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Effectiveness of Cognitive-Behavioral Insomnia Treatment in a Community Sample of Older Individuals: More Questions than Conclusions

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Effectiveness of two modified stimulus control insomnia interventions plus daily sleep self-monitoring for managing insomnia was investigated in a community sample of older adults. Significant post intervention improvement was observed in both interventions as well as in a self-monitoring only control condition. This unexpected finding led us to question the role of self-monitoring as a potential mediator of therapeutic change. Therefore, we compared long-term follow-up data from treated participants to data from similarly poor sleepers who only completed the questionnaire battery at Pre-test and long term follow-up, with no intervening treatment or self-monitoring. Both groups of poor sleepers reduced their reported amount of nocturnal wakefulness. However, only treated participants improved on their perceived frequency of insomnia episodes and insomnia-related distress. Our findings have implications both for the definition and the treatment of insomnia.

KEY WORDS: insomnia; treatment; cognitive-behavioral; intervention; aging; long-term follow-up; older adults.

In the past 20 years we have witnessed the emergence of effective cognitive-behavioral interventions for treating insomnia (Hauri & Linde, 2000). During the past decade there has been an increasing focus on insomnia in older adults, a population especially vulnerable to both insomnia as well as the detrimental effects of often prescribed sleep medications (cf. Benca, Ancoli-Israel, & Moldofsky, 2004; Lichstein & Morin, 2000).

Insomnia treatment has traditionally targeted nocturnal sleep parameters, such as total sleep and wake times. The effectiveness of the intervention has typically been determined by evaluating enhanced sleep continuity (fewer nocturnal awakenings) and Sleep efficiency (percentage of bedtime spent asleep) (Fichten, Libman, Bailes, & Alapin, 2000). Addition of cognitive aspects to behavioral interventions, a prominent feature since the early 1990s, appears to increase satisfaction and maintain treatment effectiveness in the long term (e.g., Edinger, Wohlgemuth, Radtke, Marsh, & Quillian, 2001; Krystal, 2004).

The role of pre-sleep worry and cognitive intrusions in the maintenance of insomnia has been established (Harvey, 2002). Several authors have proposed that the effective component in all successful insomnia therapies is the disruption of intrusive and negative cognitive activity during nocturnal wake times (e.g., Borkovec, Lane, & Van Oot, 1981; Coates et al., 1983; Coyle & Watts, 1991; Harvey, Tang, & Browning, 2004; Kuisk, Bertelson, & Walsh, 1989; Nicassio, Mendlowitz, Fussel, & Petras, 1985; Lacks, 1987; Lichstein & Fischer, 1985). Our own work, as well as that of others, suggests a mediational link between poor sleep and maladaptive affect, problematic sleep behaviors and erroneous information processing. Combined, these comprise both the complaint of insomnia and the perceived impairment of daytime functioning (Alapin et al., 2000; Fichten

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et al., 1995; Fichten et al., 1998, 2000; Libman, Creti, Amsel, Brender, & Fichten, 1997; McCrae et al., 2003; Tang & Harvey, 2004).

The present investigation was designed as an analogue study which examines the effectiveness of a cognitive-behavioral treatment for insomnia in an aging sample. Older individuals appear particularly vulnerable. They may interpret normal age-related physiological changes (e.g., nocturnal awakenings or early morning arousal) as abnormal. This may lead to greater anxiety/worry about sleep which may cause or exacerbate insomnia. The older adult is also more susceptible to illness, lifestyle changes (e.g., retirement), and losses (e.g., family, friends), which have also been found to be related to insomnia.

Thus, older persons are faced with many events that may potentially disrupt their sleep or increase their sleep complaint. The present study developed and evaluated an innovative technique within a traditionally formulated cognitive-behavioral program. The treatment strategy was designed to be easily implemented by older adults and to target directly the hypothesized effective component of most cognitive-behavioral treatments for insomnia—elimination of obsessive and intrusive thoughts—by refocusing attention.

Our cognitive distraction treatment strategy aimed to disrupt sleep-incompatible activities by requiring individuals to engage in a non-arousing activity in bed whenever they were unable to sleep (i.e., listening to an audiotaped novel using a pillow speaker). Because this does not necessitate opening one's eyes, leaving the bed, or making major changes in the usual pre-sleep sequence of activities, we anticipated minimal compliance problems. We also adapted passive relaxation instructions of the same format as audiobooks (i.e., passive relaxation instructions delivered by audiotape and pillow speaker), and included it as a comparative intervention.

To better represent the heterogeneity of insomnia complaints, we considered assessing treatment outcome variables beyond the traditional sleep parameters of sleep onset latency and sleep duration were considered. Consistent with the current diagnostic classification systems and outcome research, the subjective sleep experience was defined as comprising three dimensions: (1) quantity: the subjective estimate of sleep onset latency, duration of waking after sleep onset, total sleep time, and Sleep efficiency; (2) quality: subjective evaluations of Sleep quality, Insomnia frequency, distress about insomnia, and Sleep self-efficacy expectations; and (3) Daytime Sequelae: ratings of daytime sleepiness, fatigue, functioning and morning restedness.

