

SELF-AFFIRMATION AND WORKING MEMORY CAPACITY'S INFLUENCE ON  
ADHERENCE TO BRIEF BEHAVIORAL INSOMNIA TREATMENT

by

MEGAN ELISE RUITER

KENNETH L. LICHSTEIN, COMMITTEE CHAIR

JAMES D. GEYER

ROSANNA E. GUADAGNO

MARK R. KLINGER

JEROME ROSENBERG

BEVERLY E. THORN

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

2011

Copyright Megan Elise Ruitter 2011  
ALL RIGHTS RESERVED

## ABSTRACT

Sleep disorders are among medical conditions with the lowest treatment adherence rates (DiMatteo, 2004). Chronic insomnia has known, effective behavioral interventions, but these also suffer from poor treatment adherence (Perlis et al., 2004). This study evaluated the efficacy of a self-affirmation task on adherence to behavioral treatments for insomnia including sleep restriction therapy, stimulus control, and sleep hygiene. Self-affirmation, administered through a value-essay manipulation, is known to decrease defensiveness to a persuasive health message, and is predicted to enhance adherence rates to insomnia treatment. Working memory capacity, determined through an operation span task, was also hypothesized to promote adherence. A self-affirmation (presence vs. absence) by working memory capacity (continuous) hierarchical regression analysis controlling for participants' baseline insomnia severity, and need for cognition determined self-reported adherence rates two weeks after one-session of insomnia treatment.

In a sample of 54 undergraduate college students with chronic insomnia, the results indicated that self-affirmed participants were not more likely to adhere to effective, behavioral treatments for insomnia than participants who were not self-affirmed. Similarly, the working memory capacities of these participants had no predictive influence on adherence. Both groups were moderately to highly adherent to treatment which resulted in a significant reduction in insomnia severity. The only effect of the self-affirmation intervention was its ability to increase

cognitive intentions to adhere compared to the control condition. A major limitation of the study was its low sample size.

These findings join a literature of mixed results on the effect of self-affirmation on health behavior change. The literature and the current study suggest the positive effect of self-affirmation may be highly dependent on its delivery and the qualities of the subsequent health message. Future research ought to examine the long-term outcomes of variations of self-affirmation manipulations on multiple health behaviors in large samples. The relation between self-affirmation and other predictors of cognitive intentions to adhere and actual adherence also should be investigated to ascertain mediation chains to health behavior change.

## DEDICATION

This dissertation is dedicated to Vesselin Petrov and my wonderful family for their seamless support throughout this enlightening and challenging endeavor.

## LIST OF ABBREVIATIONS AND SYMBOLS

$\beta$	Type-II error
$b$	Regression coefficient
$d$	Cohen's $d$ effect size
$df$	Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data
$F$	Fisher's $F$ ratio: A ration of two variances
$f^2$	Cohen's $f^2$ effect size
ISI	Insomnia Severity Index
$M$	Mean: the sum of a set of measurements divided by the number of measurements in the set
$Mdn$	Median: a value lying at the midpoint of a frequency distribution
$N(n)$	The number of cases or observations
NCS	Need for Cognition Scale
$p$	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
PCS	Preference for Consistency Scale
phi	Chi Square phi coefficient
$r$	Pearson product-moment correlation
$r_s$	Spearman's rank correlation coefficient

$R^2$	Coefficient of determination
SA	Self-affirmation
SC	Stimulus control
<u>SD</u>	Standard deviation
<u>SE</u>	Standard error of the mean
SH	Sleep hygiene
SRT	Sleep restriction therapy
$t$	Computed value of $t$ test
TST	Average total sleep time
TIB	Average total time in bed
WMC	Working Memory Capacity
$U$	Computed value of the Mann-Whitney U test
$\chi^2$	Pearson's chi-square test
$Z(z)$	Standardized Z-test statistic
<	Less than
=	Equal to

## ACKNOWLEDGMENTS

I am thrilled to salute the many colleagues, faculty members, family, and friends who have inspired and helped me with this research project. I would like to specifically thank Vesselin Petrov for his constant devotion in helping me keep a balanced attitude and sense of humor while conducting this project, my mother, father, and sister for supporting me in any way possible, my fellow clinical psychology doctoral candidates for their encouragement, my friends for their ever vigilant commiseration, and my advisor, Kenneth L. Lichstein, for his candid and excellent guidance. I would also like to express my appreciation to my committee members, Beverly Thorn, Rosanna Guadagno, James Geyer, Mark Klinger, and Jerome Rosenberg for their wisdom and insight on this project, which, in turn, has helped me become a better researcher. Finally, I would like to give special thanks to Virginia Graydon and all of the psychology student participants for their assistance, because without it, this project would not have been possible.

## CONTENTS

ABSTRACT .....	ii
DEDICATION .....	iv
LIST OF ABBREVIATIONS AND SYMBOLS .....	v
ACKNOWLEDGMENTS .....	vii
LIST OF TABLES .....	ix
1. INTRODUCTION .....	1
a. Pilot Study .....	7
b. Present Study .....	13
2. METHOD .....	16
a. Procedure .....	26
3. RESULTS .....	29
4. DISCUSSION.....	37
REFERENCES .....	48
APPENDICES .....	61

## LIST OF TABLES

1. Pilot Study Effect Sizes for Post-Manipulation Scores.....	57
2. Participant Demographics.....	58
3. Levels of Adherence Across and Between Groups.....	59
4. Effect Sizes from the Primary Hypotheses and Sample Sizes to Achieve Power.....	60

## Introduction

Adherence to health recommendations has been defined as particular health behaviors made at an acceptable intensity, accuracy and frequency, so as to improve clinical outcomes (Berlant & Pruitt, 2003). Research on adherence to health recommendations has estimated that 30% to 70% of patients do not fully comply with the advice given by their physicians (National Heart, Lung, and Blood Institute, 1998), oftentimes to the detriment of their health (DiMatteo et al., 2002). Improvement in the effectiveness of interventions targeting adherence may be more repercussive on health outcomes than innovations on specific medical treatments (Haynes et al., 2002). The present study investigated the efficacy of a self-affirmation intervention on adherence to behavioral recommendations designed to improve insomnia. The influence of patients' working memory capacities on adherence to behavioral recommendations was also examined.

According to a quantitative review on adherence to doctors' recommendations on a variety of medical conditions, the average non-adherence rate is 24.8% (DiMatteo, 2004). Adherence to medical advice on sleep disorders is particularly poor (DiMatteo, 2004). After controlling for age, gender, education and social economic status, sleep disorders were among medical conditions with the lowest treatment adherence rates. One sleep disorder, clinically significant, chronic insomnia with daytime consequences, is found to affect 10-16% of the general population (Ford & Kamerow, 1989; Léger, Guilleminault, Dreyfrus, Delahaye, & Paillard, 2000; Lichstein, Durrence, Riedel, Taylor, & Bush, 2004; Morin, LeBlanc, Daley, Gregoire, & Mérette, 2006; Ohayon, 2002). Insufficient sleep has been related to an increased risk for developing psychiatric disorders, cognitive deficits, obesity, diabetes, heart disease, and interfering with work productivity and social functioning (National Center on Sleep Disorders

Research Task Force, 2003). The annual, direct medical costs of insomnia, estimated in 1995 U.S. dollars, was \$13.9 billion (Walsh & Engelhart, 1999). This estimate does not account for indirect costs such as treatment of insomnia-related accidents, medical costs of insomnia-associated comorbidities, lower work productivity and absenteeism (Godet-Cayré et al., 2006). Thus, chronic insomnia is a significant and costly public health problem. Research on improving adherence to treatment for insomnia is needed to alleviate its burden on society.

Effective behavioral treatments for insomnia have been developed. Stimulus control (SC) and sleep restriction therapy (SRT) are effective in the treatment of chronic insomnia (Morgenthaler et al., 2006; Edinger & Means, 2005). However, adherence to these interventions is variable (Bouchard, Bastien, & Morin, 2003; Perlis et al., 2004; Riedel & Lichstein, 2001; Sexton-Radek & Overton, 1996). At a National Institutes of Health workshop (2007), adherence to treatments for insomnia was declared a critical research issue. In order to boost insomnia treatment adherence, the workshop recommended adopting techniques from the literature on adherence. The present study tested the efficacy of an adherence intervention from the social psychology literature called self-affirmation. Its influence on adherence to SC, SRT, and basic sleep hygiene recommendations (SH) was measured with self-reported adherence logs and actigraphic measures in a subset of participants. The other primary objective was to test the influence of participants' working memory capacity on adherence.

### *What is Self-Affirmation?*

Self-affirmation (SA) is any active affirmation of an important aspect of the self such as personal values, characteristics, and positive qualities (Steele & Liu, 1983). According to self-affirmation theory (Steele 1988), engaging in behaviors that are contrary to an individual's self-

concept will lead to cognitive dissonance. Cognitive dissonance is a state characterized by mental tension caused by the presence of co-occurring cognitions that are psychologically inconsistent (Festinger, 1957). During this state, individuals perceive a threat to their global sense of self-worth and are fundamentally motivated to protect and maintain their self-worth (Baumeister, 1996; Steele, 1988). Unfortunately, the cognitive and behavioral responses people use to protect themselves can sometimes be maladaptive. Two such maladaptive responses are rationalizing and denying the actions that are not consistent with one's concept of self-worth. SA lowers these defense mechanisms and enhances adaptive processing of threatening information. If individuals affirm values that reflect their self-worth, then they will protect their self-worth in the face of threat.

SA decreases defensiveness and biased information processing while increasing acceptance of a persuasive message about a self-threatening disease state (Armitage, Harris, Hepton, & Napper, 2008; Harris, Mayle, Mabbott, & Napper, 2007; Harris & Napper, 2005; Reed & Aspinwall, 1998; Sherman, Nelson, & Steele, 2000). SA may serve as a method to cope with personally-relevant, threatening health information (Cohen et al., 2000; Correll, Spencer, & Zanna, 2004; Liu & Steele, 1986). Thus, self-affirmed individuals are less likely to block relevant health information from mental processing. Adaptive mental processing occurs more effectively if people self-affirm values that are not directly related to the domain of the persuasive health message (Blanton, Cooper, Skurnik, & Aronson, 1997; Stone & Cooper, 2003), and are intrinsic in nature (Schimel, Arndt, Banko, & Cook, 2004).

*Self-Affirmation and Behavior*

The effect of SA on intentions to adhere to health advice and actual behavioral adherence is unclear (McQueen & Klein, 2006). Some studies found no effect of SA on intentions to adhere or actual adherence to health recommendations (Dillard, McCaul, & Magnum, 2005; Reed & Aspinwall, 1998). Other studies found that SA increased intentions to adhere only in those who had a moderate to severe risk in developing negative health consequences (Harris & Napper, 2005; Harris et al., 2007). Therefore, health risk level moderates the relationships between SA and acceptance of a persuasive message, and intentions to adhere to recommendations made in that message (Armitage et al., 2008; Sherman et al., 2000).

Four studies have discovered an increase in objective behavioral adherence after a SA intervention (Armitage et al., 2008; Jessop, Simmonds, & Sparks, 2009; Ogedegbe et al., 2008; Sherman et al., 2000, study 2). Ogedegbe and colleagues (2008) conducted a randomized clinical trial of 256 patients with uncontrolled hypertension. Education materials on hypertension and its treatment were enhanced with a positive affect and SA manipulation. The SA manipulation asked patients to focus on proud moments in their lives, and to evaluate whether these thoughts helped them adhere to their anti-hypertensive medication regimen. The control group received the education materials without the SA intervention. After 12-month follow-up, self-affirmed patients achieved greater adherence to hypertensive medication than the control patients as recorded by electronic pill monitors. Self-affirmed patients also were able to achieve greater control of their blood pressure than control patients.

The other three studies used indirect, objective measures of behavioral adherence. They also found self-affirmed participants performed more health-adherent behaviors than non-affirmed participants (Armitage et al., 2008; Jessop et al., 2009; Sherman et al., 2000, study 2).

One study performed several mediation analyses to determine the nature of the relationship between SA and behavioral adherence (Armitage et al., 2008). The study concluded that the degree of acceptance of a persuasive health message mediated the relationship between SA and intentions to adhere, and intentions to adhere mediated the relationship between acceptance of a persuasive message and behavioral adherence.

#### *Attitude and Behavior Consistency*

SA affects behavior change through the mediation of a change in attitude towards acceptance of the persuasive message and intentions to change behavior. Thus, the relation between attitudes and actual behavior is not a one-to-one correspondence. Correlations of attitude and behavior consistency rarely exceed the moderate size of .30 (Wicker, 1969). SA theory may be relevant to attitude-behavior consistency such that individuals are more likely to perform behaviors that affirm values unrelated to the attitude-behavior discrepancy in question (Aronson et al., 1995; Stone & Cooper, 2003). In other words, if a patient is having trouble adhering to health recommendations, then it is recommended they not be asked to affirm values related to health.

#### *Working Memory Capacity*

Working memory capacity (WMC) is operationally defined as the number of items that can be processed and recalled from working memory span tasks. Working memory refers to the conscious, attentional system that expends mental energy to maintain and process input stimuli and assemble it with that of long-term memory stores. The capacity of this type of memory is of interest to the present study. WMC scores derived from working memory span tasks are correlated with several higher-order cognitive tasks (Conway, Cowan, Bunting, Theriault, &

Minkoff, 2002; Engle, Tuholski, Laughlin, & Conway, 1999; Kyllonen & Christal, 1990). There are individual differences in WMC that reflect differential ability in effortful, controlled processing of attention-demanding perceptual, cognitive, and behavioral tasks. The greater one's WMC, the greater the likelihood the person will adopt controlled processing in any given situation and suppress inappropriate habitual or automatic processing, which often is prone to error (Barrett, Tugade, & Engle, 2004).

WMC is theorized to be intimately involved with self-regulatory thought and behavior (Barrett et al., 2004). The mental processing system underlying self-regulation is hypothesized to be rule-based (Smith & DeCoster, 2000). This rule-based processing facilitates learning of novel information, symbolically representing that information, and using it to process and monitor future decisions and behavior. Barrett and colleagues (2004) argue persons with high WMC have a greater ability to inhibit thoughts and actions irrelevant to the goal of self-regulation. They also argue persons with high WMC can more effectively resist narrowing their attention on threatening information, and they are more apt at suppressing maladaptive habitual responses to that information, such as denial and rationalization. In contrast, persons with low WMC are less capable of rule-based processing and elaborative processing, and are more likely to suppress processing of content-related information in a persuasive message. The implication is that those with low WMC have greater difficulty learning new information, activating it, and maintaining it for use towards a goal.

Previous research discovered that higher composite indices of executive functioning and working memory are significantly predictive of medication adherence in older adults (Insel, Morrow, Brewer, & Figueredo, 2006). However, there has not been any research on the

predictive value of WMC on behavioral adherence unrelated to medication. Regardless of the lack of research it appears the feasibility of persuading those with low WMC to elaborately process health recommendations and apply and regulate new, goal-relevant behaviors is low. In spite of this assumption, WMC may not be as fixed as the general capacity hypothesis asserts (Engle et al., 1992). According to the strategic allocation hypothesis (Engle et al., 1992), those with high WMC may be better at higher-order cognitive tasks than those with low WMC because they allocate their mental resources more efficiently through the use of strategies. Therefore, WMC may be modified by providing cognitive strategies conducive to tasks requiring working memory. Assisted by a strategy, those with low WMC may be better able to engage in novel, goal-directed behavior such as adherence to health recommendations. At this time there is no research on the effectiveness of teaching cognitive strategies to promote adherent behavior.

#### *Self-Affirmation and Working Memory Capacity*

When presented with information that threatens our self-concept, evidence suggests our WMC reduces temporarily because the threat occupies attentional and cognitive resources (Schmader & Johns, 2003). This occupation diminishes allocation of mental effort to self-regulatory thought and behavior. SA can be thought of as a cognitive strategy which may free working memory resources from focusing on suppressing thoughts about the threat (Martens, Johns, Greenberg, & Schimel, 2006). SA may also provide for greater efficiency in mental control (Koole & Knippenberg, 2007).

#### *Pilot Study*

The pilot study was conducted to determine the efficacy of a SA manipulation on inducing its intended effect, a positive state of self-regard, in a college student population

compared to a control condition. Participants in the SA condition affirmed a central value by filling out a values scale to identify their highest-ranked value and writing a short essay on that value. In contrast those in the no-affirmation control condition recalled the foods, beverages, and nicotine products they consumed in the last 48 hours. All participants completed pre and post self-report questions assessing their state of self-regard. It was predicted the SA condition would foster a more positive state of self-regard, post-manipulation, than the no-affirmation control condition.

### *Method*

#### *Participants*

Under the approval of The University of Alabama Institutional Review Board, #09-OR-159, 36 college students at The University of Alabama participated in the 30-minute pilot study for one credit of research participation toward their Psychology 101 course grade. Participants freely chose their desired 30-minute time slot of thirteen time slots provided. These thirteen time slots were randomly assigned to either the SA ( $N = 20$ ) or no-affirmation control condition ( $N = 16$ ). There were no significant differences across groups in age,  $t[34]=1.32$ ,  $p = .20$ , or gender,  $\chi^2(1)= .36$ ,  $p = .55$ . Participants from ethnic minority groups represented 13.8% of the study sample and were fairly well distributed across conditions. Specifically, 17.6% of the SA condition and 14.3% of the control condition consisted of participants from ethnic minority groups.

#### *Measures*

Beyond a demographic questionnaire requesting participants' age, gender, and ethnicity, both groups were asked to answer a series of questions before and after the manipulation to

determine if the manipulation produced its intended effect, SA (see Appendix A). There are no established manipulation checks for SA tasks in the literature (McQueen & Klein, 2006). The following questions are neither standardized nor have any psychometric data. However, results from these questions revealed significant differences between self-affirmed and non-self-affirmed participants in self-reported feelings of SA (Cohen et al., 2000; Harris et al., 2007; Sherman et al., 2000, study 1; Siegel, Scillitoe, & Parks-Yancy, 2005).

The first question was “In general, how do you feel about yourself?” on a scale ranging from 1 (*extremely negative*) to 5 (*neutral*) to 9 (*extremely positive*) (Cohen et al., 2000; Sherman et al., 2000, study 1). This question is intended to measure current state of self-regard. The second question is modified into two versions, one to be answered prior to the written assignment and one to be answered after. The two modified questions, based on Siegel et al., (2005), are “In general, how meaningful do you find writing exercises?” and “How meaningful did you find the writing exercise?” on a scale ranging from 1 (*not at all*) to 7 (*very much*). This question is intended to measure how important or positively impacting the SA manipulation was in comparison to the control group’s written exercise. The last question is also modified into two versions and is based on measures from Harris et al., (2007). The questions are “How much would you agree that you are aware of what you value and think of as most personally important to you?” and “How much would you agree that the exercise made you more aware of what you value and think of what is personally important to you?” on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). This question is intended to measure the extent to which the participants self-reflected on important aspects about themselves.

