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Should We Be Anxious When Assessing Anxiety Using the Beck Anxiety Inventory in Clinical Insomnia Patients?

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Abstract

Assessing for clinical levels of anxiety is crucial, as comorbid insomnias far outnumber primary insomnias (PI). Such assessment is complex since those with Anxiety Disorders (AD) and those with PI have overlapping symptoms. Because of this overlap, we need studies that examine the assessment of anxiety in clinical insomnia groups. Participants ($N = 207$) were classified as having insomnia: 1) without an anxiety disorder (I-ND), or 2) with an anxiety disorder (I-AD). Mean Beck Anxiety Inventory (BAI) item responses were compared using multivariate analysis of variance (MANOVA) and follow-up ANOVAs. As a validity check, a receiver operating characteristic (ROC) curve analysis was conducted to determine if the BAI suggested clinical cutoff was valid for identifying clinical levels of anxiety in this comorbid patient group. The I-ND had lower mean BAI scores than I-AD. There were significant group differences on 12 BAI items. The ROC curve analysis revealed the suggested BAI cutoff (≥ 16) had 55% sensitivity and 78% specificity. Although anxiety scores were highest in those with insomnia and an anxiety disorder, those with insomnia only had scores in the mild range for anxiety. Nine items did not distinguish between those insomnia sufferers with and without an anxiety disorder. Additionally, published cutoffs for the BAI were not optimal for identifying anxiety disorders in those with insomnia. Such limitations must be considered before using this measure in insomnia patient groups. In addition, the poor specificity and high number of overlapping symptoms between insomnia and anxiety highlight the diagnostic challenges facing clinicians.

Keywords

BAI; Beck Anxiety Inventory; Anxiety; Insomnia; Assessment; Sleep

There are long established links between insomnia and anxiety (Buysse et al 2006; Uhde et al 2009). This relationship is complex and reciprocal, as insomnia can precipitate anxiety and experiencing anxiety can worsen sleep. For example, artificially increasing anxiety (e.g.,

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by telling a research participant that they will have to give a speech the following morning) results in increased sleep onset latencies, as participants experience an intrusion of unwanted and worrisome thoughts (Gross & Borkovec 1982; Hall et al 1996). Likewise, artificially inducing poor sleep increases anxiety (Bonnet & Arand 1992; Talbot et al 2010). These findings suggest that experimentally inducing anxiety or poor sleep in otherwise non-anxious good sleepers can produce increases in insomnia and anxiety respectively.

In addition to subclinical levels of insomnia and/or anxiety, there is large overlap in symptoms and occurrence between those with an insomnia diagnosis and those with an anxiety disorder (AD) diagnosis. ADs can occur before the onset of insomnia (Johnson et al 2006), or in other cases, the presence of a clinically significant insomnia can act as a risk factor for the future development of AD (Ford & Kamerow 1989). Indeed, anxiety is one of the most commonly co-occurring disorders in patients complaining of insomnia (Ford & Kamerow 1989). Further, relaxation therapy, which works to reduce anxiety and tension, is a modestly effective treatment for insomnia (Steinmark & Borkovec 1974).

Insomnia has traditionally been viewed as a symptom of psychiatric disorders, including ADs, rather than a stand-alone diagnosis. This assumption is reinforced by the fact that sleep disturbance is currently listed as a symptom of specific ADs in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychiatric Association 2000). Those ADs that list sleep disturbance as a possible symptom include Generalized Anxiety Disorder (GAD) and Post-Traumatic Stress Disorder (PTSD) (Belanger et al 2004). While insomnia is a common subjective complaint among those suffering from ADs, insomnia seen in the context of an anxiety disorder is not always a secondary symptom (Carney & Edinger 2010; Harvey 2002). In comparison to those with ADs only, the outcomes of those with comorbid anxiety and insomnia tend to be worse (Ramsawh et al 2009). Also, the assumption that treating the anxiety disorder only will resolve the insomnia problem is not true for many (Zayfert & DeViva 2004). As such, comorbid anxiety and insomnia is an important area of research for practitioners. Assessing for clinical levels of anxiety in insomnia populations is crucial as comorbid insomnias far outnumber primary insomnias.