The original objective of the present study was to conduct a preliminary comparative evaluation of a modified stimulus control strategy (countercontrol, Zwart & Lisman, 1979) using audiobooks and audiotaped passive relaxation as the specific intervention techniques for insomnia. The initial plan was to have poor sleepers self-monitor and compare two active interventions (audiobook or relaxation) with what we conceptualized as a control condition (self-monitoring only). The comparison was designed in the tradition of the relatively few studies of insomnia treatment with older adults in which a control group was included (see Morin, Mimeault, & Gagné, 1999, for a review).

In Study 1 we report on the comparison among the three groups. The unexpected finding of significant improvement over time, but no significant differences among the three groups, led us to question the role of self-monitoring and spontaneous remission in therapeutic change. Therefore, in Study 2, as a second step we examined long-term follow-up data from treated subjects as well as from similarly poor sleepers who had no treatment, evaluation, or self-monitoring after the Pre-test. To provide an additional index of change, we also examined follow-up data from good sleepers with no sleep complaints.

METHOD

Participant Recruitment and Screening

As part of a larger sleep study, both good and poor sleepers were recruited through media publicity. Selection criteria were: (a) age 55 and over, (b) community resident, (c) prescription sleep medication, if used, was currently taken less than 3 nights per week, (d) psychological status: currently not receiving psychiatric or psychological care, no evidence of psychopathology or depression as measured by the Brief Symptom Inventory (Derogatis, Rickels, & Rock, 1976), (e) health status: absence of major illness or drug use directly associated with sleep disturbance (cf Lacks, 1987; Nicassio & Buchanan, 1981), (f) no self-report evidence of primary sleep disorder (e.g., sleep apnea, restless leg/periodic limb movements disorder) or (g) of parasomnia or sleep phase disorder. One hundred and eighty-nine good and poor sleepers comprised the pool from which the intervention and the no intervention samples were drawn.

Measures

Demographic and Socioeconomic Factors

Background Information Form (Libman, Creti, & Fichten, 1987; Libman et al., 1989a, 1989b). This provides information on age, sex, and demographic variables.

Sleep Variables

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, including frequency of prescription sleep medication use, presence of major illness, and drug use associated with sleep disturbance.

Sleep Questionnaire (Fichten et al., 1995; Libman, Fichten, Bailes, & Amsel, 2000; Alapin et al., 2002). This brief objective questionnaire inquires about usual sleep experiences during the past typical month, including: (1) type and frequency of sleep medication use, (2) sleep onset latency (SOL), (3) waking after sleep onset (WASO): duration of nocturnal arousals, (4) total sleep time (TST), (5) Sleep efficiency (SE), (6) Insomnia frequency (10-point rating scale ranging from 1 = "*very rarely*" to 10 = "*very often*"), (7) insomnia distress (10-point rating scale ranging from 1 = "*very rarely*" to 10 = "*very often*"), and (8) frequency of Daytime fatigue (days per week). Data indicate good psychometric properties for these scores as well as high correlations between equivalent scores or this measure and on the Daily Sleep Diary (Fichten et al., 1995; Libman et al., 2000). The information provided allows us to specify the duration of the insomnia problem and to diagnose the presence or absence of difficulty initiating or maintaining sleep (DIMS) in accordance with typically used research criteria (cf. Edinger et al., 1996; Morgan, 2000; Fichten et al., 2000; Lichstein, Riedel, & Means, 1999) - i.e., 30 min of undesired awake time at least three times per week, problem duration at least 6 months.

Daily Sleep Diary. This is a 15-item modified version of Lacks' measure (Lacks, 1987, 1988; Libman et al., 2000) which allows participants to monitor their sleep experience on a daily basis. Dependent variables derived from this measure include: (1) sleep onset latency (SOL), (2) waking after sleep onset (WASO): duration of nocturnal arousals, (3) total sleep time (TST), (4) Sleep efficiency: total sleep time divided by the usual hours in bed, multiplied by 100, (5) Sleep quality (rated on a 5-point scale ranging from 1 = "*very poor*" to 5 = "*very good*"), (6) daytime functioning (rated on a 5-point scale ranging from 1 = "*very poorly*" to 5 = "*very well*," (7) morning restedness (rated on a 5-point scale ranging from 1 = "*very poorly rested*" to 5 = "*very well rested*").

Daytime Sleep Related Variables

Stanford Sleepiness Scale (Hoddes, Zarcone, Smythe, Phillips, & Dement, 1973). This is a frequently used measure of daytime sleepiness/alertness which consists of a 7-point Guttman-scaled item where responses range from 1 = "*feeling active and vital*; *alert; wide awake*") to 7 = "*lost struggle to remain awake*." Respondents in this study selected only one option which best described how sleepy they felt on most days.

Sleep Self-Efficacy Scale (Cook & Lacks, 1984; Lacks, 1988). This 9-item scale evaluates individuals' beliefs about their ability to influence their own sleep-related motivation and behavior. Higher scores indicate stronger Sleep self-efficacy expectations.

Psychological Adjustment

Brief Symptom Inventory (BSI) (Derogatis et al., 1976). This brief self-report psychological symptom inventory has 53 items which form subscales for nine symptom dimensions and three global indices. It is a brief version of the SCL-90 (Derogatis, 1977)—a frequently used instrument with acceptable reliability and validity. Of interest to the present investigation is the symptom dimension score for depression. Lower scores indicate better adjustment.

