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Cognitions and Insomnia Subgroups

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Abstract

Purpose—This study explored cognitive predictors of multiple symptoms of insomnia (difficulty with sleep initiation, maintenance, and early morning awakenings) among a sample of individuals seeking cognitive-behavior therapy for insomnia.

Methods—Participants consisted of 146 clinical patients with insomnia of which 67 (45.89%) were classified as Single Symptoms subgroup and 79 (54.11%) as Combined subgroup. A receiver operating curve (ROC) analysis was conducted to identify predictors of Combined versus Single Symptom subgroups. The set of predictor variables included demographics, sleep-related cognitions, circadian preferences, depression symptoms, and self-report sleep parameters with insomnia subgroups (Combined versus Single Symptom only) as the dependent variable.

Results—The ROC analysis identified two significant predictors: Self Efficacy Scale (SES) < 23 and a 3-item subscale of the Glasgow Content of Thoughts Inventory (GCTI) assessing "thoughts about the environment" with scores ≥ 5. Post-hoc comparisons revealed that individuals with combined symptoms who had SES score < 23 had significantly longer sleep onset latency (SOL) and more number of nights with SOL>30 minutes, poorer sleep quality, higher insomnia severity, less morningness tendency, higher depression symptom severity, and more anxiety about anxiety and about sleep compared to individuals with SES score ≥ 23.

Conclusions—These findings indicate that low self-efficacy and increased thoughts about the environment are associated with having multiple symptoms of insomnia. Further research should examine the specific role of self-efficacy and thought content in the etiology of individuals who suffer from multiple symptoms of insomnia.

Introduction

The role that cognitive factors play in the process of sleep disturbances has been widely studied. Cognitive processes, such as worry, beliefs about sleep, and pre-sleep thought content are correlated with insomnia severity and impact response to treatment (see Harvey, Tang & Browning, 2005 for a review). For example, patients with primary insomnia often worry about their difficulty sleeping, generate a higher number of possible negative consequences for not sleeping, and report higher levels of dysfunctional beliefs compared to good sleepers (Harvey & Greenall, 2003; Carney, Edinger, Manber, Garson & Segal, 2007).

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The content of thoughts in relation to sleep is one specific area that has received attention in the literature. Watts, Coyle and East (1994) identified 6 broad domains of pre-sleep thought content among people with insomnia. Using principle components analysis they identified the following domains: mental activity and rehearsal, thoughts about sleep, family and long-term concerns, positive plans and concerns, somatic preoccupations and work and recent concerns. Fichten, Libman, Creit, Amsel, and Tagalaqkis (1998) classified thought content of patients with insomnia into generalized positive thinking, generalized negative thinking, and thoughts related to sleep. Wicklow and Espie (2000) asked participants presenting with sleep initiation difficulties to say their thoughts out loud into an audio recorder as they tried to fall asleep. Content analysis of the transcribed audiotapes revealed that thinking about sleep and the anticipated consequences of getting poor sleep were two of the strongest predictors of sleep latency as assessed by actigraphy (Wicklow & Espie, 2000). Another study, using a similar methodology, found that pre-sleep thought content differentiates individuals with insomnia and good sleepers and was significantly correlated with measures of sleep disturbance (Harvey & Espie, 2004). In another study, Harvey (2000) found that compared to good sleepers, individuals with insomnia were more likely to report pre-sleep cognitive interference and that the sleep interfering cognitions were about solving problems, general worries, general concerns, reviewing events of the day, thinking about their sleep pattern, and environmental noises.

