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Role of Thoughts During Nocturnal Awake Times in the Insomnia Experience of Older Adults

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The frequency of difficulty initiating and maintaining sleep increases with age. Yet, not all poor sleepers complain of insomnia. Our cognitive model of insomnia predicts that sleep complaints *in poor sleepers are a function of negative thinking during nocturnal wakefulness as well as of poor sleep quality. To test descriptive aspects of the model, we examined the content and valence of thoughts listed or endorsed by two large samples of older adults. We compared positive and negative thoughts reported by good sleepers and by 2 types of poor sleepers: those experiencing either high or low distress about their insomnia. Thought listing and inventory results both support the model: negative thought frequencies were closely related to poor sleep, distress about insomnia, and poor daytime psychological adjustment. The findings provide an empirical basis for the modification of maladaptive cognitions as potentially important in therapeutic intervention for insomnia.*

KEY WORDS: insomnia; sleep; self-statements; thoughts; cognitive model.

Sleep researchers and clinicians have increasingly implicated cognitive hyperarousal and distressing and intrusive thoughts in the etiology and maintenance of insomnia (e.g., Bonnet & Arand, 1998; Borkovec, Lane, & Van Oot, 1981; Coates et al., 1983; Kuisk, Bertelson, & Walsh, 1989; Lamarche & Ogilvie, 1997; Lichstein & Fanning, 1990; Lundh, 1998; Morin, 1993; Perlis, Giles, Mendelson, Bootzin, & Wyatt, 1997; Waters, Adams, Binks, & Varnado, 1993). Yet, little is known about the nature or the content of thoughts experienced either by good or by poor sleepers when they are awake during the night. The literature shows that younger good and poor

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sleepers, even when sleep status is determined by objective measurement of nocturnal sleep parameters, can be distinguished on the basis of their thought content during the day (Marchini, Coates, Magistad, & Waldum, 1983; Van Egeren, Haynes, Franzen, & Hamilton, 1983). It has also been demonstrated that the addition of cognitive aspects to cognitive–behavioral interventions, such as changing maladaptive beliefs and attitudes about sleep, has beneficial effects on the complaint of insomnia (Morin, Kowatch, Barry, & Walton, 1993). Indeed, some have argued that a common mediating mechanism—disruption of intrusive cognitive activity—can best explain the demonstrated effectiveness of a wide variety of cognitive–behavioral interventions in treating sleep problems (cf. Borkovec, 1982; Lacks, 1987; Lichstein & Fischer, 1985).

Because sleep disruption becomes more prevalent as people age, evaluating the content, valence (positive and negative), and role of thoughts experienced by older individuals when they are awake during the night is likely to be of theoretical and practical importance. Therefore, one goal of this investigation was to answer the following questions, "What do older people think about during periods of nocturnal wakefulness?" and "What is the role of worry and of valenced thoughts in the insomnia experience?"

A second objective was to examine thoughts in older individuals with and without insomnia complaints to test a central aspect of our cognitive model of insomnia (Fichten & Libman, 1991; Libman, Creti, Amsel, Brender, & Fichten, 1997), namely that negative cognitive activity—primarily negative, worrying, and anxious thoughts and self-statements during periods of nocturnal wakefulness—is likely to be an important component of insomnia complaints (see Fig. 1). There is little in the psychological literature that demonstrates empirical links between the conceptual theoretical cognitive field on the one hand and clinical cognitive–behavioral interventions on the

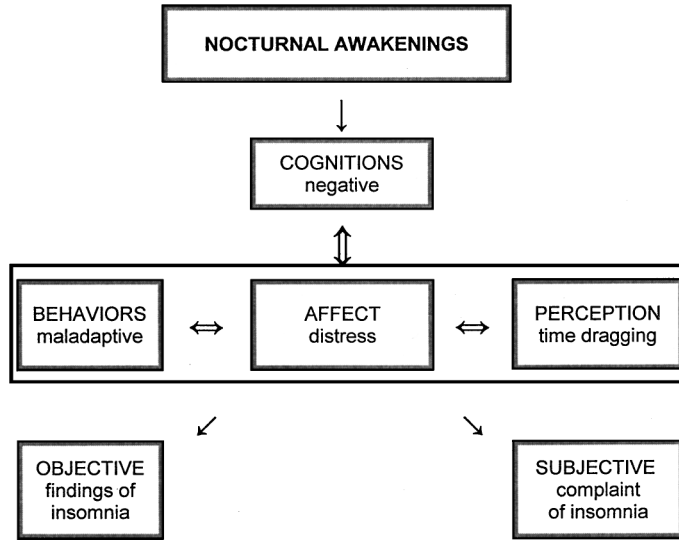

Fig. 1. Revised cognitive model of insomnia.

other. The overall aim of the present investigation is to establish such an empirical link in the area of sleep and insomnia.

Our model begins with the recognition that nocturnal awakenings will occur in most older individuals. It then proposes that negative cognitive activity, such as concerns about the day's events and worry about miscellaneous matters, including the consequences of not getting enough sleep, is associated with other maladaptive nocturnal events that, in turn, both magnify the sleep complaint as well as contribute to the negative cognitive experiences that interfere with falling asleep or returning to sleep. The model predicts that minimizing negative thoughts is likely to be effective because this targets cognitive activities that may (1) prevent sleep, (2) cause negative affect, (3) result in maladaptive sleep-related behaviors, and (4) contribute to distorted perceptions of the passage of time.

Maladaptive sleep-related behaviors and distorted perceptions of the passage of time are not the focus of this paper. Nevertheless, in support of descriptive aspects of the model, it has been demonstrated that people generally overestimate the duration of "empty" blocks of time, such as those experienced in periods of nocturnal wakefulness, and that they perceive empty time as "dragging" (Fichten, Creti et al., 2001). Poor sleepers report that they engage in a large variety of sleep-related behaviors, many of which are maladaptive (e.g., tossing and turning: Libman et al., 1997). Numerous studies have shown that individuals who complain of insomnia experience more negative affect and have poorer daytime psychological adjustment than do good sleepers (e.g., Gourash Bliwise, 1992; Morgan, Healey, & Healey, 1989; Morin & Gramling, 1989). In addition, it has been shown that the actual amount of sleep deprivation for insomnia complainers in many cases is of no great clinical significance (Chambers & Keller, 1993), and that they do not experience excessive daytime sleepiness (Lichstein, Wilson, Noe, Aguillard, & Nellur, 1994). The model proposes that nocturnal negative thoughts and self-statements provide the mediational mechanism by which poor daytime adjustment influences the insomnia experience and nocturnal distress.

There have been hints in the literature that some "insomniacs" fail to experience high levels of anxiety, tension, or arousal (Chambers & Kim, 1993; Seidel et al., 1984; Stepanski et al., 1989). Recently, we have been able to distinguish two types of poor sleepers—those who are highly distressed by their sleep problem and those who have similarly serious sleep disturbance, but are minimally distressed about it. The "low distress poor sleeper" group consists of people who are relatively untroubled by the psychophysiological changes in sleep architecture that accompany aging. Others, too, have discussed noncomplaining poor sleepers (Ancoli-Israel & Roth, 1999; Coyle, 1998; Dorsey & Bootzin, 1997; Mendelson, Garnett, Gillin, & Weingartner, 1984; Ohayon, Caulet, & Guilleminault, 1997). This group is critical to understanding successful coping with age-related changes in sleep. For example, comparisons of good sleepers with high and low distress poor sleepers show that where quantitative sleep parameters are concerned, such as total sleep time, total wake time, and sleep efficiency, high and low distress poor sleepers are fairly similar to each other and very different from good sleepers. On measures of distress related to sleep disruption, however, there is greater similarity between good sleepers and low distress poor sleepers than there is between the two poor sleeper groups. This finding mirrors

the pattern of results obtained on personality and psychological adjustment (Fichten et al., 1995; Lavidor et al., 1996).

