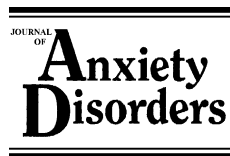




Anxiety Disorders
20 (2006) 444–458



Examination of the utility of the Beck Anxiety Inventory and its factors as a screener for anxiety disorders

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Received 16 February 2005; received in revised form 19 April 2005; accepted 24 May 2005

Abstract

The Beck Anxiety Inventory (BAI) and the Anxiety Disorders Interview Schedule (ADIS-IV) were administered to 193 adults at a major Midwestern university recruited from an anxiety research and treatment center. The BAI and its four factor scores were compared from individuals with a primary diagnosis of generalized anxiety disorder (GAD), specific or social phobia, panic disorder with or without agoraphobia, obsessive–compulsive disorder (OCD), and no psychiatric diagnosis. The cut scores on the BAI and its factors, their sensitivity, specificity, as well as positive and negative predictive values were calculated for each group. The results of this study support previous findings that the strongest quality of the BAI is its ability to assess panic symptomatology. The present study also expands on this notion by establishing that the BAI can be used as an efficient screening tool for distinguishing between individuals with and without panic disorder.
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Keywords: Beck Anxiety Inventory; Anxiety; Screening; Sensitivity; Specificity

The Beck Anxiety Inventory (BAI; Beck & Steer, 1990) has been designed to differentiate between behavioral, emotional, and physiological symptoms in individuals with anxiety and depression. In order to achieve that goal, the authors incorporated items that are specific to the physiological and cognitive symptoms

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of anxiety and independent of the symptoms of depression. The BAI has been widely used to measure severity of anxiety by self-report (Osman, Kopper, Barrios, Osman, & Wade, 1997). Moreover, Beck, Epstein, Brown, and Steer (1988) suggested that the BAI can be used to measure anxiety treatment outcome. Others however have suggested that the BAI is not a measure of anxiety in general but rather of symptoms of panic (Cox, Cohen, Dorenfeld, & Swinson, 1996). Some support for this position is found in studies of the BAI where individuals with panic disorder endorse significantly higher scores on the BAI than those with other anxiety disorders (e.g., Beck & Steer, 1990). If the BAI is a measure of panic more than a measure of global anxiety, this may have serious implications for both the clinical and research-oriented assessment of anxiety, because the instrument has been widely considered a valid tool for assessing anxiety, independent of the nature of the anxiety.

One approach to investigating what the BAI measures is to perform factor analyses of the BAI and to examine the emerging factors. Several factor analytic studies of the BAI have been conducted with psychiatric outpatient samples, with the number of identified factors varying from 2 to 4 (Beck et al., 1988; Beck & Steer, 1990, 1991; Cox et al., 1996; Steer, Ranieri, Beck, & Clark, 1993)

The first principal factor analysis (Beck et al., 1988) was done with a sample of 160 psychiatric outpatients. It revealed two factors: *somatic*, which included the 12 items describing physiological symptoms, such as “numbness or tingling,” “feeling dizzy or lightheaded” and others; and *subjective anxiety and panic*, which included the remaining nine items of the BAI, such as “fear of the worst happening” and “unable to relax.” However, factor loadings for some of the items were rather low.

An exploratory factor analysis was also carried out as a part of the test of the psychometric properties of the BAI (Beck & Steer, 1990), using a sample of 393 outpatient adults. A four factor structure emerged, corresponding to neurophysiological, subjective, autonomic, and panic components of anxiety, and the mean factor scores for the following anxiety disorders were calculated: panic disorder with and without agoraphobia, social phobia, obsessive–compulsive disorder (OCD), generalized anxiety disorder (GAD), simple phobia, and other. Individuals with panic disorder received higher scores on all the four factors than those with other anxiety disorders. The four factors termed subjective, neurophysiological, autonomic, and panic also emerged in a study by Steer et al. (1993) in an outpatient sample of 470 individuals with a variety of DSM-III-R disorders. The item loadings were almost identical to the previous study. Only two items had a loading below .45: “indigestion” and “heart pounding.”

In another study of the BAI properties, using a sample of 367 outpatient adults with DSM-III-R (American Psychiatric Association, 1987) anxiety disorders, Beck and Steer (1991) found that the BAI items loaded on four factors, which were conceptualized to be representative of *subjective, neurophysiological, autonomic, and panic* symptoms of anxiety. Overall, the four factors explained approximately 59% of the total variance. Moreover,

the *neurophysiological*, *subjective*, and *panic* subscale scores were significantly higher for individuals with panic disorder than for individuals with GAD.