### *Self-Affirmation Manipulation*

The following SA manipulation is based on paradigms described by Charlson and colleagues (2007) and other studies using a SA value-essay manipulation in relation to health attitudes and behaviors (Harris & Napper, 2005; Sherman et al., 2000). Participants rank ordered eleven values and characteristics from the Sources of Validation Scale (Harber, 1995) by personal importance (see Appendix B). Then, they wrote an essay on their top ranked value. The essay included why the value is important to them, and a description of a situation in which the value was particularly important to them. The participants were given ten minutes to complete the essay.

#### *Control Condition*

Participants randomly assigned to the non-SA condition were given a filler written exercise. The exercise, titled “Personal Recall Exercise,” was adapted from Cohen et al. (2000) (see Appendix C). The task asked participants to write down everything and at what frequency they ate, drank, or smoked in the past 48 hours. In addition, it encouraged participants “not to worry about those things you find yourself unable to remember.” The duration of the task was ten minutes making it equivalent to the duration of the SA manipulation. Previous studies have used control tasks that ask participants to write about their lowest ranked value from a provided scale and how it may be important to another person. However, Cohen et al. (2000) proposed any self-reflective writing may be construed as SA.

#### *Procedure*

The participants were instructed to come to a laboratory in the psychology department to complete the study. The study was intended to last approximately thirty minutes. At arrival, the participants read a participation information sheet about the nature of the study. After reading the

form, any questions the participant had about the study were answered in-person by the principal investigator. Demographic and pre-manipulation measures were administered. Upon completion, each group was given handouts to complete their writing assignment for ten minutes. After the manipulation was completed, post-manipulation measures were administered and collected. The participants were then debriefed about the study's purpose.

### *Results*

Checks on the responses to the pre-manipulation questions were performed. There were no significant differences between the conditions on the first question, "In general, how do you feel about yourself?",  $t[34] = 1.01, p = .32$ , the second question, "How meaningful do you find writing exercises?",  $t[34] = .34, p = .74$ , and the third question, "How much would you agree that you are aware of what you value and think of as most personally important to you?",  $t[34] = -.09, p = .93$ .

Post-manipulation scores were analyzed independently across the two conditions for each question. Effect sizes using Cohen's  $d$  (Cohen, 1988) were also extracted for post-manipulation scores across the two conditions for each question.

To examine the effect of SA on self-regard, participants responded to the first question on a 9-point scale anchored at *extremely negatively* to *extremely positively*. Affirmed participants ( $M = 7.5$ ) did not feel significantly better about themselves than non-affirmed participants ( $M = 6.8$ ),  $t[34] = 1.36, p = .18$ ; however, the distribution of post-manipulation scores appeared negatively skewed and leptokurtic suggesting possible ceiling effects. Thus, a non-parametric test was performed. Across the two conditions, the median score for self-affirmed participants was not significantly different from the median score of non-affirmed participants, ( $Z = -1.4, p = .17$ ,

using the Mann-Whitney U test). The effect size for the post-manipulation score is descriptively classified as small (Cohen, 1988; see Table 1).

Participants responded to the second question on a 7-point scale anchored at *not at all* to *very much*. Affirmed participants ( $M = 5.1$ ) found the SA exercise marginally, positively impacting compared to non-affirmed participants ( $M = 4.2$ ),  $t[34] = 1.71$ ,  $p = .09$ . The effect size for the post-manipulation scores is descriptively classified as a medium effect size (see Table 1).

For the third question, measured on a 7-point scale from *extremely disagree* to *extremely agree*, affirmed participants ( $M = 6.1$ ) were significantly more aware of what their values were after the SA manipulation compared to non-affirmed participants ( $M = 4.7$ ),  $t[34] = -3.25$ ,  $p = .003$ . The effect size for the post-manipulation scores is descriptively classified as large (see Table 1).

### *Discussion*

In contrast to the present results, the previous literature on all three of these questions demonstrated significant differences between self affirmed and non-self affirmed conditions (Cohen et al., 2000; Harris et al., 2007; Sherman et al., 2000; Siegel et al., 2005). However, samples sizes per condition were larger in these studies than in the pilot study. In regard to the first question, sample sizes for each condition was at least thirty participants (Cohen et al., 2000; Sherman et al., 2000). Results from one of the studies were marginally significant and negatively skewed, signifying possible ceiling effects. For the second and third questions, previous studies produced significant results with sample sizes per condition ranging from 55 to 152. Therefore the total  $N$  for the main study was increased to an overall sample size of 54 participants with approximately 27 participants per condition.

The main study also minutely altered the questions and the SA manipulation to increase validity, and the likelihood of producing significant results. Based on the conclusions of the pilot

study, alterations were made to the manipulation check questions (see Appendix D). The labels on the scale for the first question were altered to correct for possible ceiling effects. The anchor, “*extremely positive*,” was changed to “*very positive*” and assigned to a value of six on the scale. The label, “*extremely enthusiastic*,” was assigned to a value of nine on the scale. The reasoning behind these modifications was participants will have the opportunity to provide responses past the ceiling established in the pilot study. The second question from pre to post manipulation was changed to “In general, how *personally* meaningful do you find writing exercises/(did you find the writing exercise)?” This change is in accordance with the wording of the question in past research, and it may readjust participants’ thoughts about writing exercises to be more oriented toward self-reflection. The third question, pre-manipulation, was altered to “How much would you agree you are *fully and completely* aware of what you value and think of as most personally important to you?” The original question may have been too vague. This alteration may assist participants to think more specifically and accurately about their current status regarding how aware they are of their values, which may allow for a greater awareness post manipulation for self-affirmed participants compared to non-affirmed participants. The instructions for the SA essay were also modified to reflect the manipulation check questions better, and to aide the participant in thinking about how they will act consistently with their values in the future (adapted from Shrira & Martin, 2005), thus priming thoughts about adherent behaviors (see Appendix E).

### *Present Study*

To further understanding of adherence to health recommendations in general and insomnia recommendations in particular, the present study examined SA as a simple, inexpensive method of persuasion intended to increase adherence and enhance health. The present study

tested the efficacy of SA as a cognitive strategy to lower defensiveness towards a persuasive message on insomnia treatment recommendations and to facilitate the self-regulating task of behavioral adherence to those recommendations. It also investigated the influence of WMC on adherence rates. The study measured adherence to SC, SRT, and basic SH recommendations with self-reported adherence logs. A sub-group of participants also received actigraph watches to record their objective adherence to behavioral sleep recommendations. There have been only a few investigations on the individual effects of SA and WMC on adherence. There have been no studies conducted on the interaction between SA and WMC on adherence to any health recommendation.

### *Objective*

This study determined effects of the presence or absence of a SA essay on the adherence rates to behavioral insomnia treatment. The other primary objective was to investigate the relation between WMC and adherence rates. The first condition consisted of a SA essay prior to one session of behavioral treatment for insomnia. The second condition was a control condition. A written record on the frequency and type of food, drink and nicotine products recently consumed was completed prior to the same behavioral treatment for insomnia provided in the SA condition.

The two primary hypotheses are listed as follows: First, it was predicted the presence or absence of the SA exercise would have a main effect on adherence. Participants who completed the SA exercise would respond with greater adherence rates than those who did not self-affirm. Second, it was hypothesized WMC would be positively related to adherence.

The seven secondary hypotheses were intended to be explorative and/or replicate previous findings in the literature. First, it was predicted there would be significant interaction effect between the SA manipulation (presence vs. absence) and WMC. It has been argued that SA affects the provision of working memory processes such that when our self-concept is threatened it liberates mental resources to thoughtfully process the threat rather than focus on the discomfort it gives. Less defensive processing of the threat is predicted to increase the likelihood of adhering to behaviors that diminish the threat. It is predicted that the influence of SA as a cognitive strategy will have a stronger influence on adherence rates amongst participants with low WMC than those with high WMC as those with WMC may already be effectively using previously used cognitive strategies. Second, the SA manipulation was expected to increase acceptance of the insomnia treatment message, and intentions to adhere to treatment recommendations relative to a control condition. Third, level of insomnia severity at baseline was predicted to moderate the relations between SA and acceptance of the insomnia treatment message as well as intentions to adhere to the treatment recommendations. Fourth, insomnia severity was expected to decrease significantly from baseline to two weeks following the insomnia treatment. Fifth, it was predicted that acceptance of the insomnia treatment message would mediate the relation between SA and intentions to adhere to insomnia treatment. Sixth, intentions to adhere to insomnia treatment would mediate the relation between acceptance of the insomnia treatment message and actual adherence. Seventh, frequency of SA use was predicted to moderate the effect of the SA manipulation on adherent behavior to insomnia treatment recommendations.

## Method

### *Participants*

Fifty-four college men and women at The University of Alabama participating to satisfy a course requirement or acquire extra credit from a psychology course accepted an invitation to participate in the study. These participants met two major criteria to be included in the study. First, they met or exceeded a clinical cutoff score of eight on the Insomnia Severity Index (ISI; Morin, 1993). Second, they met the International Classification of Sleep Disorders-II criteria for an insomnia disorder (ICSD-2; AASM, 2005). Participants with other probable sleep disorders, as determined through the Global Sleep Assessment Questionnaire (Roth et al., 2002), were pregnant, or employed in shift work were not eligible for the study. Those with severe, unstable mental or physical illness, or mobility restrictions were also excluded based on clinical contraindications (Smith & Perlis, 2006).

### *Screening Measures*

*Insomnia severity index.* The Insomnia Severity Index (ISI; Morin, 1993; see Appendix F) was used as a brief screening measure of insomnia. The ISI quantifies perceived sleep difficulties and insomnia severity. It is a seven-item instrument with ratings on a 0 to 4 point scale. It ascertains the following: perceived severity of sleep onset, sleep maintenance, and early morning awakening problems; daytime functioning impairment; the conspicuousness of the impairment caused by the sleep problem; distress caused by the sleep problem; and contentment with the current sleep pattern. A total composite score is computed by summing up the seven ratings, with higher scores indicating greater severity of insomnia. A clinical cut-off score of eight was used as an identifier of threshold insomnia because it has optimal sensitivity and

specificity in distinguishing people with insomnia from normal sleepers (Savard, Savard, Simard, & Ivers, 2005). The ISI has demonstrated good internal consistency, test-retest reliability, construct validity, and temporal stability (Bastien, Vallie`res, & Morin, 2001; Blais, Gendron, Mimeault, & Morin, 1997; Savard et al., 2005).

*Sleep disorders screener.* The Global Sleep Assessment Questionnaire (GSAQ; Roth et al., 2002; see Appendix G) was distributed to all potential participants to eliminate individuals with other sleep disorders. The questionnaire consists of 11 items each with four response options (i.e., ‘never’, ‘sometimes’, ‘usually’, ‘always’). The GSAQ is designed as a screening tool to distinguish the presence and absence of sleep disorders and to differentiate insomnia, insomnia associated with a mental disorder, obstructive sleep apnea, periodic limb movement, and parasomnias. Sensitivity and specificity analyses concluded there was good discrimination between disorders (Roth et al., 2002). Participants with scores indicative of no sleep disorder or any sleep disorder other than insomnia or insomnia associated with a mental disorder were excluded from the study.

*Demographic questionnaire.* The demographic questionnaire was developed by the principal investigator (see Appendix H). Screening items included ICSD-II criteria for an insomnia disorder, self-reported questions on mental health, physical health, and mobility restrictions. If participants did not fit criteria for an insomnia disorder they were excluded. Of the participants that did fit criteria for an insomnia disorder, those who indicated they had severe mobility restrictions, moderate to severe physical health limitations and/or mental disorders that significantly affect their everyday functioning greater than some of the time, were excluded. Other demographic questions were administered for descriptive rather than screening purposes.

Items included age, gender, self-reported ethnic identity, the duration of their insomnia, the frequency of insomnia nights per week, and the presence or absence of a bed partner or pet.

### *Baseline Measures*

*Need for cognition.* The short form of the need for cognition scale can be found in Appendix I (NCS; Cacioppo, Petty, & Kao, 1984). The scale was used to assess participants' inclination toward, and engagement in, cognitively effortful tasks. It is an 18-item questionnaire using a 5-point response format ranging from *extremely uncharacteristic of me* to *extremely characteristic of me*. The short form of the NCS is correlated with the 34-item version of the scale. It also has good reliability, and a validating factor analysis found the dominant factor was retained between the two scales (Cacioppo et al., 1984). Research indicates need for cognition is predictive of the likelihood a person will organize, elaborate on, and deal with tasks and social information. The greater the NCS score, the greater the effort put forth to evaluate a persuasive message (Cacioppo & Petty, 1982). Compared to those obtaining low NCS scores, higher NCS scorers are more likely to have prolonged attitude change from a persuasive message (Haugtvedt & Petty, 1992), and increased attitude-behavior consistency (Pieters & Verplanken, 1995). All participants were administered this test and the scores were controlled for in the analyses on the effects of WMC and SA on adherence.

*Preference for consistency.* The preference for consistency scale (PCS; Cialdini, Trost, & Newsome, 1995), found in Appendix J, measures the disposition to respond to incoming stimuli in a way that is consistent with previous commitments, expectations, and choices. The scale contains 18 items with a 9-point response format ranging from 'strongly disagree' to 'strongly agree'. Previous research has found strong support for the measure's construct validity and

reliability (Cialdini et al., 1995; Nail et al., 2001). Higher scores on the PCS are associated with higher rates of compliance with a request (Cialdini et al., 1995; Guadagno, Asher, Demaine, & Cialdini, 2001). It is likely high preference for consistency is positively related to adherence to the behavioral insomnia recommendations. Therefore, PCS scores were controlled for in the analyses on the effects of WMC and SA on adherence.

*Working memory capacity.* The automated operation span task (Aospan; Schrock, Unsworth, & Heitz, 2003), a computer-operated working memory span task, is a valid and reliable measure of WMC (Conway et al., 2005; Unsworth, Schrock, Heitz, & Engle, 2005). It required the participants to solve a set of simple, mathematical problems while trying to memorize letters. These operations force working memory storage of the letters during simultaneous mathematical processing to ultimately utilize executive attention processes. The Aospan was administered independent from the investigator. The entire task is mouse driven. It starts with a practice session split into three parts: a letter span task with ordered recall, a mathematical task structured into true or false statements, and both tasks administered simultaneously. During the actual administration, participants were encouraged to keep their math accuracy above 85% to ensure both tasks are performed. The program creates simultaneous math problems and letters to be memorized in set sizes ranging from three to seven. Each set size is produced three times during the task. In total, 75 sets are presented. Set size is randomized. The task takes approximately 20-25 minutes. Five scores were displayed at the completion of the task as follows: Ospan score (i.e., the sum of all perfectly recalled sets), total number of letters recalled in the correct order, math errors, speed errors, and accuracy errors. The total number of letters recalled in the correct order was used as the continuous independent variable.

### *Measures administered during treatment*

*Manipulation check.* Based on results from the pilot study all three manipulation check questions were retained with minor alterations (see Appendices D and E). These questions were intended to ensure that the SA manipulation induced a greater state of positive self-regard in self-affirmed participants than non-affirmed participants. They were measured both before and after the SA manipulation.

*Values scale.* The Sources of Validation Scale (see Appendix B; Harber, 1995) used in the pilot study was retained for the present study. Participants were asked to rank a list of 11 values and personal characteristics from this scale in order of personal significance. The list includes values and personal characteristics as follows: artistic skills/aesthetic appreciation, sense of humor, relations with friends/family, spontaneity/living life in the moment, social skills, athletics, musical ability/appreciation, physical attractiveness, creativity, business/managerial skills, and romantic values. This scale was intended to help participants indicate values with which they strongly identify. There are no psychometric data for the scale; however, it is commonly used in studies investigating the effects of SA on a threatening health message (Cohen et al., 2000, Harris & Napper, 2005; Hoshino-Browne, Zanna, Spencer, Zanna, Kitayama, & Lackenbauer, 2005; Sherman et al., 2000; Shrira & Martin, 2005).

*Efficacy.* Four items assessing response efficacy and self efficacy were administered as variables of interest unrelated to the present study's hypotheses. These items can be found in Appendix K amongst other questions described later. Response efficacy was measured with two items as follows(adapted from Ruiters, Verplanken, Kok, & Verrij, 2003), "If I follow treatment recommendations over the next few weeks, I will reduce my insomnia symptoms and make me

feel more refreshed” and “If I follow treatment recommendations over the next few weeks, I will reduce my risk of developing multiple medical and/or psychiatric conditions in the future” .

These items were measured on a 1 to 9 scale from totally disagree to totally agree. Self efficacy was measured with two items adapted from Reed and Aspinwall’s (1998) item “If I wanted to, I could easily cut down the number of cigarettes I smoke in the next 7 days.” This was modified into two questions differing only in the specified time frame. The questions were, “If I wanted to follow treatment recommendations it would be easy for me to do so tonight” and “If I wanted to follow treatment recommendations it would be easy for me to do so over the next few weeks.”

These items were measures on a 1 to 9 scale from totally disagree to totally agree.

#### *Dependent Variables*

*Level of severity.* Previous research has found the risk status of developing a particular disease state, or the negative consequences of it, moderates acceptance of a health treatment message, and intentions to adhere to health-related recommendations. Similarly, severity level of insomnia may moderate acceptance of and intentions to adhere to insomnia treatment. Therefore, level of severity was measured using baseline ISI with higher scores indicating greater severity. Specifically, mild, subclinical insomnia was assigned to values from 8 to 14, moderate, clinically significant insomnia to values from 15 to 21, and severe, clinically significant insomnia to values from 22 to 28.

*Acceptance.* Acceptance of the health message on insomnia and how to treat it was assessed with the following question adapted from Sherman et al., (2000): “How important do you think it is that people engage in the sleep-promoting behaviors that were discussed to avoid

the consequences of poor and limited sleep?” The question will be answered using a 0-9 scale, anchored from *Not Important* to *Very Important*. This item can be found in Appendix K.

*Intentions to adhere.* Intentions to adhere to behavioral treatment for insomnia recommendations was assessed with the question adapted from Sherman et al., (2000): “How likely do you think it is that you personally will actually follow the behavioral recommendations to treat your insomnia?” This question was measured using a 0-9 scale, and it was anchored from *Not Likely* to *Very Likely*. This item can be found in Appendix K.