In this investigation we explored the content of thoughts experienced by older adults during periods of nocturnal wakefulness. We also examined predictions that derive from the literature and from our model. For example, we tested the prediction that the complaint of insomnia in older individuals is based not only on disrupted sleep but also on the aversiveness of the experience while awake during the night and that negative cognitive activity—primarily negative, worrying, and anxious thoughts and self-statements during periods of nocturnal wakefulness—is likely to be an important component of insomnia complaints. In particular, we expected thinking in low distress poor sleepers to more closely resemble that of good sleepers than of highly distressed poor sleepers. We also expected thoughts experienced during the night to relate to both daytime adaptation as well as to sleep parameters such as total sleep and wake times.

METHOD

In the present investigation, we first explored the content and valence of thoughts experienced during periods of nocturnal wakefulness in a sample of 160 older adults who completed a thought listing measure (Sample 1). Second, in two samples of older adults, we tested aspects of our cognitive model of insomnia that deals with the hypothesis that negative thinking is a hallmark of distress related to insomnia—our definition of the insomnia complaint. To test this hypothesis, 160 Sample 1 participants completed a variety of measures, including open-ended thought listing (Cognitive Content Questionnaire). To provide replication and to extend the findings, the 445 individuals in Sample 2 completed an endorsement measure of valenced thoughts: the Self-Statement Test: 60+.

MEASURES

Sleep Measures

Structured Sleep History Interview

A modified version of the clinical instrument developed by Lacks (1987) provides extensive information on medically based sleep disorders as well as other exclusion criteria (e.g., sleep apnea, parasomnias, physical disorders, sleep phase disorder, medication use). Most questions require a Yes/No answer.

Sleep Questionnaire

This brief, objective questionnaire inquires about usual sleep experiences (during the past typical month), including hours slept per night, duration of nocturnal arousals, as well as frequency (0–7 days/week) of difficulty falling asleep, getting back to sleep after nocturnal awakenings, and falling asleep after waking up too early. It

also inquires how frequently (0–7 days/week) each of these three sleep problems is accompanied by feelings of distress. These and computed scores (sleep efficiency, sleep difficulty, sleep distress) have acceptable psychometric properties for research use (Fichten et al., 1995; Libman et al., 1999).

Self-Efficacy Scale (Sleep)

This nine-item scale evaluates individuals' beliefs about their ability to influence their own sleep-related motivation and behavior. Validity data provided by the scale's authors indicate higher scores (stronger sleep self-efficacy expectations) after behavioral treatment for insomnia (Cook & Lacks, 1984; Lacks, 1988). Our data on older individuals indicate reasonable temporal stability for the measure, $r(57) = .77$, $p < .001$. The scale was included as a valid "psychologically laden" sleep measure that was developed in a laboratory other than ours.

Sleep Behaviors Listing

In an open-ended manner, participants indicate what they do when experiencing trouble sleeping. Responses are scored by coders trained to a minimum of 70% interrater agreement in accordance with a manual (Creti, Fichten, Lennox, & Libman, 1994) into 20 behavior categories (e.g., have an alcoholic drink, pray, read). Total scores reflect the number of different sleep behaviors noted, with higher scores indicating a greater variety of behaviors. Findings indicate that poor sleepers have higher scores than do good sleepers (Fichten et al., 1995; Libman et al., 1997).

Sleep Behaviors Scale: 60+

This measure, recently developed by our team, is derived from open-ended listings of sleep behaviors. Respondents rate, on a 5-point scale, how often they engage in each of 30 activities when having problems falling asleep or getting back to sleep at night (e.g., toss and turn, eat, read, imagine a scene). Ratings are summed to provide a total score that reflects the frequency and variety of behaviors engaged in. Good validity and reliability have been demonstrated for this scale. For example, the measure has good temporal stability ($r = .85$) as well as internal consistency (Cronbach's $\alpha = .80$), and poor sleepers have been shown to have higher total scores on this measure than do good sleepers (Libman et al., 1997).

Thoughts During Nocturnal Arousals

Cognitive Content Questionnaire (CCQ)

This thought-listing form consists of ruled lines that allow respondents or interviewers to indicate, in an open-ended manner, the content and valence (pleasant [+] or unpleasant [−]) of an individual's thoughts when trying to fall asleep. Participants answer the following question, "When people can't sleep, they may think of many things. When you are trying to fall asleep, what are the things you usually think about?" After listing their thoughts, subjects indicate whether each thought

was pleasant (+) or unpleasant (−). Scores are reported as Positive and Negative thought frequencies and as Schwartz and Garamoni's states-of-mind (SOM) ratios (Positive/[Positive + Negative]); higher SOM scores indicate more adaptive thinking in a variety of realms (Amsel & Fichten, 1998; Schwartz & Garamoni, 1986). In addition, bacause worry may be a hallmark of distress associated with insomnia, negative thoughts were also designated as "worry" or "nonworry" thoughts. Worry thoughts consisted of references to uncertain future outcomes, rumination about past events or losses, and thoughts reflecting hopelessness about the future (cf. Andrews & Borkovec, 1988). Temporal stability data based on 43 participants who completed the CCQ twice, 4 weeks apart, indicate acceptable results for Negative, $r(41) = .65$, $p < .001$, and Worry thoughts, $r(41) = .45$, $p < .01$, as well as for SOM ratios, $r(30) = .40$, $p < .05$. The coefficient for Positive thought frequency, however, was not significant, $r(41) = .08$.

Self-Statement Test: 60+ (SST: 60+)

This 34-item inventory measure of valenced thoughts experienced during times of wakefulness was developed by our team (Fichten et al., 1998). Item content was derived from thought listings on the CCQ. The measure yields two thought frequencies—Positive and Negative—as well as a SOM ratio (Positive/[Positive + Negative]). Higher frequencies denote more Positive and Negative thoughts, and higher SOM ratios indicate more adaptive thinking (Amsel & Fichten, 1998; Schwartz & Garamoni, 1986). Data indicate acceptable psychometric properties for research use.

Overall Thought Pleasantness Rating

This single, 5-point Likert-type rating scale item inquires about the pleasantness of respondents' thoughts while trying to fall asleep; higher scores indicate mostly pleasant thoughts, and lower scores indicate mostly unpleasant thoughts. Reasonable temporal stability, $r(35) = .63$, $p < .001$, and validity data reported elsewhere (Fichten et al., 1995, 1998) suggest acceptable psychometric properties for research. For example, Rating scores are related significantly to the frequency of Negative thoughts on both the CCQ ($r = -.44$) and the SST: 60+ ($r = -.41$).

Psychological Adjustment: Sleep-Related "State" Measures

Presleep Arousal Scale

This measure consists of 16 items assessing the phenomenology of presleep and nocturnal awake times with the use of a 5-point rating scale. Two scores are derived: Somatic (e.g., "a tight tense feeling in your muscles") and Cognitive arousal (e.g., "thoughts keep running through your head"). Nicassio, Mendlowitz, Fussel, and Petras (1985) showed good psychometric properties for this scale. Subscales were shown to be internally consistent and stable over time. Means for people with insomnia were significantly higher than for normal sleepers for both subscales, reported Cronbach's alpha for subscales ranged from .67 to .88, and test-retest

correlations ranged from .72 to .76. Test-retest correlations obtained in our laboratory on older individuals are more modest: Somatic subscale, $r(56) = .36$, $p < .01$; Cognitive subscale, $r(56) = .52$, $p < .01$.