Cox et al. (1996) combined the BAI items with the items on the Panic Attack Questionnaire (PAQ; Norton, Dorward, & Cox, 1986) and subjected them to factor analysis. The scree plot suggested a three-factor solution, which accounted for 46.9% of the total variance. The first factor consisted of items related to feeling faint or dizzy, including such items as “hands trembling” and “shaky” from the BAI, which may be related to the symptoms produced by hyperventilation. The second factor consisted of “catastrophic cognitions/fear”, including the BAI “fear of the worst happening” item and a similar item on the PAQ “fear of death or serious illness.” The third factor was related to cardiological and respiratory symptoms, including the BAI “feelings of choking,” “difficulty breathing,” and others.

A confirmatory factor analysis conducted by Osman, Barrios, Aukes, Osman, and Markway (1993) was unable to generalize the two-factor model from Beck et al. (1988) to their non-clinical sample of 225 adults. However, when they conducted an exploratory principal components analysis, the BAI items loaded on four factors, which accounted for 64.6% of the total variance. In a later study, Osman et al. (1997) were able to confirm the four-factor model by means of a confirmatory factor analysis.

The four factors of the BAI appear to represent four aspects of anxiety (e.g., Steer et al., 1993). Beck and Steer (1991) suggested that three factors of the BAI adequately discriminated between generalized anxiety disorder and panic disorder as shown by the significant difference in the mean factors scores between individuals with panic disorder and GAD. However, no further studies have been conducted to determine whether the BAI or its factors are able to differentiate between DSM-IV (American Psychiatric Association, 2000) anxiety disorders. If the BAI and/or its factor scores adequately differentiate between anxiety disorders, further work can be done by determining the cut-off scores on the instrument and its factors for each of the anxiety disorders, in order to be able to use it as a brief screener for various disorders in a variety of clinical and medical settings. Obviously, the BAI is not a diagnostic tool. However, its brevity and simplicity make it an ideal tool for use as a pre-screen for presence of an anxiety disorder. The utility of the BAI will be enhanced by establishing sufficiently sensitive and specific cut-off scores for DSM anxiety diagnoses. Additionally, the four factors of the BAI may be representative of different types of anxiety and each factor may have specific utility in screening for a particular anxiety disorder. Examining the diagnostic reliability of each factor through the determination of cut scores for different anxiety disorders may lead to more efficient use of the BAI. Finally, determining sensitivity and specificity of the BAI itself as a measure of anxiety in general as well as specific anxiety disorders will provide insight into the validity of the tool as a diagnostic screener.

Only one study to date has attempted to establish cutting scores for the BAI to differentiate between those with panic disorder and those without (Stein et al., 1999). A sample of 511 outpatients in a medical setting was administered a diagnostic interview and asked to fill out the BAI. The optimal cut-off for the BAI was determined to be a score of 20, which had a sensitivity of .67 and a specificity of .93. The cut score of 20 yielded a positive predictive value of .46 and a negative predictive value of .97. These were estimated based on panic disorder prevalence findings in primary care settings, the rates being as high as 13% in some of the cases. However, it is important to note that this positive predictive value is associated with higher prevalence rates, therefore, in the general population where the prevalence of panic disorder has been found to be 1–2.3% (APA, 2000), the positive predictive value of the instrument would be significantly lower. Whereas this study was able to determine cutting scores, sensitivity and specificity for the BAI, the sample was limited to panic disordered patients in primary care settings, limiting its generalizability.

The current study compares the subjective, neurophysiological, autonomic, and panic factor scores between panic disorder, social and specific phobias, obsessive–compulsive disorder, and generalized anxiety disorder as well as a group of individuals without a psychiatric diagnosis, in order to determine whether the BAI and its factor scores are significantly different as a function of a DSM-IV anxiety disorder. In addition to examining the clinical utility of BAI and its factor scores, the current study also revisits examination of the BAI severity scores by determining cut scores and calculating specificity and sensitivity for both the instrument as a whole, as well as for each of the factors using the four-factor model.