Intervention Related Measures

Client Satisfaction Questionnaire (Larsen, Attkinson, Hargreaves, & Nguyen, 1979). This 8-item measure assesses participants' evaluation of their satisfaction with various aspects of a treatment. Internal consistency is high and it correlates well with therapists' estimates of client satisfaction. Higher scores indicate greater satisfaction.

Intervention Evaluation Form. This is a modified version of Borkovec and Nau's (1972) 5-item credibility/expectancy-for-improvement scale which

was developed to assess different therapy rationales. The scale was adapted for use with insomnia treatment: this resulted in four 10-point items which are summed and prorated out of five to render them comparable with Borkovec and Nau's (1972) measure. Higher scores indicate greater credibility.

STUDY 1: TREATMENT

Participants

Of the 189 individuals in the total sample, 52 agreed to receive an experimental, short-term, nonpharmacological intervention for insomnia. 41 of them completed all required Pre-test and Post-test assessments: 28 women and 13 men whose age averaged 67 years ($SD = 7$ years, range = 55–85). Subjects were predominantly married (68%) and living with a spouse or other companion (73%). Although socio-economic background varied extensively, most participants were Jewish (61%; the research was conducted in the proximity of Jewish community services), well educated (98% had at least a high school education), not currently employed (76%), had an income in the early 1990s that was greater than $30,000 CDN (61%), and were reasonably satisfied with their income (75% indicated that their income was "adequate" or "more than adequate" in meeting their needs).

Four individuals (10% of the sample) met conventional research criteria for sleep onset insomnia only (i.e., a minimum of 30 min of undesired wakefulness at least three times per week, problem duration greater than 6 months), 20 participants (49% of the sample) met the criteria for only sleep maintenance insomnia (i.e., duration of awakenings after sleep onset greater than 30 min at least three times per week, problem duration greater than 6 months), and 17 participants (41% of the sample) met the criteria for both sleep onset and maintenance insomnia. Sleep problems were mostly chronic, with a mean duration of 15 years ($SD = 13$, range = 1–50 years). 12 participants (29%) used prescribed or over-the-counter sleep medication an average of 1.71 times a week (range = 1–3) and had been using this medication for an average of 5 years (range = 3 months to 15 years).

The 52 original participants were randomly divided into three conditions. Similar numbers dropped out across conditions, resulting in a final sample of 41. The number of completers were: Self-Monitoring Only = 13, Relaxation = 14, Audiobook = 14.

Procedure

All participants completed an extensive questionnaire battery (Pre-test). This was followed by 2 weeks of self-monitoring (i.e., completing the Daily Sleep Diary during the 2 week baseline period). During the 2-week intervention period that followed, all participants continued to self-monitor. Participants in the Audiobook and Relaxation groups were instructed to use a tape at night whenever they were awake for longer than 10 min. Those in the Self-Monitoring Only condition merely continued to self-monitor. At the end of the 2-week intervention period, all participants once more completed the questionnaire battery (Post-Test).

Intervention Conditions

Self-Monitoring Only. Participants in this condition were asked to monitor their sleep for an additional 2 weeks before beginning their treatment with the rationale that this would provide more information about their sleep pattern and, thus, help with their treatment.

Audiobook and Self-Monitoring. Participants in this condition were told that thoughts, whether distressing or just mentally involving, could keep them awake and thus interfere with going to sleep. Therefore, a "cognitive refocusing" technique that involved listening to audiotaped novels could help them get into a more favorable sleeping state. Audiobooks were selected from commercially available materials consisting of plays, dramatized novels, and radio dramas. Audiotapes were mostly 90 and 120 min.

Relaxation and Self-Monitoring. Participants in this condition were given a similar rationale to the Audiobook group. It was explained that the audiotape would allow them to focus on and to relax different parts of their bodies, making it more likely they would fall asleep. The relaxation intervention consisted of an audiotape of a modified version of Bernstein and Borkovec's (1973) progressive muscle relaxation instructions, with the tension component eliminated and only the relaxation aspect included. Audiotapes in the two active intervention conditions were similar in length.

Short-Term Follow-Up Period

Following the 2-week intervention component, all participants continued to self-monitor for another 2 week period (Short-Term Follow-Up). Those in the two active intervention conditions (Relaxation and Audiobook) had the option of using or not using the intervention materials. At the end of the short-term follow-up period 23 individuals once more completed a questionnaire battery. Then, those in the Self-Monitoring Only group were randomized into the Relaxation and Audiobook interventions, where they followed the same protocol as those who were originally assigned to these conditions. Thus, they completed an additional 4 weeks of self-monitoring: 2 weeks while engaged in the requirements of the active treatment intervention and 2 weeks during the short-term follow-up period.

Approximately 20 months (range = 13–27 months) later we attempted to contact all participants for a long-term follow-up evaluation. We administered a brief version of the Sleep Questionnaire by telephone to 23 individuals (51% of the original 41 participants who completed the intervention measures) whom we were able to contact. Although they were all asked to complete Daily Sleep Diaries for 1 week, only 12 participants returned these Diaries.