Assessment of anxiety in a sleep-disturbed population is complex, as those with ADs and those with insomnia present with overlapping symptoms (e.g., tension, reduced sleep, catastrophizing). This strong association between anxiety symptoms in insomnia patients justifies the routine inclusion of anxiety measures in clinics and also insomnia research studies (Buysse et al 2006). It is recommended that the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID) (Spitzer et al 1996) should be used to establish comorbid psychiatric diagnoses in sleep disorder settings (Buysse et al 2006); however resources may not be available to administer an expensive and long instrument like the SCID. Buysse et al (2006) advocate against the use of self-report questionnaires in making diagnoses, but for the same reasons the SCID may not be used (i.e., lack of resources), clinics may opt for the use of quick screening questionnaires to detect whether they should follow-up a possible comorbid disorder. Thus, data are needed to evaluate such tools, but psychometric data for various psychological measures in those with clinically relevant insomnia is sorely lacking. Whereas the State-Trait Anxiety Inventory (STAI; Spielberger et al 1970) is recommended for use in insomnia research studies (Buysse et al 2006); this recommendation appears to be based on its wide use rather than on psychometric evaluations of the instrument. The STAI has been criticized in the anxiety literature for not being able to adequately differentiate between anxiety and depression (Beck et al 1988; Bieling et al 1998; Gros et al 2007). The Beck Anxiety Inventory (BAI; Beck & Steer 1993) may be a useful alternative especially since its sibling instrument, the Beck Depression Inventory (BDI-II) (Beck et al 1996) is a recommended instrument for use in insomnia (Buysse et al 2006) and these widely used instruments share the same simple format and scoring structure. The BAI is routinely used in

insomnia research including experimental studies (e.g., Harvey 2001; Morin et al 2003) and clinical trials (e.g., Mimeault & Morin 1999; Rybarczyk et al 2002). Like the BDI-II, the BAI is a 21-item self-report measure, but the focus of inquiry is on anxiety symptoms experienced in the past week. A significant proportion of the BAI questions assess for autonomic symptoms of anxiety which has led to criticism of the measure (Cox et al 1996). Despite these concerns over the BAI, it continues to be a widely used measure of anxiety.

The BAI was originally developed for use with adult psychiatric patients (Beck et al 1988), and has since been validated for use in other populations; namely, those with intellectual disabilities (Lindsay & Skene 2007), community populations (Osman et al 1993), older adults (Morin et al 1999), medical patients (Steer et al 1993; Wetherell & Arean 1997), adolescent psychiatric inpatients (Osman et al 2002) and adult psychiatric outpatients (Steer et al 1993). However, the measure needs to be investigated in populations of insomnia sufferers given the overlap of symptoms in those with insomnia and those with anxiety problems. Thus, the purpose of the present study was to assess a commonly used measure, the BAI, for discriminating those with verified anxiety disorders from those suffering from solely an insomnia disorder.

Method

Participants

Study participants were recruited at two collaborating medical centers: Duke University Medical Center, Durham, NC and Rush Medical Center, Chicago, IL. Each site has a sleep center with insomnia clinic, which includes physicians and psychologists who specialize in sleep medicine. Participants were those seeking insomnia treatment, as well as research volunteers recruited via advertisements. Eligible participants (N = 372) were recruited into a larger diagnostic insomnia parent study funded by the National Institute of Mental Health. The eligibility criteria are as follows: 1) 18 years or older, 2) fluency in English, 3) mentally competent to provide informed consent, 4) no self-reported acute psychiatric or medical conditions, 5) not currently an inpatient, 6) no indication of significant cognitive impairment (i.e., score above 24 on the Mini Mental Status Exam), and 7) not previously evaluated by any of the 6 diagnostic study clinicians at the recruitment site. The exclusion criteria is as follows: 1) Apnea/Hypopnea Index (AHI) ≥ 15 on overnight polysomnography (PSG), or AHI ≥ 5 with an Epworth Sleepiness Scale score ≥ 10 , to exclude those with clinically significant sleep apnea, 2) Periodic Limb Movement arousal index > 5 on PSG, to exclude those with PLM disorder, and 3) participants with a primary diagnosis of Restless Leg Syndrome or a Circadian Disorder. Because other mental disorders could influence responding on the measure, for the purposes of this study, we excluded those with Axis I disorders other than an Anxiety Disorder using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) (First et al 2002). Eighty-four were excluded because of Axis I disorders other than an Anxiety Disorder. Sixty-three participants were excluded based on the sleep apnea criteria and seven additional participants were excluded based on the PLM criteria. Eleven people were excluded because of missing data. Table 1 provides demographic information for the final sample (n=207).