1. Methods

1.1. Participants

The study sample was obtained from consecutive adult referrals to an anxiety research and treatment center from 1994 to 2004. Two hundred eleven individuals participated in the study. Five individuals had a primary diagnosis of post-traumatic stress disorder (PTSD) and were excluded from the analyses because of the small number. Individuals with a primary diagnosis of an affective disorder (major depressive, dysthymic, and bipolar disorders) or an adjustment disorder were excluded ($N = 13$). The final sample consisted of 193 adults; 114 (88.4%) of the participants were Caucasian, 11 (8.5%) were African American, 3 (2.3%) were Hispanic, and one was Native American. Age of the individuals ranged from 17 to 76 years (mean = 34.9 years, S.D. = 8.9). Forty-five participants (23.3%) were males, and 148 (76.7%) were females. Slightly less than half of the participants (44.6%) reported a household income of below \$30,000, 18.1% had

an income ranging from \$30,000 to \$50,000, and the rest reported an income of above \$50,000.

1.2. Measures

1.2.1. *Anxiety Disorders Interview Schedule-4th Edition (ADIS-IV; Brown, DiNardo, & Barlow, 1994)*

Diagnostic status of the participants was obtained using the ADIS-IV, a semi-structured clinical interview based on DSM-IV diagnostic criteria. Although designed primarily for diagnosis of anxiety disorders, the ADIS-IV also allows for the diagnosis of other Axis-I disorders that are commonly associated with anxiety disorders, including major depression and substance abuse. The ADIS-IV is structured so that differential diagnoses among Axis-I disorders can be made, and date of onset and degree of impairment of the disorder(s) can be ascertained. A primary diagnosis is assigned to the disorder that causes the most distress and functional impairment in the individual; secondary diagnoses are also assigned to other present disorders. Although no current psychometric data are available for the ADIS-IV, the ADIS-IV: Lifetime Version (ADIS-IV-L) has been reported to have good to excellent reliability (kappas .58–.81; Brown, Di Nardo, Lehman, & Campbell, 2001). Moderate to excellent test-retest reliability has also been reported for the predecessor of the ADIS-IV, the ADIS-Revised (Di Nardo, Moras, Barlow, Rapee, & Brown, 1993), with kappas of .43–.82 for the anxiety disorders.

1.2.2. *Beck Anxiety Inventory (BAI; Beck & Steer, 1990)*

The BAI is a 21-item self-report questionnaire that lists symptoms of anxiety. The respondent is asked to rate how much each symptom has bothered him/her in the past week. The symptoms are rated on a four-point scale, ranging from “not at all” (0) to “severely” (3). The instrument has excellent internal consistency ($\alpha = .92$) and high test-retest reliability ($r = .75$; Beck & Steer, 1990).

1.3. Procedure

All the interviews were conducted by a graduate student therapist and assigned a preliminary diagnosis. The student then met with his/her supervisor, a licensed clinical psychologist, with whom a final diagnosis was assigned. One-third of the interviews were rated by a second rater, yielding a kappa of .89 for interrater reliability. The participants completed the BAI on the same visit that the ADIS-IV was conducted. The interviewers were unaware of the BAI scores of the participants. The factor scores for each participant were calculated using the factor loadings reported by Beck and Steer (1991) on the following factors: *autonomic arousal*, *subjective anxiety*, *neuropsychological arousal*, and *panic*.

2. Results

2.1. Sample diagnoses

Forty-four individuals (22.8%) received a primary diagnosis of generalized anxiety disorder (GAD). Thirty-seven individuals (19.2%) received a primary diagnosis of either specific or social phobia. Thirty-six individuals (18.7%) received a primary diagnosis of panic disorder with or without agoraphobia. Twelve individuals (6.2%) received a primary diagnosis of obsessive–compulsive disorder (OCD). Sixty-four individuals (33.2%) received no psychiatric diagnosis.

2.2. BAI total score comparison between the primary diagnoses

The participants' BAI scores ranged from 0 to 63, with the average score for the sample being 12.32 (S.D. = 13.88). The BAI scores for the diagnostic groups are presented in Table 1. One-way ANOVA was utilized to compare the BAI total scores between the five diagnostic groups, yielding significant results, $F(4, 188) = 30.59, p < .001$ (partial $\eta^2 = .62$). Games–Howell was utilized for post hoc comparisons, as the number of participants in each group was not equal, and this is a more powerful test than others designed for unequal groups (Toothacker, 1993). Post hoc comparisons revealed that individuals with a primary diagnosis of panic disorder had significantly higher BAI scores than those in the rest of the diagnostic groups with the exception of OCD. Additionally, those with no anxiety diagnosis had a significantly lower score on the BAI than those with any anxiety diagnosis. No significant difference was found between the other diagnostic groups.