Results

Equivalence of Groups at Pre-Test

Chi-square tests on six demographic variables (marital status, living arrangement, education level, employment status, income, and religion) failed to reveal any significant differences between males and females. *T*-tests also failed to indicate significant sex differences on age, $t_{(39)} = -1.72$, $p > .05$, or income adequacy, $t_{(38)} = .56$, $p > .05$. As no sex differences were found, subsequent analyses did not include sex as a variable.

Chi-square tests also failed to reveal any significant differences between intervention groups and one-way ANOVAs revealed no significant differences between groups either in age, $F(2, 38) = .29$, $p > .05$, or income adequacy, $F(2, 37) = .63$, $p > .05$. Similarly, no significant differences were found between groups on the host of sleep related variables evaluated using chi-square and one-way ANOVAs. These are listed in Table I.

Treatment Effects

Pre- to Post-test. Mean scores were used to evaluate Pre- to Post-test changes. Pre-test means reflect the first week of the two-week baseline self-monitoring. Post-Test means reflect the second week of the two-week intervention self-monitoring.

The effects of the intervention on different parameters of functioning were examined using a 3×2 [Group (Audiobook/Relaxation/Self Monitoring Only) $\times$ Time (Pre/Post)] mixed design multivariate analysis of variance (MANOVA), with Time as a repeated measure. MANOVAs were used to examine three aspects of the sleep experience: (1) Quantitative Aspects (SOL, WASO, TST, Sleep efficiency), (2) Qualitative Aspects (Sleep quality, Insomnia frequency, Distress frequency, Sleep self-efficacy), and (3) Daytime Sequelae (morning restedness, daytime functioning, daytime sleepiness, Daytime fatigue). Variables measuring each of these aspects were grouped together and included in one of three MANOVAs.

The three MANOVAs and subsequent ANOVAs failed to reveal any significant main effects for Group or any significant Time $\times$ Group interactions. However, significant main effects for Time were found for Quantitative variables as well as for Qualitative variables indicating improvements Pre- to Post- on 6 of the 8 variables examined: WASO, $F(1, 38) = 6.08$, $p < .05$, TST, $F(1, 38) = 7.98$, $p < .01$, Sleep efficiency, $F(1, 38) = 8.80$, $p < .01$, Sleep quality, $F(1, 38) = 6.22$, $p < .05$, Insomnia frequency $F(1, 38) = 31$, $p < .001$, and Sleep self-efficacy Expectations, $F(1, 38) = 12.4$, $p < .01$). Means and standard deviations for each intervention group are presented in Table I. Although the interactions were not significant, the means suggest that improvement occurred primarily in the Audiobook and Relaxation groups while the Self-Monitoring group means remained unchanged for the following variables: WASO, TST, and Sleep efficiency.

Pre- to Post- changes on SOL and Insomnia Distress were not significant, although again, the means suggest a greater improvement in the treated groups, particularly the Relaxation group. Similarly, Pre- to Post- changes on Daytime Sequelae (Fatigue and Sleepiness) were not significant although the means suggest some improvement in the Relaxation group on Daytime fatigue.

Short- and Long-Term Follow-Up. To maximize response rate, long-term follow-up testing consisted

Table I. Pre- to Post- Intervention Changes: Means and Standard Deviations for Quantitative and Qualitative Sleep Variables for the Three Intervention Groups

		Intervention groups					
		Audiobook		Relaxation		Self-monitoring	
Variables		*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)
Quantitative aspects (Daily Sleep Diary)							
Sleep onset latency[b] (SOL)/hr	Pre	.68	(.56)	.73	(.40)	.74	(.77)
	Post	.52	(.35)	.48	(.43)	.65	(.40)
Waking after sleep onset[b] (WASO)/hr	Pre	1.87	(1.39)	1.98	(1.01)	1.29	(1.11)
	Post	1.57	(1.02)	1.51	(1.18)	1.23	(.92)
Total sleep time[a] (TST)/hr	Pre	5.30	(1.42)	5.01	(1.31)	5.67	(1.09)
	Post	5.77	(1.38)	5.41	(1.06)	5.69	(.69)
Sleep efficiency[a] (SE) %	Pre	66.00	(18.00)	62.00	(17.00)	73.00	(14.00)
	Post	69.00	(17.00)	71.00	(17.00)	72.00	(6.00)
Qualitative aspects							
Sleep quality (5-point scale)	Pre	3.13	(.86)	2.91	(.57)	3.17	(.55)
(Daily sleep diary)[a]	Post	3.41	(.84)	3.31	(.68)	3.32	(.65)
Insomnia frequency (10-point scale)	Pre	8.29	(1.54)	8.21	(2.16)	8.39	(1.45)
(Sleep questionnaire)[b]	Post	7.43	(1.83)	6.57	(2.14)	6.39	(2.69)
Insomnia distress (10-point scale)	Pre	5.79	(2.81)	6.14	(2.32)	5.62	(1.39)
(Sleep questionnaire)[b]	Post	6.00	(2.45)	4.92	(2.79)	5.54	(1.81)
Sleep self-efficacy[a]	Pre	24.43	(7.18)	24.14	(5.83)	26.39	(3.75)
	Post	26.71	(6.38)	27.36	(7.80)	29.54	(4.37)