*Actigraphy.* A goal of at least 10 participants from each of the two experimental conditions were to wear a Mini-Mitter actigraph 24-hours a day for two weeks following the insomnia treatment session. These participants completed all other dependent measures concurrently. An actigraph is an apparatus worn on the wrist that records movement. It is a direct measure of physical activity. The actigraph watches are equipped with an event marker that participants use to specify the time they entered bed at night and got out of bed in the morning. These specific event markers were an additional, objective measure of adherence with SRT and a subset of the SC instructions. The Actiware – Sleep 3.4 software package at the high sensitivity setting was used to identify periods of sleep and wake during the night through the presence or absence of movement (Lichstein, Stone, Donaldson, Nau, Soeffing, Murray, Lester, & Aguillard, 2006). The epoch length was set at 30 seconds. The actigraph also allows for objective assessment of common sleep measures presented in the following: sleep-onset latency (SOL), wake after sleep onset (WASO), total sleep time (TST), total time in bed (TTIB), terminal wake time prior to getting out of bed (TWAK), and sleep efficiency (SE; i.e. the proportion of TST over TTIB).

*Adherence logs.* Adherence to sleep recommendations was measured with sleep diaries and two adherence logs specific to sleep hygiene and stimulus control instructions. Sleep diaries are a record of a participant's sleep and wake time each night for a period of two weeks. The sleep diary for the present study is by Perlis and colleagues (2005; see Appendix L). This particular diary was used because it documents common sleep variables, variables related to SC instructions, variables related to SRT instructions, and daytime functioning variables. Primary dependent variables from the sleep diary were deviation from prescribed bedtime and deviation from prescribed wake time.

Two other adherence logs were used to document adherence to the SC instructions and SH recommendations (see Appendices M & N). The SC adherence log assesses whether the participants were able to follow each of the six instructions of SC each night through a series of yes-or-no answers indicating adherence to the instructions. The SH adherence log also assesses whether participants were able to follow the five instructions of SH each day through a series of yes-or-no answers. The proportion of the days the participants were compliant to each instruction to the 14-days measured was used to determine adherence.

#### *Follow-up measure*

To determine if the self-affirmed participants used SA to help them adhere to insomnia treatment recommendations, they were asked the frequency of SA use with the question, "How much of the time over the past two weeks did you recall your most important values to help you overcome any obstacles you encountered in following insomnia treatment recommendations?" on the following scale: *none of the time, a little of the time, some of the time, most of the time, all of the time* (see Appendix O).

### *Self-Affirmation Manipulation*

The SA manipulation described and modified from the pilot study is based on paradigms described by Charlson and colleagues (2007) and other studies using a SA value-essay manipulation in relation to health attitudes and behaviors (see Appendices D & E; Cohen et al., 2000, study 1; Harris & Napper, 2005; Sherman et al., 2000, study 2; Shrira & Martin, 2005). Prior to insomnia treatment, participants underwent the SA manipulation. During the first part of the manipulation, participants rank ordered the 11 values and characteristics from the Sources of Validation Scale by personal importance. Then, they wrote an essay on their top ranked value. The essay included why the value is important to them, how it makes them feel good about themselves, a description of a situation in which the value was particularly important to them, and how they will act consistently with their value in the future. The participants were given ten minutes to complete the essay. The second part of the manipulation occurred after the insomnia treatment session. At that time participants were reminded of the value they had written about. They were encouraged to think of this value whenever they encounter obstacles to adherence with insomnia treatment recommendations. This cognitive strategy was intended to motivate participants to overcome the obstacles to adherence so their behaviors are consistent with their concept of self-worth. The script (see Appendix P) used in the second part of the manipulation is adapted from Charlson and colleagues (2007).

### *Behavioral Insomnia Treatment*

The treatment took place in one, 1.5-hour session. The treatment consisted of sleep and insomnia education, and three behavioral treatment components: SC, SRT, and SH. For a script of how each component was presented verbally, please see Appendix Q. Within the segment on

sleep and insomnia education, the patient were given knowledge of the symptoms and consequences of insomnia and sleep deprivation. This information represents threatening health information. The treatment session had a maximum enrollment size of 12 participants. The treatment session was not structured as a group therapy session but as a lecture accompanied by a Microsoft Powerpoint visual presentation. Questions about the material presented were allowed; however, discussion amongst the participants about personal sleep experiences was discouraged.

SC (Bootzin, Epstein, & Ward, 1991) is used to reestablish a consistent sleep/wake schedule, and sleep promoting associations with the bed/bedroom. The participants were encouraged to follow six instructions. First, discontinue all activities conducted in the bed/bedroom (i.e. watching TV, reading, worrying) except sleep and sex. Second, go to bed only when sleepy; however, this instruction was coordinated with SRT. An expanded discussion is included in the SRT section. Third, if they did not fall asleep within 15 to 20 minutes of going to bed they were asked to get out of bed and engage in a quiet activity in another room until they feel sleepy again. Fourth, for awakenings during the night, participants followed the third instruction and repeated it as many times as needed. Fifth, the participants were instructed to get up at the same time every morning regardless of how much sleep they obtained. Sixth, they were told to avoid napping.

The second component of treatment, SRT (Spielman, Saskin, & Thorpy, 1987), is a behavioral treatment designed to increase sleep consolidation by creating a state of partial sleep deprivation. SRT prescribes a restricted amount of time spent in bed (TIB) equal to the average total sleep time (TST). The participants were asked to estimate their typical TIB, estimate their typical TST, choose a fixed wake-up time, and restrict their TIB to their typical TST. The

participants were encouraged go to bed no earlier than a bedtime calculated by subtracting typical TST from their chosen, fixed wake-up time. The participants were encouraged to get up at this fixed wake-up time no matter the amount of sleep they actually received. This procedure may create mild to moderate sleep loss; however, it allows for greater sleep continuity. During the lecture, the participants were asked to recall their typical bedtime and wake time on recent weekdays.

The third component of treatment is SH (Lichstein & Morin, 2000). This psychoeducational intervention consists of five instructions meant to discourage certain behaviors that influence sleep quality and quantity. The instructions were to avoid caffeine after noontime, avoid exercise within two hours of bedtime, avoid nicotine within two hours of bedtime, avoid alcohol within two hours of bedtime, and avoid heavy meals within two hours of bedtime.

#### *Control Condition*

Participants randomly assigned to the non-SA condition were given the same filler written exercise described in the pilot study (see Appendix C).

#### *Procedure*

All screening and baseline measures mentioned previously were disseminated as a separate, preliminary online study to participating Psychology 101 classes and upper division psychology courses. Participants that met inclusion criteria were emailed an invitation to join the main study. Acceptance of the invitation resulted in random assignment to one of the two conditions.

The first visit for both conditions consisted of providing information about the study via a handout (see Appendix R) and giving participants the opportunity to ask questions about its contents. Once understanding of the study procedures, risks, and benefits was acquired, both conditions were informed the current research study was intended to discover what aspects of behavioral insomnia treatment make it effective. This message was delivered with the intention to dampen any suspicions of the study's actual objective: to measure adherence to the treatment. Next, the experimental manipulation took place during which one group received a SA task and the other the control task. Both groups answered manipulation check questions described and modified in the pilot study before and after the manipulation. Then, all participants received the same interactive lecture on insomnia, its consequences, and behavioral treatment. At the end of the lecture, the SA group was given the second part of the manipulation. This second part was delivered as a rationale for completing the essay. The control group was told the rationale for completing the Personal Recall Exercise was to assist recall of behaviors relevant to the SH treatment. The rationale for and method of filling out the sleep diaries and adherence logs (via online forms sent through e-mail) was explained. At least twenty participants received actigraph watches. Participants were instructed they would receive course credit regardless of their adherence to the insomnia treatment recommendations. However, they must complete the logs and the post-treatment questionnaires at the two-week follow-up to receive course credit. Then, acceptance and intentions measures were answered before dismissal. At the two-week follow-up, participants were emailed post-treatment questionnaires that included a repeat ISI, and repeat measures of acceptance, intentions, self-efficacy, and response efficacy. The participants from the SA condition also completed the follow-up questions measuring the frequency of SA use as a

strategy to overcome obstacles to adherence and its helpfulness. All participants were also asked to complete the Aospan test of WMC once again. Finally, they were debriefed via e-mail and given course credit. Participants were also offered an in-person debriefing session if they found it necessary.

## Results

### *Descriptive Statistics for the Sample*

Fifty-four participants completed the treatment protocol and adherence logs. Descriptive statistics including participant demographic information can be found in Table 2. The sample was composed of 87% women, 74% Caucasian-Americans, 96% full-time students, and 15% employed persons but no more than part-time. None of the participants reported being diagnosed or treated for a mental disorder. They reported experiencing difficulty sleeping on average 4.65 nights per week ( $SD = 1.39$ ) despite having adequate opportunity to sleep. Notably, randomization between groups on demographic information was successful with the exception of baseline ISI. Participants randomized to the control condition reported significantly more severe insomnia than those randomized to the self-affirmation condition. As a result, baseline ISI was controlled for in all appropriate analyses including those conducted for the primary hypotheses. There were also several outliers evident in the distribution of WMC indicating six participants focused on accurately completing the mathematical computations, but failed to put effort into memorizing the letters. Hence, these participants scores do not accurately reflect the use of working memory as they did not consciously process both tasks simultaneously. As a result, these six participants were dropped from the analyses regarding WMC.

### *Manipulation Check*

Difference scores of the manipulation check questions from pre to post manipulation were calculated. The difference score in the first manipulation check question was log-normalized to correct for non-normal distribution. A between subjects  $t$ -test was conducted to

determine the effect of the presence and absence of SA on self-regard as measured by the question, “In general, how do you feel about yourself?” Results indicate the SA task ( $M = 6.25$ ,  $SD = 1.65$ ) produced a trend toward greater feelings of self-regard compared to the control task ( $M = 5.92$ ,  $SD = 1.23$ ),  $t(52) = 1.76$ ,  $p = .084$ ). The mean differences from pre to post manipulation also indicate that participants in the control task felt slightly more negatively about themselves after the control task ( $M = -.15$ ,  $SD = .92$ ) compared to self-affirmed participants ( $M = .32$ ,  $SD = 1.28$ ). In addition, a between subjects  $t$ -test was administered to assess whether the written exercises (i.e., SA essay and the Personal Recall Exercise) were important or self-relevant to the participants by their responses to the question, “How personally meaningful did you find the writing exercise?” Participants who underwent the SA task ( $M = 5.0$ ,  $SD = 1.51$ ) found it more personally meaningful than participants in the control task ( $M = 3.77$ ,  $SD = 1.45$ ),  $t(52) = -2.69$ ,  $p = .01$ . This significant difference was also reflected in the mean difference scores from pre to post manipulation between control participants ( $M = -.31$ ,  $SD = 1.64$ ) and self-affirmed participants ( $M = .71$ ,  $SD = 1.12$ ). Lastly, a between subjects  $t$ -test was conducted to assess whether the experimental manipulation altered how aware participants felt they were about their most important values by responding to the question: “How much would you agree that the exercise made you more aware of what you value and think of as most personally important to you?” The SA task ( $M = 5.39$ ,  $SD = 1.40$ ) did not induce stronger self-reported awareness of personal values than the control task ( $M = 4.08$ ,  $SD = 1.29$ ); however, the control task induced significantly weaker self-reported awareness of personal values ( $M = -1.54$ ,  $SD = 1.58$ ) whereas awareness did not significantly change for participants in the SA condition ( $M = -$

29,  $SD = 1.56$ ),  $t(52) = -2.93$ ,  $p = .005$ . Overall, it can be surmised that the experimental manipulation was moderately successful in its intent.

#### *Statistical tests on the primary hypotheses*

On the SC and SH adherence logs, adherence was defined as the proportion of the number of times the participant was able to adhere to a particular instruction over the total number of days measured (i.e., fourteen). For measured SRT adherence, discrepancies between recommended bedtimes and wake times and that of actual bedtimes and wake times were calculated for each night and averaged over the fourteen nights. Analyses were conducted on mean adherence scores. Raw scores were converted to z scores and averaged to create a composite adherence index representing all three interventions.

In the case of the participants that wore actigraph watches for the two-week period, adherence to SC and SRT instructions regarding objective values of bedtime and wake time was checked for consistency with sleep diary values. However, only thirteen of the twenty participants randomized to use the actigraphs provided complete actigraph data; 3 of 5 from the SA condition and 10 of 15 from the control condition. The difference in number between conditions of those receiving actigraphs is explained by the variance in the number of participants present per treatment session. Circumstantially, treatment sessions with randomized actigraph distribution occurred when SA group sessions were small and control group sessions were large. There is not enough actigraph data to warrant further analysis as any conclusions drawn from this data would be tentative at best given the small  $n$  per group condition.

*Primary hypotheses 1 & 2: Main effects of SA and WMC on adherence.* Test variables predicting adherence for each treatment and the composite adherence index were evaluated in

separate hierarchical regression models. Covariates, NCS and PCS were to be entered on step 1. However, PCS had no significant correlations with any of the adherence variables. Therefore it was omitted from the results reported below. Analyses with PCS as a covariate were completed, but the results were no different than those reported here. Instead, baseline insomnia severity as measured by the ISI was entered to control for its influence since it was found to differ significantly between groups. Main effects of dummy-coded group conditions and WMC were assessed on step 2.

It was found that the test of the overall model when examining adherence to all three behavioral insomnia interventions was nonsignificant ( $F[4, 43] = .79, p = .54, R^2 = .068$ ). Since the overall regression model is nonsignificant it is not justified to examine the tests of the individual coefficients. It was found that the tests of the overall model when examining adherence to SRT ( $F[4, 43] = .84, p = .69, R^2 = .072$ ), SC ( $F[4, 43] = 1.04, p = .40, R^2 = .088$ ), and SH ( $F[4, 43] = 1.01, p = .41, R^2 = .086$ ) were all nonsignificant. Differences in adherence across group conditions alone can be found in Table 3. Exploratory analyzes on actual significant predictors of treatment adherence can be found in Appendix S.

#### *Statistical tests on the secondary hypotheses*

*Secondary hypothesis 1: Interaction of SA and WMC on adherence.* The same statistical analyses used to investigate the primary hypotheses described previously were conducted. However, on step 3 a product vector representing the interaction between the dummy coded group conditions and the centered WMC variable was added.

The full regression model with the interaction between group condition and WMC added was not able to explain a significant amount of variability in the composite adherence index

( $F[5,42] = .91, p = .48, R^2 = .098$ ), in SRT adherence ( $F[5,42] = 1.25, p = .31, R^2 = .129$ ), in SC adherence ( $F[5,42] = 1.05, p = .40, R^2 = .111$ ), or in SH adherence ( $F[5,42] = .79, p = .56, R^2 = .086$ ).

*Secondary hypothesis 2: Effects of SA on acceptance and intentions to adhere.* In order to replicate the findings of previous studies (Armitage et al., 2008; Sherman et al., 2000) indicating that SA reduces biased, defensive processing of threatening health information, a multivariate *t*-test with condition (SA group vs. control group) as the independent variable, and acceptance and intentions to adhere as a combined dependent variable was to be analyzed. Since the distribution of the intentions to adhere variable was negatively skewed, nonparametric tests were used with this variable. There was a nonsignificant Spearman's correlation coefficient between acceptance and intentions,  $r_s = .21, N = 59, p = .13$ . This nonsignificant relationship does not justify combining these two dependent variables. As a result, independent analyses of each dependent variable were conducted. A between subjects *t*-test was performed to compare acceptance of treatment between groups. There was no significant difference in acceptance between the SA group ( $M = 7.6, SD = 1.0$ ) and the control group ( $M = 7.5, SD = .86$ ),  $t(52) = -.28, p = .78$ . A Mann-Whitney U test was run to compare the intentions to adhere variable between groups. There was a significant difference in intentions to adhere between the SA group ( $Mdn = 8.0, n = 28$ ) and the control group ( $Mdn = 7.0, n = 26$ ),  $U = 225, z = -2.49, p = .013$ . Therefore, the findings from previous studies were partially replicated. SA did not increase acceptance of the treatments more than the control group, but the results suggest SA still may have reduced biased, defensive processing of threatening health information based on the results for intentions to adhere.

*Secondary hypothesis 3: Moderating effects of insomnia severity status.* Armitage and colleagues (2008) found risk status moderated the relations between SA and that of acceptance of the persuasive message and intentions to adhere to behavioral recommendations. Correspondingly, level of insomnia severity as measured by the ISI was expected to moderate the same relations. In order to replicate these findings using severity status instead of risk status, acceptance of the message was regressed on a dummy-coded SA condition variable, the centered ISI variable, and the Condition X ISI interaction term. Using the same model, log-normalized intentions to adhere was also regressed on the variables and terms listed above.

The full regression model described above was not able to explain a significant amount of variability in acceptance of the insomnia treatments ( $F[3,50] = 1.63, p = .19, R^2 = .087$ ). However the full regression model did explain a significant amount of variability in intentions to adhere to treatment recommendations ( $F[3,50] = 2.93, p = .043, R^2 = .149$ ). Upon further examination it was revealed that the interaction term between group condition and insomnia severity status was not significant,  $b = .07, t(53) = 1.23, p = .23$ . Consequently, insomnia severity status did not moderate the relationship between SA and intentions to adhere.

*Secondary hypothesis 4: Insomnia outcome.* The differences in mean pre and post-treatment ISI scores for both the SA and control groups were calculated. A one-way between groups analysis of covariance was conducted on ISI mean difference scores to determine insomnia outcome between groups. Baseline ISI scores was used as the covariate since these scores were significantly different between groups. After adjusting for baseline ISI scores, there was no significant difference between the SA condition and the control condition in insomnia severity outcome,  $F(1,49) = 2.97, p = .09$ . Eight participants in the SA condition attained

clinically significant reductions in ISI (i.e., no longer had insomnia) compared to three participants in the control condition. This, however, was not a significant difference between conditions,  $\chi^2(1, n = 52) = 1.85, p = .17, \phi = -.24$ . Although, group condition had a nonsignificant effect on insomnia severity outcome, a paired-samples *t*-test was conducted to evaluate the impact of one session of behavioral insomnia treatment for the sample as a whole. There was a statistically significant decrease in ISI scores from pre-treatment ( $M = 12.4, SD = 3.43$ ) to post-treatment ( $M = 10.6, SD = 3.81$ ),  $t(51) = -3.75, p < .001$ . The eta squared statistic (.22) indicated a large effect size

*Secondary hypotheses 5 & 6: Mediators between SA and adherence.* In order to replicate results by Armitage and colleagues (2008) on the relation between SA and adherence, mediation analyses using the Baron and Kenny (1986) method were planned to be conducted. However, in order for the mediation analyses to be conducted all paths between SA, acceptance of the insomnia treatment message, intentions to adhere, and adherence need to be significant. In the case of this sample, not all of the regression equations between these variables of interest were significant. Particularly, SA, as explored in the primary hypotheses, did not significantly relate to adherence of any of the treatments or the treatments as a whole. Therefore, the planned mediation analyses were not warranted. A mediation analysis examining whether intentions to adhere mediates the relation between acceptance of treatment and adherence is also not warranted because there was a nonsignificant relation between acceptance of treatment and intentions to adhere.