2.3. Factor score comparisons between diagnoses

Means and standard deviations of the factor scores per primary diagnoses are presented in Table 2. The MANOVA comparing individuals with a primary diagnosis of panic disorder, phobia, OCD, GAD and no diagnosis was significant, $F(4, 185) = 76.88, p < .0001$ (partial $\eta^2 = .62$). For the *subjective* factor, Games–Howell post hoc comparisons revealed that individuals with a primary diagnosis

Table 1
Principal diagnoses as determined by ADIS-IV ($N = 193$) and the corresponding BAI scores

Diagnosis	<i>N</i>	%	BAI mean	S.D.	Range
Panic disorder with or without agoraphobia	36	18.7	26.6	14.4	0–50
GAD	44	22.8	10.3	7.5	0–35
OCD	12	6.2	18.7	13.1	0–47
Social or specific phobia	37	19.2	15.8	16.9	0–63
None	64	33.2	2.5	2.8	0–11
Entire sample	193	100	12.3	13.9	0–63

Table 2

Factor scores per principal diagnosis

Factor	Diagnosis	Mean	S.D.	Range
Factor 1: Subjective	Panic disorder	6.6	3.59	0–12.1
	GAD	2.9	2.6	0–10.7
	OCD	5.2	3.4	0–12.8
	Phobia	3.5	3.7	0–12.8
	None	0.6	0.8	0–2.9
Factor 2: Neurophysiological	Panic disorder	4.5	3.4	0–11.2
	GAD	1.2	1.6	0–7.1
	OCD	3.0	3.15	0–7.8
	Phobia	3.0	3.6	0–13.1
	None	3.2	0.6	0–3.2
Factor 3: Panic	Panic disorder	2.4	2.1	0–6.9
	GAD	1.2	1.2	0–4.6
	OCD	2.2	2.2	0–6.1
	Phobia	1.7	2.1	0–6.9
	None	0.3	0.1	0–2.3
Factor 4: Autonomic	Panic disorder	1.8	1.6	0–5.9
	GAD	0.3	0.7	0–3.8
	OCD	0.8	1.0	0–3.3
	Phobia	0.9	1.6	0–5.9
	None	0.07	0.2	0–1.3

of panic disorder had significantly higher scores than those with GAD, phobia, and no diagnosis. Individuals with a primary diagnosis of GAD also scored significantly higher on the *subjective* factor than those with no diagnosis. Individuals who received no diagnosis scored significantly lower on the *subjective* factor than those with any primary anxiety disorder diagnosis.

Individuals with a primary diagnosis of panic disorder scored significantly higher on the *neurophysiological* factor than those with a diagnosis of GAD and no diagnosis. The score on this factor for those with GAD was also significantly lower than that for those with phobia. However, it was significantly higher than that for those with no diagnosis.

The scores on the *panic* factor were significantly higher for those with all anxiety diagnoses, except OCD, than for those with no diagnosis. They were also significantly higher for those with panic disorder than GAD.

The *autonomic* factor differentiated between panic disorder and GAD, and panic disorder and no diagnosis, the scores for those with panic disorder being significantly higher. Overall, individuals with panic disorder had the highest scores on all the four factors, followed by those with OCD on all the factors except the *autonomic* factor (see Fig. 1 for the mean factor scores for each diagnosis).

Because 41% of the sample had more than one diagnosis, we eliminated those with co-morbid disorders and re-ran the MANOVA. This reduced the sample to $N = 114$; of remaining participants, eight individuals (7%) had a diagnosis of