Self-efficacy is another cognitive process that has been widely studied. Perceived self-efficacy refers to the belief in one's capabilities to organize and perform an action that is required to produce a given outcome. Self-efficacy is related to clinical severity and treatment outcome in a wide variety of other physical and mental health domains (see Bandura, 2007 and O' Leary, 1985 for more information). In the past decade, with increased focus on cognitive processes in insomnia, the relationship between self-efficacy and insomnia has received increased attention. Studies using an insomnia specific self-efficacy scale found that higher levels of sleep-related self-efficacy are associated with lower insomnia severity among primary care patients with clinical levels of insomnia (Bluestein, Rutledge, & Healey, 2010). Sleep-related self-efficacy has also been shown to play a role in treatment for insomnia by way of predicting adherence to cognitive-behavioral therapy for insomnia (CBTI), with sleep-related self-efficacy increasing over the course of treatment for insomnia (Bouchard, Bastien, & Morin, 2003; Harris, Lack, Wright, Gradisar & Brooks, 2007). In two other studies, perceived general self-efficacy about the ability to discontinue/refrain from using hypnotics was examined in a group of insomnia patients tapering off of benzodiazepine medication for insomnia (Belanger et al., 2005; Belleville & Morin, 2008). Results from these studies found that although not different at baseline, compliant patients had higher ratings of self-efficacy about refraining from using hypnotics throughout the treatment compared to noncompliant patients, and patients who were successful at discontinuing sleep medication at the end of treatment had higher self-efficacy ratings about refraining from hypnotic use in various situations compared to their unsuccessful counterparts. Another study found that patients with primary insomnia who were tapering off hypnotic medication were able to taper by a greater dosage percentage if they had first taken part in a self-efficacy enhancement program (Yang, Tseng, Lai & Hsu, 2011). However, the latter is only available as an abstract, which does not specify whether the aim of the self-efficacy enhancement program was to increase self-efficacy about sleep itself or about ability to refrain from taking hypnotic medication. Based on these studies, both general and sleep-related self-efficacy appear relevant to the presentation and treatment of insomnia.

Several studies have attempted to discover and create meaningful insomnia subgroups. One aspect of insomnia subgroups that has not received much attention is the presence of single versus multiple nocturnal symptoms of insomnia. Patients with insomnia may present with

initiation or maintenance difficulties, early morning awakenings, or some combination of the three. Edinger et al. (1996) used hierarchical cluster analysis to empirically identify naturally occurring subgroups. In their study, cross-classification tests showed a marked discrepancy between their empirical classification results and the clinically assigned DSM and ICSD insomnia diagnoses. They found that individuals presenting with only initiation or only maintenance problems fell into separate clusters than individuals presenting with multiple insomnia symptoms. These findings suggest that a variety of clinically distinct subgroups exist, but that the nosology systems commonly used for insomnia diagnoses do not reflect these different subgroups.

Foley et al. (2010) used latent class analysis and identified four different clusters of insomnia subgroups, which differed, among other things, on the number of sleep disturbance symptoms (single versus multiple sleep symptoms). The four clusters were labeled as distressed, transient, difficulty maintaining sleep, and comorbid/nonrestorative sleep clusters. Individuals who suffered from a single sleep complaint fell mainly in the distressed cluster, and individuals who had difficulties with a combination of sleep disturbance symptoms, such as those with initiation, maintenance, and early morning awakenings combined were predominantly in the comorbid and nonrestorative sleep cluster. Individuals in the comorbid and nonrestorative sleep cluster were more likely to use prescription sleep medication, and had more functional impairments, higher insomnia severity, and the highest percentage of comorbid psychiatric and medical illnesses compared to the other clusters. Individuals in both the distressed cluster (80.2%) and comorbid/nonrestorative sleep cluster (76%) reported worry to strongly contribute to their sleep difficulties.

A few studies have attempted to characterize differences between the insomnia subgroups based on presence of single versus multiple symptoms. Recent data indicate that Combined subgroup is the most common type of insomnia, and compared to those who only have difficulty maintaining sleep, those with combined insomnia include a lower percentage of people who reported sleeping well as children, suggesting a different development trajectory (Espie, 2011). One study suggested that individuals with only sleep initiation difficulties were more likely to be depressed (Yokoyama et al., 2010), while another study found that those with only early morning awakenings was more closely related to depression (Hartz, Daly, & Kohatsu, 2007). Parameters that have been examined in these studies include the number of sleep disturbances, the frequency of the symptoms, functional impairment, insomnia severity, and presence of comorbidities. Little is known about differences between individuals with single versus multiple sleep symptoms based on cognitive factors. It has been suggested that worrying about difficulty sleeping may be particularly characteristic of individuals with sleep-onset subgroup (Harvey, 2000).