*Secondary hypothesis 7: Predictive effects of SA use frequency.* Frequency of SA as a strategy to overcome obstacles to insomnia treatment recommendation adherence was

hypothesized to be a significant predictor of adherence to each treatment and the composite adherence index. Adherence variables in the SA group only, were regressed on SA use frequency using simple linear regression.

Frequency of use of SA as a strategy to promote adherence was not able to explain a significant amount of variability in overall treatment adherence ( $F[1,24] = 2.86, p = .10, R^2 = .107$ ), in SRT adherence ( $F[1,24] = .24, p = .63, R^2 = .01$ ), and in SH adherence ( $F[1,24] = 2.09, p = .16, R^2 = .08$ ). There was trend toward significance for SC adherence,  $F[1,24] = 4.23, p = .051, R^2 = .15$ , such that participants with more frequent SA usage also were more adherent.

## Discussion

The experimental inquiry on the influences of WMC and a SA manipulation on self-reported adherence to recommendations from one-session of behavioral insomnia treatment drew non-significant results. Neither the action of self-affirming nor participants' WMC positively influenced treatment adherence above a control condition. Consequently, the primary hypotheses were not supported. In addition, many of the analyses on the secondary hypotheses did not replicate findings from the previous literature or support theoretical-based explorations. The exception was the hypothesis predicting self-affirmed participants would report significantly stronger intentions to adhere to treatment recommendations than non-affirmed participants. This hypothesis was confirmed suggesting a readiness to change. The current theoretical model in the literature emphasizes that SA affects intentions to adhere through mediation of various predictors of intentions inherent in the health information message such as acceptance, response-efficacy, self-efficacy, perceived threat, etc. (Harris & Epton, 2010). Then, depending on the steadfastness and hardiness of the intentions based on these relationships, behavior change may follow (Cooke & Sheeran, 2004). Based on the present results it does not appear these higher intentions translated into greater actual adherence relative to the control group.

Despite these null findings, it is notable that this sample of participants as a whole were moderately to highly adherent of the treatments as evidenced in Table 3. Also, the severity of their insomnia was significantly reduced, albeit not clinically, after only one 90-minute session of treatment. Nonetheless there are several questions left unanswered as to why there were several null findings and how these findings could be interpreted. We will first examine the lack of predictive value of SA as well as WMC from a theoretical and methodological perspective.

There is burgeoning evidence in the literature that suggests that the present study does not represent a foundering in SA theory, but perhaps a mishap in methodology. This study joins the ranks of other studies that have also not been able to demonstrate health behavior changes amongst self-affirmed participants compared to non-affirmed participants (Harris et al., 2007; Harris & Napper, 2005; Reed & Aspinwall, 1998). Harris and Epton (2009) suggest that SA may only induce an insecure state of motivation to change that is vulnerable over time and less likely to promote sustainable health behavior change without other important ingredients such as planning for implementation. This argument and the mixed results on SA inducing health behavior change in the literature indicate the effects of SA can be highly changeable depending on how it is applied in conjunction with a health-related, treatment message. Therefore we turn to exploring how the implementation of the SA manipulation and the treatment itself may explain the null findings.

#### *Changes to the SA manipulation*

New studies, since the present study was first conceptualized, along with past literature have revealed several possible reasons why the SA manipulation used did not induce more highly adherent behavior. Here, we outline some of these reasons and suggest ways the manipulation could be changed in the future.

One aspect of the SA manipulation that may have diminished its effectiveness was its prompting of participants to gauge how their most important value has led to specific, explicit benefits, and ask them to plan how they will behave in accordance with their value in the future as was used by Shrira and Martin (2005). Research demonstrates that SA that is intrinsic in nature (i.e., focuses on how a persons' values make them feel) can reduce defensive, biased

responding to threatening information more successfully than SA that focuses on the explicit benefits of their values (Schimel et al., 2004). Although the manipulation also encouraged an intrinsic-focus while self-affirming, these added extrinsic-focused aspects of the SA task may have nullified the impact of the SA process.

The lack of significant results may also represent a problem with the use of value-affirmations in the experimental manipulation as opposed to other types of SA. Value-affirmations are a common method in the literature (McQueen & Klein, 2006). However, a recent study by Jessop et al., (2009) compared value-affirmations with kindness and trait affirmations. They found that trait affirmations were the only type of affirmation that stimulated more requests for samples of sunscreen than a control condition (i.e., a behavioral change). This study highlights the complicated nature and influence of SA on behavior. Currently, there are no studies that have attempted to replicate these findings. Consequently there is little evidence to imply that the type of affirmation has differential effects on health behavior change. However, it may be possible that value-affirmations are not as influential because they lack a subtlety argued to be needed for SA manipulations to be effective (Sherman & Cohen, 2006). A trait-oriented SA manipulation may be a valuable alternative.

Another reason the self-affirmation manipulation may have had a weak influence on this sample is it encouraged participants to recall self-affirmative thoughts about their values as a means to adhere. However, this encouragement may have actually negated an effect of SA on persuasion to adhere. Recent studies conducted by Sherman et al., (2009) indicate there is an attenuation in the influence of SA on reducing biased processing of a message about personal health risks once participants become aware of a connection between SA and persuasion. There

were a couple of main differences between this study and the present study that lessen this finding's applicability to the current study's results. One difference is Sherman et al., (2009) made participants aware of a possible influence of SA prior to delivering the health message whereas the present study made this connection post-delivery. A second difference is Sherman et al. (2009) suggested SA may influence health beliefs, whereas the present study suggested SA could be used to enhance behavior as was found to be a successful method by Charlson and colleagues (2007). Nonetheless it is probable induced awareness of the possible influence of SA on behavior may have voided its influence. Omitting this portion of the SA manipulation, thus making it more subtle in its connection to the persuasive treatment message, may be worth testing.

Another proposed change to the SA task is it could be designed to be more brief, convenient, and translatable to a clinical setting. An example of a more practical task is a brief inventory utilized by Reed and Aspinwall (1998) and Armitage, et al. (2008) that asks patients to recall whether or not they have engaged in examples of past, specific acts of kindness in a yes-or-no format. This format could be specified to ask if patients have performed behaviors consistent with commonly held values or not. Another example, described by Napper, Harris, and Epton (2009), is a 32-item inventory called the Values in Action Strengths scale that asks participants to focus on how much various thought statements reflecting strengths and values most resemble their own thoughts. This inventory is both briefer and more subtle than the present study's task, and it is yet to be tested in a health behavior change experimental paradigm.

*Changes to the control task*

In considering the present study's experimental manipulation, the control task must also be scrutinized as a factor contributing to the null findings. One possibility that may explain the non-significant main effect of group condition is the control task may have lacked equivalency to the SA manipulation since it was asking the control group to perform a task completely different from the SA manipulation (i.e., recall food and drink consumption). Poor control task equivalency has been identified as an overlooked potential flaw in the SA literature (Napper, et al., 2009). Although the timing of the manipulation was equalized across groups, the differences in the task may have been too great to allow the active component of SA to be made statistically evident in the participants' behavior.

Another potential flaw in the control task was it may have invoked mild SA. Although the manipulation check questions seem to indicate that the SA essay task was more inducing of SA than the control task, another study suggests this particular control task may prompt more thoughts about positive aspects of the self and induce less positive mood than other control tasks (Napper et al. 2009). Napper and colleagues (2009) developed an alternative brief control task found to be equal to or superior to the present study's control task in maintaining participant defensiveness and not inducing SA. This control task is matched with the 32-item Values in Action Strengths scale described earlier, but it has not been tested yet in a health behavior change experimental paradigm. Nonetheless, this control task and its matched SA task may be a valuable alternative for future studies.

#### *Changes to the structure, content, and delivery of the insomnia intervention*

There are several ways the protocol could be improved to enhance potential mediators of SA on behavior change suggested and tentatively tested in the literature. Epton and Harris (2008)

propose that SA interventions may most promote health behavior change through response and self-efficacy mediation. Therefore the health behavior message and recommendations should enhance response and self efficacy to maximize the potential benefits of SA. In their study, response efficacy, or how effective participants believed the health behavioral changes would be, mediated the influence of SA on objective fruit and vegetable consumption (Epton & Harris, 2008). Jessop et al., (2009) also showed a significant difference in response efficacy between self-affirmed and non-affirmed participants. Given the present study did not show a significant difference in response efficacy across groups, it may be the case that the treatment message was weak in content connecting how treatment recommendations could reduce risk. As a result the participants neither felt threatened nor had the need to maintain their self-integrity; hence SA had little influence. Evidence for this possibility is most well demonstrated in the high rates of acceptability of the treatment suggesting little defensiveness. However, it is notable that both groups responded with moderate to high response efficacy for both items indicating they felt the treatment would reduce their insomnia, make them feel more refreshed, and reduce their chances of developing medical and psychiatric conditions in the future.

Another possibility, is the content on the risks of untreated chronic insomnia did adequately connect how treatment recommendations could reduce risk, but the risks identified were not salient to this young adult population. Many of the risks referred to long-term chronic health conditions most often associated with the latter years of life. The protocol could have focused on risks more relevant to the context of young adulthood such as increased risk of accidents, higher rates of absenteeism from work and school, poor concentration, poor performance at work and school, depression (Roth, 2007), decreased ability to handle minor

irritations, decreased ability to enjoy family and social life, and more relationship problems (Shochat, Umphress, Israel, & Ancoli-Israel, 1999). Adding a measure of the level of personal threat the participants experienced may have been illuminating regarding this issue, particularly since it is argued that SA will fail under conditions of low and high threat (van Koningsbruggen, 2009). This may explain why the participants generally believed that the treatment would produce a beneficial response for them, yet the gravity of that response on them personally may have been low. Further evidence of this possibility can be found in the lack of a significant relationship between both items of response efficacy and self-reported adherence.

Self-efficacy, or the belief in one's ability to accomplish a task, has been proposed as a potential mediator between SA and health behavior change (Epton & Harris, 2008). It has been found to be positively correlated with health behavior change in SA paradigms (Epton & Harris, 2008; Jessop et al., 2009). In the present study, self-efficacy for following treatment recommendations immediately ( $r = .38, N = 52, p = .006$ ) and over the next few weeks ( $r = .37, N = 48, p = .011$ ) were found to be positively correlated with adherence to stimulus control instructions, but not other treatment recommendations. Therefore, it may be warranted to enhance self-efficacy messages for SRT and SH recommendations. SA has been found to moderate the effect of self-efficacy on acceptability of a health promotion message (Good & Abraham, 2011), but this was not the case in the present study. This finding further highlights the failure of the SA manipulation used.

Another way the treatment protocol could have been modified to promote adherence and enhance the possible influence of SA was to simply minimize the treatment recommendations. Behavioral sleep recommendations require a broad scope of lifestyle, physiological, and social

modifications. Asking the participants to incorporate several behavioral modifications to their sleep all at once may have been too overwhelming and nullified any potential effect of SA. SA may be most powerful when asking people with insomnia to change only a few aspects of their current sleep behaviors. The type of sleep behavior change may also moderate the effectiveness of SA as suggested by Harris and Epton (2010) and evidenced by Pietersma & Dijkstra (2011a).

#### *WMC and adherence*

WMC and each self-reported measure of adherence were not significantly correlated (all  $ps >.05$ ); therefore WMC did not predict behavioral adherence. Original hypotheses predicted participants with low WMC would most benefit from SA as strategy to promote adherence. However, the vast majority of participants in the present study proved to have average to high WMC. The distribution of WMC was both negatively skewed and leptokurtic suggesting the range of WMC in this sample was limited. This distribution is not dissimilar from normative data presented when the Aospan task was first validated (Unsworth et al., 2005). Analyses using another traditional measure of WMC (i.e., Ospan or the sum of all perfectly recalled sets) that did have a normal distribution, also resulted in null findings. In short, there was not enough variance in the present sample to moderate any possible effects of SA. Recruitment may need to expand to young adults in the community not attending an exclusive university to capture a greater range of WMC.

#### *Limitations*

Beyond the methodological shortcomings mentioned above, one of the major limitations to this study is its small sample size. There is not enough power to ascertain significant results if they are present. A power analysis using G\*Power 3 (Faul, Erdfelder, Lang & Buchner, 2007)

was conducted to determine the power of each analysis ( $1 - \beta$ ) conducted for the primary hypotheses. Effect sizes were calculated from the resulting squared multiple correlation coefficients from the hierarchical multiple regression analyses examining the main effects of SA and WMC controlling for baseline ISI and NCS on each measure of adherence. These effect sizes, along with the study's achieved sample size, and an  $\alpha$  level of .05 were used to calculate the power of each analysis (see Table 4). Then, the sample sizes needed to achieve sufficient enough power (i.e., 80%) to detect a significant omnibus test of each model were computed (see Table 4). The power analysis concluded that the smallest overall sample size to detect at least one significant finding would be 129 participants. Certainly, new recruitment strategies are needed when appealing to this population. To increase desirability of the study, it may be fruitful to apply for funding that will offer participants a small form of compensation for their efforts such as a low-value gift card to a local establishment. The study could also be inclusive of other majors and disciplines across campus.

Another limitation may have been a lack of defensiveness from the control group as they had already identified themselves as persons with sleep difficulties causing them some sort of distress or impairment. This could explain the high level of acceptance of the treatment recommendations across both conditions. However, the level of their distress about their sleep may have been minimal as 76% of the study sample had insomnia severity in the mild, sub-clinical range, 24% were in the clinical, moderate severity range, and no participants reported clinically severe insomnia. Insomnia severity status was hypothesized to moderate the effect of SA on intentions to adhere such that participants with severe insomnia would be more likely to intend to adhere. In the present study the variance of insomnia severity was not broad making it

difficult to measure its influence as a moderator. It also suggests that not only were the participants not defensive to the treatment message, a majority of them may not have been terribly distressed by their sleep difficulties which may have blunted a strong treatment adherence response between groups.

Other limitations are not accounting for other state and trait variables that may moderate or mediate the effect of self-affirmation on health behavior change. One recently identified variable is that of cognitive self-affirmation inclination, or trait-like SA. Pietersma and Dijkstra (2011b) found that participants with greater cognitive self-affirmation inclination were less affected by SA manipulations' influence on acceptability and persuasiveness of a health message. It may be possible that the present study had a disproportionate amount of participants with high levels of trait-like SA, and thus were less likely to be affected by the SA manipulation. In Harris and Epton (2010), they outline several other potential moderators of SA on responsiveness to threatening health information such as trait self-esteem, regulatory focus, threat orientation, and behavioral approach/avoidance, among others. Other relevant variables are those established in the behavioral sleep medicine literature as predictors of adherence to behavioral treatment for insomnia. Specifically, pre-treatment sleepiness, perceived barriers to treatment such as annoyance and boredom (Vincent, Lewycky & Finnegan, 2008), psychiatric symptoms, and dysfunctional thoughts and beliefs that interfere with sleep (Siebern & Manber, 2011) have been found to significantly influence adherence. The inclusion of instruments meant to measure these variables may have revealed more nuances in the study's null findings, but to decrease participant burden and to focus the study design, they were not included.

*Future research*

Future research ought to examine the effects of the changes suggested earlier with this population. The sustainable efficacy of a SA paradigm used to promote treatment adherence and actual behavioral change is yet to be realized. Experimentation with variations in these paradigms is needed prior to translation to a clinical setting for an effectiveness trial. These investigations should focus on examining potential mediators between SA, intentions to change, and health behavior change as there has been little research (Harris & Epton, 2010). Intentions to change and actual durable health behavior change are distal variables likely to have multiple predictors across various contexts. SA as a moderator variable between predictors of health behavior change and adherence should also be addressed. There are predictors established in many health behavior models that are yet to be thoroughly analyzed in a SA paradigm such as attitudinal variables from the Theory of Planned Behavior (Ajzen, 1991), perceptions of threat and self-efficacy from the Protection Motivation Theory (Rogers, 1983), or measures of constructs related to the Information-Motivation-Behavioral Skills Model (Fisher & Fisher, 1992; Fisher et al., 1996). These investigations could be quite clinically informative and ultimately lead to brief persuasive health interventions that reduce the public health burden of insomnia amongst other medical and psychiatric conditions.

## References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211.
- American Academy of Sleep Medicine (AASM). The International Classification of Sleep Disorders & Diagnostic & Coding Manual. 2nd ed. Westchester, Ill: AASM; 2005.
- Armitage, C. J., Harris, P. R., Hepton, G., & Napper L. (2008). Self-affirmation increases acceptance of health-risk information among UK adult smokers with low socioeconomic status. *Psychology of Addictive Behaviors*, *22*, 88-95.
- Aronson, J., Blanton, H., & Cooper, J. (1995). From dissonance to disidentification: Selectivity in the self-affirmation process. *Journal of Personality and Social Psychology*, *68*, 986-996.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182.
- Barrett, L. F., Tugade, M. M., & Engle, R. W. (2004). Individual differences in working memory capacity and dual process theories of mind. *Psychological Bulletin*, *130*, 553-573.
- Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the insomnia severity index as an outcome measure for insomnia research. *Sleep Medicine*, *2*, 297-307.
- Baumeister, R. F. (1996). Self-regulation and ego threat: Motivated cognition, self-deception, and destruction in goal setting. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 27-47). New York: Guilford.
- Berlant, N. E., & Pruitt, S. D. (2003). Adherence to medical recommendations. In L. M. Cohen, D. E. McChargue, & F. L. Collins, Jr. (Eds.), *The health psychology handbook: Practical issues for the behavioral medicine specialist* (pp. 208-224). Thousand Oaks, CA: Sage Publications, Inc.
- Blais, F., Gendron, L., Mimeault, V., & Morin, C. M. (1997). Evaluation de l'insomnie: validation de trois questionnaires. *L'Ence'phale*, *23*, 247-453.
- Blanton, H., Cooper, J., Skurnik, I., & Aronson, J. (1997). When bad things happen to good feedback: Exacerbating the need for self-justification with self-affirmations. *Personality and Social Psychology Bulletin*, *23*, 684-692.
- Bootzin, R. R., Epstein, D., & Ward, J. M. (1991). Stimulus control instructions. In Hauri, P., ed. *Case studies in insomnia* (pp. 19-28). New York, NY, Plenum Press.

