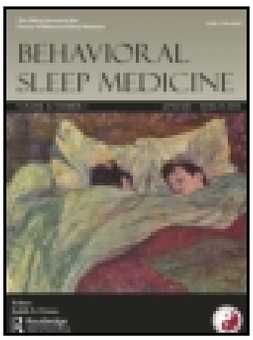

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Behavioral Sleep Medicine

ISSN: 1540-2002 (Print) 1540-2010 (Online) Journal homepage: https://www.tandfonline.com/loi/hbsm20

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To cite this article: Soyoung Youn, Changnam Kim, Joohee Lee, Sungook Yeo, Sooyeon Suh & Seockhoon Chung (2019): Development of Dysfunctional Beliefs and Attitude about Sleep Scale for Cancer Patients, Behavioral Sleep Medicine, DOI: 10.1080/15402002.2019.1578773

To link to this article: https://doi.org/10.1080/15402002.2019.1578773

Published online: 21 Feb 2019.

BEHAVIORAL SLEEP MEDICINE
https://doi.org/10.1080/15402002.2019.1578773

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Development of Dysfunctional Beliefs and Attitude about Sleep Scale for Cancer Patients

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ABSTRACT

Study objectives: This study aimed to develop a scale utilizing the original Dysfunctional Beliefs and Attitudes about Sleep (DBAS) scale that measured maladaptive cognitions associated with sleep that is especially sensitive to cancer patients. In addition to the original scale, we added two additional items that reflected cancer-specific dysfunctional beliefs about sleep. *Methods*: Participants consisted of 337 cancer patients (mean age 54.0 ± 11.8 years, 32.0% men). All participants completed the DBAS-16, two cancer specific items, and the Insomnia Severity Index. Item-to-total-score correlations, internal consistency, item selection, and factor structure were examined. *Results*: The DBAS-16 was found to be reliable, and internal consistency was also adequate when adding two cancer-specific questions (Cronbach's alpha = 0.89). A total of 14 items were selected, and a four-factor model was selected using exploratory factor analysis (Tucker-Lewis index = 0.86, root mean square error of approximation = 0.08). The four factors were (a) sleep expectations, (b) worry about insomnia, (c) perceived consequences of insomnia and medication, and (d) two cancer-related items. The modified 14 items of the Cancer-related DBAS (C-DBAS-14) well differentiated cancer patients with and without insomnia. *Conclusions*: The C-DBAS-14 is a promising measure that has adequate internal consistency. It is also sensitive to sleep-related cognitions in cancer patients and can discriminate patients with cancer who are experiencing insomnia from those who are good sleepers. The enhanced utility of the shortened 14-item scale tailored specifically to cancer patients may be useful in both clinical practice and research settings.

Abbreviations: CBT: cognitive behavioral therapy; C-DBAS-14: Cancer-Related Dysfunctional Beliefs and Attitude about Sleep; C-DBS: Cancer-Related Dysfunctional Beliefs about Sleep; DBAS-16: Dysfunctional Beliefs and Attitudes about Sleep; ISI: Insomnia Severity Index

Introduction

Sleep disturbance is one of the most common symptoms reported by patients with cancer, with prevalence ranging from 30% to 43% (Palesh et al., 2010; Sharma et al., 2012) depending on criteria used to define sleep disturbance. Cancer diagnosis and uncertain prognosis are accompanied by many precipitating factors, including psychological distress and cancer-related physical symptoms such as pain, hot flashes, nausea, dyspnea, or pruritus. Additionally, arduous cancer treatments such

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This study was performed in Asan Medical Center.
All authors have seen and approved the manuscript.

as surgery, chemotherapy, radiation therapy, antihormonal therapy, medication and even hospitalization often trigger sleep disturbance (Ancoli-Israel, 2015). It would not be an overstatement that most patients with cancer experience insomnia symptoms at some point in some form or another because of the various factors involved that interfere with sleep. While these symptoms can be managed and diminish over time, they may persist with life-long implications in some patients without detection or intervention.

According to the cognitive-behavioral model, acute insomnia can be aggravated and develop into a chronic condition by perpetuating factors such as maladaptive sleep habits and dysfunctional cognitions or beliefs about sleep (Spielman, Caruso, & Glovinsky, 1987). For example, if individuals with insomnia have dysfunctional beliefs about the consequences of poor sleep, such cognitions will promote behaviors that can lead to problematic behaviors, such as spending much more time in bed or napping excessively to compensate for insufficient sleep. Sleep-related cognition plays an important role in perpetuating the vicious cycle of developing insomnia by provoking anxiety, worry, and eventually maladaptive behaviors, which can lead to the disruption of normal homeostasis (Palagini, Moretto, Dell'Osso, & Carney, 2017).