Although a great deal of research has addressed cognition as it relates to insomnia, to our knowledge, there is no published study examining the potential contribution of cognitive processes in differentiating insomnia subgroups. In particular, it is unclear if there are different cognitive profiles between those with multiple symptoms of insomnia (e.g., difficulty initiating and maintaining sleep) compared to those with only one symptom of insomnia (e.g., difficulty maintaining sleep only). Therefore, the aim of this study was to address this question by conducting exploratory data analyses on the relationship between cognitions and insomnia symptoms. Using a set of variables collected on a clinical sample of treatment-seeking insomnia patients, we used the receiver operating characteristics curve (ROC) approach to investigate cognitive predictors of membership in a Combined subgroup versus the subgroups of individuals with only single symptoms. These findings are intended to generate hypotheses about the relationship between cognitions and insomnia subgroups that could later be tested in controlled studies.

Methods

Participants

This study analyzed pre-treatment data gathered from patients who attended group CBTI at the Stanford Sleep Disorders Clinic between 2000 and 2004. Patients with an initial complaint of insomnia were first evaluated by sleep center physicians and/or psychologists and then referred to the group CBTI program if clinically appropriate. All patients who attended the group CBTI were eligible to participate in this study, and only the pre-treatment data were used for the purpose of this paper. We did not exclude individuals with co-morbid psychiatric, sleep, or medical disorders and those with concomitant use of sleep or other medications. The protocol was pre-approved by the Institutional Human Subjects Review Board at Stanford University and permitted use of de-identified, archival data collected prior to 2004.

Measures

Insomnia Severity Index (ISI)—The Insomnia Severity Index (ISI) is a 7-item self-report scale that assess nocturnal (item 1) and daytime symptoms (items 2 – 7) of insomnia (Bastien, Vallieres et al. 2001). Each item is scored on a 5-point Likert scale ranging from 0 to 4, with a higher score represents greater symptom severity. For our study, we used item 1 (a, b, and c) of the ISI to create the insomnia subgroup categories, following the definition used by Bastien and colleagues (2001).

Item 1 is divided into three questions asking about the severity of initiating sleep (a), staying asleep (b), and problem with waking up too early (c). Participants were divided into subgroups using 3 (moderately severe) or above as a threshold. Participants who endorsed only initiation difficulties, maintenance difficulties, or only early morning awakenings above threshold were labeled as the “Single Symptom subgroup.” Those who endorsed both initiation and at least one of the difficulties of staying asleep or only early morning awakenings above threshold were labeled as the “Combined subgroup.” In addition, item 5 (“How worried/distressed are you about your current sleep problem?”) was used as a measure of distress about insomnia.

Glasgow Content of Thoughts Inventory (GCTI)—The GCTI is a 25-item self-report scale to assess pre-sleep thought content (Harvey & Espie, 2002). Each item is scored on a 4-point scale ranging from 1 (never) to 4 (always). We found no published research on the structure of the GCTI. We created four conceptual subscales and computed the Cronbach alpha reliability value for each. The sample size was not large enough for conducting a principal components analysis or factor analysis. The first subscale consisted of 9 items addressing “general worries” (Cronbach’s alpha = 0.82). It included items such as worries about “things in the future” and “things that happened during the day”. The second subscale consisted of 6 items addressing “anxiety about anxiety” (Cronbach’s alpha = 0.79) and included items such as worries about “how you can’t stop your mind from racing” and “how thinking too much is the problem”. The third subscale consisted of 7 items addressing “anxiety about sleep” (Cronbach’s alpha = 0.88) and included items such as worries about “how long you’ve been awake” and “the effects of not sleeping well”. The fourth subscale consisted of 3 items addressing “thoughts about the environment” (Cronbach’s alpha = 0.60) and included items such as “how hot/cold you feel” and “how light/dark the room is.” Reliability was adequate for all four subscales. A list of all items for each of the four subscales can be found in Table 1.