- Bouchard, S., Bastien, C., & Morin, C. M. (2003). Self-efficacy and adherence to cognitive-behavioral treatment of insomnia. *Behavioral Sleep Medicine, 1*, 187-199.
- Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology, 42*, 116-131.
- Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment, 48*, 306-307.
- Charlson, M. E., Boutin-Foster, C., Mancuso, C. A., Peterson, J. C., Ogedegbe, G., Briggs, W. M., Robbins, L., Isen, A. M., & Allegrante, J. P. (2007). Randomized controlled trials of positive affect and self affirmation to facilitate healthy behaviors in patients with cardiopulmonary diseases: Rationale, trial design, and methods. *Contemporary Clinical Trials, 28*, 748-762.
- Cialdini, R. B., Trost, M. R., Newsom, J. T. (1995). Preference for consistency: The development of a valid measure and the discovery of surprising behavioral implications. *Journal of Personality and Social Psychology, 69*, 318-328.
- Cohen, A. T. (1957). Need for cognition and order of communication as determinants of opinion change. In C.I. Hovland (Ed.), *The order of presentation and persuasion*. New Haven: Yale University Press.
- Cohen, G. L., Aronson, J., & Steele, C. M. (2000). When beliefs yield to evidence: Reducing biased evaluation by affirming the self. *Personality and Social Psychology Bulletin, 26*, 1151-1164.
- Cohen J. *Statistical power analysis for the behavioral sciences, 2nd ed.* Hillsdale, NJ: Lawrence Earlbaum Associates, 1988.
- Conway, A. R. A., Cowan, N., Bunting, M. F., Therriault, D. J., & Minkoff, S. R. B. (2002). A latent variable analysis of working memory capacity, short-term memory capacity, processing speed, and general fluid intelligence. *Intelligence, 30*, 163-184.
- Conway, A. R. A., Kane, M. J., Bunting, M. F., Hambrick, D. Z., Wilhelm, O., & Engle, R. E. (2005). Working memory span tasks: A methodological review and user's guide. *Psychonomic Bulletin & Review, 12*, 769-786.
- Cooke, R., & Sheeran, P. (2004). Moderation of cognition-intention and cognition-behaviour relations: A meta-analysis of properties of variables from the theory of planned behaviour. *British Journal of Social Psychology, 43*, 159-186.

- Correll, J., Spencer, S. J., & Zanna, M. P. (2004). An affirmed self and an open mind: Self affirmation and sensitivity to argument strength. *Journal of Experimental Social Psychology, 40*, 350-356.
- Dillard, A. J., McCaul, K. D., & Magnan, R. E. (2005). Why is such a smart person like you smoking? Using self-affirmation to reduce defensiveness to cigarette warning labels. *Journal of Biobehavioral Research, 10*, 165-182.
- DiMatteo, R. M. (2004). Variations in patients' adherence to medical recommendations: A quantitative review of 50 years of research. *Medical Care, 42*, 200-209.
- DiMatteo, R. M., Giordani, P. J., Lepper, H. S., & Croghan, T. W. (2002). Patient adherence and medical treatment outcomes: A meta-analysis. *Medical Care, 40*, 794-811.
- Edinger J. D., & Means M. K. (2005). Cognitive-behavioral therapy for primary insomnia. *Clinical Psychology Review, 25*, 539-558.
- Engle, R. W., Cantor, J., & Carullo, J. J. (1992). Individual differences in working memory for comprehension: A test of four hypotheses. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18*, 972-992.
- Engle, R. W., Tuholski, S. W., Laughlin, J. E., & Conway, A. R. A. (1999). Working memory, short-term memory, and general fluid intelligence: A latent-variable approach. *Journal of Experimental Psychology: General, 128*, 309-331.
- Epton, T., & Harris, P. R. (2008). Self-affirmation promotes health behavior change. *Health Psychology, 27*, 746-752.
- Faul, F., Erdfelder, E., Lang, A.-G. & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavioral Research Method, 39*, 175-191.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.
- Ford D. E., & Kamerow D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders: an opportunity for prevention. *Journal of the American Medical Association, 262*, 1479-1484.
- Godet-Cayré, V., Pelletier-Fleury, N., Le Vaillant, M., Dinét, J., Massuel, M., & Léger, D. (2006). Insomnia and absenteeism at work. Who pays the cost? *Sleep, 29*, 179-184.

- Good, A., & Abraham, C. (2011). Can the effectiveness of health promotion campaigns be improved using self-efficacy and self-affirmation interventions? An analysis of sun protection messages. *Psychology & Health*, doi 10.1080/08870446.2010.495157
- Guadagno, R. E., Asher, T., Demaine, L. J., & Cialdini, R. B. (2001). When saying yes leads to saying no: Preference for consistency and the reverse foot-in-the-door effect. *Personality and Social Psychology Bulletin*, 27, 859-867.
- Fisher, J. D., & Fisher, W. A., (1992). Changing AIDS-risk behavior. *Psychological Bulletin*, 111, 455-474.
- Fisher, J. D., Fisher, W. A., Miscovich, S. J., Kimble, D. L., & Malloy, T. E. (1996). Changing AIDS risk behavior: Effects of an intervention emphasizing AIDS risk reduction information, motivation, and behavioral skills in a college student population. *Health Psychology*, 15, 114-123.
- Harber, K. (1995). Sources of Validation Scale. Unpublished scale.
- Harris, P. R., & Epton, T. (2009). The impact of self-affirmation on health cognition, health behaviour, and other health-related responses: A narrative review. *Social and Personality Psychology Compass* 3, 962-978.
- Harris, P. R., & Epton, T. (2010). The impact of self-affirmation on health-related cognition and health behaviour: Issues and prospects. *Social and Personality Psychology Compass* 4, 439-454.
- Harris, P. R., Mayle, K., Mabbott, L., & Napper, L. (2007). Self-affirmation reduces smokers' defensiveness to graphic on-pack cigarette warning labels. *Health Psychology*, 26, 437-446.
- Harris, P. R., & Napper, L. (2005). Self-affirmation and the biased processing of threatening health-risk information. *Personality and Social Psychology Bulletin*, 31, 1250-1263.
- Haugtvedt, C. P., & Petty, R. E. (1992). Personality and persuasion: Need for cognition moderates the persistence and resistance of attitude changes. *Journal of Personality and Social Psychology*, 63, 308-319.
- Haynes, R. B., Montague, P., Oliver T., McKibbin, K. A., Brouwers, M. C., & Kanani, R. (2002). Interventions for helping patients to follow prescriptions for medications. *Cochrane Database of Systematic Reviews*, 2.
- Hoshino-Browne, E., Zanna, A. S., Spencer, S. J., & Zanna, M. P. (2004). Investigating attitudes cross-culturally: A case of cognitive dissonance among East Asians and North Americans.

In G. Haddock & G. R. Maio (Eds.), *Contemporary perspectives on the psychology of attitudes* (pp. 375-397). New York: Psychology Press.

- Insel, K., Morrow, D., Brewer, B., & Figueredo, A. (2006). Executive function, working memory, and medication adherence among older adults. *Journal of Gerontology: Psychological Science*, 61B, P102-P107.
- Jessop, D. C., Simmonds, L. V., Sparks, P. (2009). Motivational and behavioural consequences of self affirmation interventions: A study of sunscreen use among women. *Psychology & Health*, 24, 529-544.
- van Koningsbruggen, G. M. (2009). Processing and acceptance of threatening health information. Unpublished PhD thesis, Free University of Amsterdam.
- Koole, S. L., & van Knippenberg, A. (2007). Controlling your mind without ironic consequences: Self-affirmation eliminates rebound effects after thought suppression. *Journal of Experimental Social Psychology*, 43, 671-677.
- Kyllonen, P. C., & Christal, R. E. (1990). Reasoning ability is (little more than) working-memory capacity? *Intelligence*, 14, 389-433.
- Le'ger, D., Guilleminault, C., Dreyfrus, J. P., Delahaye, C., & Paillard, M. (2000). Prevalence of insomnia in a survey of 12 778 adults in France. *Journal of Sleep Research*, 9, 35-42.
- 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., & Morin, C. M. (2000). *Treatment of late-life insomnia*. Thousand Oaks, CA: Sage Publications.
- Lichstein, K. L., Stone, K. C., Donaldson, J., Nau, S. D., Soeffing, J. P., Murray, D., Lester, K. W., & Aguillard, R. N. (2006). Actigraphy validation with insomnia. *Sleep*, 29, 232-239.
- Liu, T. J., & Steele, C. M. (1986). Attributional analysis as self-affirmation. *Journal of Personality and Social Psychology*, 51, 531-540.
- Martens, A., Johns, M., Greenberg, J., & Schimel, J. (2006). Combating stereotype threat: The effect of self-affirmation on women's intellectual performance. *Journal of Experimental Social Psychology*, 42, 236-243.
- McQueen, A., & Klein, W. M. P. (2006). Experimental manipulations of self-affirmation: A systematic review. *Self & Identity*, 5, 289-354.

- Morgenthaler, T., Kramer, M., Alessi, C., Friedman, L., Boehlecke, B., Brown, T., et al. (2006). Practice parameters for the psychological and behavioral treatment of insomnia: An update. An American Academy of Sleep Medicine report. *Sleep*, 29, 1415-1419.
- Morin, C. M. (1993). *Insomnia: psychological assessment and management*. New York: Guilford Press.
- Morin, C. M., LeBlanc, M., Daley, M., Gregoire, J. P., & Mérette C. (2006). Epidemiology of insomnia: Prevalence, self-help treatments, consultations, and determinants of help-seeking behaviors. *Sleep Medicine*, 7, 123-130.
- Nail, P. R., Correll, J. S., Drake C. E., Glenn, S. B., Scott, G. M., & Stuckey, C. (2001). A validation study of the preference for consistency scale. *Personality and Individual Differences*, 31, 1193-1202.
- Napper, L., Harris, P. R., & Epton, T. (2009). Developing and testing a self-affirmation manipulation. *Self and Identity*, 8, 45-62.
- National Center for Sleep Disorders Research. (2003). *National sleep disorders research plan*. (NIH publication No.03-5209). Washington, DC: U.S. Department of Health and Human Services.
- National Heart, Lung, and Blood Institute. (1998). *Behavioral research in cardiovascular, lung, and blood health and disease*. Washington, DC: U.S. Department of Health and Human Services.
- National Institutes of Health (2007). Effects of sleep disorders and sleep restriction on adherence to cardiovascular and other disease treatment regimens: Research needs. *Behavioral Sleep Medicine*, 5, 83-87.
- Ogedegbe, G. O., Boutin-Foster, C., Wells, M. T., Allegrante, J. P., Jobe, J. B., & Charlson, M. E. (2008). Abstract 5131: The healthy habits trials: Positive affect induction improves medication adherence in hypertensive African Americans. *Circulation*, 118, S1148.
- Ohayon, M. M. (2002). Epidemiology of insomnia: What we know and what we still need to learn. *Sleep Medicine Reviews*, 6, 97-111.
- Perlis, M.L., Jungquist, C., Smith, M.T., & Posner, D. (2005). *Cognitive behavioral treatment of insomnia: A session-by-session guide*. New York: Springer Science+Business Media, Inc.
- Perlis, M. L., Smith, M. T., Orff, H., Enright, T., Nowakowski, S., Jungquist, C., & Plotkin, K. (2004). The effects of modafinil and cognitive behavior therapy on sleep continuity in

patients with primary insomnia. *Sleep*, 27, 15-25.

Pieters, R. G. M., & Verplanken, B. (1995). Intention-behavior consistency: Effects of consideration set size, involvement and need for cognition. *European Journal of Social Psychology*, 25, 531-543.

Pietersma, S., & Dijkstra, A. (2011a). Do behavioural health intentions engender health behaviour change? A study on the moderating role of self-affirmation on actual fruit intake versus vegetable intake. *British Journal of Health Psychology*, 16: no. doi: 10.1111/j.2044-8287.2011.02018.x

Pietersma, S., & Dijkstra, A. (2011b). Cognitive self-affirmation inclination: An individual difference in dealing with self-threats. *British Journal of Social Psychology*, 50: no. doi: 10.1348/014466610X533768

Reed, M. B., & Aspinwall, L. G. (1998). Self-affirmation reduces biased processing of health-risk information. *Motivation & Emotion*, 22, 99-131.

Riedel, B. W., & Lichstein, K. L. (2001). Strategies for evaluating adherence to sleep restriction treatment for insomnia. *Behavior Research and Therapy*, 39, 201-212.

Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In J. Cacioppo & R. Petty (Eds.), *Social psychophysiology*. New York: Guilford.

Roth, T. (2007). Insomnia: Definition, prevalence, etiology, and consequences. *Journal of Clinical Sleep Medicine*, 3, S7-S10.

Roth, T., Zammit, G., Kushida, C., Doghramji, K., Mathias, S. D., Wong, J. M., & Buysse, D. J. (2002). A new questionnaire to detect sleep disorders. *Sleep Medicine*, 3, 99-108.

Ruiter, R. A. C., Verplanken, B., Kok, G., & Verrij, M. Q. (2003). The role of coping appraisal in reactions to fear appeals: Do we need threat information?. *Journal of Health Psychology*, 8, 465-174.

Savard, M.H., Savard, J., Simard, S., & Ivers, H. (2005). Empirical validation of the insomnia severity index in cancer patients. *Psychooncology*, 14, 429-441.

Schimmel, J., Arndt, J., Banko, K. M., & Cook, A. (2004). Not all self-affirmations were created equal: The cognitive and social benefit of affirming the intrinsic (vs. extrinsic) self. *Social Cognition*, 22, 75-99.

- Schmader, T., & Johns, M. (2003). Converging evidence that stereotype threat reduces working memory capacity. *Journal of Personality and Social Psychology, 85*, 440-452.
- Schrock, J. C., Unsworth, N., & Heitz, R. (2003). AutomaticOspan [Computer program]. Atlanta, GA: Georgia Institute of Technology.
- Sexton-Radek, K., & Overton, S. (1996). Practical treatment considerations: Compliance with sleep restriction treatment in a nondisordered sample of sleepers. *Psychotherapy in Private Practice, 15*, 1-13.
- Sherman, D. K., & Cohen, G. L. (2006). The psychology of self-defense: Self-affirmation theory. *Advances in Experimental Social Psychology, 38*, 183-242.
- Sherman, D. K., Cohen, G. L., Nelson, L. D., Nussbaum, A. D., Bunyan, D. P., & Garcia, J. (2009). Affirmed yet unaware: Exploring the role of awareness in the process of self-affirmation. *Journal of Personality and Social Psychology, 97*, 745-764.
- Sherman, D. K., Nelson, L. D., & Steele, C. M. (2000). Do messages about health risks threaten the self? Increasing the acceptance of threatening health messages via self-affirmation. *Personality and Social Psychology Bulletin, 26*, 1046-1058.
- Shochat, T., Umphress, J., Israel, A. G., & Ancoli-Israel, S. (1999). Insomnia in primary care patients. *Sleep, 22*, S359-65.
- Shrira, I., & Martin, L. L. (2005). Stereotyping, self-affirmation, and the cerebral hemispheres. *Personality and Social Psychology Bulletin, 31*, 846-856.
- Siebern, A. T., & Manber, R. (2011). New developments in cognitive-behavioral therapy as the first-line treatment of insomnia. *Psychology Research and Behavior Management, 4*, 21-28.
- Siegel, P. A., Scillitoe, J., & Parks-Yancy, R. (2005). Reducing the tendency to self-handicap: The effect of self-affirmation. *Journal of Experimental Social Psychology, 41*, 589-597.
- Smith, E. R., & DeCoster, J. (2000). Dual-process models in social and cognitive psychology: Conceptual integration and links to underlying memory systems. *Personality and Social Psychology Review, 4*, 108-131.
- Smith, M. T., & Perlis, M. (2006). Who is a candidate for cognitive-behavioral therapy for insomnia? *Health Psychology, 25*, 15-19.
- Spielman, A. J., Saskin, P., & Thorpy, M. J. (1987). Treatment of chronic insomnia by restriction of time in bed. *Sleep, 10*, 45-56.

- Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. *Advances in experimental social psychology, 21*, 261-302.
- Steele, C. M., & Liu, T. J. (1983). Dissonance processes as self-affirmation. *Journal of Personality and Social Psychology, 45*, 5-19.
- Stone, J., & Cooper, J. (2003). The effect of self-attribute relevance on how self-esteem moderates attitude change in dissonance processes. *Journal of Experimental Social Psychology, 39*, 508-515.
- Unsworth, N., Heitz, R. P., Schrock, J. C., & Engle, R. W. (2005). An automated version of the operation span task. *Behavioral Research Methods, 37*, 498-505.
- Vincent, N., Lewycky, S., & Finnegan, H. (2008). Barriers to engagement in sleep restriction and stimulus control in chronic insomnia. *Journal of Consulting and Clinical Psychology, 76*, 820-828.
- Walsh, J. K., & Engelhart, C. L. (1999). The direct economic costs of insomnia in the U.S. for 1995. *Sleep, 22*, S386-93.
- Wicker, A. W. (1969). Attitude versus actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues, 25*, 41-78.

Table 1. Pilot study effect sizes for post-manipulation scores

Effect Sizes: Cohen's <i>d</i>	
Question 1, post-manipulation	0.46
Question 2, post-manipulation	0.57
Question 3, post-manipulation	1.10

Table 2. Participant demographics

	Whole sample	Self-affirmation condition	Control condition			
	( <i>N</i> = 54)	( <i>n</i> = 28) <sup>1</sup>	( <i>n</i> = 26) <sup>1</sup>	$\chi^2$	df	<i>p</i>
Gender (females/males)	47/7	23/5	24/2	1.29	1	0.26
Ethnicity (CA/Other <sup>2</sup> )	40/14	21/7	19/7	0.06	1	0.85
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>t</i>	df	<i>p</i>
Age	19.3 (3.2)	19.5 (4.0)	19.1 (2.0)	-0.44	52	0.66
Perceived Health Status	1.4 (.8)	1.3 (.7)	1.5 (.9)	0.80	52	0.43
Baseline ISI	12.4 (3.4)	11.4 (2.8)	13.5 (3.6)	2.42	46.7	0.02*
Insomnia duration (in months)	20.3 (70.8)	28.0 (99.0)	12.5 (17.5)	-0.78	50	0.44
PCS total score	107.4(20.1)	105.5(21.4)	109.5(18.8)	0.73	52	0.47
NCS total score	56.4(12.1)	56.7 (11.0)	56.0 (13.4)	-0.20	52	0.84
Bed Partner	.63 (.88)	.57 (.92)	.69 (.84)	0.51	52	0.61
Self-Efficacy (immediate)	6.3 (1.8)	6.6 (1.9)	5.9 (1.7)	-1.49	52	0.14
Response-Efficacy (medical/psychiatric)	6.6 (1.8)	6.6 (1.8)	6.6 (1.8)	-0.06	52	0.95
	<i>M</i> ( <i>SD</i> )	<i>Mdn</i>	<i>Mdn</i>	<i>U</i>	<i>Z</i>	<i>p</i>
WMC <sup>3</sup>	60.7 (12.6) <sup>4</sup>	66.5	64.5	209.0	-1.63	0.10
Self-Efficacy <sup>3</sup> (next few weeks)	6.9 (1.5)	7.0	7.0	308.5	-0.99	0.32
Response-Efficacy <sup>3</sup> (relief/refreshed)	7.0 (1.2)	7.0	7.0	327.5	-0.65	0.52

<sup>1</sup> For Insomnia Duration the whole sample *N* was 52; the *n* for the self-affirmation group was 26.