Measures

Participants completed the measures listed below and were sent home with two weeks of prospective sleep diaries that were completed each morning.

Beck Anxiety Inventory (BAI; Beck & Steer 1993)—The BAI is a 21-item self report questionnaire which asks about common symptoms of anxiety, such as feeling nervous, scared, and fear of dying, and was designed to distinguish anxiety symptoms from

depressive symptoms. Each item is rated on a 4-point Likert scale for symptom severity in the past week, ranging from 0 (not at all) to 3 (severely). The range of total scores is from 0 to 63, with higher numbers suggesting greater degrees of anxiety. The recommended clinical classification of scoring results are as follows: 0–7 suggests minimal anxiety, 8–15 suggests mild anxiety, 16–25 suggests moderate anxiety, and 26–63 suggests severe anxiety. According to the manual, the suggested cutoff for clinically significant anxiety on the BAI is 16 (Beck & Steer 1993). The BAI demonstrates high internal reliability and good factorial and discriminant validity (Kabacoff et al 1997). Despite wide use in the insomnia research field, this is the first psychometric evaluation of the BAI in an insomnia population.

Beck Depression Inventory, Second Edition (Beck et al 1996)—The BDI-II is a 21-item self report measure that assesses common depressive symptoms, such as depressed mood, hopelessness, suicidal ideation, sleep disturbance, and appetite change. The recommended interpretive guidelines are as follows: scores of 0–13 suggests minimal or no depression, scores of 14–19 suggest mild depression, scores of 20–28 suggest moderate depression, and scores of 29 or above suggest severe depression (Beck et al 1996). The BDI-II has good internal consistency (Cronbach's $\alpha = .92$) (Dozois et al 1998). It also has well established content validity and is good at differentiating between depressed and non-depressed individuals (Beck et al 1996; Richter et al 1998). The BDI-II has been used in insomnia research and clinical applications, but a previous study suggests that there are some limitations that encumber its use in clinical insomnia samples (Carney et al 2009).

Sleep Logs—Subjective sleep estimates were acquired using hand-held computers, programmed to record this information. The electronic log consisted of a Palm Pilot®-style personal data assistant (PDA) with a program that routinely collects subjective sleep data. The program uses Satellite Forms software (Thacker Network Technologies, Inc, Lacombe, Alberta), and asks participants about their nighttime bed habits, such as the length of time it takes to fall asleep, number and length of nocturnal awakenings, time of final awaking, and rising time. Participants also rate the quality of their sleep, as well as how rested they felt upon wakening using 10-point Likert scales. All information was recorded daily upon wakening, over a two-week prior to the interview assessment period of the study. Taken together, the information derived from these sleep logs was as follows: total sleep time (TST), sleep onset latency (SOL), time spent awake after initially falling asleep or “wakefulness after sleep onset” (WASO), the percentage of time in bed spent sleeping or “sleep efficiency” (SE), a 10-point Likert-scale rating of sleep quality, and a 10-point Likert-scale rating of restfulness upon awakening. These estimates are common subjective sleep indices recommended as per the established guidelines in the literature (Buysse et al 2006).

Sleep History Questionnaire—Participants completed an unpublished questionnaire that queried the nature of their sleep complaints as well as whether they had any current medical problems. Participants were asked (yes/no) if they had any of the following medical problems currently: weight problem, high blood pressure, headaches, cataracts, glaucoma, difficulty hearing, cancer (any type), throat, nose, tonsils, thyroid disease, diabetes, high cholesterol, heart (valves), heart palpitations/rhythm, heart attack, angina, chest pain/pressure, stroke, vein or blood clot, shortness of breath, lung/chest problem, asthma, pneumonia/bronchitis, tuberculosis, esophagus (reflux, etc.), stomach (peptic ulcer, etc.), intestines, gall bladder (gall stones, etc.), liver (hepatitis, etc.), urinary infections, urination problems, kidney (kidney stones, etc.), venereal disease, arthritis, muscles/joints/bones, back/neck/spine, osteoporosis, skin, allergies or eczema, breasts, polio, epilepsy/seizures, brain tumor, head injury, blood (anemia/bleeding), pain, other (condition).