Dysfunctional Beliefs and Attitudes about Sleep (DBAS)—The DBAS is a 30-item scale used to assess faulty beliefs and unrealistic expectations about sleep that was originally

developed by Morin and colleagues (Morin, Stone et al. 1993).This study used the abbreviated 10-item version (DBAS-10), validated by Espie and colleagues (2000). The DBAS-10 has adequate internal consistency (Coefficient alpha =0.69) and is divided into 3 subscales. Scale 1 (5 items) includes items about negative beliefs about immediate consequences of insomnia. Scale 2 (3 items) includes items about negative beliefs about long-term negative consequences of insomnia. Scale 3 (2 items) includes beliefs about the need for control over insomnia (Espie, Inglis et al., 2000).

Self-Efficacy Scale (SES)—The SES is a 9-item scale used to assess patients' sense of self-efficacy in regard to sleep (Lacks, 1987). The participants are asked to rate how confident they are to accomplish a behavior, such as "lie in bed feeling mentally relaxed" or "Fall asleep at night in less than 30 minutes" on a 5-point scale, with higher scores reflecting greater self-efficacy relating to sleep. The SES has adequate internal consistency (Coefficient alpha =0.71; Edinger, Wohlgemuth et al., 2001). Internal consistency for the SES in our sample was 0.54.

Beck Depression Inventory-I (BDI)—The BDI is a 21-item self-report inventory used to assess the severity of depressive symptoms (Beck et al., 1961) over the past week. Total scores on the BDI can range from 0 to 63, with higher scores reflecting greater levels of depressive symptom severity. The BDI has yielded adequate reliability estimates, and has been well validated as a measure of depressive symptomatology (Beck, Steer, & Garbin, 1988).

Morningness-Eveningness Composite Scale (MECS)—The MECS is a 13-item scale used to determine an individual's preference for various activities and ease of rising in the morning (e.g. times to get up and to go to sleep, how easy to rise at 6am; Smith, Reilly, Midkiff, 1989). The scale was developed using the Horne-Ostberg Morningness-Eveningness scale and the Torsvall and Akerstedt scales. The MECS has excellent internal consistency (alpha=.87) and demonstrated psychometric properties that are comparable or better than the Horne-Ostberg and Torsvall and Akerstedt scales.

Pain severity—Participants rated their perception of pain interfering with sleep on a single item asking, "Does your pain interfere with your sleep?" on a 6-point Likert scale from "I don't have pain, not applicable" to "All of the time".

Sleep Diaries—Participants completed prospective sleep/wake diaries for seven days prior to treatment. Five items from the sleep diary were included as predictors: total sleep time (TST), sleep onset latency (SOL), wake after sleep onset (WASO), self-rated level of daytime fatigue/sleepiness during the day on a scale of 1 (very fatigued/sleepy) to 10 (optimally energetic/alert) and use of medications to facilitate sleep (using or not using). For each item, a weekly score was obtained by averaging the value across the 7 days. For the medication use item, a dichotomous variable was used based on whether the individual was taking sleep medication or not. Sleep diaries are routinely used for clinical and research purposes and are considered the standard of practice for measuring subjective sleep in insomnia populations (Buysse, Ancoli-Israel et al., 2006).