In patients with cancer, significantly reduced activity and decreased social interaction are common, especially during the period of active treatments including surgery, chemotherapy, or radiation therapy (Bower et al., 2018; Parker et al., 2008; Savard & Morin, 2001). Qualitative studies have showed that these patients tend to experience severe fatigue not only as a side effect of the treatments, but also as a symptom of cancer itself. Cancer patients often view fatigue as a sign that they should take rest, which leads to prolonged periods in bed in a wakeful state (Ebede, Jang, & Escalante, 2017; Medysky, Temesi, Culos-Reed, & Millet, 2017). In particular, patients with cancer tend to be overconcerned about the negative consequences of poor sleep on their health. For example, "*sleep during a specific time period (e.g., 10 pm to 2 am) is critical for immune functioning*" or "*poor sleep affects cancer progression*," are common dysfunctional beliefs about sleep observed among patients with cancer experiencing insomnia (Chung, Youn, & Choi, 2017). In other words, obtaining sleep can be perceived as a life-or-death problem for some patients, and not just a quality of life issue like most individuals. Such catastrophic thinking and pressure to sleep may lead them to go to bed earlier than their habitual sleep time before the diagnosis of cancer and try to fall asleep even though they are not sleepy. Combined with decreased physical activity, such maladaptive behavioral responses to sleep disturbance followed by cancer-related dysfunctional beliefs are regarded as the principal mediating factors for the development of chronic insomnia and these should be corrected using the cognitive-behavioral approach (Garland et al., 2014; Savard & Morin, 2001; Zeichner, Zeichner, Gogineni, Shatil, & Ioachimescu, 2017; Zhou, Suh, Youn, & Chung, 2017).

The most widely used tool for evaluating sleep-related cognitions is the Dysfunctional Beliefs and Attitudes about Sleep scale (DBAS-16), a 16-item self-reported questionnaire utilizing a 10-point Likert scale. The 16 items are divided into four factors that assess (1) the consequences of insomnia, (2) worry about sleep, (3) sleep expectations, and (4) medication. Previous studies have reported that several items of the scale are useful for detecting subjects with insomnia and are sensitive to changes after CBT (Carney & Edinger, 2006; Eidelman et al., 2016).

Despite the importance of evaluating dysfunctional cognition about sleep, few studies to date have applied and validated the DBAS-16 in patients with various types of cancers (Garland, Campbell, Samuels, & Carlson, 2013; Tremblay, Savard, & Ivers, 2009). Furthermore, if a measure performs its function accurately and effectively in a future investigation, it must be developed to reflect the characteristics of the target population. Ultimately, it is necessary to modify the previous measure for cancer patients with insomnia, recognizing that their symptom is largely based on unique cognitive processes that are different from that of the general population. There are more than 100 different types of cancer (Courneya, 2003), and it is unlikely that they all have the same impact on treatment, perceived burden and outcome.

Since it is difficult for physicians to prescribe sleep medication to cancer patients who are currently taking numerous medications for their disease and symptoms, cognitive-behavior therapy

can be a useful tool to reduce their sleep problem. Thus, clinicians need to identify specific maladaptive thoughts or dysfunctional beliefs associated with sleep in cancer patients to be able to provide tailored treatment for their sleep problems. One study conducted a cluster analysis with insomnia patients based on the DBAS-16, and identified four subgroups of insomnia. These four subgroups showed differential treatment effects following cognitive-behavior therap for insomnia, suggesting that tailoring CBT protocols based on specific dysfunctional beliefs may be useful to match the need of the patient (Montserrat Sanchez-Ortuno & Edinger, 2010). Therefore, the current study aimed to develop a questionnaire assessing the dysfunctional beliefs and attitudes about sleep of patients with cancer based on the current DBAS-16 by adding cancer-specific items.

Methods

Participants and procedures

All cancer patients participating in the study completed the 16-item Dysfunctional Beliefs about Sleep Scale (DBAS-16) with two additional cancer-specific items (Chung et al., 2017), and the Insomnia Severity Index (ISI). We retrospectively reviewed the medical records of cancer patients who visited the Sleep Clinic for Cancer Patients of Asan Medical Center between January 2017 and February 2018. The study protocol was approved by the Institutional Review Board of Asan Medical Center (2018–0618).

We included 337 cancer patients older than 18 years who (1) could complete the rating scales without any help, (2) had no problems in communication, and (3) had no delirium or major psychotic disorders such as schizophrenia or bipolar disorder. The average age of participants was 54 (± 11.8) years, and 32.0% were men (n = 108, Table 1). The sample comprised of patients with various types of cancer, with breast cancer being the most frequent diagnosis (n = 149, 44.2%), followed by lung (n = 37, 11.0%), pancreatic and biliary tract (n = 34, 10.0%), gastro-esophageal (n = 28, 8.3%), colorectal (n = 25, 7.4%), hematologic (n = 16, 4.7%), gynecologic (n = 11, 3.3%), and urinary tract (n = 10, 3.0%).

Among the 310 patients with cancers that could be graded using the TNM staging system, the stages were relatively evenly distributed. The cancer stages had not yet been confirmed for 34 patients (11.0%) at the time of the first visit. At the time of the first visit to the Sleep Clinic for Cancer Patients, 118 patients (35.0%) had been diagnosed as having major depressive disorder, 115 (34.1%) as having insomnia, and 32 (9.5%) as having anxiety disorder or somatic symptom disorder.

Measures

16 item dysfunctional beliefs and attitudes about sleep scale (DBAS-16)

The DBAS-16 is a widely used tool for assessing the patients' dysfunctional beliefs about sleep. The original 30-item version of the DBAS (Morin, 1994) has been validated to be shortened to a 16-item questionnaire – the DBAS-16 (Morin, Vallieres, & Ivers, 2007). The scale is divided into four subscales: "consequences," "worry/helplessness," "expectations," and "medication." Patients were asked to rate their cognitions about sleep for each of the 16 items on a Likert-type scale ranging from 0 (strongly disagree) to 10 (strongly agree).

Cancer-related dysfunctional beliefs about sleep

The two cancer-related items were developed in a previous study (Chung et al., 2017) and included the following questions: "*My immune system will have serious problems if I don't go to sleep at a certain time*" (Cancer 1) and "*If I don't sleep well at night, my cancer may recur or metastasize*" (Cancer 2). The items were developed by interviewing ten cancer patients about their sleep-related beliefs and cognitions. A focus group meeting consisting of two psychiatrists, one psychologist, and one nurse with expertise in sleep medicine decided on the two items based on the patient interviews. We asked the patients to rate their experience with the two dysfunctional beliefs on a scale of 0 to 10. A higher score reflected that their beliefs were dysfunctional.