Note. Boxed items denote significant improvement pre to post intervention for all groups combined. $N = 41$.
[a]Higher scores indicate better adaptation.
[b]Higher scores indicate worse adaptation.

of a brief version of the Sleep Questionnaire administered by telephone, followed by 1 week of Daily Sleep Diaries. Of the 23 participants whom we were able to contact at long-term follow-up, all (Relaxation: $N = 11$, Audiobook: $N = 12$) completed the Sleep Questionnaire but only a few participants ($N = 12$) completed and returned Sleep Diaries. Therefore, the dependent variables used in the following analyses were derived from the brief Sleep Questionnaire. This included all four Quantitative Variables, but for only 2 of the 4 Qualitative Variables (Insomnia frequency, Insomnia distress) and only one of the Daytime Sequelae variables (Daytime fatigue). It should be noted that for the 12 participants who completed both measures, 3 of the 4 pairs of Quantitative scores on the Sleep Questionnaire and Daily Sleep Diary at long-term follow-up were highly correlated (r: SOL = .20, WASO = .75, $p < .01$; TST = .93; $p < .001$; SE = .95, $p < .001$). The distribution of drop-outs from the two experimental conditions was not found to be statistically significant. Non completers were compared to completers on all dependent variable scores at baseline, post-intervention, and follow-up with a series of *t*-tests. When Bonferroni corrections were applied, no significant differences were found.

Because previous analyses failed to reveal significant Group effects, follow-up scores were collapsed across intervention conditions. One-way repeated measures ANOVAs [four testing times (pre/post/short-term follow-up/long-term follow-up)] on the seven Sleep Questionnaire variables were conducted, with Newman–Keul's post-hoc tests where indicated. Means and standard deviations for all seven variables at the four testing times are presented in Table II.

Results, after the application of Bonferroni corrections, indicate significant changes over Time on three variables: one Quantitative (WASO, $F(3, 66) = 7.10$, $p < .01$), and two Qualitative Variables (Insomnia frequency $F(3, 66) = 16.34$, $p < .01$, Insomnia Distress, $F(3, 66) = 8.15$, $p < .01$). Newman–Keul's post-hoc tests, with alpha set at .05, indicate significant improvement on WASO from Pre- to Post-test (an overall 49% improvement rate), with no further significant change at short-term or long-term follow-up. There was also improvement on Insomnia frequency from Pre-test to long-term follow-up, with an improvement rate of 48% for this time period. Insomnia distress shows significant improvement from Pre-test to short-term follow-up, and continued improvement

Table II. Follow-Up of Treated and Untreated Poor Sleepers and Good Sleepers: Sleep Questionnaire Variables

	Pre test		Post test		Short-term follow-up		Long-term follow-up		Analysis of variance Step 2: long term follow-up			Newman–Keul's post-hoc Step 2: pre-test vs long-term follow-up $p<$
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	Effect	*F*	*p*	
Sleep onset latency (SOL)[b]/hr												
Treated poor sleepers	0.68	(1.14)	0.39	(0.31)	0.31	(0.20)	0.32	(0.29)	Group	$F(2, 75) = 6.12$	0.05	
Untreated poor sleepers	0.78	(0.81)					0.54	(0.61)	Time	$F(1, 75) = 4.97$	0.05	
Good sleepers	0.15	(0.14)					0.23	(0.24)	Interaction	$F(2, 75) = 3.03$	ns	
Waking after sleep onset[b] (WASO)/hr												
Treated poor sleepers	2.66	(1.94)	1.37	(1.45)	1.42	(1.91)	1.00	(1.27)	Group	$F(2, 75) = 26.15$	0.001	.01
Untreated poor sleepers	2.97	(2.14)					1.75	(1.97)	Time	$F(1, 75) = 20.51$	0.001	.01
Good sleepers	0.05	(0.11)					0.25[a]	(0.62)	Interaction	$F(2, 75) = 8.80$	0.001	ns
Total sleep time[a] (TST)/hr												
Treated poor sleepers	5.27	(1.45)	5.61	(1.15)	5.80	(1.02)	5.58	(1.21)	Group	$F(2, 75) = 10.10$	0.001	
Untreated poor sleepers	5.37	(1.63)					5.75	(1.80)	Time	$F(1, 75) = 2.62$	ns	
Good sleepers	6.91	(1.16)					6.76	(1.06)	Interaction	$F(2, 75) = 2.53$	ns	
Sleep efficiency[a] (%)												
Treated poor sleepers	0.69	(0.18)	0.72	(0.15)	0.74	(0.16)	0.74	(0.18)	Group	$F(2, 75) = 11.86$	0.001	
Untreated poor sleepers	0.66	(0.23)					0.75	(0.21)	Time	$F(1, 75) = 10.14$	0.05	
Good Sleepers	0.88	(0.11)					0.90	(0.15)	Interaction	$F(2, 75) = 1.18$	ns	
Insomnia frequency[b] (1–10)												
Treated poor sleepers	8.26	(1.96)	6.47	(2.48)	5.35	(2.69)	4.30	(2.65)	Group	$F(2, 75) = 37.85$	0.001	.01
Untreated poor sleepers	6.29	(3.28)					5.25	(2.97)	Time	$F(1, 75) = 14.62$	0.001	ns
Good sleepers	1.26	(0.58)					2.77	(2.35)	Interaction	$F(2, 75) = 28.06$	0.001	.05
Insomnia distress[b] (1–10)												
Treated poor sleepers	5.17	(2.10)	5.57	(2.33)	4.91	(2.78)	2.91	(2.39)	Group	$F(2, 75) = 15.03$	0.001	.01
Untreated poor sleepers	4.54	(3.71)					3.00	(2.15)	Time	$F(1, 75) = 11.81$	0.001	ns
Good sleepers	1.16	(0.58)					2.07	(1.63)	Interaction	$F(2, 75) = 11.12$	0.01	ns
Daytime fatigue[b] (1–10)												
Treated poor sleepers	1.96	(2.08)	2.17	(1.83)	2.35	(1.43)	1.39	(1.23)	Group	$F(2, 73) = 12.48$	0.001	
Untreated poor sleepers	3.32	(2.84)					3.59	(2.38)	Time	$F(1, 73) = .89$	ns	
Good sleepers	0.94	(1.83)					1.07	(1.39)	Interaction	$F(2, 73) = .04$	ns	