<sup>2</sup> CA refers to Caucasian-Americans; Other refers to all other ethnic groups (9 African-Americans, 1 Hispanic-Latino, 3 Biracial, and 1 Other).

<sup>3</sup> These three items were not normally distributed so Mann-Whitney U tests were performed and medians were calculated.

<sup>4</sup> For WMC the whole sample *N* was 48.

\* *p* < .05

Table 3. Levels of adherence across and between groups.<sup>a</sup>

	Whole Sample ( <i>N</i> = 54)	Self Affirmation Condition ( <i>n</i> = 28)	Control Condition ( <i>n</i> = 26)	<i>F</i>	df	<i>p</i>
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SE</i> )	<i>M</i> ( <i>SE</i> )			
Composite Adherence Index	0 (.74)	.08 (.15)	-.08 (.15)	0.60	1, 51	0.44
SRT Adherence	54 (29)	51.2 (5.6)	57.2 (5.8)	0.53	1, 51	0.47
SC Adherence	.77 (.11)	.77 (.02)	.76 (.02)	0.12	1, 51	0.74
SH Adherence	.86 (.13)	.87 (.03)	.84 (.03)	0.46	1, 51	0.50

<sup>a</sup> Controlling for baseline insomnia severity

Note. SRT = sleep restriction therapy; SC = stimulus control; SH = sleep hygiene; *M* = estimated marginal mean; *SE* = standard error

For the composite adherence index, positive values indicate values greater than the mean; the more positive the value the greater the adherence.

For SRT adherence, the marginal means represent the number of minutes discrepant from recommended bedtimes and wake times

For SC and SH adherence, the marginal means represent proportions of treatment recommendations followed ranging from 0 to 1; values closer to 1 indicate greater compliance.

Table 4. Effect sizes from the primary hypotheses and sample sizes to achieve power.

---

	$f^2$	Projected $N$
Composite Adherence Index	0.26	169
SRT Adherence	0.27	159
SC Adherence	0.33	129
SH Adherence	0.32	132

---

Appendices

Appendix A

ID# \_\_\_\_\_

Date \_\_\_\_\_

**Background Questionnaire**

**Age:** \_\_\_\_\_

**Gender (please check one):**

Female       Male       Other, please explain

**Ethnicity:**

- \_\_\_\_\_
- Black or African-American
  - Caucasian-American
  - Asian-American
  - Hispanic or Latino-American
  - American Indian or Native American
  - Hawaiian or Pacific Islander
  - Unknown
  - Other: \_\_\_\_\_

ID# \_\_\_\_\_

Date \_\_\_\_\_

### Baseline Questionnaire

In general, how do you feel about yourself? (please circle one)

*extremely negative*

*neutral*

*extremely positive*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7 - - - - - 8 - - - - - 9

2. In general, how meaningful do you find writing exercises? (please circle one)

*not at all*

*very much*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7

3. How much would you agree that you are aware of what you value and think of as most personally important to you? (please circle one)

*strongly disagree*

*strongly agree*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7

ID# \_\_\_\_\_

Date \_\_\_\_\_

### Post-Writing Exercise Questionnaire

Please answer the following questions about how you are feeling *at this moment*:

1. In general, how do you feel about yourself? (please circle one)

*extremely negative*

*neutral*

*extremely positive*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7 - - - - - 8 - - - - - 9

2. How meaningful did you find the writing exercise? (please circle one)

*not at all*

*very much*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7

3. How much would you agree that the exercise made you more aware of what you value and think of as most personally important to you? (please circle one)

*strongly disagree*

*strongly agree*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7

## Appendix B

### Sources of Validation Scale

#### RANKING OF PERSONAL CHARACTERISTICS AND VALUES

Below is a list of characteristics and values, some of which maybe important to you, some of which may be unimportant. Please rank these values and qualities in order of their importance to you, from 1 to 11 (1 = *most important item*, 11 = *least important item*). Use each number only once.

\_\_\_\_\_ Artistic skills/aesthetic appreciation

\_\_\_\_\_ Sense of humor

\_\_\_\_\_ Relations with friends/family

\_\_\_\_\_ Spontaneity/living life in the moment

\_\_\_\_\_ Social skills

\_\_\_\_\_ Athletics

\_\_\_\_\_ Musical ability/appreciation

\_\_\_\_\_ Physical attractiveness

\_\_\_\_\_ Creativity

\_\_\_\_\_ Business/managerial skills

\_\_\_\_\_ Romantic values

SOURCE: K. Harber (1995).

Once you have completed the scale, please wait for the examiner to give you further instructions.

You have ten minutes to write a short essay about your top-ranked value/quality. Please write about why this value/quality is important to you. Describe a time when it was particularly important to you. Be specific.

## Appendix C

### **Personal Recall Exercise**

Please write down all the foods, drinks and cigarettes you consumed in the last 48 hours. Be sure to also include the quantity and the time of day you consumed each item. Do not worry about those things you find yourself unable to remember. You have ten minutes to complete this exercise.

Appendix D

ID# \_\_\_\_\_

Date \_\_\_\_\_

**Baseline Questionnaire**

1. In general, how do you feel about yourself? (please circle one)

*extremely negative*

*neutral*

*very positive*

*extremely enthusiastic*

1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7 - - - - 8 - - - - 9

2. In general, how personally meaningful do you find writing exercises? (please circle one)

*not at all*

*very much*

1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7

3. How much would you agree that you are fully aware of what you value and think of as most personally important to you? (please circle one)

*strongly disagree*

*strongly agree*

1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7



## Appendix E

You have ten minutes to write a short essay about your top-ranked value/quality. Please write about why this value/quality is important to you and how it makes you feel good about yourself. In addition, describe a time when it was particularly important to you, and how you plan to act consistently with this value in the future. Be specific.

Appendix F

**Insomnia Severity Index (ISI)**

**ID:** \_\_\_\_\_ **Date:** \_\_\_\_\_

1. Please rate the current (i.e., last 2 weeks) **SEVERITY** of your insomnia problem(s).

None Mild Moderate Severe

---

Very

a) Difficulty falling asleep:	0	1	2	3	4
b) Difficulty staying asleep:	0	1	2	3	4
c) Problem waking up too early:	0	1	2	3	4

2. How satisfied/dissatisfied are you with your current sleep pattern?

<u>Very Satisfied</u>	Satisfied	Neutral	Dissatisfied	<u>Very Dissatisfied</u>
0	1	2	3	4

3. To what extent do you consider your sleep problem to interfere with your daily functioning (e.g. daytime fatigue, ability to function at work/daily chores, concentration, memory, mood, etc.).

Not at all Interfering	A Little	Somewhat Interfering	Much	Very Much Interfering
0	1	2	3	4

4. How noticeable to others do you think your sleeping problem is in terms of impairing the quality of your life?

Not at all Noticeable	A little	Somewhat	Much	Very Much Noticeable
0	1	2	3	4

5. How worried/distressed are you about your current sleep problem?

Not at all Worried	A Little	Somewhat	Much	Very Much Worried
0	1	2	3	4

© Morin, C.M. (1993)

## Appendix G

### GLOBAL SLEEP ASSESSMENT QUESTIONNAIRE

Patient Initials: _____ Date: ___/___/___	Employment Status: <input type="checkbox"/> Day shift <input type="checkbox"/> Night shift <input type="checkbox"/> Rotating shift
Age: _____ Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	<input type="checkbox"/> Retired <input type="checkbox"/> Unemployed <input type="checkbox"/> Employed Full-time
Height: _____ Weight: _____	<input type="checkbox"/> Employed Part-time <input type="checkbox"/> Homemaker (Please check all that apply.)
Over the past month, have you had a major or stressful event that you feel affected your sleep? If so, please describe: _____	

**INSTRUCTIONS:** Please answer the questions below by writing on the line provided or by checking the box that best describes you. Please select only one answer for each question.

During the **PAST 4 WEEKS**, how often . . .

- (Check one box on each line.)
- |  |  |
|--|--|
| 1. Did you have difficulty falling asleep, staying asleep, or feeling poorly rested in the morning?          | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 2. Did you fall asleep unintentionally or have to fight to stay awake during the day?                        | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 3. Did sleep difficulties or daytime sleepiness interfere with your daily activities?                        | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 4. Did work or other activities prevent you from getting enough sleep?                                       | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 5. Did you snore loudly?   | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 6. Did you hold your breath, have breathing pauses, or stop breathing in your sleep?                         | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 7. Did you have restless or "crawling" feelings in your legs at night that went away if you moved your legs? | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 8. Did you have repeated rhythmic leg jerks or leg twitches during your sleep?                               | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 9. Did you have nightmares, or did you scream, walk, punch, or kick in your sleep?                           | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| 10. Did the following things disturb your sleep:   |  |
| a. Pain .....  | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| b. Other physical problems.....  | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| c. Worries .....   | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| d. Medications .....   | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| e. Other: .....  | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |
| (Please specify)   |  |
| 11. Did you feel sad or anxious?   | <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Usually <input type="checkbox"/> Always |

©Pharmacia Corporation 2001 All Rights Reserved  
This questionnaire was developed through a grant from Pharmacia Corporation

Appendix H

**Background Questionnaire**

**Age:** \_\_\_\_\_

**Gender (please check one):**

Female       Male       Other, please explain

**Ethnicity:**

- Black or African-American
- Caucasian-American
- Asian-American
- Hispanic or Latino-American
- American Indian or Native American
- Hawaiian or Pacific Islander
- Unknown
- Other(i.e. Mixed), Please describe: \_\_\_\_\_

**Do you have any disabilities that severely restrict your mobility?**

- Yes  No

**In general, would you say your health is:**

- Excellent  Very Good  Good  Fair  Poor

**How much does your health limit your ability to participate in regular daily activities?**

- None  
 Mildly limited  
 Moderately limited  
 Severely limited

**Have ever you been or are currently diagnosed with any of the following conditions: bipolar disorder, epilepsy, orthostatic hypotension, or a parasomnia?**

- Yes  No

**Do you currently have any severe, unstable medical conditions?**

- Yes  No

**Have you ever been diagnosed with a mental disorder? (If you answered yes, then complete the next two questions)**

- Yes  No

**If so, are you currently being treated for this disorder by a mental health professional (i.e., psychiatrist, psychologist, counselor, therapist, etc.)**

- Yes  No

**During the past 4 weeks, how much of the time did your mental disorder interfere with your social, occupational, school, or any other important activities?**

- All of the time  
 Most of the time  
 Some of the time  
 A little of the time  
 None of the time

**During the past 4 weeks:**

1. Did you have difficulty falling asleep, staying asleep, waking up too early, or feeling poorly rested in the morning? Never Sometimes Usually Always

2. How many nights per week, on average, did you have these kinds of difficulties sleeping?

\_\_\_\_\_

3. Did you have trouble sleeping despite having adequate opportunity and circumstances to sleep? Never Sometimes Usually Always

4. How often did you sleep in bed with another person or pet with you?

Never Sometimes Usually Always

Please check as many of the following forms of daytime impairment related to your nighttime sleep difficulty that apply to you:

- fatigue/malaise
- attention, concentration, or memory impairment
- social/vocational dysfunction or poor school performance
- mood disturbance/irritability
- daytime sleepiness
- motivation/energy/initiative reduction
- proneness for errors/accidents at work or while driving
- tension headaches, and/or gastrointestinal symptoms in response to sleep loss
- concerns or worries about sleep

How long have you had difficulty sleeping (in months)? \_\_\_\_\_

## Appendix I

### Need for Cognition Scale (from Cacioppo, Petty, & Kao, 1984)

For each of the statements below, please indicate whether or not the statement is characteristic of you or of what you believe. For example, if the statement is extremely uncharacteristic of you or of what you believe about yourself (not at all like you) please place a "1" on the line to the left of the statement. If the statement is extremely characteristic of you or of what you believe about yourself (very much like you) please place a "5" on the line to the left of the statement. You should use the following scale as you rate each of the statements below.

1 extremely uncharacteristic of me	2 somewhat uncharacteristic of me	3 uncertain	4 somewhat characteristic of me	5 extremely characteristic of me
---	--	----------------	--	---

1. ____	I prefer complex to simple problems.
2. ____	I like to have the responsibility of handling a situation that requires a lot of thinking.
3. ____	Thinking is not my idea of fun.**
4. ____	I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.**
5. ____	I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something.**
6. ____	I find satisfaction in deliberating hard and for long hours.
7. ____	I only think as hard as I have to.**
8. ____	I prefer to think about small daily projects to long term ones.**
9. ____	I like tasks that require little thought once I've learned them.**
10. ____	The idea of relying on thought to make my way to the top appeals to me.
11. ____	I really enjoy a task that involves coming up with new solutions to problems.
12. ____	Learning new ways to think doesn't excite me very much.**
13. ____	I prefer my life to be filled with puzzles I must solve.
14. ____	The notion of thinking abstractly is appealing to me.
15. ____	I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
16. ____	I feel relief rather than satisfaction after completing a task that requires a lot of mental effort.**
17. ____	It's enough for me that something gets the job done; I don't care how or why it works.**
18. ____	I usually end up deliberating about issues even when they do not affect me personally.

Note: \*\*=reverse scored item.

## Appendix J

### Preference for Consistency Scale

In front of each item below, please type the number: 1 if you strongly disagree, 2 if you disagree, 3 if you somewhat disagree, 4 if you slightly disagree, 5 if you neither agree nor disagree, 6 if you slightly agree, 7 if you somewhat agree, 8 if you agree, or 9 if you strongly agree. Please answer each question as honestly and accurately as you can, but don't spend too much time thinking about each answer.

	strongly disagree			neither agree nor disagree			strongly agree		
	1	2	3	4	5	6	7	8	9
1. I prefer to be around people whose reactions I can anticipate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. It is important to me that my actions are consistent with my beliefs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Even if my attitudes and actions seemed consistent with one another to me, it would bother me if they did not seem consistent in the eyes of others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. It is important to me that those who know me can predict what I will do.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I want to be described by others as a stable, predictable person.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Admirable people are consistent and predictable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The appearance of consistency is an important part of the image I present to the world.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. It bothers me when someone I depend upon is unpredictable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I don't like to appear as if I am inconsistent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I get uncomfortable when I find my behavior contradicts my beliefs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. An important requirement for any friend of mine is personal consistency.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I typically prefer to do things the same way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I dislike people who are constantly changing their opinion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. I want my close friends to be predictable.
15. It is important to me that others view me as a stable person.
16. I make an effort to appear consistent to others.
17. I'm uncomfortable holding two beliefs that are inconsistent.
18. It doesn't bother me much if my actions are inconsistent

Source: Cialdini, R. B., Trost, M. R., & Newsom, J. T. (1995). Preference for consistency: The development of a valid measure and the discovery of surprising behavioral implications. *Journal of Personality & Social Psychology*, 69, 318-328.

Appendix K

How important do you think it is that people engage in the sleep-promoting behaviors that were discussed to avoid the consequences of poor and limited sleep?

*Not Important*

*Very Important*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7 - - - - - 8 - - - - - 9

How likely do you think it is that you personally will actually follow the treatment recommendations to improve your sleep?

*Not Likely*

*Very Likely*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7 - - - - - 8 - - - - - 9

If I follow treatment recommendations over the next few weeks, I will reduce my insomnia symptoms and make me feel more refreshed.

*Totally Disagree*

*Totally Agree*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7 - - - - - 8 - - - - - 9

If I follow treatment recommendations over the next few weeks, I will reduce my risk of developing multiple medical and/or psychiatric conditions in the future.

*Totally Disagree*

*Totally Agree*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7 - - - - - 8 - - - - - 9

If I wanted to follow treatment recommendations it would be easy for me to do so tonight.

*Totally Disagree*

*Totally Agree*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7 - - - - - 8 - - - - - 9

If I wanted to follow treatment recommendations it would be easy for me to do so over the next few weeks.

*Totally Disagree*

*Totally Agree*

1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5 - - - - - 6 - - - - - 7 - - - - - 8 - - - - - 9

**Appendix L  
Sleep Diary**

NAME \_\_\_\_\_ DATE \_\_\_\_\_

**PRESCRIBED TIME TO BED FOR THE NEXT TWO WEEKS** \_\_\_\_\_

**PRESCRIBED TIME OUT OF BED FOR THE NEXT TWO WEEKS** \_\_\_\_\_

**COMPLETE IMMEDIATELY UPON AWAKENING**

Dates									MEAN
Time to Bed (Clock Time)									
Time out of Bed (Clock Time)									
Time to Bed (Deviation from Prescribed)									
Time out of Bed (Deviation from Prescribed)									
(SL) Time to fall asleep									
(FNA) # times awakened									
(WASO) Wake after sleep onset									
(TTOB) Total amount time out of bed									
(FW) Final wake time (Clock Time)									
(TST) Total Sleep Time (min.)									
How long did you nap the day before? (min.)									

**COMPLETE IMMEDIATELY PRIOR TO BED: REGARDING HOW YOU FELT TODAY:**

Dates									MEAN
Typical Day (Yes/No)									
Fatigue (NONE 0—1—2—3—4—5 A LOT)									
Stress (NONE 0—1—2—3—4—5 A LOT)									
Alert (NOT VERY 0—1—2—3—4—5 VERY)									
Concentration (GOOD 0—1—2—3—4—5 POOR)									
Mood (BAD 0—1—2—3—4—5 GOOD)									
Time spent exercising (min)									
Time spent outside (min)									
# Alcoholic Beverages									
Prescriptions Today (Yes/No)									
OTC Meds Today (Yes/No)									
Pain Today (NONE 0—1—2—3—4—5 A LOT)									
Health (FELT FINE 0—1—2—3—4—5 BAD)									
Menstrate Today (Yes/No)									
Menstrual Pain (FELT FINE 0—1—2—3—4—5 BAD)									

**PLEASE INDICATE ON THE BACK OF THIS SHEET WHY ANY GIVEN DAY WAS NOT TYPICAL AND/OR WHAT MEDICATION YOU TOOK ON ANY GIVEN DAY**

## Appendix M

### Stimulus Control Instructions

1. Don't use your bed or bedroom for anything (any time of the day) but sleep (or sex).
2. Go to bed only when sleepy.
3. If you do not fall asleep within about 15–20 minutes, leave the bed and do something in another room. Go back to bed only when you feel sleepy again. Clock watching with regard to the 15–20 minute rule is not recommended. If you do not fall asleep within 20 minutes upon returning to bed, repeat this instruction as many times as needed.
4. If you wake up during the night and do not fall back to sleep within 20 minutes, follow rule 3 again.
5. Use your alarm to leave bed at the same time every morning regardless of the amount of sleep obtained.
6. Avoid napping, but if you must, do not nap past 3 pm.