Data Analysis

The ROC analysis was conducted using the ROC4 program (see Kraemer, 1992) on a set of variables to identify variables that could predict the subgroup of insomnia with multiple symptoms. ROC analysis is a nonparametric technique that evaluates multiple potential predictors and provides an optimal cut-point for each predictor considering the balance between sensitivity and specificity for predicting the outcome of interest (in this case,

insomnia subgroup). The advantage of this technique is that it does not make restrictive assumptions such as collinearity, additivity, and homoscedasticity that is required when using linear models. When the best predictor and optimum cut-point is identified, the group with the success criterion is tested against a stopping rule (cut-point significant at $p<.01$ level). If the stopping rule is not met, no further action is taken. If the group passes the rule, the sample is divided into two subgroups on the basis of the selected predictor variable. The analyses are then restarted for each of the two subgroups in an iterative process until the stopping rule is encountered (either a subgroup reaches a sample size of $n<10$ or the optimal test is not statistically significant at the .01 level). The ROC approach has been used previously in our lab to examine predictors of dropouts from CBTI (Ong, Kuo, & Manber, 2008).

In the present study, ROC analysis was conducted to examine predictors for having both initiation and maintenance problems (Combined subgroup) relative to those who have sleep onset or sleep maintenance difficulties (Single Symptom subgroup). The dependent variable was a dichotomized variable with two subgroups: Combined subgroup (individuals with multiple symptoms) versus Single Symptom subgroup (initiation, maintenance, or early morning awakenings only), derived from the ISI (as discussed previously). The set of predictors (Independent Variables) in the present study included age, gender, sleep-related distress (item 5 from the ISI), BDI, MECS, the 3 subscales of the DBAS, the 4 subscales of the GCTI, SES, pain severity, use of sleep medications, and the five sleep diary variables (SOL, WASO, TST, TIB, daytime sleepiness/fatigue). These IVs were selected on the conceptual basis that they provide clinically relevant information on sleep-related cognitions, circadian preferences, depression symptoms, insomnia related variables, and demographics. In the ROC analysis, the weight for the ROC analysis for kappa was set at 0.50 so that false negatives and false positives are given equal consideration.

Following the ROC analysis, a series of post-hoc one-way ANOVAs were conducted to further characterize subgroups of insomnia that were identified by the results of the ROC analysis. A Bonferroni correction was applied to avoid inflated Type I error for multiple comparisons. Using a p value of .05 with 15 comparisons, only p values < .00333 were deemed statistically significant.

Results

Insomnia Subgroups

Of the total sample of 146 patients (mean age was 45.97 ±13.81, 45.2% male), 79 (54,11%) had both initiation and maintenance problems (Combined subgroup). The remaining patients constituted the Single Symptom subgroup (17 had difficulty with sleep initiation only, 46 had difficulty with sleep maintenance only, and 4 had difficulties with early morning awakenings only).

Combined Subgroup vs. Single Symptom Subgroup

Results from the ROC analysis revealed two predictor variables of the Combined subgroup (See Figure 1 for ROC tree). At the first level, the best predictor was the SES with a cut-point of 23 ($\chi^2 = 25.85$, $p<.001$). Of the 67 patients who reported SES ≥ 23, 31.3% (n = 21) were in the Combined subgroup. For this group, the stopping rule went into effect and the ROC analysis did not further differentiate any subgroups. In contrast, out of the 79 patients who reported SES < 23, 73.4% (n = 58) were in the Combined subgroup. Subsequently, this group was further differentiated by the GCTI Subscale 4 (“thoughts about the environment”) score, with a cut-point of 5 ($\chi^2 = 9.05$, $p<.01$). Of the 63 patients who reported SES < 23 and GCTI Subscale 4 ≥ 5, 81% (n = 51) were in the Combined subgroup. In contrast, out of

the 16 patients who reported SES < 23 and GCTI Subscale 4 < 5, 43.8% (n = 7) were in the Combined subgroup. At this point, the stopping rule went into effect for all groups. No other significant variables were identified in the ROC analysis.