Note. Boxed items denote significant Time effects for treated subjects in Study 1. Sample sizes are as follows: Treated poor sleepers $n = 23$; Untreated poor sleepers $n = 24$; Good sleepers $n = 31$.

[a]Higher scores indicate better adaptation.

[b]Higher scores indicate worse adaptation.

at long-term follow-up, with an overall magnitude of improvement of 44%.

Treatment Implementation

A rigorous comparative evaluation of the interventions also required assessment of the following three potentially confounding components of treatment implementation: treatment credibility, satisfaction with the treatment, and treatment compliance.

Treatment credibility and satisfaction. Two *t*-tests for independent samples were performed on treatment credibility (Intervention Evaluation Form) and treatment satisfaction (Client Satisfaction Questionnaire) means in the two treatment groups. Results revealed that the two groups did not differ on evaluations of credibility, $t(1, 32) = 1.24$, $p < .05$, or satisfaction, $t(1, 33) = .27$, $p < .05$. Means for the whole sample indicate that credibility was fairly high, with a mean of 37.38, where the maximum possible score is 50. Participants also felt reasonably satisfied with the treatment they received, reporting an average satisfaction of 24.28 out of a maximum possible score of 32.

Treatment compliance. Participants in the two treatment groups were instructed to use a tape at night whenever they were awake for longer than 10 min. Treatment compliance was computed as a percentage of the number of times that participants used a treatment tape divided by the number of times that they were expected to use a tape. Data reduction was accomplished by averaging daily compliance rates over 1 week. Since participants experienced insomnia both when retiring at night and in the middle of the night, an estimate of how many participants complied with the treatment regardless of type of insomnia episode was evaluated. Treatment compliance was considered high if the participants used the treatment tape(s) during more than 50% of undesired awake times for at least one insomnia episode (sleep onset or maintenance). Low overall treatment compliance was defined as using treatment tapes less than 50% of the time during both sleep onset and sleep maintenance episodes.

Chi-square comparisons on the proportion of participants who had Low and High levels of compliance failed to reveal differences between Relaxation and Audiobook groups at either post-intervention, or short-term follow-up. As a whole group, 78% of participants had high compliance at post-intervention and 59% had high compliance at short-term follow-up (when use of the audiotapes was optional).

STUDY 2: LONG-TERM FOLLOW-UP

Although the treatment analyses of Step 1 failed to find significant differences among the three groups on Quantitative or Qualitative variables, means suggest that Pre- to Post-test differences were present mainly in the active treatment groups rather than the Self-Monitoring Only group. Given the small sample size, there may not have been sufficient statistical power to detect statistically significant differences. For the treated groups, gains were generally maintained over 1–1/2 years later at the time of the long-term follow-up. There were no significant changes on daytime variables.

We were now faced with two questions: (1) Was the statistical power in Step 1 insufficient to detect real differences among our interventions? and (2) Since we failed to employ a true waiting-list control group, are the "gains that were maintained over 1–1/2 years" really the result of our interventions? At this point nothing could be done about Question 1. Question 2 could be addressed indirectly by examining what happened with the passage of time in a group of similarly poor sleepers who had no treatment and did not self-monitor but were part of our original sample of 189. Of course, we are very much aware that it would have been preferable to have collected data from a randomly assigned non self-monitoring control group who followed the same protocol and testing schedule as that in our intervention samples. However, these data are not available.

Participants and Procedure

Of the original sample of 189 good and poor sleepers 78 participants completed both Pre-test and long-term follow-up measures as described in Study 1. These were grouped as follows: (1) 23 of the 41 treated individuals from Study 1 (i.e., those who provided long-term follow-up data—Treated poor sleepers—8 males and 15 females), (2) 24 poor sleepers who were surveyed about their sleep experience but were not treated and did not self-monitor—Untreated poor sleepers—6 males and 18 females), and (3) 31 Good sleepers—8 males and 23 females. Good sleepers were those who did not meet the diagnostic criteria for difficulty initiating or maintaining sleep (DIMS) at

the Pre-test evaluation. This third group was included to evaluate the possibility of regression toward the mean.