Table 1. Clinical characteristics of the study subjects.

Variable	Subjects (n = 337)
Male, n (%)	108 (32.0%)
Age (years)	54.0 ± 11.8
Cancer type	
Breast	149 (44.2%)
Lung	37 (11.0%)
Pancreatic and biliary tract	34 (10.0%)
Gastro-esophageal	28 (8.3%)
Colorectal	25 (7.4%)
Hematologic	16 (4.7%)
Gynecologic	11 (3.3%)
Urinary tract	10 (3.0%)
Liver	9 (2.7%)
Kidney	7 (2.1%)
Thyroid	4 (1.2%)
Others	7 (2.1%)
Cancer stages (n = 316)*	
Stage 0	7 (2.3%)
Stage I	62 (20.0%)
Stage II	85 (27.4%)
Stage III	54 (17.4%)
Stage IV	68 (21.9%)
Not yet confirmed	34 (11.0%)
Psychiatric diagnosis	
No diagnosis	29 (8.6%)
Acute stress reaction/adjustment disorder	24 (7.1%)
Major depressive disorder	118 (35.0%)
Insomnia	115 (34.1%)
Anxiety disorder/somatic symptom disorder	32 (9.5%)
Mixed anxiety and depressive disorder	15 (4.5%)
Others	4 (1.2%)
Rating scale scores	
Insomnia Severity Index	16.0 ± 6.1 (1–28)
Dysfunctional Beliefs and Attitude about Sleep-16	88.3 ± 28.7 (0–156)
Cancer-Related Dysfunctional Beliefs about Sleep	11.9 ± 5.7 (0–20)

* among patients with cancer graded using the TNM staging system

Insomnia severity index

The ISI is a self-reported measure comprising seven items assessing insomnia symptom severity during the previous 2 weeks (Bastien, Vallieres, & Morin, 2001). The ISI is rated on a 4-point Likert scale, with higher scores reflecting more severe insomnia symptoms. In this study, we defined 10 point of ISI score as having clinical levels of insomnia (Morin, Belleville, Belanger, & Ivers, 2011).

Statistical analyses

All statistical analyses for factor analysis were conducted using MPLUS 7 (Muthen & Muthen), and all other analyses were performed using IBM SPSS Statistics, Version 23.0 for Windows (IBM Corp., Armonk, NY, USA). Response distribution and floor and ceiling effects were analyzed using the mean, standard deviation, and frequency analyses for each item. In this study, significant floor or ceiling effects were defined as >25% of respondents choosing the lowest or highest score. Pearson's correlation coefficient was used to correlate each item to the total score for item-total correlation, with item-total correlations ≥0.30 being considered acceptable based on a previous study (Chung et al., 2008). Internal consistency was evaluated using Cronbach's alpha.

Morin et al.'s criteria for developing the DBAS-16 from the original scale was used to select items for the new Cancer-Related Dysfunctional Beliefs and Attitude about Sleep (C-DBAS-14) scale.

Exploratory factor analyses using maximum likelihood was used, and factors were rotated using Geomin, a type of oblique rotation that minimizes variable complexity (Sass & Schmitt, 2010). Factor numbers were selected on the basis of eigenvalues, inflection points on the scree plot, total variance explained by retained factors, and the number of items loading on each retained factor above 0.32 representing more than 10% of the shared variance (Tabachnick & Fidell, 2014). A sample size of 337 yielded a subject-to-item ratio of 24:1, which well exceeded the recommended number needed for factor analyses.

Results

Analyses of the original DBAS-16 with two additional cancer items

The objective was to construct a cohesive scale sensitive to the beliefs and attitudes of patients with cancer on the basis of the original DBAS-16, while adding the two items developed specifically for cancer patients. Descriptive statistics (means, standard deviations, and percentage for the lowest and highest scores) for the original 16 items and the two additional cancer items are presented in Table 2. Both item 3 (*"consequences of insomnia on health"*) and 5 (*"insomnia interferes with daytime functioning"*) had a high percentage of individuals choosing the highest score (31.3% and 28.9%, respectively).

Items that differentiated the insomnia and non-insomnia groups

The sample was divided into two groups – cancer patients who reported having insomnia symptoms (ISI scores ≥ 10, n = 278) and those without insomnia symptoms (ISI scores < 10, n = 52) excluding 7 subjects whose ISI score was not recorded. Approximately 84% reported having clinical levels of

Table 2. Descriptive statistics for the original dysfunctional beliefs and attitudes about sleep-16 items and the two cancer-related items.