Post-hoc comparisons based on ROC analyses

A series of one-way ANOVAs were conducted to characterize differences in mood, cognition, chronotype tendency, and sleep diary variables between the groups that were identified by the ROC analyses. First, two groups divided by the first level of ROC analyses (SES score 23 cutoff) were compared. The 79 individuals with a low SES score (SES score <23) were significantly different to the 67 individuals who had a high SES score (SES score ≥ 23) on average SOL [$F(1, 108) = 9.37$, $p=.003$], number of nights with SOL>30 minutes [$F(1, 112) = 11.79$, $p=.001$], ISI [$F(1, 77) = 10.72$, $p=.002$], MECS [$F(1, 131) = 9.45$, $p=.003$], BDI [$F(1, 114) = 10.49$, $p=.002$], GCTI scale 2 [$F(1, 100) = 12.29$, $p=.001$], GCTI scale 3 [$F(1, 105) = 15.36$, $p<.001$], and DBAS scale 2 [$F(1, 137) = 24.74$, $p<.001$]. In other words, individuals with low SES scores had significantly longer SOL and more number of nights with SOL>30 minutes, higher insomnia severity, less morningness tendency, higher levels of depression compared to individuals with higher SES scores. These individuals also expressed more anxiety about anxiety, and thoughts about sleep, and more negative beliefs about long-term negative consequences of insomnia. Descriptive data for the variables can be found in Table 2.

Post-hoc ANOVAs were also conducted to compare individual with higher scores on the GCTI scale 4 (score ≥ 5) versus lower scores (score < 5) among individuals with low SES scores. There were no significant differences between the 17 individuals with GCTI scale 4 score < 5 compared to the 62 individuals with GCTI scale 4 score ≥ 5.

To further explore variables that distinguish between having both sleep initiation and maintenance or having one of the symptoms, we repeated the identical ROC analysis comparing the Combined subgroup to patients with sleep initiation difficulties only and, separately, to patients with sleep maintenance difficulties only. The first model did not converge, likely because the number of patients with sleep initiation difficulties only was very small. The second model yielded results identical to the comparison between the Combined and Single Symptom subgroups.

Discussion

The goal of this study was to identify unique characteristics of patients with both initiation and maintenance difficulties compared to those with a single symptom.. Overall, the findings revealed that cognition emerged as a significant variable in predicting the Combined subgroup. That is, self-efficacy and thought content about the environment were both significantly related to having multiple symptoms of insomnia. Specifically, the ROC analysis revealed that patients who reported a score of less than 23 on the self-efficacy scale were more likely to belong to the Combined subgroup of insomnia. In addition, among those patients who scored 23 or less on the SES, those who also reported a score of 5 or above on the GCTI Subscale 4 (Thinking about the environment), which reflects higher thought content about the environment prior to sleeping, were more likely to belong in the Combined subgroup of insomnia. These findings provide evidence that having low self-efficacy, especially when accompanied by an externalized attribution style, distinguishes between those with multiple insomnia symptoms (having both initiation and maintenance difficulties) from those with single insomnia symptoms alone, and also provide preliminary recommendations for cutoff scores on these variables. It appears that these findings are driven primarily by the group of patients with sleep maintenance only among the Single Symptoms subgroup, when compared to the Combined subgroup.

To our knowledge, this study is the first to identify a link between self-efficacy, thought content, and insomnia subgroups. Given that the aim of this study was to generate hypotheses, these findings suggest a need for further investigation into the relationship between cognitions and the etiology of the Combined subgroup. One important issue is to clarify the temporal relationship between self-efficacy and insomnia subgroups. For example, is general low self-efficacy a predisposing factor for the Combined subgroup or does self-efficacy change as a result of the progression from a single symptom to multiple symptoms? The present study utilized a cross-sectional design, thus precluding analyses to differentiate temporal relationships but future studies might examine this issue in a longitudinal design.

Another issue to examine is the impact of self-efficacy on the perception of sleep disturbance. Given that the present study utilized a self-report rather than an objective measure to categorize insomnia subgroups, it could be hypothesized that low self-efficacy is associated with a biased perception of the severity of sleep disturbance. In Bandura's Social Cognitive Theory (1977), self-efficacy is closely related to self-perception and the perceived ability to achieve or avoid tasks. Further research that includes objective measures of sleep could help examine the impact of self-efficacy on sleep perception and the potential role this might play in paradoxical insomnia. These findings also point to a need to examine attribution style in the context of insomnia. The importance of low self-efficacy combined with anxious thoughts about the environment among the Combined group is interesting when considered with a recent finding that individuals who attributed their insomnia to environmental factors were much more confident that a psychological treatment would help compared to a biological treatment (Harvey et al., 2011). It appears that further studies on attribution styles and its impact on treatment are now warranted.