Tension Thermometer

A single-item measure developed by our team asks, "When you are lying in bed trying to fall asleep, how tense do you generally feel?" Responses are made on an 11-point scale: 0 = *not at all tense*, 100 = *very tense*, with ratings made at 10-point intervals. Our data indicate reasonable temporal stability, $r(35) = .67$, $p < .001$, and the pattern of correlations between scores on this measure and relevant sleep variables shows logical, highly significant relationships (Fichten et al., 1995, 1998). For example, correlation coefficients between scores on the Tension Thermometer and on psychologically laden sleep variables such as Sleep Self-Efficacy, Sleep Difficulty, and Sleep Distress all exceed .40.

Anxious Self-Statement Questionnaire (ASSQ)

The frequency of anxious self-talk is evaluated by this 32-item self-report measure. Higher scores indicate more anxious self-talk. Kendall and Hollon (1989) indicated that reliability for the questionnaire is acceptable (split-half reliability was .92; item–total correlations ranged from .45 to .79) and that scores increased following a stressful event. In our studies, the measure was modified by asking participants to base their responses on periods of sleeplessness; our unpublished data on older individuals indicate acceptable temporal stability in this context, $r(56) = .69$, $p < .001$.

Psychological Adjustment: Trait Measures

Brief Symptom Inventory (BSI; Derogatis, Rickels, & Rock, 1976)

A 53-item self-report psychological symptom inventory, the BSI has subscales for nine symptom dimensions (e.g., Depression, Anxiety) and three global indices. It is a brief version of the SCL-90 (Derogatis, 1977) that is a frequently used instrument with acceptable reliability and validity. Validation data indicate correlations from .92 to .98 between the symptom dimensions and global indices of the BSI and the SCL-90 (Derogatis, 1977). Normative data for an elderly sample are provided by Hale, Cochran, and Hedgepeth (1984). Because we are investigating psychological adjustment, rather than psychopathology, only two subscales are used: Anxiety and Depression. Lower scores indicate better adjustment.

Eysenck Personality Inventory (EPI; Eysenck & Eysenck, 1968)

This reliable and valid, empirically based questionnaire is among the most frequently used measures of personality (Digman, 1990). It evaluates the dimensions of Neuroticism and Extraversion–Introversion, as well as the tendency to respond in a socially desirable direction. Because this study focuses on psychological

adjustment, only the Neuroticism subscale is used. Higher scores indicate greater Neuroticism.

Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990)

On 16 items respondents indicate, using a 5-point scale, how typical of them each statement is. Internal consistency coefficients (Chronbach's alpha) obtained in the eight validation studies conducted by the questionnaire's authors ranged from .91 to .95. Test-retest reliability coefficients ranged from .74 to .92. Data provided by the scale's authors on concurrent and criterion group validity and a recent validation study provide support for the use of this measure with older individuals (Beck, Stanley, & Zebb, 1995). Higher scores indicate a more worrying personality style.

Participants and Procedure

Two samples were recruited from the community through media publicity consisting of press releases, presentations and mailings to seniors' groups, and of notices in community clinics and residences for seniors. Participants in both samples were volunteers, aged 55 and over, community residents, and had sufficient intellectual and language skills to complete the measures. Table I provides a listing of the measures administered to each sample along with means and standard deviations.

Sample 1

Sample 1 included 160 individuals (51 men and 109 women; mean age = 70, range = 55–89). These participants met the following additional selection criteria evaluated via interview: (a) prescription sleep medication, if used, was currently taken less than three nights per week; (b) currently not receiving psychiatric or psychological care, no evidence of psychopathology or depression; (c) absence of major illness or drug use directly associated with sleep disturbance; (d) no evidence of physically based sleep disturbance such as sleep apnea (to the extent that this can be determined through interview in an older sample); and (e) no evidence of parasomnias or sleep phase disorder. Twenty-nine individuals were excluded from the original group of 189 who met these selection criteria because they failed to complete the CCQ or indicated that they did not think of anything when trying to fall asleep. In general, participants were "middle class" (36% reported an annual income over $40,000, 43% reported income ranging from $20,000 to $40,000, and only 21% reported income below $20,000; in addition, 38% of participants had completed university, and an additional 56% had completed high school). Subjects in Sample 1 were participating in a larger investigation of sleep, lifestyle, and nondrug treatment of insomnia (Creti, Libman, & Fichten, 1999; Fichten et al., 1995). All completed the following measures on an individual basis under the supervision of a member of the research team in our laboratory: Structured Sleep History Interview, Sleep Questionnaire, Self-Efficacy Scale (Sleep), Sleep Behaviors Listing, CCQ, Overall Thought Pleasantness Rating, Presleep Arousal Scale, ASSQ, BSI, EPI, and Penn State Worry Questionnaire.

Table I. Measures Administered to the Two Samples: Means and Standard Deviations

Variable	Sample 1		Sample 2	
	M	*SD*	*M*	*SD*
Sleep measures				
Structured Sleep History Interview	Administered	Administered	—	—
Sleep Questionnaire				
Total sleep time (hr)	5.83	1.50	6.46	1.33
Total wake time (hr)	2.15	2.20	1.36	1.63
Sleep efficiency %	74%	19%	77%	28%
Sleep distress: Level (1–10)	3.54	2.82	2.93	2.45
Sleep distress: Frequency (0–21)	4.66	5.31	3.36	4.19
Self-Efficacy Scale (Sleep)	30.35	8.63	30.87	8.82
Sleep behaviors				
Sleep Behaviors Listing	2.61	1.36	2.35	1.38
Sleep Behaviors Scale: 60+	—	—	31.09	12.59
Thoughts During Nocturnal Arousals				
Cognitive Content Questionnaire (CCQ)				
Positive thoughts	1.62	1.62	1.80	2.14
Negative thoughts	1.19	1.54	1.25	1.47
States-of-mind ratio (SOM)	0.53	0.18	0.53	0.19
Worry thoughts	0.47	0.96	0.60	1.22
Self-Statement Test: 60+ (SST: 60+)				
Positive thoughts	—	—	28.73	12.08
Negative thoughts	—	—	23.39	11.47
States-of-mind ratio (SOM)	—	—	0.56	0.16
Overall Thought Pleasantness	3.76	0.89	3.28	1.07
Psychological Adjustment: Sleep-Related "State" Measures				
PreSleep Arousal Scale				
Somatic arousal	9.80	2.60	10.12	3.39
Cognitive arousal	14.00	5.87	14.27	5.83
Tension Thermometer	—	—	29.14	26.15
Anxious Self-Statement Questionnaire (ASSQ)	50.81	20.65	51.90	21.11
Psychological Adjustment: Trait Measures				
Brief Symptom Inventory (BSI)				
Anxiety	0.49	0.54	0.53	0.55
Depression	0.53	0.63	0.57	0.64
Eysenck Personality Inventory (EPI) Neuroticism	9.01	5.30	9.20	4.89
Penn State Worry Questionnaire	45.63	15.03	45.62	14.38

Note. Dashes indicate that the measures were not administered. In Sample 2, many of the measures were administered only to a subset of participants (see Method for details).

Poor sleepers who were either not appropriate for or interested in our ongoing treatment study or whose sleep complaint appeared to have a medical basis, as assessed by the Structured Sleep History Interview, were given appropriate referrals.

Sample 2

The 445 individuals who comprised Sample 2 (136 men, 309 women; mean age = 68, range = 55–88) were not screened for physical or psychological status or for sleep medication use. These individuals, who were also participants in two investigations where the objective was to develop and validate measures (SST: 60+, Fichten et al., 1998; Sleep Behaviors Scale: 60+, Libman et al., 1997) and to explore

daytime sleepiness and fatigue (Alapin et al., 2001) participated on an anonymous basis and completed the following measures either in a seniors' group context or at home: Sleep Questionnaire, Sleep Behaviors Scale: 60+, Self-Statement Test: 60+ (SST: 60+), Overall Thought Pleasantness Rating, and Tension Thermometer. Approximately 75% of these participants belonged to university or college seniors' groups. Because of the requirements of the larger investigation, a subsample consisting of 139 of the participants came to our laboratory and completed most of the Sample 1 measures at a different testing time; this permitted us to report on the relationships between key variables administered only to Sample 2 (e.g., Tension Thermometer) and a broad range of psychologically laden sleep variables (e.g., Sleep Self-Efficacy) and psychological adjustment measures (e.g., Cognitive and Somatic Arousal).