	Without insomnia (n = 52) (ISI score < 10)	With insomnia (n = 278) (ISI score ≥ 10)			
Item	Mean (SD)	Mean (SD)	% with lowest score	% with highest score	p-value
1. Need 8 hours of sleep	7.79 (2.82)	7.41 (2.49)	2	31	0.322
2. Need to catch up on sleep loss	6.46 (2.76)	6.37 (2.84)	3.6	19.6	0.845
3. Consequences of insomnia on health	4.71 (3.43)	7.60 (2.64)	3.9	**31.3**	**<.0001***
4. Fear of losing control over sleep	3.44 (2.99)	6.46 (2.93)	6.8	20.8	**<.0001***
5. Insomnia interferes with daytime functioning	6.75 (2.85)	7.54 (2.34)	1.2	**28.9**	0.032
6. Better taking sleeping pills	3.21 (3.35)	5.73 (3.28)	13.4	16.1	**<.0001***
7. Mood disturbances due to insomnia	4.11 (3.10)	5.39 (2.90)	7.1	10.4	0.004
8. One poor night disturbs whole week	3.80 (3.10)	4.97 (2.88)	7.1	9.2	0.008
9. Cannot function without a good night	3.65 (2.75)	5.04 (2.75)	6.8	6.8	**0.001***
10. Sleep is unpredictable	4.02 (3.32)	6.47 (2.79)	7.4	17	**<.0001***
11. Unable to manage consequences	3.29 (2.83)	5.70 (2.81)	8.3	10.4	**<.0001***
12. Lack of energy due to poor sleep	4.75 (2.70)	6.30 (2.67)	3.6	14	**<.0001***
13. Insomnia resulting from chemical imbalance	3.40 (2.70)	4.27 (2.70)	10.9	5.8	0.037
14. Insomnia destroying life	2.85 (2.89)	4.79 (2.91)	13.4	8.1	**0.001***
15. Medication as a solution	2.51 (3.00)	4.03 (2.92)	19.2	6	**<.0001***
16. Cancel obligations	2.80 (2.85)	4.25 (2.84)	14.7	5.1	**<.0001***
Cancer 1. Problems with immune system without sleep	3.90 (2.93)	6.52 (2.80)	4.8	16.4	**<.0001***
Cancer 2. Cancer may recur or metastasize	3.38 (2.82)	6.29 (3.04)	7.7	19	**<.0001***

ISI, insomnia severity index; Seven subjects whose Insomnia Severity Index score was not recorded in the medical record were excluded in this analysis.

* Bonferroni correction was used to avoid alpha error inflation, with alpha set at .002.

insomnia. Independent t-tests were conducted to differentiate items that discriminated cancer patients with and without insomnia. A Bonferroni correction was applied to avoid alpha error inflation (alpha was set at .002). Among the 18 items, 12 items significantly discriminated the two groups (Table 2).

Item selection of the C-DBAS-14

According to Morin et al.'s original article about DBAS (Morin et al., 2007), item selection for the DBAS-16 was based on seven criteria: (1) normal distribution, (2) moderate variance, (3) moderate endorsement (no low or high mean), (4) use of entire range of response choice (from 0 to 10), (5) low rate of missing data, (6) adequate item-total correlations on exploratory internal consistency analysis, and (7) being associated with only one factor on an exploratory oblique factor analysis. On the basis of these criteria and exploratory factor analysis of the DBAS-16 with two additional cancer items, we excluded items 10 (*"sleep is unpredictable"*), 11 (*"unable to manage consequences"*), and 16 (*"cancel obligations"*) because these were associated with multiple factors. Additionally, item 5 (*"insomnia interferes with daytime functioning"*) was excluded because of a high ceiling effect, and because it could not distinguish between cancer patients with and without insomnia. Although item 3 (*"consequences of insomnia on health"*) had a high ceiling effect, we decided to include the item owing to the characteristics of the sample, and its utility in discriminating cancer patients with and without insomnia. This resulted in the inclusion of 14 items in the final scale (Table 3).

Internal consistency of the C-DBAS-14

Analysis for internal consistency of the C-DBAS-14 was conducted using Cronbach's alpha coefficient and item-total correlations (Table 4). Cronbach's alpha was adequate for the sample (.88). Item-total correlations ranged from .3 to .71 for the sample (Table 4).

Exploratory factor analysis of the modified C-DBAS-14

Exploratory factor analysis was used to explore the factor structure of the C-DBAS-14. The eigenvalues were 5.2, 1.55, and 1.26 for the first three factors and 0.94 for the fourth factor. While the criteria of eigenvalues > 1 is traditionally used to select the number of factors, a comparison of

Table 3. Item selection for the cancer-related dysfunctional beliefs and attitudes about sleep scale.

Item	Inclusion/Exclusion	Exclusion Reason
1. Need 8 hours of sleep		
2. Need to catch up on sleep loss		
3. Consequences of insomnia on health	Consider	High extreme on scores
4. Fear of losing control over sleep		
5. Insomnia interferes with daytime functioning	Exclusion	High extreme on scores
6. Better taking sleeping pills		
7. Mood disturbances due to insomnia		
8. One poor night disturbs whole week		
9. Cannot function without a good night		
10. Sleep is unpredictable	Exclusion	Low factor loadings (<.4)
11. Unable to manage consequences	Exclusion	Low factor loadings (<.4)
12. Lack of energy due to poor sleep		
13. Insomnia resulting from chemical imbalance		
14. Insomnia destroying life		
15. Medication as a solution		
16. Cancel obligations	Exclusion	Low factor loadings (<.4)
Cancer 1. Problems with immune system without sleep		
Cancer 2. Cancer may recur or metastasize		

Table 4. Item-total correlations for the cancer-related dysfunctional beliefs and attitudes about sleep-14 scale.