### Monitoring Use of Stimulus Control Instructions

We want to evaluate how many of the 6 stimulus control instructions you use. Please fill out the following table. Each column is a different day, and each row is a different instruction. Put the date in the top row and check only those boxes for instructions 1–6 to show success.

Today's date ⇒	1/1								
1. Did you avoid bedroom activities besides sleep and sex?	√								
2. Did you go to bed only when you felt tired?	√								
3A. Did it take less than 15–20 min. to go to sleep after you first went to bed?	√								
3B. If not, did you get up within 20 min. and go back to bed only when you felt sleepy, repeating this step as many times as needed?									
4A. Did you sleep through the night or were you able to fall asleep within 15–20 min. after <u>each</u> awakening during the night?									
4B. If not, did you get up within 20 min. and go back to bed only when you felt sleepy, repeating this step as many times as needed or it was time to get up?	√								
5. Did you get up at about the same time you usually do?									
6. Did you avoid napping the day before?	√								

In the above example, the individual complied with all stimulus control instructions except they did not awaken at the usual time (#5). They restricted bedroom use to sleep and sex (1), they went to bed only when tired (2), it took less than 20 min. to fall asleep initially (3), they were awake for more than 20 min. during the night, but did leave the bed and return as instructed (4), and they limited their napping (6).

## Appendix N

### Sleep Hygiene Instructions

1. Avoid caffeine after noon.
2. Avoid exercise within 2 hours of bedtime.
3. Avoid nicotine within 2 hours of bedtime.
4. Avoid alcohol within 2 hours of bedtime.
5. Avoid heavy meals within 2 hours of bedtime.

#### Monitoring Use of Sleep Hygiene Instructions

We want to evaluate how many of the 5 sleep hygiene instructions you use. Please fill out the following table. Each column is a different day, and each row is a different instructions. Put the date in the top row and check only those boxes for instructions 1-6 to show success.

Today's date ⇒	1/1							
	2							
1. Did you avoid caffeine after noon?	✓							
2. Did you avoid exercise within 2 hours of bedtime?	✓							
3. Did you avoid nicotine within 2 hours of bedtime?	✓							
4. Did you avoid alcohol within 2 hours of bedtime?								
5. Did you avoid a heavy meal within 2 hours of bedtime?	✓							

In the above example, the individual complied with all stimulus control instructions except they did not avoid alcohol within 2 hours of bedtime (#4). They avoided caffeine after noon (1), avoided exercise within 2 hours of bedtime (2), avoided nicotine within 2 hours of bedtime (3), and avoided a heavy meal within 2 hours of bedtime (5).

## Appendix O

During the treatment session, we asked you to write about your most important value.

You agreed to think of this value when you encounter some difficulties or are in a situation that makes it hard for you to adhere to insomnia treatment recommendations.

How much of the time over the past two weeks did you recall your most important values to help you overcome any obstacles you encountered in following insomnia treatment recommendations?

- None of the time (0 days)
- A little of the time (1-4 days)
- Some of the time (5-9 days)
- Most of the time (10-13 days)
- All of the time (14 days)

How often would you say that recalling your important values actually helped you follow insomnia treatment recommendations?

**Never**    **Sometimes**    **Usually**    **Always**

## Appendix P

### Use of Self-Affirmation Script

When people think about some important values in their lives or things that they have done that demonstrate their values, it also helps them overcome challenges.

Now, reflect on your most important value that you listed earlier. Thinking about how this value is important to you and represents who you are may encourage you to engage in better sleep behaviors. Give this a try.

When you encounter some difficulties or are in a situation that makes it hard for you to follow good sleep behaviors, think about your important values and see if these thoughts help you to make decisions to perform behaviors that are consistent with these values and will help improve your insomnia.

## Appendix Q

### Behavioral Insomnia Treatment Script

❖ Slide 1

❖ Welcome Participants and tell them before to read the Participant Information Sheet.

❖ Allow time to read and then ASK IF THEY HAVE ANY QUESTIONS about the study

❖ Introduction:

**This study is called *Behavioral Treatment for Insomnia: What Makes it Work?***

**Thank you for participating in this important study.**

**My name is \_\_\_\_\_ and I will be teaching you ways to improve your insomnia today. I am a behavioral sleep specialist in training here at The University of Alabama. Our University is one of a handful of other facilities around the country that provide this kind of training. Our sleep program is an accredited training program, one of only 7 in the country.**

**I will be teaching you three different techniques to improve insomnia. I will take time and go over each of the techniques separately.**

**Physicians typically do not have a training background in these techniques.**

**There are also only a small number of behavioral sleep specialists that are trained to give these interventions.**

**Thousands of people suffering from insomnia have used these techniques with great success. When these techniques are used accurately and consistently as many have done before you, research has found that 70 to 80 percent of insomnia patients have benefited from these treatments. Insomnia patients applying these techniques experience an average reduction of 50 to 60% in insomnia symptoms such as the time it takes to fall asleep, wake time during the night, and total sleep time. Beyond changes in these symptoms, improved sleep quality, a greater sense of control over sleep, and diminished emotional distress have also been found.**

**Based on these facts, researchers have found that these techniques do work for a majority of insomnia sufferers. What we don't know is how they work and**

under what circumstances they are most effective. To answer these questions, is the purpose of the present study. (*Cover Story*) By participating in this study, you are joining others who have chosen to take charge of their insomnia and not let it run their lives. It is not the easiest of tasks, so you should all be very proud of yourselves for taking a stand.

**\*\*\*\*\*Administer Questionnaires and Research Manipulation\*\*\*\*\***

(i.e., baseline questionnaire; validation scale/personal recall exercise 10 minutes];  
post writing exercise questionnaire; then hand out slides)

❖ Slide 2

There are three major goals for this presentation. They are.....(read them off the slide).

Before I begin to teach about these techniques, it is important that you learn a little more about insomnia and sleep in general. Therefore, I will give you new information regarding your insomnia so you can become the expert.

❖ Slide 3 (Read from the slide and add these tidbits)

- **Growth and Development:** During deep sleep, human growth hormone is secreted, and helps children grow into adults
- **Memory Consolidation:** Sleep plays an important role in enhancing learning and strengthening memory.
  - Performance on a newly learned task is often better the next day if adequate sleep is achieved during the night.
- **Emotional Regulation -** At night it appears sleep functions to effectively “strip” the emotional tone from memories we have so when we recall them later memories we prefer not to have are not as intense.



Slide 4 (Click to add each bullet as you speak at the appropriate parts)

**How Many Sleep Stages are There?**

**Sleep is divided into two distinct states, non-REM and REM**

**(REM standing for What? Rapid Eye Movement)**

**Non-Rem sleep is divided into 4 sleep “stages”, which are defined by changes in brain waves, eye movements, and muscle tension.**

**Stage 1 sleep is a brief transitional state between wake and sleep, it is easy to wake from.**

**Stage 2 sleep is also fairly light, and it is safe to say you are definitely asleep in this stage.**

**Stages 3 and 4 are also called “deep sleep” or SWS (slow wave sleep)**

**The distinguishing features of REM sleep – muscle paralysis, REM, and dream generation.**

❖ Slide 5 (Describe the X axis (hours of sleep) and Y axis (different stages of sleep) and use the laser pointer

**As you can see, we cycle through the stages.**

**This is a typical sleep pattern in young adults with 8 hours of sleep:**

**Throughout the first hour the young adults sleeps progressively deeper from 1, 2, 3, 4, the person begins to cycle back through the stages from stage 4 to stages 3 and 2 and then REM.**

**The sequence repeats with each cycle lasting approximately 90 minutes.**

**We go through about 4 - 5 cycles in a good 7 1/2 hour sleep period**

**As you can see, REM periods lengthen and get closer together as the night progresses.**

**If you don't sleep long enough, you don't get much REM sleep**

❖ Slide 6 (Again describe the X and Y axis of the graph, the blue, and red lines)

**As you can see total sleep time decreases with age**

**The Average sleep time for 1 month old = 16 hours**

**The Average sleep time for 6 year old = 10 hours**

**The Average sleep time for 80 year old = 6 hours**

**The percentage of time spent in REM and SWS also decreases**

**Does this mean we NEED less sleep as we age?**

**No, this is a common myth. Elderly often have excessive daytime sleepiness. And may experience a forward shift in sleep meaning they get sleepy earlier, wake earlier).**

**Sleep doesn't have to be bad when you get older. Sleep on average gets shorter, but it doesn't HAVE to be this way. Just because you are aging doesn't mean you have to sleep poorly. Aging doesn't cause bad sleep, but the things that come along with aging such as illness, a non-stimulating retirement, and the death of others.**

❖ Slide 7

**Two processes combined determine sleep propensity or how sleepy we feel and the duration of sleep.**

**The first is our circadian rhythm a process driven by our own biological clock:**

**All animals produce endogenous circadian rhythms, internal mechanisms that operate on an approximately 24 hour cycle.**

**Therefore the term circadian, meaning close to a day, regulates the sleep/ wake cycle.**

**Many other physiologic functions such as hormone secretion, urine production, and changes in blood pressure are under circadian control and synchronized with the sleep/wake cycle.**

**It is NOT altered by the amount of sleep we obtain. Instead environmental cues such as sunlight periodically reset our rhythms each day.**

**It can differ between people and lead to different patterns of wakefulness and alertness such that some people are more morning people and others night owls. Because of our circadian rhythm we feel sleepy around the same times each day.**

**Basically, the purpose of the circadian rhythm is to keep our internal workings in phase with the outside world.**

❖ Slide 8

**The other sleep process is the: Homeostatic sleep drive**

**Homeostasis is from Greek and means "to stand equally"**

**Homeostasis is the ability or tendency of an organism to maintain internal equilibrium by adjusting its physiological processes.**

**Having a homeostatic sleep drive means that your:**

- Level of sleepiness simply increases with waking time**
- This is a linear and cumulative effect; you get more tired with each passing hour. In other words, your sleep load increases.**
- Interestingly if you stay up for a long time you get more REM sleep rebound and increased deep sleep: for this reason researchers have suggested that these stages of sleep may be most important.**

❖ Slide 9 (Describe the X and Y axis; click along as you talk about each point and use the laser pointer)

**Again, the Homeostatic process: as the day progresses, you get sleepier**

**Again, the Circadian process: there are certain times during the day when you are sleepy, regardless of recent sleep history**

**These 2 processes interact with each other—the circadian rhythm influences how sleepy a sleep-deprived individual feels. After a night without sleep, one may be fairly alert at 10 AM because the circadian decrease in sleepiness counteracts the accumulated physiological sleep need; but in the afternoon the biological and physiological influences may combine to create an intense need for sleep.**

❖ Slide 10 (Read first three bullets from slide and then the following)

**•Not everyone needs the same amount of sleep. There are natural short and long sleepers. People feel comfortable at anywhere between 5 and 10 hours, with an average of 7 hours.**

**Most people worry about getting too little sleep, and they are right to be concerned:**

Read the next two bullet points and then the following:

**However,**

- 1) The best survival is experienced by those who sleep 6.5-7.5 hours on weekdays.**
- 2) The mortality risk of those who sleep less than 6.5 hours is of more concern than the risk of those who sleep more than 8 hours.**
- 3) The morality risk increases by 15% and greater for those reporting more than 8.5 hours sleep or less than 3.5 or 4.5 hours.**

❖ Slide 11 (Now lets talk specifically about insomnia)

❖ Slide 12 (Read from the slide then say the following:)

**•The #1 complaint is feeling unrested; the #2 complaint is difficulty falling asleep.**

❖ Slide 13 (Read the first bullet point then the following)

**Transient (or adjustment) insomnia– is the inability to sleep well over a period of a few nights; usually lasts less than 3 months. It is associated with temporary and identifiable stressors such as noise, different sleep environment, extreme temperatures, short-term illness, anxiety about next day's events, etc. The insomnia is expected to resolve when the acute stressor resolves or the person adjusts to the stressor.**

**Chronic Insomnia – this type of insomnia does not resolve once the instigating event or stressor has resolved. 20 million Americans complain of this – these people have poor sleep every night or most nights for more than 6 months.**

***WHAT IS THE DIFFERENCE BETWEEN PRIMARY AND SECONDARY INSOMNIA?***

**Primary (also called learned insomnia) – is not related to any other health problem and there is no other causal condition for the patient's sleep difficulties that can be identified.**

**Comorbid – can be caused by a medical condition (such as cancer, asthma, or arthritis), drugs, stress or a mental health problem (such as depression), or a poor sleep environment (such as too much light or noise, or a bed partner who snores). 2ndary insomnia may be relieved by successful treatment of the primary psychiatric or medical disorder.**

**The above sleep difficulties occurs despite adequate opportunity and circumstance for sleep.**

❖ Slide 14

Read the slide, but just say a few of the daytime impairments and the pause to allow time for reading

❖ Slide 15

**Chronic Insomnia whether primary or comorbid can increase risk for and make worse the following medical and psychiatric conditions.**

(List them)

❖ Slide 16

**This brings us to those proven behavioral techniques to help your insomnia. We will go through each one and if you have any questions as we go along please let me know.**

❖ Slide 17

**For your information these techniques work for all types of insomnia.**

Then read the rest of the slide.

❖ Slide 18

**Now we will be going over a technique that will increase the likelihood that you will sleep better. This technique is called Stimulus Control.**

**Stimulus Control is about what we call “making associations.” In other words, sometimes we smell a rose and it reminds us of our grandmother’s backyard. That is an association; we associate the smell of the rose with our grandmother’s backyard (you can also ask the participant if she can come up with an example – like why they may return to a certain vacation spot; they associate that spot with a fun or relaxing time).**

**“Lets look at all of the instructions for Stimulus Control first, be sure to stop me if you have any questions.”**

**A person's bedroom should be a room that invites sleep. A person's body should automatically associate getting into bed with going to sleep.**

**Sometimes people develop habits that can make the bedroom a non-sleep promoting place. For example, using the bed or bedroom for other activities, such as reading or watching TV, or spending too much time awake in bed, may cause a person's body to associate getting into bed with being awake. This may cause difficulty falling asleep and difficulty staying asleep.**

**Stimulus Control is a technique that helps a person to discontinue habits that interfere with sleep. This technique works by reestablishing sleep-promoting associations to the person's bedroom.**

*Explain that some instructions will be more applicable to their situation than others.*

❖ Slide 19 [Instruction 1]

**1. Don't use your bed or bedroom for anything (at any time of the day) but sleep (or sex).**

**Doing other things in bed is “misusing” the bed.**

**(1) There is an appropriate time and place for everything.**

**(2) Doing other things in bed strengthens the idea that a variety of activities are suitable for the bedroom. (For example, if you often watch television in bed, going to bed will become a cue to begin thinking about things related to what you have seen on television.)**

**(3) If the bed is reserved for sleep alone, then climbing into bed will be a strong cue for you to fall asleep.**

❖ Slide 20 [Now, Instruction 2]

**2. Go to bed only when sleepy.**

**Let your body tell you when it is tired.**

**If you go to bed when you are sleepy, you are more likely to go to sleep right away; this will strengthen the association between bed and sleep.**

**If you are not sleepy when you go to bed, you might toss and turn and you might get mentally and physically aroused and more wide awake. That would only strengthen the old habit patterns we are trying to eliminate.**

**But, if you follow the rules of Stimulus Control, your body can determine how much sleep you need to function well. Your body will let you know the right bedtime by getting tired when it is time for you to go to bed.**

**For example, if you establish a fixed time for getting up in the morning and allow your bedtime to vary depending on when you get sleepy, then your body can determine how much sleep you need to function well.**

Discuss how participants can tell when he/she feels sleepy (for example, yawning, rubbing eyes, etc.). Tell them this is a little different for everyone. Have participants become aware of his/her own feelings and signs of sleepiness and tell them to use these feelings as a cue to go to bed. (Many people are unaware of their own signs of sleepiness when they begin Stimulus Control.)

❖ Slide 21 [Now, Instruction 3]

**3. If you do not fall asleep within about 15-20 minutes, leave the bed and do something in another room. Go back to bed only when you feel sleepy again.**

**Clock watching for this 15-20 minute rule is not recommended.** [It is important to discourage clock-watching; clock-watching stimulates arousal. Suggest turning clock away from participant if this is a common difficulty.] **If you do not fall asleep within about 20 minutes after returning to bed, repeat this instruction. Repeat it as many times as needed throughout the night.**

**The idea of getting out of bed to promote better sleep might seem surprising or strange, (Emphasize that) the reason for following this rule is to strengthen the association of the bed and the bedroom with sleep. By getting out of bed when you are still awake after 15-20 minutes, you can promote this association. (And, you weaken the association of the bed with being awake [by getting out of bed].)**

Elaborate

**(1) Return to bed when you feel sleepy. Pay attention to the signs of sleepiness and don't fall asleep in a room other than the bedroom.**

**(2) The goal is for you to more strongly associate the bed and the bedroom with sleeping.**

**Often, the bed becomes a cue for non-sleep activities because the poor sleeper would watch television or eat or read, or do other things, as a way to distract herself from her main concern—not falling asleep.**

**(3) If you stay in bed when you cannot sleep, the bed becomes a cue for worrying about insomnia and a cue for all the anxiety and frustration of not falling asleep. As a result, the insomnia sufferer “fights the bed.” (In other words, you waste your time lying in bed awake, and upset about it.)**

[Those who report worrying and planning during the night, should be encouraged to set aside some time prior to bedtime to make plans or list worries and possible solutions.]

**(4) If you stay in bed awake, the bed becomes a cue to stay awake.**

**(5) This is why some people who suffer from insomnia fall asleep better in places other than their own beds (for example, in a chair while watching television, or in a hotel). See if participants have had this experience, and discuss it briefly.**

b. Plan what the participant will do to follow Instruction 3:

(1) Quick Brainstorm with participants what they are likely to be doing now when he/she cannot fall asleep. Elicit concrete examples.

(2) Suggest where he/she could go and what he/she could do when he/she cannot fall asleep.

(3) Suggest beginning with activities he/she is doing now (e.g., reading), and help him/her find another place to do it.

- Discourage exercise, or anything else that might make feeling sleepy more difficult.

[Any materials needed to perform the behavior planned for after leaving the bedroom, should be prepared before bedtime.]

❖ Slide 22 [Now, Instruction 4]

**4. If you wake up during the night and do not fall back to sleep within 20 minutes, follow rule 3 again (leave the bed and do something in another room, go back to bed only when you feel sleepy).**

Elaborate:

**The new habits of Stimulus Control treatment will come only with repeated practice.**

**When first beginning this treatment, it is common to have to get up a number of times each night before falling asleep.**

**Encourage the participant by noting that it takes “good sleepers” 10 to 20 minutes to fall asleep.**

**This procedure is to be followed any time you wake up during the night.**

Discuss what the participants do now if they wake up during the night.