Grouping Participants: Good Sleepers, High Distress Poor Sleepers, and Low Distress Poor Sleepers

Sleep status was based on Sleep Questionnaire scores. Polysomnography (PSG) was not carried out because the central issue for our study is self-report of sleep quality. Moreover, data show that self-reports and objectively measured sleep parameters are generally highly correlated, even though means often differ substantially (e.g., Hoch et al., 1987; Kryger, Steljis, Pouliot, Neufeld, & Odynski, 1991).

Poor Sleepers were those (1) who met the following typically used research criteria for the diagnosis of difficulty initiating or maintaining sleep (DIMS): 30 min of undesired awake time at least 3 times per week, problem duration at least 6 months (c.f. Edinger et al., 1996; Fichten, Creti et al., 2000; Lichstein, Wilson, & Johnson, 2000; Morgan, 2000); and (2) whose Sleep Questionnaire responses indicated problematic sleep on both of two items: a relatively high Sleep Difficulty/Frequency of Problem Episodes score (4 or greater on a 10-point scale) as well as a relatively high subjective rating of Sleep Difficulty/Occurrence of Sleep Problems (at least 6).

High Distress Poor Sleepers were those Poor Sleepers whose subjective Sleep Distress/Level of Distress was 6 or greater (i.e., above the midpoint of the scale) and whose Sleep Distress/Frequency of Distress Episodes score was at least 9 (i.e., a minimum of three very upsetting nights per week). Low Distress Poor Sleepers were those Poor Sleepers whose scores on these two items indicated relatively low distress: subjective Sleep Distress/Level of Distress score fell below the midpoint on the scale (5 or less) and Sleep Distress/Frequency of Distress Episodes score was 8 or less (i.e., fewer than three upsetting nights per week).

Good Sleepers were individuals who failed to meet the criteria for a diagnosis of DIMS and who met the following requirements: Sleep Difficulty/Frequency of Problem Episodes score 3 or lower, subjective Sleep Difficulty/Occurrence of Sleep Problem score below the midpoint of the scale, Sleep Distress/Frequency of Distress Episodes score below 3, and subjective Sleep Distress/Level of Distress score 3 or lower.

Some individuals had elements of both Good and Poor Sleep. Designated "Medium Quality" Sleepers, their data are included in all analyses that do not

specifically require Good and Poor Sleepers. Longitudinal data indicate that membership in these sleep status groups is reasonably stable (Libman et al., 1998).

Sample 1

Of the 160 individuals in Sample 1, 47 met the criteria for Good Sleeper, 27 for Low Distress Poor Sleeper, and 23 for High Distress Poor Sleeper status. The remaining 63 participants were either "Medium Quality" Sleepers ($n = 41$) or Poor Sleepers who could not be classified as experiencing either High or Low Distress. Of the 72 Poor Sleepers, 50% had difficulty initiating sleep (i.e., met the criteria for sleep onset insomnia: a minimum of 30 min of undesired wakefulness at least 3 times per week), 83% had difficulty returning to sleep after waking in the middle of the night (sleep maintenance insomnia), and 84% had difficulty getting back to sleep after waking up too early (terminal insomnia). Three percent of Poor Sleepers failed to meet the criteria for any of the three diagnostic categories but experienced 30 min of undesired wakefulness at least 3 times per week in two of the three categories. Of Poor Sleepers, 16% had only one diagnosable sleep problem, 45% had two, and 36% had all three sleep problems. Poor Sleepers had experienced insomnia for a mean of 17 years (range = 0.5–60), indicating a chronic, rather than an acute sleep problem for most participants; there was no significant difference between Low and High Distress Poor Sleepers either on this variable or on age.

Sample 2

Of the Sample 2 participants, 189 were classified as Good Sleepers, 55 as Low Distress Poor Sleepers, and 36 as High Distress Poor Sleepers (see Table II). The remaining participants were either "Medium Quality" Sleepers ($n = 134$) or Poor Sleepers who failed to meet the criteria for either High or Low Distress ($n = 31$). Because of the treatment aspects of the larger investigation, Sample 1 contains a disproportionately large number of Poor Sleepers; Sample 2, with 189 Good and 122 Poor Sleepers, probably better resembles population sleep parameters of well-functioning older community residents (cf. Prinz, 1994). Of Sample 2 Poor Sleepers, 56% had sleep onset insomnia, 76% had sleep maintenance insomnia, and 60% had terminal insomnia. Five percent of Poor Sleepers failed to meet the criteria for any of the three diagnostic categories but experienced 30 min of undesired wakefulness at least 3 times per week in two of the three categories. Of Poor Sleepers, 27% had only one diagnosable sleep problem, 44% had two, and 24% had all three sleep problems. Poor Sleepers had experienced insomnia for a mean of 13 years (range = 1–63); there was no significant difference between High and Low Distress Poor Sleepers on this variable, although the three groups differed slightly, but significantly, on age, $F(2, 267) = 4.67$, $p < .05$, $MSE = 50.28$. The Tukey HSD test indicates that Low Distress Poor Sleepers were significantly older ($M = 70$, $SD = 7$) than Good Sleepers ($M = 66$, $SD = 7$). High Distress Poor Sleepers ($M = 67$, $SD = 7$) did not differ significantly from either group. As can be seen in Table II, the sleep characteristics of the three groups were similar to those in Sample 1.

One-way ANOVA comparisons on relevant sleep parameters of Good Sleepers, Low Distress Poor Sleepers, and High Distress Poor Sleepers were all significant at

Table II. Sleep Parameters and Sleep Behaviors: Mean Scores of Good Sleepers and High and Low Distress Poor Sleepers

Variable	Good sleepers	Poor sleepers		TUKEY HSD Tests ($p < .05$)
		Low distress	High distress	
Sleep parameters				
[a]Total sleep time				
Sample 1 (hr)	6.86 (1.07)	5.03 (1.03)	4.24 (1.32)	Hi < Lo < Good
Sample 2 (hr)	7.13 (0.98)	5.56 (1.32)	5.29 (1.40)	Hi = Lo < Good
[a]Total wake time				
Sample 1 (hr)	1.05 (0.93)	2.97 (1.77)	3.71 (1.95)	Hi = Lo > Good
Sample 2 (hr)	0.25 (0.21)	2.63 (1.89)	3.97 (1.57)	Hi > Lo > Good
[a]Sleep efficiency				
Sample 1 (%)	87 (11)	65 (16)	55 (19)	Hi = Lo < Good
Sample 2 (%)	97 (3)	70 (16)	58 (13)	Hi < Lo < Good
[a]Sleep behaviors				
Sample 1	2.00 (0.99)	2.74 (1.53)	3.09 (1.56)	Hi > Good[b]
Sample 2	25.56 (11.66)	36.47 (12.20)	36.96 (12.93)	Hi = Lo > Good

Note. All 1-way ANOVAs were significant at the .01 level or better. Sample 1 dfs range from 2.89 to 2.94, Sample 2 dfs range from 2.231 to 2.274.

[a]These variables were calculated differently for Samples 1 and 2 because of differences in available scores. For Sample 1: Sleep Efficiency was calculated by dividing Total Sleep Time by Total Bed Time. Total Wake Time is the result of subtracting Total Sleep Time from Total Bed Time. Sample 2: Total Wake Time is the result of summing 3 daily wake times (sleep onset latency, waking after sleep onset, morning wakefulness). Sleep Efficiency was calculated by dividing Total Sleep Time by the sum of Total Sleep Time and Total Wake Time. Sleep behaviors are based on the open-ended Sleep Behaviors Listing in Sample 1, and on the Sleep Behaviors Scale: 60+ in Sample 2.

