td>
<td>SD SQR</td>
<td>1.26 (0.83)</td>
<td>2.32</td>
<td>.128</td>
<td>3.53 (0.70-17.95)</td>
</tr>
</tbody>
</table>

*Note.* BDI-18 = Beck Depression Inventory total score less scores on the three items measuring hopelessness, suicidal ideation, and sleep. STAI = State-Trait Anxiety Inventory. SE = sleep efficiency. SD SQR = within-person variability in sleep quality ratings.
Table 6

*Frequency of each type of insomnia by level of suicide risk.*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Suicide Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Type of insomnia</td>
<td></td>
</tr>
<tr>
<td>Onset</td>
<td>20 (22.7%)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>31 (35.2%)</td>
</tr>
<tr>
<td>Mixed</td>
<td>16 (18.2%)</td>
</tr>
<tr>
<td>Combined</td>
<td>21 (23.9%)</td>
</tr>
</tbody>
</table>

*Note.* Suicide risk is the sum of each participant’s scores on items 2 and 9 of the BDI. Suicide risk did not vary significantly by insomnia type.
Table 7

*Mean SOL and WASO by level of suicide risk.*

<table>
<thead>
<tr>
<th>Outcome variable</th>
<th>0 (n = 88)</th>
<th>1 (n = 24)</th>
<th>2 (n = 15)</th>
<th>3 or 4 (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOL</td>
<td>41.81 (25.82)</td>
<td>41.50 (24.68)</td>
<td>44.76 (15.10)</td>
<td>49.86 (29.79)</td>
</tr>
<tr>
<td>WASO</td>
<td>55.16 (41.08)</td>
<td>52.53 (48.87)</td>
<td>45.61 (37.74)</td>
<td>57.44 (18.40)</td>
</tr>
</tbody>
</table>

*Note.* Suicide risk is the sum of each participant’s scores on items 2 and 9 of the BDI. SOL = sleep onset latency. WASO = wake time after sleep onset.
Table 8

*Frequency of insomnia complaint and poor sleep by level of suicide risk.*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Suicide Risk</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3 or 4</td>
<td></td>
</tr>
<tr>
<td>Insomnia complaint</td>
<td>Present</td>
<td>159 (27.6%)</td>
<td>43 (42.6%)</td>
<td>19 (59.4%)</td>
<td>12 (66.7%)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>418 (72.4%)</td>
<td>58 (57.4%)</td>
<td>13 (40.6%)</td>
<td>6 (33.3%)</td>
</tr>
<tr>
<td>Poor sleep</td>
<td>Present</td>
<td>198 (32.8%)</td>
<td>42 (38.9%)</td>
<td>18 (51.4%)</td>
<td>11 (57.9%)</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>406 (67.2%)</td>
<td>66 (61.1%)</td>
<td>17 (48.6%)</td>
<td>8 (42.1%)</td>
</tr>
</tbody>
</table>

*Note.* Suicide risk is the sum of each participant’s scores on items 2 and 9 of the BDI.
### Table 9

**Coefficients and odds ratios for insomnia complaint at each level of suicide risk.**

<table>
<thead>
<tr>
<th>Suicide Risk</th>
<th>Predictor</th>
<th>B (SE)</th>
<th>Wald</th>
<th>p</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Constant</td>
<td>-1.98 (0.14)</td>
<td>198.68</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insomnia complaint</td>
<td>0.67 (0.22)</td>
<td>9.06</td>
<td>.003</td>
<td>1.95 (1.26-3.01)</td>
</tr>
<tr>
<td>2</td>
<td>Constant</td>
<td>-3.47 (0.28)</td>
<td>151.86</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insomnia complaint</td>
<td>1.35 (0.37)</td>
<td>13.11</td>
<td>&lt;.001</td>
<td>3.84 (1.85-7.96)</td>
</tr>
<tr>
<td>3 or 4</td>
<td>Constant</td>
<td>-4.24 (0.41)</td>
<td>106.53</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insomnia complaint</td>
<td>1.66 (0.51)</td>
<td>10.65</td>
<td>.001</td>
<td>5.26 (1.94-14.25)</td>
</tr>
</tbody>
</table>