Diagnostic Interviews—Given that the parent study evaluated the reliability of insomnia diagnoses, pairs of assessors provided diagnoses for each participant. Six clinicians at each study site were divided into three sets of dyads, which were randomly assigned to one of three different assessment methods. Each dyad had different pieces of information available to them. The first dyad used a structured interview, the Duke Structured Interview for Sleep Disorders (DSISD; Edinger et al 2004), to query diagnostic DSM-IV-TR criteria for sleep disorders. The second dyad had access to an unstructured clinical interview along with the patients' sleep history questionnaire and summary statistics from the 2-week sleep diaries. The third dyad had the most amount of information, including summary statistics from the two nights of PSG, an unstructured clinical interview, sleep history questionnaire and summary statistics from the 2-weeks of sleep diaries. Immediately after the interviews, the clinicians used electronic diagnostic rating forms to assign insomnia diagnoses on a programmed PDA computer. Clinicians rated each DSM-IV-TR diagnosis on a 100-point visual analogue scale (VAS) ranging from “doesn't fit at all” to “fits extremely well” at each end. Clinicians were instructed to consider each sleep disorder diagnosis separately and rate how well that diagnosis “fit” each participant.

Procedure

The study procedures were reviewed and approved by the Research Ethics Boards of the two collaborating study sites. All participants reviewed and signed research consent forms prior to enrolling in the study. Interested participants contacted the project coordinator and underwent a brief insomnia phone screen to determine whether they were eligible to proceed to the in-lab interview. The project coordinator conducted the in-lab interview, which included the SCID. The SCID was used to exclude those with Axis I disorders other than an Anxiety Disorder. Participants also completed the Sleep History Questionnaire and the self-report survey test battery. They were then scheduled for two consecutive overnight sleep studies, using PSG, and asked to complete two weeks of sleep diaries. Upon completion of the sleep diaries, each participant was randomly assigned and scheduled to see one of the three possible clinician dyads. Thus, each participant was assessed by each one of the three clinician dyads, and by each of the three different methods: 1) structured interview, 2) unstructured interview plus sleep logs, and 3) unstructured interview, sleep logs plus PSG. All participants were assigned DSM-IV-TR diagnoses by the three dyads of clinicians at each site and the highest mean rated DSM-IV-TR sleep disorder diagnosis was retained as the primary diagnosis. Only participants with a diagnosis of insomnia were selected for analysis in the present study.

Analyses

Using the DSISD and SCID results, participants were classified as having insomnia: 1) without an anxiety disorder (I-NAD), or 2) with an anxiety disorder (I-AD). Mean BAI item responses were compared using multivariate analysis of variance (MANOVA) and follow-up analyses of variance (ANOVAs). The accuracy rate for the recommended BAI clinical cutoff score of 16 was evaluated using a Receiver operating characteristic (ROC) curve.

Results

Cronbach's alpha was calculated as an index of the internal consistency of the BAI in an insomnia population. The internal consistency was found to be good with $\alpha = .89$.

Group Comparisons

Table 1 and 2 provide a summary of the demographics characteristics of the sample, and the group means and standard deviations calculated from the sleep logs and the BAI. An ANOVA revealed that I-AD and I-NAD groups did not differ on age, $F(1, 205) = .58, p = .$

45. Chi Square analyses found that the groups were not statistically different on distributions of ethnicity/race, $X^2(4) = 4.23$, $p = .376$, or sex, $X^2(1) = .599$, $p = .439$. A MANOVA revealed no significant group differences on sleep log indices of sleep onset latency (SOL), wake time after sleep onset (WASO), total sleep time (TST), and sleep efficiency (SE), $F(4, 202) = .063$, $p = .993$.