Demographic characteristics of the Untreated poor sleeper and the Good sleeper participants were similar to those of Treated poor sleepers. Mean duration of insomnia for both Treated and Untreated poor sleeper participants and insomnia type were also similar.

Results

To evaluate changes over time in Good sleepers and in Treated and Untreated poor sleepers, a series of 2 × 3 repeated measures ANOVAs were conducted on the long-term follow-up variables described in Study 1. Means, standard deviations and ANOVA test results are presented in Table II.

Pre-Test Group Differences

Significant Group main effects were found on all variables. Of interest are the results at Pre-testing, where Newman—Keul's post-hoc tests, with alpha set at.05, indicate that Good sleepers had significantly better scores than either Treated or Untreated poor sleepers on all variables except one: Daytime fatigue. Although the means suggest that both groups of Poor Sleepers reported more Fatigue than Good Sleepers, a significant difference was found only between Good sleepers and Untreated poor sleepers. Significant differences were found between the Treated and Untreated poor sleeper groups on only one variable: Insomnia frequency, with Treated poor sleepers having worse scores than Untreated poor sleepers.

Changes with Time

Significant Time main effects in the direction of improvement were found on 5 of the 7 variables (all except Total Sleep Time and Daytime fatigue) and significant Group × Time interactions were found on three: (1) Quantitative Variable (WASO) and (2) Qualitative Variables (Insomnia frequency, and Insomnia Distress). Newman—Keul's post-hoc tests show that Treated poor sleepers improved significantly on all three variables while Untreated poor sleepers improved significantly only on WASO. Good sleepers changed significantly on one variable: they deteriorated slightly on Insomnia frequency. The nature of changes in the three groups over time is best seen in Figure 1.

DISCUSSION

The present data indicate statistically significant improvement from pre- to post-intervention (2-week period) in the self-reported sleep experience of older adults in all three intervention groups, including the self-monitoring only group. Unlike both the quantitative and qualitative sleep variables, the Daytime Sequelae failed to show any significant changes. Over the long term (about a 20 month period), when compared to untreated poor sleepers and good sleepers, treated older poor sleepers improved on one quantitative sleep parameter (WASO) and two qualitative aspects (perceived insomnia frequency and insomnia-related distress). Untreated poor sleepers improved only on WASO. Therefore, the only changes that might be attributed to treatment are perceived lower frequency of insomnia episodes and diminished related distress. This suggests that our attention refocusing technique improved the insomnia complaint by enhancing quality of nocturnal wakefulness rather than improving quality of sleep. The fact that the improvement was detectable after a lengthy period of time raises some interesting questions. What exactly do participants learn? What do they do differently after treatment has ended?

In the present study, compliance with the treatment appeared to be satisfactory, as did participants' ratings of credibility and satisfaction with the treatment. However, assessing compliance is challenging given the lack of empirical information on how to best assess this construct. What amount of compliance is acceptable, or even necessary, for treatment effectiveness? Do participants use the treatments, or variations of the treatments, in the long term? Many of our participants requested copies of our relaxation tapes and wanted to know where they could obtain their own audiobooks.

As for the apparently spontaneous improvement of WASO in untreated poor sleepers, studies have suggested that Sleep quality can remain constant, deteriorate or even improve over time (e.g., Libman et al., 1998; Mendelson, 1995; Monjan & Foley, 1995; Morgan, Healey, & Healey, 1989). That improvement can be substantial is demonstrated by an epidemiological study of insomnia in older adults that showed that the rate of insomnia remission after three years was almost 50% (Foley, Monjan, Simonsick, Wallace, & Blazer, 1999).