*Note.* Suicide risk is the sum of each participant’s scores on items 2 and 9 of the BDI.
APPENDIX A

Health Survey

Please PRINT and Supply ALL Information

ID# ____________________  Height __________  Weight __________
Race ____________________

1. Do you have a sleep problem? yes or no

   If yes, describe (e.g., trouble falling asleep, long or frequent awakenings, sleep apnea):
   _____________________________________________________________________________

   If yes, on average, how many nights per week do you have this problem? _________________

   How long have you had this sleep problem? _______ years _______ months

2. Please indicate whether you or your bed partner have noticed any of the following:

   Are you a heavy snorer? yes no

   Do you have difficulty breathing or gasp for breath during sleep? yes no

   Do your legs jerk frequently during sleep or do they feel restless before sleep onset? yes no

   Do you have sleep attacks during the day or paralysis at sleep onset? yes no

   If yes to any of the questions under #2, please explain and indicate how often symptoms occur:
   _____________________________________________________________________________
   _____________________________________________________________________________

3. Indicate with a check mark if you have the following health problems, and put the number of years you’ve had each problem:

   Yes       Years
4. Please list any mental health disorders you have and the number of years you’ve had the disorder(s)

___________________________________________________________________________
___________________________________________________________________________

5. List any other health problems you have (and the number of years you’ve had the problem).

___________________________________________________________________________

6. Medical and mental health disorders may disrupt sleep. Medication may also disturb sleep. Please list any disorder or medication that affects your sleep and describe how it affects sleep.

7. List ALL medications taken within the past month, the frequency with which they are taken (e.g., daily, 3 times a day, weekly), time of day, and the purpose of the medication.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Frequency</th>
<th>Time of Day</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
b. __________________________________________

c. __________________________________________

d. __________________________________________

e. __________________________________________

f. __________________________________________________________________________

g. __________________________________________________________________________

8. List ALL vitamins taken within the past month, the frequency with which they are taken (e.g., daily, 3 times a day, weekly), time of day, and the purpose of the medication.

a. __________________________________________________________________________

b. __________________________________________________________________________

c. __________________________________________________________________________

d. __________________________________________________________________________

9. On average, how many alcoholic drinks do you drink per week? __________

10. On average, how many cigarettes do you smoke per day? __________

11. On average, how many caffeinated drinks do you have per day? __________

12. What is your highest level of education? __________

13. If you have a spouse, what is his or her highest level of education? __________
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.

**EXAMPLE**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>TUES 10/14/97</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>day 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>day 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>day 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>day 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>day 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>day 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>day 7</td>
</tr>
</tbody>
</table>

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) | Ambien 10 mg 10:40 pm

**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 or 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.
APPENDIX C

Telephone Script
Hello, this is __________. I am a student researcher at The University of Memphis. How are you doing today ma’am/sir? Great, the reason I have called you is to inform you that the University of Memphis is conducting a research project and looking for people in Memphis to participate.

If you are at least 20 years old, The University of Memphis will pay you $15 (or revised amount) to participate and, in addition to this cash payment, we will enter you in a $250 raffle if you complete the project.

The project is a sleep survey. It is conducted in your home and no one will call on you, nor will you have to come to the University. We will mail you the forms to complete which we call sleep diaries. What you will do is pick a 14-day period to record basic sleep information such as the time you go to bed, the time you get up, and any time during your sleep that you wake up. At the end of the 14 day period, there are 7 forms that we ask you to complete. The entire 14-day process will take approximately an hour to complete.

Would you be interested in participating in this survey for the $15 (or revised amount) paycheck?

(if they say yes) Super, could you give me your name? May I ask your age sir/ma’am? And could you give me the address where to mail the packet?

If you have a spouse or significant other, they would not be eligible to also participate, but we can accept a child, parent, or grandparent over 20 years old that lives in the household with you. Is there anyone else in the household who is eligible and might be interested? (If yes, then get their name and age. We can interview the second person at this time, but it may be preferable to call back.) We will call back in about a week to talk with ________ (the new potential participant). What would be a good time of day to call? OK, thank you very much for your time sir/ma’am, and you can expect that packet to arrive within a week. I will give you a call in about 2 weeks to make sure you received the packet and answer any questions you may have.