Review the strategies developed under instruction 3.

❖ Slide 23 [Now, Instruction 5]

**Use your alarm to leave bed at the same time every morning regardless of the amount of sleep obtained.**

**This will help your body acquire a consistent sleep rhythm.**

**Your body has an “internal clock” that regulates certain body functions such as body temperature and the sleep/wake cycle.**

**Maintaining a consistent sleep schedule will help your body’s internal clock to establish a more stable and consistent pattern of sleeping and waking. An inconsistent sleep schedule may upset the rhythm of your internal clock, making you feel alert when you want to be asleep and sleepy when you want to be awake.**

**It is important to help your body to establish a regular body rhythm for the daily pattern of sleep time and awake time.**

Describe the 24-hour sleep-wake cycle, and the circadian rhythm of “peaks” and “valleys” of high alertness and low alertness that occur each day (for example, the low alertness that typically occurs some time each afternoon).

**A routine is needed to establish a sleep rhythm and a rhythm of peaks and valleys.**

**By varying the time you get up you are shifting your rhythm each day so that it is not in stable harmony with clock time. Make an analogy to jet lag. (For example, if you fly to England, their clock time is 6 hours later than your home time and English clock conflicts with your body’s rhythm.)**

**Do not get up later on weekends. If you do not follow this instruction now, you will not be able to establish a consistent rhythm.**

**First, you must get a consistent rhythm.**

**Once you have established a consistent sleep rhythm, probably by the end of treatment, you can vary your sleep schedule within careful limits.**

Discuss:

How participants may determine when they get up?

How consistent is he/she is, including weekends?

Have him/her set a time that he/she will get up every morning.

Explore how well he/she can live with the time.

❖ Slide 24 [Now, Instruction 6]

**Avoid napping.**

**Naps meet some of your sleep need and make it less likely that you will fall asleep quickly at bedtime. By not napping, you also help to ensure that any sleep loss you feel today because of a bad night you had last night will increase your likelihood of falling asleep quickly tonight.**

Elaborate

**Napping throws your body rhythm off schedule and makes it more difficult for you to sleep at night.**

Discuss other activities they might use to replace naps (e.g., afternoon walk, jog, or swim).

**Concluding the Stimulus Control Presentation:**

*Ask the participants if he/she has any questions about the instructions or about the rationale for stimulus control.*

Emphasize the importance of following stimulus control instructions and strongly encourage participants to faithfully adhere to instructions.

❖ Slide 25 Sleep Restriction

**The next technique is called Sleep Restriction Therapy.**

Ask the participants to recall and their typical total sleep time and typical time spent in bed, and their usual bedtime and wake times on weekdays.

❖ Slide 26

**This technique is known to treat sleep initiation and maintenance problems and is often used concurrently with Stimulus Control. Sleep Restriction Therapy requires patients to limit the amount of time they spend in bed to an amount equal to their average total sleep time. Therefore you should spend no more time in bed than your estimated total sleep time plus a half-hour under Sleep Restriction Therapy. Like Stimulus Control it indicates the need for a fixed wake time. Unlike Stimulus Control it indicates bed time to be your average total sleep time subtracted from your fixed wake-up time. Therefore, bedtime can come no earlier than that calculated time.**

**For example, if you need to get up by 7:30 AM to make it to class and work and you are getting an average of 5.5 hours of sleep each night, then bedtime would be no earlier than 2:00AM. This applies to weekdays and weekends.**

The following is adapted from Perlis and colleagues (2005):

**Initially, this intervention may result in mild to moderate sleep loss. This sleep loss usually leads to a decrease in the time to fall asleep and the time to fall back to sleep from awakenings during the night. Thus, during the beginning of treatment, you will get less sleep, but sleep in a more consolidated fashion. This means you will fall asleep more quickly and stay asleep for longer periods of time. As the proportion of total sleep time to the total time you are spending in bed to get that sleep increases you may gradually increase the amount of time you spend in bed by 15-minute increments.**

**It should be noted that SRT has a couple of paradoxical aspects to it. One paradox is that people who report “not getting enough sleep” are, in essence, being told to “sleep less”. The other paradox occurs over the course of treatment. With therapy, patients find that it is difficult to stay awake until the prescribed hour. This, if not paradoxical, is at least ironic for the person that initially presents with trouble falling asleep.**

❖ Slide 27

**SRT is thought to be effective for two reasons. First, it prevents a person from coping with their insomnia by extending sleep opportunity. Extending your sleep opportunity by spending more time in bed is a compensatory strategy. Increasing the opportunity to get more sleep, produces a form of sleep that is shallow and fragmented. Second, the initial sleep loss that occurs with SRT is also thought to increase the biological drive to sleep which in turn produces a shorter time to fall asleep, less wake during the night, and better sleep quality.**

**Please determine the time you need to wake up to be on time to all your daily obligations and write it down on the sleep diaries given to you. Now, subtract your estimated total sleep time plus one half-hour from this wake time and write down that value. Between these times is your allotted time in bed if you are to follow Sleep Restriction Therapy.**

❖ Slide 28

Discuss the graph as an example of a patient’s schedule.

**If you remember the second instruction of Stimulus Control treatment, go to bed only when sleepy, one may ask how do I follow both treatments simultaneously if I have a fixed bedtime every night. The resolution is to not go to bed any earlier than your fixed bedtime. According to sleep restriction therapy, you are allowed to go to bed later than your recommended bedtime if you are not sleepy yet.**

*Ask the participants if he/she has any questions about the instructions or about the rationale for sleep restriction therapy.*

❖ Slide 29 *Sleep Hygiene*

**The last technique I will discuss is called sleep hygiene. Sleep hygiene is a set of instructions that request alterations in behaviors known to alter sleep. When you follow these instructions, it increases the likelihood that you will sleep well. If you fail to follow any of these instructions, it may lead to sleep disruption.**

**Read Sleep Hygiene Instructions verbatim**

❖ Slide 30

**Avoid caffeine after noon: Caffeine is a stimulant. It can lead to increased arousal at night and lead to difficulty falling asleep and difficulty staying asleep. Some people are very sensitive to the effects of caffeine, and use of caffeine after noon may disrupt their sleep at night.** (note: remember that some soft drinks, tea, chocolate and some medications contain caffeine)

Read the rest of the slide

❖ Slide 31

**Avoid nicotine within 2 hours of bedtime: Nicotine, like caffeine, is a stimulant that can make it difficult to fall asleep and difficult to stay asleep.**

Read the rest of the slide

❖ Slide 33

**Avoid alcohol within 2 hours of bedtime: Although you may feel sleepy after drinking alcohol, alcohol use near bedtime usually leads to more awake time during the night.**

Read the rest of the slide

❖ Slide 34

**Avoid heavy meals within 2 hours of bedtime: Heavy meals close to bedtime put a strain on your digestive system while you are trying to sleep. Heavy meals may produce physical discomfort or metabolic changes that interfere with sleep.**

Read the rest of the slide

❖ Slide 35

**Avoid exercise within 2 hours of bedtime: Exercising too close to bedtime may put your body in an aroused state when you need to be relaxing. However, participation in regular exercise that occurs earlier in the day may improve your sleep.**

Read the rest of the slide

*Ask the participants if he/she has any questions about the instructions or about the rationale for sleep hygiene.*

❖ **SELF AFFIRMATION GROUP ONLY:**

Remind the participants of the essay they filled out earlier.

**When people think about some important values in their lives or things that they have done that demonstrate their values, it also helps them overcome challenges.**

**Now, reflect on your most important value that you listed earlier.**

**Thinking about how this value is important to you and represents who you are may encourage you to engage in better sleep behaviors.**

**Give this a try.**

**When you encounter some difficulties or are in a situation that makes it hard for you to follow good sleep behaviors, think about your important values and see if these thoughts help you to make decisions to perform behaviors that are consistent with these values and will help improve your insomnia.**

**Do you agree to do this? \*\*\*\*\*Try to get them to do a verbal or body language agreement\*\*\*\*\***

**CONTROL GROUP ONLY:**

Tell them the reason why they did the writing exercise earlier was to get them thinking about some of their own sleep hygiene behaviors

**FOR ALL GROUPS:**

- ❖ Hand out Acceptance/Intentions/Self-efficacy Questionnaire
  
- ❖ Explain what they will need to do over the next two weeks.

**Explain that research has shown that monitoring one's progress on a daily basis is very helpful when one is trying to make and maintain changes in behaviors, such as sleep hygiene behaviors.**

Subsequently, subjects will be directed to a website they must visit daily to fill out sleep diaries and adherence logs to document their adherence to the treatments for the next 14 days. The participants will enter in their assigned ID numbers whenever they enter in their data. This ID number is provided during the session and it will be emailed to them after the session. On the sleep diaries, the participants will make their best guesses of how they slept the night prior. They do not have to make any mathematical calculations. Participants will be instructed they will receive course credit regardless of their adherence to the insomnia treatment recommendations. However, they must fully complete the logs to receive full course credit. If they do not complete the study, they will only receive partial credit.

**ACTIGRAPH USERS ONLY:**

Explain that they must wear it 24/7 for two weeks, explain that it captures movement data so we'll be able to tell when they fall asleep and when they get up, and how much

activity they have during the day and the night. Tell them the watches are water proof, but we'd prefer if they would take it off and put it back on after showering or swimming. Lastly, explain the event marker: they must click it twice each day. Once when they are getting into bed intending to sleep, and once when they are getting out of bed for the day.

Tell them to return them at the end of two weeks to the psychology department main office. They will have to sign in the watches with Robin or Colett.

**UNIVERSITY OF ALABAMA**  
**Participant Information Sheet for a Research Study**

You are being asked to take part in a research study. This study is called *Behavioral Treatment for Insomnia: What Makes it Work?* The study is being done by Megan Ruitter who is a doctoral student at the University. Ms. Ruitter is being supervised by Dr. Lichstein, a professor and licensed clinical psychologist.

**What is this study about?**

This study is being done to find out why behavioral treatments help people with insomnia improve their sleep, and what parts of the treatments work best.

**Why is this study important--What good will the results do?**

This knowledge is important because it will help us figure out which recommendations improve insomnia the best, and which ones do not. With this knowledge, doctors, psychologists, and nurses will be able to give the best treatments to their patients right away.

**Why have I been asked to take part in this study?**

You have been asked to be in this study because in a previous study you participated in you reported that you have either difficulty sleeping or tend to not feel refreshed by your sleep. You also reported these difficulties are severe and affect how you function during the day. These symptoms suggest you may be currently experiencing insomnia. *However, if you have any of the following conditions, then you do not qualify for the study. The conditions are: bipolar disorder, severe major depression, orthostatic hypotension, epilepsy, parasomnias, mobility restrictions, or any unstable psychiatric or medical condition. Please approach the researcher, and notify them that you cannot participate.*

**How many people besides me will be in this study?**

About 128 other people will be in this study.

**What will I be asked to do in this study?**

If you decide to be in this study, you will be asked to do these things:

Treatment Session: (will take place in groups, but you will not have to work or talk with the other participants):

First, you will complete a written exercise and some questionnaires made to test your memory for past activities and recall of experiences about your self. The results of this exercise will be used to help you understand and use the insomnia treatments well. The exercise will take about 10 minutes.

Second, you will be given information about insomnia, its consequences, and three insomnia treatments.

Third, you will be given a website address. The website has a set of online sleep diaries and other monitoring logs for you to record how you slept each night, and your daily use of the treatment recommendations. You will fill out these diaries and logs each day over the next two weeks. You must fill out your use of the treatment instructions each day.

Some of you will be chosen at random to wear what is called an actigraph watch. You will wear this watch 24 hours per day for two weeks and record your use of the treatment recommendations. An actigraph watch appears similar to a wrist watch except instead of measuring time it measures wrist movement. How long you sleep or are awake can be measured by the presence or absence of movement. The actigraph watch used in this study has a button that you will be asked to push to indicate the time you entered bed and got up in the morning. Once the two weeks are completed, you must return the watch to the Sleep Research Project in Gordon Palmer Hall Room 158.

Fourth, once these two weeks are completed, the website will ask you to fill out some short follow-up questions about your experiences over the two weeks. You will also be asked to take a memory test online. The memory test will last 20 to 25 minutes.

Fifth, once you complete these follow-up questions you will be given full course credit for your participation. If you do not complete the study fully, you will only receive partial credit.

### **How much time will I spend being in this study?**

Being in this study will take about 3.5 hours total. The current treatment session will be approximately 1.5 hours. The time to fill out the sleep diaries and monitoring logs each day will be approximately 5 minutes. The time to complete the memory test will be

approximately 20 to 25 minutes. The time to complete the follow-up questionnaires will be approximately 10 minutes.

### **Will I be paid for being in this study?**

Whether you are a student, faculty, or staff, you will not be paid for being in this study. If you are a student you will receive *five* research credits toward your Psychology 101 course grade for completing the study. If you do not complete the study in its entirety (i.e., complete all the sleep diaries and questionnaires) you will only receive partial credit. You will receive one credit for attending the treatment session, two credits for completing the questionnaires during the first week after the treatment session, and another two credits for completing the questionnaires during the second week after the treatment session. If you are one of the participants that will use an actigraph watch, then you must return the actigraph watch to receive any course credit.

### **Will being in this study cost me anything?**

There will be no cost to you except for your time to complete the treatment session, the monitoring logs, the questionnaires, and in some cases wearing the actigraph watch.

### **Can the researcher take me out of this study?**

The researcher may take you out of this study if something happens to you that means you no longer meet the study requirements. You will be removed from the study if you have a sleep disorder other than insomnia. You may be removed if you have a severe, unstable physical or mental health condition. You will also be removed if you have severe mobility restrictions the researcher believes will make it hard for you to may to fully participate and benefit from the study.

What are the benefits (good things) that may happen to me if I am in this study?

Although benefits cannot be promised in research, it is likely that you will learn new ways to help you sleep, and you may feel more refreshed during the day. It is possible that you will also learn more about yourself. You may or may not regard information about yourself as a benefit.

### **What are the benefits to scientists or society?**

This study will help doctors, nurses, and psychologists learn how to better provide treatment for those suffering from insomnia.

### **What are the risks (dangers or harm) to me if I am in this study?**

There is little to no risk from participating in this study. There is a possibility that you may experience temporary daytime sleepiness if you chose to try some of the treatments for insomnia. While daytime sleepiness can be uncomfortable, it is a common occurrence in everyday living and will likely be mild. Also, if you are one of the individuals randomly selected to wear an actigraph watch for two weeks, wearing the actigraph watch during sleep might cause a slight sense of discomfort to individual participants.

How will my confidentiality (privacy) be protected? What will happen to the information the study keeps on me?

All raw data collected from you will be linked to your name, campus-wide identification number, and email address until you complete the study. Whether you are a student, faculty, or staff member, the researchers need this information to give you course credit and to contact you during the study. When you come to the treatment session you will be asked by either the primary researcher or a trained research assistant to write your name and email address on a sign-in sheet. You will also be assigned an ID number that will be linked with your name, campus-wide identification number, email address, and raw and online data. This information will be securely stored within a locked file cabinet within the locked Sleep Research Project laboratory until you complete the study. At that time, your names and email addresses will be shredded.

When you provide the researchers with online data, you will be asked to enter your ID number. This ID number will be given to you through email and during the treatment session. All of your online data will be entered into a secure computer server with password protection. The server will be in the locked Sleep Research Project Laboratory and only personnel directly involved with the project will have access to it. Once you complete the study your name, campus-wide identification number and email addresses on the computer server will be erased. Lastly, the raw data will be shredded once it is entered into the secure computer server.

### **What are the alternatives to being in this study? Do I have other choices?**

The alternative/other choice is to not participate in this study.

### **What are my rights as a participant?**

Taking part in this study is voluntary—it is your free choice. You may choose not to take part at all. If you start the study, you can stop at any time. Leaving the study will not result in any penalty; however, you will not receive full course credit if you do not participate in the study until its completion.

The University of Alabama Institutional Review Board (IRB) is the committee that protects the rights of people in research studies. The IRB may review study records from time to time to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

**Who do I call if I have questions or problems?**

If you have questions about the study right now, please ask them. If you have questions about the study later on, please call the investigator Megan Ruitter at (205)-348-6385. If you have questions about your rights as a person in a research study, call Ms. Tanta Myles, the Research Compliance Officer of the University, at 205-348-8461 or toll-free at 1-877-820-3066.

## Appendix S

Upon further examination of the correlations of multiple variables with the composite adherence index, some exploratory analyses were investigated. It was found that the only significant predictors of overall adherence to the behavioral insomnia treatments were the frequency of having a bed partner and the level of self-efficacy to engage in treatment recommendations immediately. The total variance explained by the model as a whole was 32.9%,  $F(2,51) = 12.5, p < .001$ . The test for bed partner frequency explained a significant amount of variance in the composite adherence index ( $b = .21, t[54] = 2.26, p = .026$ ) as well as the test for immediate self-efficacy ( $b = .20, t[54] = 4.52, p < .001$ ).

Upon further examination of the correlations of multiple variables with adherence to SC, some exploratory analyses were investigated. It was found that the only significant predictors of SC adherence to the behavioral insomnia treatments were the frequency of having a bed partner, and the level of self-efficacy to engage in treatment recommendations immediately. The total variance explained by the model as a whole was 38.5%,  $F(2,51) = 15.97, p < .001$ . The test for bed partner frequency explained a significant amount of variance in SC adherence ( $b = .04, t[54] = 3.36, p = .001$ ) as well as the test for immediate self-efficacy ( $b = .03, t[54] = 4.66, p < .001$ ). When examining the self-affirmation group alone to take into account the influence of frequency of self-affirmation use along with these two predictors, the total variance explained by this new model was 51.9%,  $F(3,22) = 7.92, p = .001$ . The tests for bed partner frequency ( $b = .05, t[22] = 2.43, p = .024$ ), self-affirmation use frequency ( $b = .03, t[22] = 2.33, p = .029$ ), and self-efficacy ( $b = .03, t[22] = 3.49, p = .002$ ) all remained significant predictors of SC adherence.

Upon further examination of the correlations of multiple variables with adherence to SH, some exploratory analyses were investigated. It was found that the only significant predictors of SH adherence to the behavioral insomnia treatments were the level of self-efficacy to engage in treatment recommendations immediately and over the next few weeks, and NCS score. The total variance explained by the model as a whole was 35.8%,  $F(3,50) = 9.28, p < .001$ . The test for immediate self efficacy explained a significant amount of variance in SH adherence ( $b = .02, t[54] = 2.40, p = .02$ ) as well as the test for self-efficacy over the next few weeks ( $b = .02, t[54] = 2.05, p = .046$ ). The test for NCS score also explained a significant amount of variability in SH adherence ( $b = .003, t[54] = 2.12, p = .039$ ).

There were no significant predictors of SRT adherence after further exploratory examination.