These findings also point to clinical implications. In general theories of Health Behavior Change, self-efficacy has been found to be an important indicator of the likelihood to engage in behavioral change (Strecher, DeVellis et al., 1986). These findings would suggest that individuals with a combined type who also report low self-efficacy might need additional clinical attention to enhance self-efficacy as part of treatment. It has been found that self-efficacy enhancement strategies can facilitate hypnotic tapering, with the increase of self-efficacy associated with the magnitude of dose reduction (Belanger et al., 2005; Belleville & Morin, 2008). Since self-efficacy has been found to predict adherence to CBTI, assessment of self-efficacy would seem to be particularly important for individuals with a Combined subgroup prior to initiating CBTI.

The strength of this study was the approach of using ROC in a large sample of patients presenting to a specialty sleep clinic. This approach identified self-efficacy and cognitions related to the environment as key variables that are related to the Combined subgroup of insomnia. Moreover, the ROC approach provided cut-off scores on these measures that optimize the clinical utility of these findings. In addition, the analyses were conducted on clinic patients, thus enhancing the generalizability of the findings.

The limitations of the study were the surprisingly small subgroup of patients who reported problems with initiation only and early morning awakening only. As a result, we were not able to conduct analyses on these subgroups of insomnia so it is unclear if there might be differences between individuals with these single complaints versus those with sleep maintenance only. In addition, objective measures were not systematically collected and some patients did not provide complete data. However, the data presented are typically used in Behavioral Sleep Medicine clinics and fall under the recommendations for the assessment of insomnia (Buysse et al., 2006).

Despite these limitations, the present findings provide a first step towards investigating the relationship between self-efficacy, thought contents, and insomnia subgroup for patients presenting for CBTI. It especially highlights the role of cognition, and deserves further attention in the etiology of the Combined subgroup compared with subgroups of insomnia patients who suffer from single symptoms. Further research examining specific aspects of the relationship among these variables is warranted.

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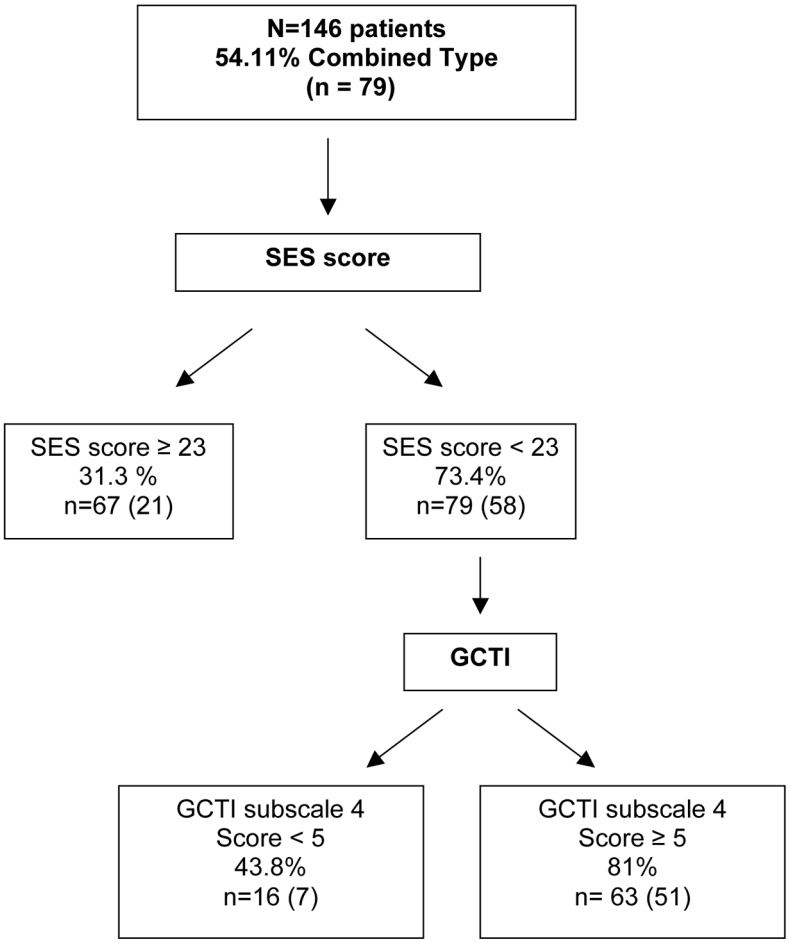