Item	Sample
1. Need 8 hours of sleep	0.3
2. Need to catch up on sleep loss	0.42
3. Consequences of insomnia on health	0.66
4. Fear of losing control over sleep	0.67
6. Better taking sleeping pills	0.59
7. Mood disturbances due to insomnia	0.67
8. One poor night disturbs whole week	0.71
9. Cannot function without a good night	0.67
12. Lack of energy due to poor sleep	0.66
13. insomnia resulting from chemical imbalance	0.53
14. Insomnia destroying life	0.7
15. Medication as a solution	0.61
Cancer 1. Problems with immune system without sleep	0.6
Cancer 2. Cancer may recur or metastasize	0.52
Internal consistency (Cronbach's alpha)	**0.86**

goodness-of-fit indices for three factors rather than for four factors revealed that the four-factor model had better goodness-of-fit for the C-DBAS-14 on all indices (three vs. four factors: comparative fit index = 0.89 vs. 0.94, Tucker-Lewis index = 0.8 vs. 0.86, root mean square error of approximation = 0.1 vs. 0.08, and standardized root mean square residual = 0.04 vs. 0.03). Based on the goodness-of-fit indices, the C-DBAS-14 adopted a four-factor structure (Table 5). The four factors were (1) sleep expectations and consequences of insomnia, (2) worry about sleep, (3) medication, and (4) cancer-related concerns. While item 14 ("*insomnia destroying life*") loaded similarly on both factors 1 and 4, the authors agreed the item would fit conceptually better with factor 1 rather than factor 4. The factors were all correlated, with correlation coefficients ranging from .25 to .52.

Discussion

This study was conducted to develop a tool for assessing the dysfunctional beliefs about sleep among cancer patients. The C-DBAS-14 was modified from the original DBAS-16 by adding new items that reflected the concerns of cancer patients and selecting proper items. The findings suggest adequate reliability and validity of the C-DBAS-14 in this population, with good internal consistency and a clinically relevant factor structure.

Previous studies have produced evidence of the relationship between dysfunctional beliefs and attitudes about sleep and subjective sleep variables (Morin, Stone, Trinkle, Mercer, & Remsberg,

Table 5. Exploratory factor analysis for the cancer-related dysfunctional beliefs and attitudes about sleep-14 scale.

Items	Factor 1	Factor 2	Factor 3	Factor 4
1. Need 8 hours of sleep	**0.473***	0.108	−0.281	−0.098
2. Need to catch up on sleep loss	**0.637***	−0.036	−0.18	−0.068
3. Consequences of insomnia on health	0.072	**0.764***	−0.001	0.124
4. Fear of losing control over sleep	0.003	**0.633***	0.286	−0.021
6. Better taking sleeping pills	0.044	0.105	**0.537***	0.018
7. Mood disturbances due to insomnia	**0.530***	0.042	0.206	−0.01
8. One poor night disturbs whole week	**0.601***	0.02	0.145	0.11
9. Cannot function without a good night	**0.649***	−0.013	0.144	0.003
12. Lack of energy due to poor sleep	**0.511***	0.145	0.011	0.16
13. insomnia resulting from chemical imbalance	0.302	−0.189	**0.464***	0.026
14. Insomnia destroying life	**0.372***	0.047	0.383*	0.074
15. Medication as a solution	0.001	0.034	**0.832***	−0.094
17. Problems with immune system without sleep	0.188	−0.028	−0.015	**0.819***
18. Cancer may recur or metastasize	−0.055	0.138	0.031	**0.763***

1993; Smith & Trinder, 2001). Although the DBAS-16 is not a diagnostic measure for insomnia, several items in this measure show higher scores in individuals with insomnia than in healthy controls (Carney & Edinger, 2006; Carney et al., 2010). Our findings are consistent with those of previous studies, which suggest that the DBAS-16 is also capable of discriminating good sleepers from those with insomnia among patients with cancer. Significant differences were observed in 10 of the 16 items in total, and item 3 (*"consequences of insomnia on health")* exhibited the greatest difference in the mean score (4.71 vs. 7.60), reflecting the worry of patients with cancer experiencing insomnia. However, some of the items failed to demonstrate any intergroup differences. For instance, items 1 (*"need 8 hours of sleep"*), 2 (*"need to catch up on sleep loss"*), and 5 (*"insomnia interferes with daytime functioning"*) seem common dysfunctional beliefs that most patients with cancer with and without insomnia tend to strongly agree on, while item 13 (*"insomnia resulting from chemical imbalance"*) is a seldom-used expression and difficult to understand within the cultural context owing to a gap in knowledge. The term "*chemical imbalance*" may be terminology that is used more widely to explain mental illness in Western countries, where mental illness has strong roots in the medical model. In contrast, mental illness has until recently been explained by holistic medicine in Korea, and thus the term *chemical imbalance* may not be a common or layman term that is easy to comprehend in Korean culture. In a treatment context, especially for non-pharmacological treatments such as cognitive-behavioral therapy for insomnia, clinicians should focus on these specific cognitions in tailoring treatments for the cancer-specific population when modifying maladaptive cognitions associated with sleep.

Cancer-related items (*"problems with immune system without sleep"* and *"cancer may recur or metastasize"*) contained in the C-DBS are commonly expressed beliefs about sleep among patients with cancer who are experiencing any kind of sleep disturbance (Chung et al., 2017). Even patients who have reached a stable state of disease 5 years after cancer diagnosis cannot completely be free from the risk of recurrence or metastasis. Therefore, many patients with cancer have a fear of cancer recurrence, which can make them exceptionally sensitive to even minor health problems (Koch, Jansen, Brenner, & Arndt, 2013; Sharpe, Curran, Butow, & Thewes, 2018; Simard et al., 2013). Therefore, it is understandable that item 3 (*"consequences of insomnia on health")* exhibited the highest mean score with a high ceiling effect, particularly in the insomnia group in the present study population. Cancer-related items also discriminated the insomnia and non-insomnia groups and exhibited the greatest difference in the mean scores (3.90 vs. 6.52 and 3.38 vs. 6.29, respectively). These findings also corresponded well with those of our pilot study, which found that the scores of those two beliefs were significantly correlated with insomnia severity (Chung et al., 2017).