For the list of the medical problems, we coded yes=1 and no=0 and then summed the score to calculate a general medical problems score. Using an ANOVA we compared the two groups (I-AD vs I-NAD) to see if they differed on the number of medical problems. There was no significant group difference on the ANOVA ($p=.11$). In addition, to examine whether groups differed on specific groupings of disorders, we created the following categories: 1) pain (by combining pain, arthritis, muscles/joints/bones, back/neck/spine), 2) vision (by combining cataracts, glaucoma), 3) cardiac (by combining heart (valves), heart palpitations/rhythm, heart attack, angina, chest pain/pressure), 4) respiratory (shortness of breath, lung/chest problem, asthma, pneumonia/bronchitis, tuberculosis), 5) neurologic (epilepsy/seizures, brain tumor, head injury), 6) gastrointestinal (esophagus (reflux, etc.), stomach (peptic ulcer, etc.), intestines, gall bladder (gall stones, etc.), 7) urinary (urinary infections, urination problems, kidney (kidney stones, etc.)), and 8) ear/nose (throat, nose, tonsils). Data were coded such that if the participant reported yes to any of the conditions of that category, they received a score of 1=yes, and if they did not have any of the conditions, they received a score of 0=no. Chi square analyses tested whether the two groups (I-AD vs I-NAD) differed on these specific types of conditions: pain, vision, cardiac, respiratory, neurologic, gastrointestinal, urinary, ear/nose, as well as weight, blood pressure, cholesterol, diabetes, cancer, liver (hepatitis, etc.), venereal disease, skin/allergies/eczema, polio, or blood conditions. No chi square reached statistical significance ($p<.05$). For a summary of self-reported medical conditions by group, see Table 3.

A MANOVA compared the groups (I-NAD vs. I-AD) on their mean BAI score (i.e., overall anxiety symptom severity). There was a significant group difference, $F(21, 185) = 3.07$, $p < .001$. Follow-up ANOVAs revealed significant group differences on 12 of the 21 items. See Table 4 for group means and follow-up ANOVA results for each BAI item. Items that distinguished those with an anxiety disorder versus those without an anxiety disorder included: being unable to relax, fearing the worst, fear of dying or loss of control, terrified, nervous, unsteady, hands trembling, shaky, scared, heart pounding, and indigestion or discomfort in the abdomen. There were no significant differences on items relating to numbness or tingling, feeling hot, wobbliness in legs, dizzy, feelings of choking, difficulty breathing, faint, face flushed, or sweating.

Validity Analysis

A Receiver Operating Characteristic (ROC) curve analysis was conducted to assess the validity of the BAI in an insomnia population. That is, to the extent that the BAI is measuring anxiety, it should be able to detect an anxiety disorder in those with an anxiety disorder. The true state variable was the presence of an anxiety disorder according to the SCID. All those with an Anxiety disorder were coded as “1” and those with insomnia but no anxiety disorder according to the SCID were coded as “0”. We evaluated whether the BAI had high accuracy in identifying clinically relevant levels of anxiety using Swets (1988) criteria for whether the area under the curve (AUC) is suggestive of low ($AUC < 0.7$), moderate ($AUC = 0.7$ to 0.9), or high accuracy ($AUC > 0.9$). The area under the curve for the BAI ($AUC = .71$) was moderately high according to Swets criteria, and was statistically significant at $p < .001$. The 95% confidence interval was .62 to .81 ($SE = .05$). Secondly, we evaluated the sensitivity and specificity for the suggested clinical cutoffs for moderate symptoms on the BAI (≥ 16) (Beck and Steer 1993). A clinical cutoff for the BAI (≥ 16)

resulted in a sensitivity of 55% and specificity of 78%, and the “mild” cutoff (≤ 8) had 82% sensitivity, but 49% specificity. The ROC curve is presented in Fig. 1.

Discussion

The properties of a commonly used self-report measure of anxiety, the BAI, were examined in those with an insomnia diagnosis. In support of the validity of the measure, the mean BAI scores were highest in the anxiety-disordered group. Also, there were 12 BAI items that were useful for discriminating those with and without an AD. Most of these items were face-valid anxiety symptoms, such as an inability to relax, or feeling nervous, scared or terrified. It would seem that greater elevations on these symptoms are most characteristic of those with an AD rather than insomnia per se.

Although those with anxiety disorders had higher scores than those without anxiety disorders, those without an anxiety disorder exhibited mean scores suggestive of mild anxiety symptoms (i.e., they were not anxiety-symptom free). Also, the suggested BAI clinical cutoff (≥ 16) resulted in very poor sensitivity (50%) but acceptable specificity (78%) suggesting that the clinical cutoff for the BAI is more suitable for ruling out, rather than detecting, an AD in an insomnia population. The cutoff for mild symptoms (≤ 8) resulted in high sensitivity (82%) but very poor specificity (49%) suggesting that a mild symptom cutoff might result in falsely characterizing those with insomnia as having an anxiety disorder. Although the BAI is not recommended as a diagnostic tool to detect anxiety disorders, one might expect better accuracy if it were a valid measure of anxiety in those with insomnia.