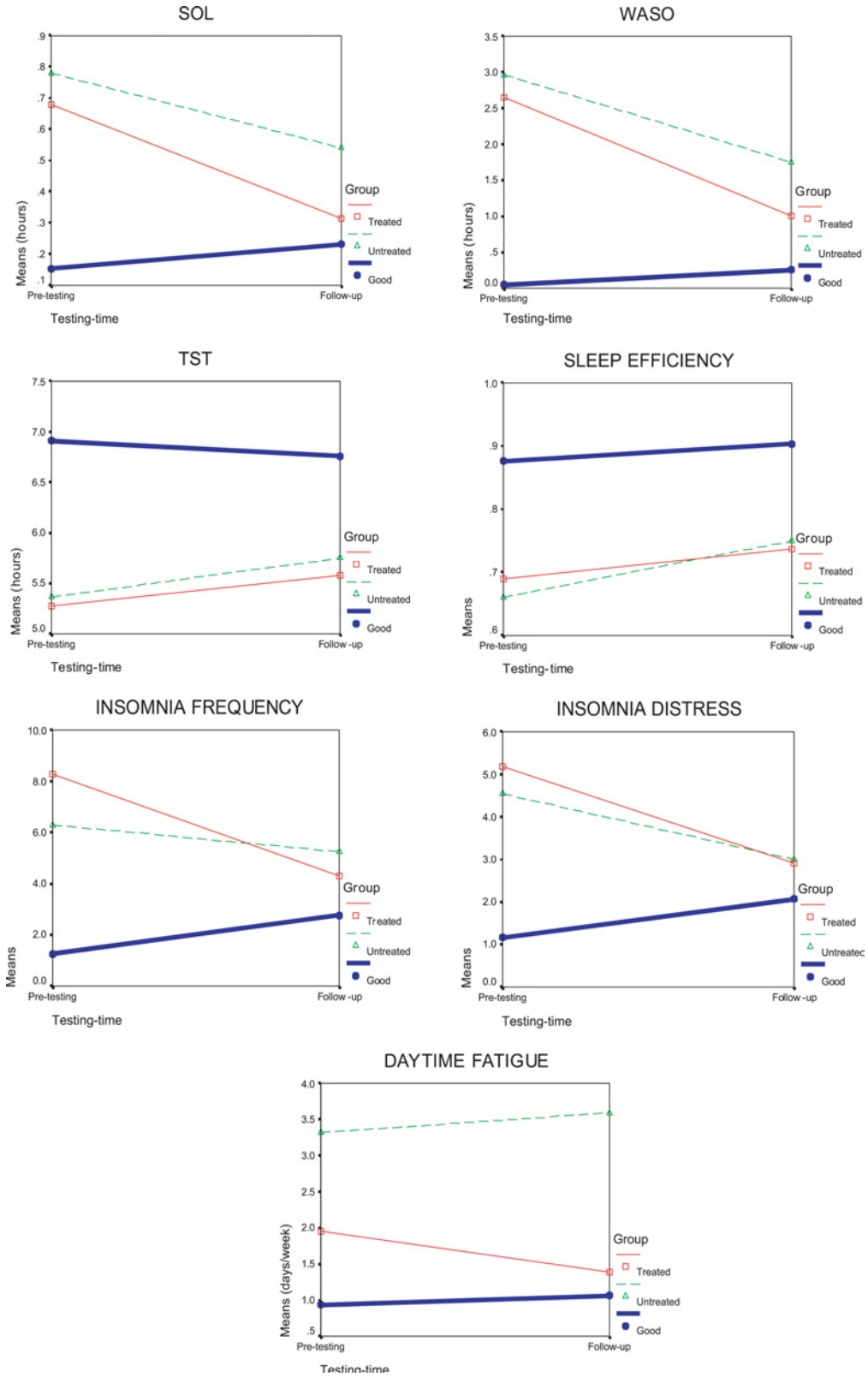

Fig. 1. Pre- and Post-test results for seven variables.

The only change over time for good sleepers was a slight increase in perceived insomnia frequency. Notably, scores on this measure remained well below the midpoint of the 10-point scale and were not accompanied by sleep-related distress.

It was interesting to note in our samples that there was no change in Daytime fatigue attributed to poor sleep, even in the treated sample where both specific sleep parameters as well as global perceptions about the insomnia experience improved. This supports a general finding in the literature that there is no consistent improvement in daytime functioning when nocturnal sleep parameters improve (Fichten et al., 1995; Lichstein, Wilson, Noe, Aguillard, & Bellur, 1994). Indeed, one study found both improved sleep parameters on long-term follow up of patients with insomnia and increased sleep-related complaints (Mendelson, 1995), a dramatic illustration of the importance of subjective experience relative to quantitative nocturnal events.

When interpreting the results, a variety of limitations need to be taken into consideration. These include: (1) the sample was biased, in that it was composed of healthy, well-educated, community dwelling older adults whose sleep problems did not require daily sleep medication, (2) sample size was small, (3) the intervention was brief: only 2 weeks long, (4) because self-monitoring only participants were randomized into the two intervention conditions after short term follow-up, it is not possible to ascertain what would have happened with this group in the long-term, (5) the long-term follow-up period had great variability and, (6) there was no "real" untreated control group in the treatment study. Nevertheless, the inclusion of untreated poor sleepers (recruited and evaluated for a parallel study in the same way as treated poor sleepers) affords us a comparison group. Notably, such a long-term follow-up (almost 2 years) of untreated individuals with insomnia is rarely available in existing insomnia studies.

Implications For Future Research

Our findings suggest that it is important to examine the developmental trajectory of sleep patterns over both short and long time periods. Our brief treatment appeared to be modestly effective, particularly in terms of the individual's perception of having a sleep problem and being distressed about his or her Sleep quality.

As is customary, in the present study, we used mean scores to evaluate improvement. We know from our own previous work (Libman et al., 1998) that over a 2-year period approximately two-thirds of older individuals maintain their sleep status—either good or poor. The remaining one-third improve or deteriorate equally often. This can result in a net "no change" when group means are examined, even though it is not the same individuals who experience good or poor sleep 2 years later. Future longitudinal studies need to examine individual changes over time in order to (a) establish, definitively, whether a particular insomnia intervention procedure works or not, and (b) identify the individual characteristics associated with improvement.

Insomnia research has shown that individual differences play an important role in how people sleep (e.g., Fichten et al., 2000) and, increasingly, in what they feel and believe about the way they function both asleep and awake (Coyle & Watts, 1991). Just as the insomnia complaint is multidimensional, the treatment should be multimodal. When sleep is severely disrupted, when daytime functioning is impaired, and when the individual is distressed, treatment needs to take all of these into account. Our findings highlight another insomnia-related aspect not often identified. Along with night-time sleep and daytime wakefulness, quality of nocturnal wakefulness has emerged as a legitimate treatment target.

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