In the process of developing the cancer-specific version of the DBAS-16 by adding two cancer-related items, the total number of items was shortened from 18 to 14 and the exploratory factor analysis yielded four factors, including (1) sleep expectations and consequences of insomnia, (2) worry about sleep, (3) medication, and (4) cancer-related concerns. The cancer-related items were loaded on a new "cancer-related concern" factor in our sample. However, other items extracted from the original version demonstrated some change in the factor structure, compared with the structure of the DBAS-16. First, the currently separated "consequences of insomnia" and "sleep expectations" factors in the DBAS-16 were integrated into one factor in the C-DBAS-14, while the "worry about sleep" and "medication" factors remained unchanged. Second, items 8 (*"one poor night disturbs whole week"*) and 14 (*"insomnia destroying life"*) were loaded on the "expectations and consequences" factor in our sample instead of the "worry about sleep" factor of the DBAS-16. Similar findings have also been reported in previous studies (Chung, Ho, & Yeung, 2016; Morin et al., 2007; Yung, Chung, Ho, Yeung, & Ng, 2016). Several items under the "consequences of insomnia" and "worry about sleep" factors of the DBAS-16 could be perceived and interpreted either way depending on the study population, implying that the two factors may have some shared properties. Finally, four items were not incorporated into the C-DBAS-14 on the basis of the criteria for selecting proper items. Item 5 (*"insomnia interferes with daytime functioning"*) was excluded because of a high ceiling effect and items 10 (*"sleep is unpredictable"*), 11 (*"unable to manage consequences"*), and 16 (*"cancel*

obligations") were excluded because they were associated with multiple factors, even though each of these items also reflected common sleep-related cognitions. One possible explanation is that some phrases used in these items are open to varying interpretations because of the clinical characteristics of patients with cancer or cultural differences. Furthermore, those items might be general concerns of this population that cannot distinguish insomnia patients from those without insomnia.

Although the cognitive-behavioral approach has been applied to manage insomnia in patients with cancer (Epstein & Dirksen, 2007; Fiorentino et al., 2010; Quesnel, Savard, Simard, Ivers, & Morin, 2003; Roscoe et al., 2015), little is known about how the sleep-disruptive cognition affects insomnia and whether it can be improved through treatment in this population. Only few studies have investigated dysfunctional sleep-related cognitions in patients with cancer experiencing insomnia (Rumble et al., 2010; Rumble, Keefe, Edinger, Porter, & Garst, 2005; Tremblay et al., 2009), and prior studies have not systematically assessed their specific dysfunctional beliefs and maladaptive responses that may contribute to the aggravation or perpetuation of insomnia. Considering the impact of sleep-related dysfunctional cognitions on insomnia in patients with cancer, the development of a reliable measure that reflects the patients' unique concerns will have to be a priority for the accurate assessment and treatment of insomnia. This study is significant because, to our knowledge, it is the first attempt to develop a scale to assess the dysfunctional beliefs and attitudes about sleep among patients with cancer experiencing insomnia. The C-DBAS-14 is a promising measure that has adequate internal consistency and an ideal factor structure with a new cancer-related factor, which can discriminate patients with cancer experiencing insomnia from good sleepers. As a shortened 14-item scale, enhanced utility of the C-DBAS-14 is also expected in both clinical practice and research even for patients with cancer.

Limitations

The main limitation of the present study is the notable heterogeneity in the study sample in terms of the cancer site, stage, and cancer treatment. Many studies on sleep disturbance in patients with cancer have often shown inconsistent results because the study subjects may be in different situations each other and the symptom itself is frequently emerged clustering with pain, fatigue, hot flash or psychological distress and hard to define. Comorbid psychiatric problems and underlying sleep disorders need to be clearly assessed using a structured interview scales or nocturnal polysomnography, though two psychiatrists who were especially trained for sleep medicine had assessed the subjects. Thus, to be more confident of the results, the validity of the C-DBAS-14 needs to be replicated in a more diverse sample by independent researchers. In addition, the current study used clinical interviews and subjective ratings to evaluate the patients' cognitions and symptoms. Finally, there were cultural differences in the interpretation of items from the original DBAS scale, especially the item associated with chemical imbalance. A similar problem was also reported with the Hindi translation of the DBAS-16, which raises the question of whether the direct translation of this item may be difficult to interpret in Asian cultures (Dhyani, Rajput, & Gupta, 2013) Future research should be conducted with objective sleep measures to investigate the relationship between the C-DBAS-14 and sleep indices and whether the C-DBAS-14 can reflect the changes produced by CBT, thereby indicating an improvement in insomnia.

Conclusion

In conclusion, the C-DBAS-14 is a promising measure for identifying clinically significant levels of dysfunctional sleep-related beliefs, especially among patients with cancer. We hope to use the C-DBAS-14 to explore the crucial factors contributing to the worsening or maintenance of insomnia prior to treatment, by extending it to assess the treatment-related cognitive changes.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Ancoli-Israel, S. (2015). Sleep disturbance in cancer: A review. *Sleep Medicine Research*, *6*, 45–49. doi:10.17241/smr.2015.6.2.45

Bastien, C. H., Vallieres, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, *2*, 297–307.