Figure 1. ROC Tree of Combined Subgroup

* The number of subjects who were Combined subgroup are in parentheses. SES = Self-Efficacy Scale; GCTI = Glasgow Content of Thoughts Inventory; GCTI Subscale 4 = Anxiety about Environment

Table 1

Subscales of the Glasgow Content of Thought Inventory

GCTI subscales	Individual Items		Cronbach's Alpha
General Worries	**1**	Things in the future	0.82
	3	Things that happened during the day	
	6	Checking the time	
	10	Your health	
	12	Things you have to do tomorrow	
	14	Your work/responsibilities	
	19	Pictures of things in your mind	
	21	Your personal life	
	23	Things in your past	
Anxiety about Anxiety	**4**	How nervous/anxious you feel	0.79
	5	How mentally awake you feel	
	7	Trivial things	
	8	How you can't stop your mind from racing	
	15	How frustrated/annoyed you feel	
	22	How thinking too much is the problem	
Sleep Anxiety	**2**	How tired/sleepy you feel	0.88
	9	How long you've been awake	
	11	Ways you can get to sleep	
	18	Being awake all night	
	20	The effects of not sleeping well	
	24	How bad you are at sleeping	
	25	Things to do to help you sleep	
Thoughts about the Environment	**13**	How hot/cold you feel	0.60
	16	How light/dark the room is	
	17	Noises you hear	

* Abbreviations: GCTI = Glasgow Content of Thoughts Inventory

Table 2

Comparisons of groups based on ROC analysis

	SES score < 23 (n=79)	SES score ≥ 23 (n=67)	p-value
Variable	**Mean (SD)**	**Mean (SD)**	
ISI	22.96 (3.19)	20.59 (3.17)	0.003**
BDI	6.63 (0.86)	6.42 (0.86)	0.002**
MECS	34.89 (7.59)	39.42 (9.36)	0.003**
DBAS Subscale 1	36.89 (7.90)	33.53 (6.54)	0.008
Subscale 2	21.61 (5.09)	17.41 (4.74)	p<.001**
Subscale 3	11.93 (3.85)	9.95 (4.17)	0.004
GCTI Subscale 1	20.65 (4.70)	17.90 (5.22)	0.006
Subscale 2	14.81 (3.76)	12.30 (3.40)	0.001**
Subscale 3	17.12 (4.71)	13.67 (4.27)	p<.001**
Subscale 4	6.05 (1.92)	5.37 (1.93)	0.07
SOL (in hours)	0.66 (5.12)	0.40 (0.28)	0.003**
TST	6.27 (1.30)	6.28 (0.88)	0.97
WASO	1.45 (0.96)	1.44 (0.88)	0.40
TIB	8.39 (1.08)	8.15 (0.92)	0.23
Number of nights with SOL > 30 min	2.09 (1.94)	0.98 (1.20)	0.001**

*Abbreviations: SES = Self Efficacy Scale; BDI = Beck Depression Inventory; MECS = Morningness-Eveningness Composite Score; DBAS = Dysfunctional Beliefs and Attitudes Scale; GCTI = Glasgow Thought Content Inventory; SOL = sleep onset latency; TST = total sleep time; WASO = wake after sleep onset; TIB = time in bed

**Significant at p<.00333 level