The item analysis revealed nine nondiscriminating items on the BAI. These items were largely somatic symptoms, such as feeling of choking, dizziness, numbness, wobbliness in legs, sweating (Wetherell & Gatz 2005). There are a few explanations for the high number of nondiscriminating items. For example, the results may be attributable to a floor effect. Visual inspection of the means of these items suggests they had low means and were infrequently endorsed items. Another plausible explanation is that given the symptoms are largely somatic, it could be that the BAI is capturing medical symptoms (i.e., they are being erroneously identified as anxiety symptoms). This is a consistent theme in the literature, as other researchers have suggested that the somatic items of the BAI may tap into medical conditions, rather than anxiety, leading the BAI to overestimate levels of anxiety (Sanford et al 2008; Wetherell & Gatz 2005). The medical conditions data suggested there were no significant differences between those with or without anxiety disorders. Moreover, those with insomnia or anxiety due to a general medical condition were excluded from these analyses. However, these data may be limited because they were dichotomous and based on a non-validated questionnaire of self-reported medical conditions. A continuous, and validated measure of somatic symptoms that could capture the range of symptom severity as well as those who have medical disorders that have yet to be identified would have helped to better investigate this possibility.

Although one could assume that the findings are attributable to differences in sleep, there were no statistically significant differences in sleep. Similarities on self-reported sleep among people with PI, with and without a comorbid AD, are not surprising. This pattern of results has been consistently demonstrated within the literature (e.g., Edinger et al 2009; Kohn & Espie 2004). Specifically, in the current sample, the presence of an AD did not influence the sleep efficiency, sleep onset latency, wakefulness after sleep onset, and total sleep time, as participants did not demonstrate any significant differences on these self-reported variables.

Despite these potentially important findings of anxiety assessment in an insomnia population, this study should be considered within the context of its limitations. For example, those with subclinical sleep disordered breathing (SDB) may have been included, because of the overlap in symptomatology between anxiety and SDB (e.g., difficulty breathing, feelings of choking). While every effort was made to protect against this, by excluding those with an AHI < 15 and those who were diagnosed as having SDB, it is plausible that some with subclinical levels of abnormal breathing were included. This possibility was however minimized by focusing on eliminating those with clinical levels of abnormal breathing (via the use of both polysomnography and sleep expert diagnoses).

This is the first examination of the BAI as a measure of anxiety within an insomnia population. Despite the possible limitation noted above, this was a large and well-characterized sample, in which highly trained sleep specialists screened all participants for insomnia diagnoses, as well as mental health comorbidities. Our findings suggest that those with an anxiety disorder score higher than those with insomnia only on the total score and on 12 of the 21 items. However, there were 9 nondiscriminating items and published cutoffs for the BAI were not optimal for identifying ADs. Using the commonly cited cutoff of 16 or greater may lead to inadequate detection of anxiety disorders whereas the use of a mild cutoff for the BAI could lead to over-diagnosing anxiety in an insomnia population. It is imperative for clinicians to be cognizant of such limitations before using the BAI as screening measure for anxiety in those with insomnia.

With the overlap in symptoms and co-occurrence of insomnia and ADs, it is imperative to find an appropriate anxiety assessment tool. The BAI does not appear to be an appropriate measure for use in an insomnia population. The STAI is the most widely used self-report anxiety instrument in insomnia studies (Buysse et al 2006), but has been criticized for not being able to adequately differentiate between anxiety and depression (Beck et al 1988; Bieling et al 1998; Gros et al 2007) and has not been empirically investigated in an insomnia population. The State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree et al 2008) may be a useful alternative self-report measure because it separates anxiety into cognitive and somatic symptoms, and appears to be a more pure self-report measure of general anxiety (Gros et al 2007). Currently, the STICSA has not been examined for use in insomnia, but its psychometrics suggest that it might be worthwhile to test it with an insomnia population.

It is essential for clinicians to find an appropriate anxiety assessment tool for use in an insomnia population. Although the BAI appears to provide a gross indicator of overall anxiety symptoms (i.e., I-NAD and I-AD groups differed significantly on the BAI total score), there are significant drawbacks to using the BAI in this population. Such limitations include suboptimal sensitivity and specificity, and the dearth of BAI items that discriminate those with an AD from those without. We strongly encourage clinicians to exercise caution when using this measure. In the meantime, research into the validity of other anxiety measures is urgently needed.