Bower, J. E., Wiley, J., Petersen, L., Irwin, M. R., Cole, S. W., & Ganz, P. A. (2018). Fatigue after breast cancer treatment: Biobehavioral predictors of fatigue trajectories. *Health Psychology*, *37*, 1025–1034. doi:10.1037/hea0000652

Carney, C. E., & Edinger, J. D. (2006). Identifying critical beliefs about sleep in primary insomnia. *Sleep*, *29*, 444–453.

Carney, C. E., Edinger, J. D., Morin, C. M., Manber, R., Rybarczyk, B., Stepanski, E. J., … Lack, L. (2010). Examining maladaptive beliefs about sleep across insomnia patient groups. *Journal of Psychosomatic Research*, *68*, 57–65. doi:10.1016/j.jpsychores.2009.08.007

Chung, F., Yegneswaran, B., Liao, P., Chung, S. A., Vairavanathan, S., Islam, S., … Shapiro, C. M. (2008). STOP questionnaire: A tool to screen patients for obstructive sleep apnea. *Anesthesiology*, *108*, 812–821. doi:10.1097/ALN.0b013e31816d83e4

Chung, K. F., Ho, F. Y., & Yeung, W. F. (2016). Psychometric Comparison of the Full and Abbreviated Versions of the Dysfunctional Beliefs and Attitudes about Sleep Scale. *Journal of Clinical Sleep Medicine*, *12*, 821–828. doi:10.5664/jcsm.5878

Chung, S., Youn, S., & Choi, B. (2017). Assessment of cancer-related dysfunctional beliefs about sleep for evaluating sleep disturbance in cancer patients. *Sleep Medicine Research*, *8*, 98–101. doi:10.17241/smr.2017.00073

Courneya, K. S. (2003). Exercise in cancer survivors: An overview of research. *Medicine and Science in Sports and Exercise*, *35*, 1846–1852. doi:10.1249/01.MSS.0000093622.41587.B6

Dhyani, M., Rajput, R., & Gupta, R. (2013). Hindi translation and validation of dysfunctional beliefs and attitudes about sleep (DBAS - 16). *Industrial Psychiatry Journal*, *22*, 80–85. doi:10.4103/0972-6748.123639

Ebede, C. C., Jang, Y., & Escalante, C. P. (2017). Cancer-Related Fatigue in Cancer Survivorship. *The Medical Clinics of North America*, *101*, 1085–1097. doi:10.1016/j.mcna.2017.06.007

Eidelman, P., Talbot, L., Ivers, H., Belanger, L., Morin, C. M., & Harvey, A. G. (2016). Change in Dysfunctional Beliefs About Sleep in Behavior Therapy, Cognitive Therapy, and Cognitive-Behavioral Therapy for Insomnia. *Behavior Therapy*, *47*, 102–115. doi:10.1016/j.beth.2015.10.002

Epstein, D. R., & Dirksen, S. R. (2007). Randomized trial of a cognitive-behavioral intervention for insomnia in breast cancer survivors. *Oncology Nursing Forum*, *34*, E51–59. doi:10.1188/07.ONF.E51-E59

Fiorentino, L., McQuaid, J. R., Liu, L., Natarajan, L., He, F., Cornejo, M., … Ancoli-Israel, S. (2010). Individual cognitive behavioral therapy for insomnia in breast cancer survivors: A randomized controlled crossover pilot study. *Nature and Science of Sleep*, *2*, 1–8.

Garland, S. N., Campbell, T., Samuels, C., & Carlson, L. E. (2013). Dispositional mindfulness, insomnia, sleep quality and dysfunctional sleep beliefs in post-treatment cancer patients. *Personality and Individual Differences*, *55*, 306–311. doi:10.1016/j.paid.2013.03.003

Garland, S. N., Johnson, J. A., Savard, J., Gehrman, P., Perlis, M., Carlson, L., & Campbell, T. (2014). Sleeping well with cancer: A systematic review of cognitive behavioral therapy for insomnia in cancer patients. *Neuropsychiatric Disease and Treatment*, *10*, 1113–1124. doi:10.2147/NDT.S47790

Koch, L., Jansen, L., Brenner, H., & Arndt, V. (2013). Fear of recurrence and disease progression in long-term (>/= 5 years) cancer survivors–A systematic review of quantitative studies. *Psychooncology*, *22*, 1–11. doi:10.1002/pon.3022

Medysky, M. E., Temesi, J., Culos-Reed, S. N., & Millet, G. Y. (2017). Exercise, sleep and cancer-related fatigue: Are they related? *Neurophysiologie Clinique*, *47*, 111–122. doi:10.1016/j.neucli.2017.03.001

Montserrat Sanchez-Ortuno, M., & Edinger, J. D. (2010). A penny for your thoughts: Patterns of sleep-related beliefs, insomnia symptoms and treatment outcome. *Behaviour Research and Therapy*, *48*, 125–133. doi:10.1016/j.brat.2009.10.003

Morin, C. M. (1994). Dysfunctional beliefs and attitudes about sleep: Preliminary scale development and description. *The Behavior Therapist*, *17*, 163–164.

Morin, C. M., Belleville, G., Belanger, L., & Ivers, H. (2011). The Insomnia Severity Index: Psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep*, *34*, 601–608.

Morin, C. M., Stone, J., Trinkle, D., Mercer, J., & Remsberg, S. (1993). Dysfunctional beliefs and attitudes about sleep among older adults with and without insomnia complaints. *Psychology and Aging*, *8*, 463–467.

Morin, C. M., Vallieres, A., & Ivers, H. (2007). Dysfunctional beliefs and attitudes about sleep (DBAS): Validation of a brief version (DBAS-16). *Sleep*, *30*, 1547–1554.