[b]Lo group is not significant different from either Hi or Good.

the .01 level or better. Findings in Table II indicate that the criteria for classifying sleep status resulted in very good and very poor sleepers in our contrast groups and that even when there is a difference between the two poor sleeper groups, their means are closer to each other than to the good sleeper group.

RESULTS

What Do People Think About During Periods of Nocturnal Wakefulness? Evaluation of Open-Ended Thought Listings

Scoring Issues

To obtain descriptive data about the content of thoughts experienced while trying to fall asleep, thought listings made by the 160 participants in Sample 1 who completed the CCQ were examined. Thought content and valence were both scored. Negative thoughts were designated as "worry" or "nonworry" thoughts by two trained coders (cf. Andrews & Borkovec, 1988).

We derived 17 specific categories (plus an 18th: "miscellaneous") to code the content of thoughts during periods of insomnia (Fichten & Lennox, 1993); Table III provides a listing. Two coders, trained to a minimum of 70% item-by-item interrater agreement (which required approximately 30 hr of training) who were blind to participants' sleep characteristics, classified responses into the 18 content codes.

Table III. Rank Ordering of Thoughts Experienced While Trying to Fall Asleep (Sample 1)

Thought category (example)	Participants (%)		[a]Thoughts (%)	
	Who thought about this	Who worried about this	Positive	Negative
Future: Short term (events of next day, week)	48	1	57	20
Friends/family: Nonspecific (friends, grandchildren, sister)	39	8	50	42
Past: Short term (events of day, past week)	27	1	49	30
Future: Long term (plans, upcoming activities)	23	5	62	30
Self: Nonspecific (current situation, personality)	22	7	23	71
Activities (volunteer work, job, chores)	16		62	23
Past: Long term (events of distant past)	15	2	50	42
Affect (positive/negative mood descriptions)	14	1	61	39
Friends/family: Health (health status of friends and family)	8	8	8	92
Entertainment (TV, book, radio, tape, movie)	6		100	0
Miscellaneous (thoughts not classified elsewhere)	6		60	30
Prayer (reference to praying)	6		44	0
Insomnia (the problem, its consequences)	5	5	0	100
Current affairs (politics, world conditions)	5		25	50
Relaxation (feeling sleepy, relaxed)	4		86	0
Room environment (noises, stillness in bedroom)	3		25	75
Self: Health (one's own health status)	1		100	0
Time (thoughts about the passage of time)	1		0	0

Note. The 160 Sample 1 participants reported a total of 397 "different" thoughts. Of these, 53 were neutral or unclassifiable. One hundred and ninty-nine were positive and 145 were negative. Fifty-nine of the negative thoughts indicated worry.
[a]The remaining thoughts were neutral or unclassifiable.

When respondents failed to indicate valence, the two trained coders classified thoughts as positive, negative, or neutral/unclassifiable. Interrater agreements were assessed on three checks of reliability (a total of 235 codes on the protocols of 69 participants). Average interrater reliability for content was 74%, with a minimum of 70%; the Kappa coefficient was .67. Agreement on Worry was 100%. For valence, the mean interrater agreement was 83%, with a minimum of 76%.

The 160 participants in Sample 1 reported a total of 516 coded thoughts (an average of 3.23 thoughts per participant). To obtain descriptive data about the percentage of participants who experienced each type of thought, we counted the number of respondents who reported experiencing positive, negative, and neutral thoughts that fell into each of the coded categories; there were 397 such "different" thoughts (i.e., if a participant indicated two or more thoughts with the same valence and content code, e.g., "I thought about tomorrow's bridge game [+]" and "I thought about going

shopping for gifts in the morning [+]," he/she was counted as one individual who had at least one positive thought in the Future: Short-Term category).

Content of Thoughts

Data in Table III provide descriptive information about thought content. These indicate that thoughts experienced by a high percentage of individuals—those relating to the self—were predominantly negative. Other popular thoughts, however, such as thoughts about one's past and future, both short and long term, were somewhat more likely to be positive than negative. The same was true of thoughts about friends and family as well as one's activities.

Do Good Sleepers and Low and High Distress Poor Sleepers' Thoughts Differ?

To explore similarities and differences in thinking among groups, we examined both Positive and Negative thought frequencies as well as the SOM ratio (Positive/[Positive + Negative]) when comparing mean scores of Good Sleepers and High and Low Distress Poor Sleepers in both Sample 1 and Sample 2. These are presented in Table IV. ANOVA comparisons were not carried out on Psychological Adjustment measures because these are available elsewhere (Fichten et al., 1995).

Measurement Issues: Thought Listing Versus Endorsement

The two samples were useful, not only because they provided replication data but also because the thought gathering process was different. In Sample 1, valenced

Table IV. Thoughts While Trying to Fall Asleep: Mean Scores of Good Sleepers and High and Low Distress Poor Sleepers

Variable	Good sleepers	Poor sleepers		TUKEY HSD Tests ($p < .05$)
		Low distress	High distress	
[a]SOM ratio				
CCQ (Ratio of means for Sample 1)	0.76	0.54	0.40	
CCQ (Mean of ratios for Sample 1)	0.57 (0.16)	0.53 (0.17)	0.44 (0.17)	Hi < Good[b]
SST: 60+ (Mean of ratios for Sample 2)	0.61 (0.16)	0.53 (0.13)	0.46 (0.14)	Hi < Good[b]
Worry thoughts (Sample 1)	0.21(0.59)	0.37 (0.69)	0.78 (1.31)	Hi > Good[b]
Overall thought pleasantness rating				
Sample 1	4.14 (0.90)	3.67 (0.83)	3.22 (1.00)	Hi < Good[b]
Sample 2	3.58 (1.05)	3.10 (0.84)	2.78 (1.19)	Hi < Lo<Good

Note. 1-way ANOVAs were significant at the .05 level or better.

[a]SOMs refer to Schwartz and Garamoni's states-of-mind ratios (Positive/(Positive + Negative) thoughts, Schwartz & Garamoni, 1986, 1989. Higher scores reflect more adaptive thinking. Mean of ratios: SOMs are calculated for each participant; the score reported is the mean of these ratios. Ratio of means: SOMs are calculated using group means for Positive and Negative thought frequencies; no inferential statistics are possible. For SST: 60+, the mean of ratios is equal to the ratio of means.

[b]Lo group is not significantly different from either Hi or Good.

and worry thoughts were collected in an open-ended manner on the CCQ. Although such data are "closer" to participants' experiences, this type of data gathering has numerous problems (Amsel & Fichten, 1998; Fichten, Amsel, & Robillard, 1988). Consistent with others' reports (Arnkoff & Glass, 1989; Glass & Arnkoff, 1994), it can be seen in Table IV that thought listing data provided by Sample 1 yielded low valenced frequencies; also, there were extremely few Worry thoughts. As noted elsewhere (Amsel & Fichten, 1990, 1998), SOM ratio values based on low frequencies should be interpreted with caution. SOM scores based on calculating the ratio of valenced scores' group means, which uses all Sample 1 data (see Table IV); however, although these may provide a better approximation of actual SOM values, statistics cannot be performed using these ratios.

In spite of the difficulties associated with low frequencies on thought listing, correlational data from the 139 Sample 2 participants who completed both the CCQ and the SST: 60+ showed reasonable concordance between the two measures of valenced thoughts. Although the r values were low, Negative thoughts on the SST: 60+ and the CCQ were significantly related, $r(137) = .29$, $p < .001$, as were SOM scores, $r(106) = .19$, $p < .05$. The coefficient for Positive thoughts, although in the right direction, did not attain significance, $r(137) = .14$, $p < .10$; this is not surprising, given the low temporal stability of CCQ Positive thoughts.