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Fig. 1.
Diagonal segments are produced by ties.

Table 1

Demographic characteristics and Axis I disorder

Variable	No Anxiety Disorder (%)	Anxiety Disorder (%)
Sex		
Female	67	74
Race/Ethnicity		
Caucasian	56	67
African American	37	27
Asian American	3	0
American Indian	1	0
Other	2	5
Anxiety Disorder *		
Panic Disorder	0	15
Obsessive Compulsive Disorder	0	8
Post-Traumatic Stress Disorder	0	33
Generalized Anxiety Disorder	0	28
Anxiety NOS	0	18

* Participants could have multiple ADs.

Table 2

Demographic, anxiety, and sleep characteristics

Variable	No Anxiety Disorder Mean (SD)	Anxiety Disorder Mean (SD)
Age	47.88 (15.23)	45.87 (12.51)
BAI total	10.02 (8.21)	16.30 (9.82)
Sleep Log		
SOL	50.21 (37.98)	52.15 (31.51)
WASO	44.46 (32.47)	42.49 (44.59)
TST	362.44 (74.52)	363.35 (70.60)
SE	73.92 (12.08)	73.82 (12.81)

Note: BAI = Beck Anxiety Inventory, SE = Sleep Efficiency, SOL = Sleep Onset Latency, WASO = Wakefulness after Sleep Onset, TST = Total Sleep Time.

Table 3

Percentage of participants reporting medical conditions

Medical condition	% reporting the medical condition	
	Anxiety Disorder	No Anxiety Disorder
Cardiac	22%	26%
Respiratory	22%	20%
Gastrointestinal	44%	29%
Neurologic	4%	1%
Urinary	11%	15%
Diabetes	7%	6%
Vision	6%	7%
Ear/Nose	3%	3%
Blood pressure	26%	34%
Weight problems	52%	41%
Cancer (any)	4%	1%
Pain	78%	63%
Venereal	33%	33%
Cholesterol	44%	56%
Liver	2%	4%
Allergies	42%	58%
Polio	0	0
Blood	2%	2%
Mean # of medical conditions (standard deviation)	5.65 (4.1)	4.66 (3.4)

Table 4Group item means and ANOVA *F* test results

BAI Item	Group Mean (SD)		<i>F</i> (1, 205)	<i>P</i> Value
	Nonanxious	Anxious		
1. Numbness or tingling	0.62 (.82)	0.63 (.82)	.005	.944
2. Feeling hot	0.95 (.95)	1.03 (1.08)	.177	.674
3. Wobbliness in legs	0.49 (.77)	0.66 (.97)	1.41	.237
4. Unable to relax	1.38 (.94)	2.03 (.72)	15.81	.001*
5. Fear of the worst happening	0.60 (.79)	1.34 (1.02)	24.62	.001*
6. Dizzy or lightheaded	0.53 (.72)	0.71 (.84)	1.77	.185
7. Heart pounding or racing	0.38 (.63)	1.11 (0.98)	32.52	.001*
8. Unsteady	0.50 (.73)	0.79 (.88)	4.67	.032*
9. Terrified	0.14 (.48)	0.50 (.73)	14.68	.001*
10. Nervous	0.76 (.86)	1.61 (.89)	29.66	.001*
11. Feelings of choking	0.10 (.36)	0.18 (.46)	1.53	.217
12. Hands trembling	0.24 (.57)	0.53 (.83)	6.67	.011*
13. Shaky	0.33 (.66)	0.58 (.86)	4.08	.045*
14. Fear of losing control	0.28 (.59)	0.82 (1.01)	19.23	.001*
15. Difficulty breathing	0.27 (.60)	0.42 (.76)	1.85	.175
16. Fear of dying	0.17 (.48)	0.45 (.83)	7.62	.006*
17. Scared	0.39 (.67)	0.87 (.91)	13.89	.001*
18. Indigestion or discomfort in abdomen	0.71 (.83)	0.11 (.31)	6.79	.01*
19. Faint	0.15 (.46)	0.05 (.22)	.30	.586
20. Face flushed	0.31(.63)	0.50 (.83)	2.57	.110
21. Sweating	0.56 (.87)	0.76 (1.0)	1.66	.20

Note.

* Significant at alpha $p < .05$.