Palagini, L., Moretto, U., Dell'Osso, L., & Carney, C. (2017). Sleep-related cognitive processes, arousal, and emotion dysregulation in insomnia disorder: The role of insomnia-specific rumination. *Sleep Medicine*, *30*, 97–104. doi:10.1016/j.sleep.2016.11.004

Palesh, O. G., Roscoe, J. A., Mustian, K. M., Roth, T., Savard, J., Ancoli-Israel, S., … Morrow, G. R. (2010). Prevalence, demographics, and psychological associations of sleep disruption in patients with cancer: University of Rochester Cancer Center-Community Clinical Oncology Program. *Journal of Clinical Oncology*, *28*, 292–298. doi:10.1200/JCO.2009.22.5011

Parker, K. P., Bliwise, D. L., Ribeiro, M., Jain, S. R., Vena, C. I., Kohles-Baker, M. K., … Harris, W. B. (2008). Sleep/Wake patterns of individuals with advanced cancer measured by ambulatory polysomnography. *Journal of Clinical Oncology*, *26*, 2464–2472. doi:10.1200/JCO.2007.12.2135

Quesnel, C., Savard, J., Simard, S., Ivers, H., & Morin, C. M. (2003). Efficacy of cognitive-behavioral therapy for insomnia in women treated for nonmetastatic breast cancer. *Journal of Consulting and Clinical Psychology*, *71*, 189–200.

Roscoe, J. A., Garland, S. N., Heckler, C. E., Perlis, M. L., Peoples, A. R., Shayne, M., … Morrow, G. R. (2015). Randomized placebo-controlled trial of cognitive behavioral therapy and armodafinil for insomnia after cancer treatment. *Journal of Clinical Oncology*, *33*, 165–171. doi:10.1200/JCO.2014.57.6769

Rumble, M. E., Keefe, F. J., Edinger, J. D., Affleck, G., Marcom, P. K., & Shaw, H. S. (2010). Contribution of cancer symptoms, dysfunctional sleep related thoughts, and sleep inhibitory behaviors to the insomnia process in breast cancer survivors: A daily process analysis. *Sleep*, *33*, 1501–1509.

Rumble, M. E., Keefe, F. J., Edinger, J. D., Porter, L. S., & Garst, J. L. (2005). A pilot study investigating the utility of the cognitive-behavioral model of insomnia in early-stage lung cancer patients. *Journal of Pain and Symptom Management*, *30*, 160–169. doi:10.1016/j.jpainsymman.2005.02.013

Sass, D. A., & Schmitt, T. A. (2010). A Comparative Investigation of Rotation Criteria Within Exploratory Factor Analysis. *Multivariate Behavioral Research*, *45*, 73–103. doi:10.1080/00273170903504810

Savard, J., & Morin, C. M. (2001). Insomnia in the context of cancer: A review of a neglected problem. *Journal of Clinical Oncology*, *19*, 895–908. doi:10.1200/JCO.2001.19.3.895

Sharma, N., Hansen, C. H., O'Connor, M., Thekkumpurath, P., Walker, J., Kleiboer, A., … Fleming, L. (2012). Sleep problems in cancer patients: Prevalence and association with distress and pain. *Psychooncology*, *21*, 1003–1009. doi:10.1002/pon.2004

Sharpe, L., Curran, L., Butow, P., & Thewes, B. (2018). Fear of cancer recurrence and death anxiety. *Psychooncology*. doi:10.1002/pon.4783

Simard, S., Thewes, B., Humphris, G., Dixon, M., Hayden, C., Mireskandari, S., & Ozakinci, G. (2013). Fear of cancer recurrence in adult cancer survivors: A systematic review of quantitative studies. *Journal of Cancer Survivorship*, *7*, 300–322. doi:10.1007/s11764-013-0272-z

Smith, S., & Trinder, J. (2001). Detecting insomnia: Comparison of four self-report measures of sleep in a young adult population. *Journal of Sleep Research*, *10*, 229–235.

Spielman, A. J., Caruso, L. S., & Glovinsky, P. B. (1987). A behavioral perspective on insomnia treatment. *The Psychiatric Clinics of North America*, *10*, 541–553.

Tabachnick, B. G., & Fidell, L. S. (2014). *Using multivariate statistics* (*6th* ed.). Harlow, UK: Pearson.

Tremblay, V., Savard, J., & Ivers, H. (2009). Predictors of the effect of cognitive behavioral therapy for chronic insomnia comorbid with breast cancer. *Journal of Consulting and Clinical Psychology*, *77*, 742–750. doi:10.1037/a0015492

Yung, K. P., Chung, K. F., Ho, F. Y., Yeung, W. F., & Ng, T. H. (2016). The Experience of Chronic Insomnia in Chinese Adults: A Study Using Focus Groups and Insomnia Experience Diaries. *Behavioral Sleep Medicine*, *14*, 406–428. doi:10.1080/15402002.2015.1017097

Zeichner, S. B., Zeichner, R. L., Gogineni, K., Shatil, S., & Ioachimescu, O. (2017). Cognitive Behavioral Therapy for Insomnia, Mindfulness, and Yoga in Patients With Breast Cancer with Sleep Disturbance: A Literature Review. *Breast Cancer*, *11*, 1178223417745564.

Zhou, E. S., Suh, S., Youn, S., & Chung, S. (2017). Adapting cognitive-behavior therapy for insomnia in cancer patients. *Sleep Medicine Research*, *8*, 51–61. doi:10.17241/smr.2017.00080