Positive and Negative Thought Frequencies, SOMs, Thought Pleasantness, and Worry in Good Sleepers and High and Low Distress Poor Sleepers

The two-way ANOVA comparisons on thought frequencies (3 Groups × 2 Valence [Positive/Negative]), with valence being a repeated measure, indicated significant interactions of Valence × Group both on the CCQ (Sample 1), $F(2, 94) = 5.39$, $p < .01$, $MSE = 2.08$, as well as the SST: 60+ (Sample 2), $F(2, 277) = 18.77$, $p < .001$, $MSE = 86.53$. These indicate that although both Good Sleepers and Low Distress Poor Sleepers had more Positive than Negative thoughts, the opposite was true for High Distress Poor Sleepers on both the CCQ as well as the SST: 60+. Tests on the significant interactions showed no significant differences between groups on Positive thoughts on either measure. However, both High and Low Distress Poor Sleepers had significantly more Negative thoughts than Good Sleepers on the CCQ, $F(2, 94) = 6.85$, $p < .01$, $MSE = 1.92$, as well as on the SST: 60+, $F(2, 277) = 39.83$, $p < .001$, $MSE = 105.37$. In addition, the Tukey HSD test showed that the three groups differed significantly from each other on SST: 60+ Negative thoughts. The similarity of these results, using two different measures and two different samples, attests to the robustness of the findings on cognitions and indicates that the significant age difference found in Sample 2 did not influence the findings.

As is evident in Table III, the one-way ANOVA comparison and Tukey HSD test results on CCQ SOMs indicate that Good Sleepers had significantly higher scores than did High Distress Poor Sleepers, $F(2, 85) = 4.63$, $p < .05$, $MSE = .03$; scores of Low Distress Poor Sleepers did not differ significantly from either of the two other groups. Analyses on SST: 60+ SOMs show the identical pattern, $F(2, 277) = 18.85$, $p < .001$, $MSE = .02$.

Findings on an additional index of thought valence, Overall Thought Pleasantness Rating, also showed that Good Sleepers had significantly higher scores than did High Distress Poor Sleepers both in Sample 1, $F(2, 91) = 8.01$, $p < .001$, $MSE = 8.01$, as well as in Sample 2, $F(2, 269) = 11.49$, $p < .001$, $MSE = 4.23$. Although Low Distress Poor Sleepers were not significantly different from the other two groups in Sample 1, Low Distress Poor Sleepers differed significantly from the other two groups in Sample 2. Results for the comparison on Worry thoughts (Sample 1) also showed significantly better scores for Good Sleepers than for High Distress Poor Sleepers, $F(2, 94) = 3.58$, $p < .05$, $MSE = .70$. Because of the low frequencies of Worry thoughts, we also performed three chi-square tests on the number of individuals who had at least one such thought; these results, too, indicated a significant difference between Good and High Distress Poor Sleepers, $\chi^2(1) = 5.14$, $p < .05$; Low Distress Poor Sleepers did not differ significantly from the other two groups.

Ruling Out the Possible Effects of Sleep Problem Severity: Mediational Effects of Negative Thoughts

Differences between groups on cognitive variables may have been due to differences in sleep problem severity. Therefore, a series of analysis of covariance (ANCOVA) comparisons were made on the cognition variables, using Sleep Efficiency as the covariate. In all cases, the same comparisons were significant as on the ANOVAs. This is consistent with previously reported findings that the severity of the sleep problem is frequently unrelated to psychological adjustment, as measured by personality and psychopathology scales (Levin, Bertelson, & Lacks, 1984; Shealy, Lowe, & Ritzler, 1980).

As a further check, we also conducted regression analyses. Here, the relationship between thought content and sleep complaints remained significant even after controlling for sleep parameters. For example, a hierarchical regression was run to predict Level of Distress with the use of frequencies of Positive and Negative thoughts as independent variables and Total Sleep Time (TST) and Total Wake Time (TWT) as covariates.

For Sample 1, TST and TWT significantly predicted Level of Distress, $F(2, 143) = 43.03$, $p < .001$, with $R = .61$. The part correlations of TST, $t = 2.48$, $p < .05$, and TWT, $t = 4.99$, $p < .001$, were significant, showing that each accounted for unique variation in the model. When Positive and Negative thoughts were added to the equation, the unique contribution of Positive thoughts was not significant, $t = .421$, $p > .05$, whereas Negative thoughts contributed significantly beyond TST and TWT, $t = 3.88$, $p < .001$. The four independent variables yielded an $R = .661$, $F(4, 141) = 28.00$, $p < .001$, indicating that cognitions account for an additional 6% of the variation beyond TST and TWT in predicting Distress.

For Sample 2, a parallel analysis yielded an $R = .60$, $F(2, 368) = 105.12$, $p < .001$, when TST and TWT were used to predict distress. The part correlation of TWT was significant, $t = 11.09$, $p < .05$, whereas that of TST was not, $t = 1.45$, $p > .05$. Again, the addition of Positive and Negative thoughts yielded a modest gain of 4% in the variation accounted for, with $R = .64$, $F(4, 366) = 61.97$, $p < .001$. Positive thoughts did not show a significant part correlation, $t = 1.86$, $.1 > p > .05$,

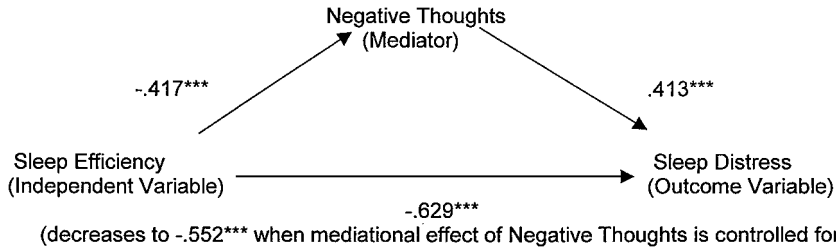

Fig. 2. Mediational analysis: Correlations among variables.

whereas the part correlation for Negative thoughts was again significant, $t = 4.97$, $p < .001$.

As a further test of the mediational role of Negative thoughts in the relationship between sleep problem severity and sleep distress, in Sample 2 we calculated three correlations: between the independent variable (Sleep Efficiency) and the proposed mediator variable (Negative thoughts), between negative thoughts and the outcome variable (Sleep Distress), and between Sleep Efficiency and Sleep Distress. It can be seen in Fig. 2 that all three correlations are significant at the .001 level. When a regression was done to examine the mediational effects of Negative thoughts on the relationship between Sleep Efficiency and Sleep Distress, it can be shown that this relationship is reduced, but not eliminated (see Fig. 2). This suggests that Negative thoughts may play a modest mediating role in the relationship between Sleep Efficiency and Sleep Distress (cf. Baron & Kenny, 1986). There was no evidence that Positive thoughts played a mediating role as a partial correlation removing the effect of positive thoughts showed no change in the correlation between Sleep Efficiency and Sleep Distress (i.e., $r = -.629$, $p < .001$ remained the same).

Relationships Between Sleep Parameters and Thoughts During Nocturnal Awake Times

Pearson product–moment correlation coefficients in Table V show the relationships between sleep parameters, SOM scores, and valenced thought frequencies. Worry thoughts are not included because only 40 of the 160 Sample 1 participants reported any Worry thoughts. Correlations between sleep parameters and nocturnal ("state") and daytime measures ("trait") of anxiety and poor adjustment are provided for comparison.

Results indicated that all correlations between SST: 60+ Negative thought frequencies and sleep parameters were highly significant, and, with one exception, exceed .40. The SST: 60+ SOM ratios were also significantly related to all of these variables, but the coefficients were somewhat smaller. Many CCQ Negative thought frequencies and, to a lesser extent, SOMs were also significantly related to scores on sleep measures, but only to those with appreciable "psychological" loading (e.g., sleep self-efficacy expectations, distress concerning one's sleep problems); we believe that these "weaker" results on CCQ scores (only 50% of coefficients were significant) are due to low frequencies with the use of thought listing. Although correlations between sleep parameters and most of the other measures of thinking and adjustment also showed significant relationships with psychologically laden sleep

Table V. Relationship Between Sleep Parameters and State and Trait Measures of Thinking, Personality, and Adjustment

	Sleep parameters				Psychologically laden sleep parameters				
					Sleep difficulty			Sleep distress	
	Total sleep time	Total wake time	Sleep efficiency	*Sleep behaviors*	Frequency of problem episodes	Occurrence of sleep problem	Self-efficacy	Frequency of distress episodes	Level of distress
State measures									
Self-Statement Test: 60+ (SST: 60+)									
Negative	*−.24***	*.40***	*−.42***	*.52***	*.46***	*.41***	*−.48***	*.47***	*.41***
Positive	−.12**	.02	−.05	*.43***	.05	.04	−.18*	.09	−.02
SOM	.10*	−.33**	.32**	*−.13**	−.35**	−.30**	.17*	−.33**	−.34**
Cognitive Content Questionnaire (thought listing)									
Negative	*−.11*	*−.02*	*−.02*	*.05*	*.23***	*.21***	*−.31***	*.31***	*.32***
Positive	.01	−.02	.01	*.20**	−.02	−.03	.06	−.13	.04
SOM	.09	.03	.01	*.11*	−.17*	−.15	.24**	−.28**	−.20*
Presleep Arousal									
Cognitive	−.26**	.12	−.16*	*.17**	.40**	.41**	−.59**	.48**	.53**
Somatic	−.12	.13	−.11	*.01*	.16	.25**	−.35**	.17*	.32**
ASSQ	−.20**	.29**	−.30**	*.31***	.40**	.40**	−.53**	.42**	.45**
Tension Thermometer	−.04	−.02	−.02	*−.09*	.14	.13	−.39**	.29**	.26**
Overall Thought Pleasantness	.06	−.19**	.18**	*−.15***	−.25**	−.21**	.40**	−.25**	−.28**
Trait measures									
Personality									
EPI Neuroticism	−.13	.12	−.15	*.16*	.31**	.31**	−.52**	.38**	.39**
Penn State Worry	−.12	.03	.06	*.05*	.35**	.28**	−.48**	.45**	.42**
Symptoms									
BSI Anxiety	−.04	−.07	.03	*.01*	.13	.13	−.41**	.25**	.26**
BSI Depression	−.01	−.09	.05	*−.12*	.18*	.16*	−.36**	.31**	.35**

Note. Notable findings are given in italic. Sample 1 scores, except for SST: 60+ and Tension Thermometer. Sample 1 sizes vary from 137 to 160. Sample 2 sizes vary from 139 to 445.

* $p < .05$.

** $p < .01$ or better.

variables, it is noteworthy that only cognitive variables—Negative thoughts, SOMs, Tension Thermometer scores, and Cognitive (but not Somatic) Presleep Arousal—were found to be significantly related to those sleep parameters that evaluate "quantitative" aspects of the sleep experience such as total sleep and wake times and sleep efficiency.

Correlations with Positive thoughts showed substantially different results, with most coefficients being very small and nonsignificant. Here, the only notable finding on both the CCQ and SST: 60+ was *positive* correlations with Sleep Behaviors.

How Are Thoughts During Nocturnal Awake Times Related to Personality and Adjustment?

Pearson product–moment correlation coefficients in Table VI show that both CCQ and SST: 60+ Negative thought frequencies were significantly correlated ($p <$ .05 or better) with scores on *all* measures of poor adaptation examined. Generally, correlations with the SST: 60+ were higher than with the CCQ. SOMs on both measures were also logically and significantly related to many of these variables, but the size of the coefficients was somewhat smaller. High and significant correlations were also found between Tension Thermometer scores and, with the exception of Positive thoughts and the SOM ratio on the CCQ, on all measures of thinking and adjustment.

Positive thought frequency on the CCQ was not related significantly to scores on any of the adjustment measures, with the exception of Depression and Overall Thought Pleasantness; although these results are significant ($p < .05$ or better) and in the expected direction, coefficients are quite low. Correlations between SST: 60+ Positive thought frequencies and scores on the other measures were, however, *in the same direction* as correlations with Negative thoughts, although these were lower, and many were nonsignificant.

DISCUSSION

Features of the Present Study

Our findings are based on two large samples of older individuals who lived in the community and were generally healthy, well-adjusted, educated, and financially comfortable. It is possible that the findings may not be generalizable to other, less advantaged older populations. It should also be noted that our findings are correlational rather than causal, and that poorer adaptation in highly distressed older poor sleepers does not appear to be limited to the sleep experience. Whether negative thinking and psychological maladjustment in highly distressed poor sleepers precedes the onset of insomnia (e.g., Healey et al., 1981) or whether these result from sleeplessness (e.g., Morgan et al., 1989) cannot be determined by our data.

We also assessed sleep parameters with the use of retrospective questionnaires rather than with objective measures such as PSG. Although self-reports are less "objective," we believe that these are more valid in defining insomnia (cf. Fichten, Libman, Bailes, & Alapin, 2000). Although PSG may be vital in the disorders such as

Table VI. Relationships Between Thoughts During Nocturnal Awake Times and Trait and State Measures of Thinking, Personality, and Adjustment

	Trait measures				State measures				
	Personality		Symptoms			Presleep arousal			
	Penn State Worry	EPI Neuroticism	BSI Anxiety	BSI Depression	Overall Thought Pleasantness	Cognitive	Somatic	Tension Thermometer	Anxious Self-Statements Questionnaire
Self-Statement Test: 60+ (SST: 60+)									
Negative	*.49***	*.46***	*.41***	*.40***	*−.41***	*.49***	*.41***	*.54***	*.49***
Positive	.30**	.31**	.15	.10	.07	.32**	.22*	.09	.32**
SOM	−.08	−.06	−.15	−.19*	.38**	−.09	−.10	−.37**	−.08
Cognitive Content Questionnaire (thought listing)									
Negative	*.30***	*.30***	*.24***	*.28***	*−.44***	*.33***	*.17**	*.20**	*.30***
Positive	−.09	−.10	−.14	−.18*	.21**	−.05	.04	−.08	−.15
SOM	−.23**	−.23**	−.24**	−.32**	.40**	−.22**	−.05	−.15	−.28**
Thought Pleasantness	−.27**	−.26**	−.28**	−.29**	1.00	−.40**	−.21**	−.34**	−.30**
Tension Thermometer	.52**	.37**	.33**	.24**	−.50**	.46**	.42**	1.00	.25**

Note. Notable findings are given in italic. Sample 1 scores, except for SST: 60+ and Tension Thermometer. Sample 1 sizes vary from 146 to 160. Sample 2 sizes vary from 110 to 445.

* $p < .05$.

** $p < .01$ or better.

sleep apnea and restless legs/periodic limb movement disorder, it seems to have little to add to self-report in the case of insomnia (Reite, Buysse, Reynolds, & Mendelson, 1995; Standards of Practice Committee of the American Sleep Disorders Association, 1995; Vgontzas, Kales, Bixler, Manfredi, & Vela-Bueno, 1995).

What Do Older Individuals Think About When Trying to Fall Asleep and Why is This Important?

Consistent with reports in the literature that older individuals tend to report primarily positive, rather than negative or worry thoughts (Powers, Wisocki, & Whitbourne, 1992; Wisocki, 1988), participants in Sample 1 of our study, too, were most likely to think about positive activities and events in the near future and in the recent past. Activities in general and plans for the future were also popular and largely positive themes.

Various nonhealth issues related to friends and family were the second most frequently mentioned topic. However, here, approximately half of the thoughts were negative and 8% of participants indicated that they worried about friends or family members. Similarly, thoughts about the distant past were ambivalent, with only slightly more positive than negative thoughts.

Thoughts about oneself and one's situation were also common; the majority of such thoughts was negative. Participants were most likely to worry about their own circumstances and those of family and friends; this has also been found in other studies (Wisocki, 1988). Thoughts about one's own health were rare and, surprisingly, even though almost half of the sample had diagnosable insomnia, only 5% of participants reported that they thought about their troubled sleep or its consequences while awake during the night. These results might have been different if participants had been asked to record their thoughts while awake during the night or immediately after getting up in the morning. In future research on thoughts during nocturnal awake times, more immediate reporting techniques that are less affected by memory should be used. Nevertheless, this demonstrates the range of presleep cognitive content in older adults, a classificatory scheme, and documents that valence of thoughts cannot be assumed automatically from their content.

Valenced Thoughts in the Experience of Insomnia

Sleep parameters of highly and minimally distressed poor sleepers were fairly similar, although where differences occurred, highly distressed poor sleepers had worse scores. Both groups of poor sleepers differed substantially from good sleepers on total sleep and wake times as well as on sleep efficiency. When positive and negative thoughts during nocturnal awake times are concerned, high distress poor sleepers had the worst scores, and low distress poor sleepers had intermediate scores and, in many ways, resembled good sleepers. Both covariance and regression analyses—to control for the effects of sleep parameters—indicate that although sleep parameters such as total sleep and wake times were most heavily implicated in distress about sleep, negative thoughts made a substantial contribution to sleep complaints above and beyond the influence of sleep problem severity.

Significant interactions of sleep status and thought valence in both samples suggest that both good sleepers and minimally distressed poor sleepers tended to report more positive than negative thoughts and had a better balance of positive to negative thoughts than did their similarly poor—but more highly distressed—counterparts. Results using the SOM ratio, which reflects the balance between positive and negative thinking, confirmed that highly distressed poor sleepers' thinking is the most maladaptive.

Positive and Negative Thought Frequencies and SOMs

We also found that negative thought frequencies and, to a lesser extent, SOM ratios provide better measures of dysfunctional thinking during nocturnal awake times than do positive thought frequencies. These results underscore the need to report both positive and negative thought frequencies as well as SOM ratios (cf. Amsel & Fichten, 1998). Valenced frequencies can be used to study etiology and cognitive mediation of affect and behavior, whereas SOM ratios, which reflect the balance between positive and negative thinking, permit comparisons across different studies and methodologies (e.g., Bruch, 1997; Bruch, Hamer, & Kaflowitz-Lindner, 1992; Haaga, Davison, McDermut, Hillis, & Twomey, 1993; Heimberg, Bruch, Hope, & Dombeck, 1990; Schwartz, 1997; Schwartz, Reynolds, Thase, Frank, & Fasiczka, 1995). In support of proposals in the literature that positive and negative thoughts may serve different mediating functions, our data echo Kendall's "power of non-negative thinking" conclusion (Kendall, 1984) and suggest that it is the *absence of a negative* cognitive–affective set that characterizes successful coping with age-related changes in sleep and wakefulness.

Thinking positive thoughts may be a "coping strategy" to combat negatives. First, positive thoughts in both samples were essentially unrelated to any of the other sleep parameters evaluated. Second, positive and negative thoughts on the SST: 60+ had same rather than opposite sign correlations with state and trait measures of adjustment. These results and findings reported elsewhere (Fichten et al., 1998; Libman et al., 1997) suggest that frequent positives may both signal the presence of a problem as well as serve as a buffer, by helping to combat negative thinking. This hypothesis should be tested in studies with the use of experimental rather than correlational designs.

Relationships With Sleep Measures

Correlational data show that negative thoughts and, to a lesser extent, the SOM ratio are strongly and significantly related to sleep measures that have an appreciable psychological loading (e.g., sleep self-efficacy expectations, distress concerning one's sleep problem). Trait measures of personality and adjustment as well as state measures that evaluate thinking and affect during nocturnal wake times were also found to be related to these psychologically laden sleep variables. What differentiates findings on thoughts from findings on other measures is that SST: 60+ negative thoughts and, to a lesser extent, SOM scores are also highly and significantly related

to the more "quantitative" aspects of sleep (i.e., total sleep and wake times and sleep efficiency).

Cognitive Versus Somatic Arousal

Consistent with views expressed by many sleep researchers and clinicians (cf. Lichstein & Rosenthal, 1980; Morin, Culbert, & Schwartz, 1994), our findings on the somatic and cognitive subscales of the Presleep Arousal Scale suggest that the cognitive aspects of state anxiety are more closely related to troubled sleep than are the somatic aspects. The pattern of correlations also suggest that "tension," as measured by the single item Tension Thermometer, reflects cognitive rather than somatic arousal and that it functions similarly to negative thoughts in its relation to sleep parameters. Others have also reported finding strong relationships between tension and worry, and worry is often assumed to be the cognitive (as opposed to somatic) component of anxiety (Borkovec & Inz, 1990; East & Watts, 1994; Mathews, 1990). Indeed, correlations between worry and "tension" are typically higher than those between worry and either anxiety or depression (Brown, Anthony, & Barlow, 1992) and worriers have been shown to have more frequent negative and less frequent positive thoughts than have nonworriers (Pruzinsky & Borkovec, 1990).

Cognitive Model of Insomnia

The findings provide support for heuristic, descriptive aspects of our cognitive model of insomnia and also provide some support for the mediational role of negative thoughts in insomnia-related distress. Although perceived severity of the sleep problem accounts for most of the variability in distress about poor sleep, negative thoughts also make a significant contribution. These cognitive aspects were more closely related to the various components of the insomnia experience than *any* of the state or trait measures of anxiety and adjustment, suggesting a mediational role for negative thinking during nocturnal awake times.

Our findings suggest that thoughts during the day and during the night may pose a mediational link between personality and psychological adjustment on the one hand and distress about insomnia on the other (Fichten et al., 1998). The root cause of insomnia distress may be central nervous system (CNS) hyperarousal or cortical arousal during unwanted nocturnal wakefulness (Bonnet & Arand, 1997, 1998; Lamarche & Ogilvie, 1997; Perlis et al., 1997; Vgontzas et al., 1998). The CNS hyperarousal formulation is entirely consistent with our view that negative thoughts mediate aspects of the insomnia complaint (i.e., negative thinking is the experiential component of physiological cortical arousal). Whatever their source, the powerful impact of negative thinking on affect and behavior has been amply demonstrated in the vast cognitive therapy literature. Because effective techniques for altering negative thoughts are readily available, our findings have a variety of applied implications for the treatment of insomnia.

Using the Model to Conceptualize Where and How to Intervene

Our study provides an empirical link between cognitive concepts and therapeutic intervention. The therapeutic approach clearly suggested by our model and our data is to reduce negative thoughts and "tension" during nocturnal awakenings. This may be accomplished in a variety of ways. First, individuals may be taught to replace negative thoughts with neutral, "defusing," or positive thoughts and images. Second, people may be instructed to distract themselves (cf. Mathews & Milroy, 1994); this can be accomplished by refocusing attention away from the negatives by watching TV, reading, listening to the radio or to audiotapes with verbal content (Creti et al., 1999). Third, it is possible to interrupt negative thoughts by engaging in incompatible activities either in bed (e.g., relaxation exercises) or out of bed, as prescribed in Bootzin's popular stimulus control insomnia treatment (Bootzin, Epstein, & Wood, 1991). Finally, our data also implicate daytime contributors to insomnia, including anxiety, tension, depression and an anxious, worrying personality style. This suggests that effective therapeutic intervention for insomnia might address the broader goal of modifying maladaptive daytime thoughts and feelings as well.

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