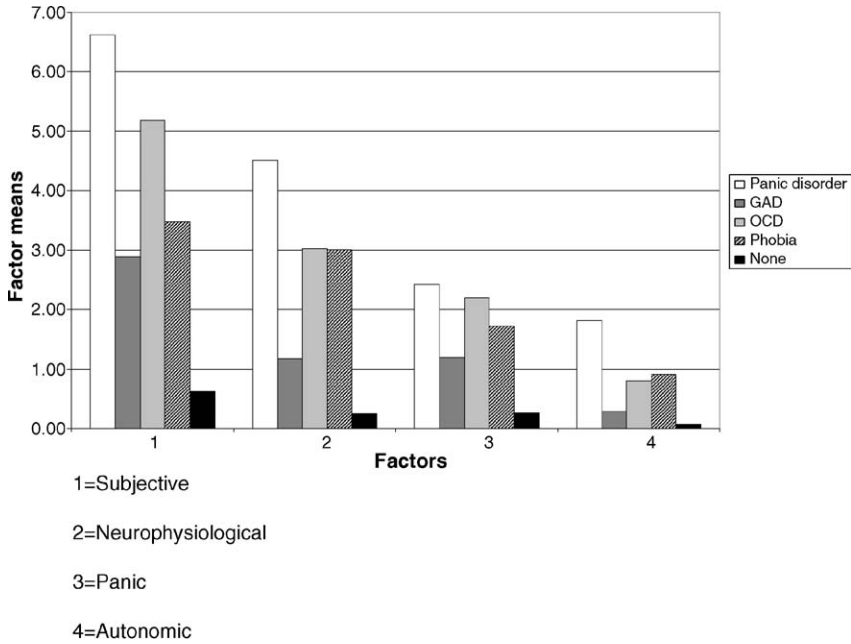


Fig. 1. Mean factor scores for the entire sample. (1) Subjective, (2) neurophysiological, (3) panic and (4) autonomic.

panic disorder, 18 (15.8%) GAD, 5 (4.4%) OCD, 19 (16.7) social or specific phobia, and 64 (56.1%) had no psychiatric diagnosis. The MANOVA was significant, $F(4, 106) = 32.19, p < .0001$, however the effect size decreased (partial $\eta^2 = .55$). The post hoc comparisons revealed a significant difference on the *subjective* factor between Panic disorder and no diagnosis and GAD and no diagnosis. No other differences were found in the factor scores. Overall, the factor scores per diagnosis were lower than when the entire sample was included (Fig. 2).

2.4. BAI and BAI factor cut scores

2.4.1. Cut scores

An ROC analysis (Hsiao, Bartko, & Potter, 1989) using SPSS was conducted to determine cut-off scores for the BAI and its factor scores that would optimally differentiate between individuals with one of the following primary diagnoses: panic disorder, phobia, and GAD (the cut scores for OCD were not calculated because of its low prevalence in the sample) and no disorder or any other anxiety disorder. Overall cut scores for anxious (operationally defined as having any of the aforementioned anxiety disorders) versus non-anxious individuals were determined as well. BAI total and factor scores for each participant were

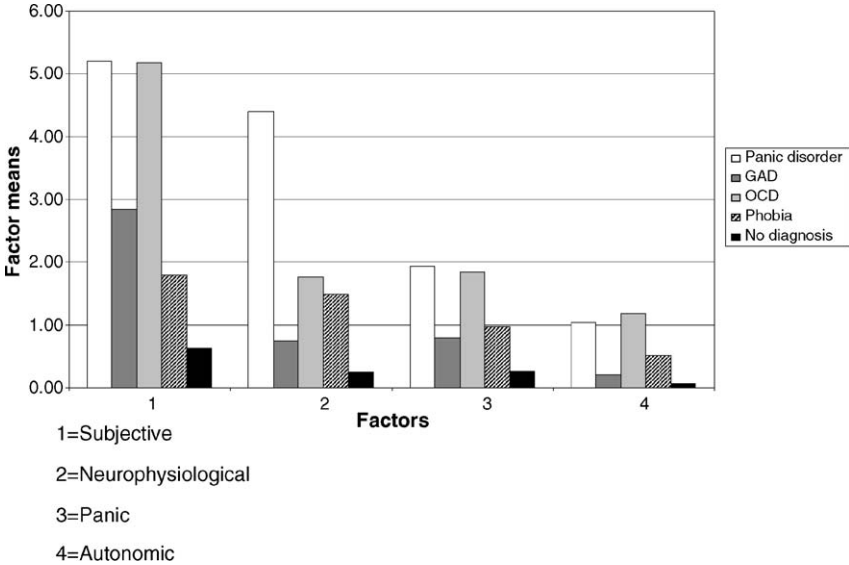


Fig. 2. Mean factor scores for individuals with a single diagnosis. (1) Subjective, (2) neurophysiological, (3) panic and (4) autonomic.

entered into the analysis three times, for each primary diagnosis as determined by the ADIS-IV interview. The ROC analysis calculates sensitivity and specificity for each possible cut score, enabling the researcher to choose the cut score that produces the optimal balance of sensitivity and specificity, depending on the purpose of the instrument. For example, a researcher may choose a cut score that maximizes sensitivity if it is necessary to identify all positive cases. However, maximizing sensitivity is often accomplished at the expense of specificity, likely increasing the false positive rate. Because the BAI is not a diagnostic instrument, but rather an informative tool, we operationalized the most appropriate cut scores as those that found the optimal balance of sensitivity and specificity, so as to minimize both false positive and false negative rates.

Positive and negative predictive values, the probability that a positive or negative score on test will be a true positive or negative, were also calculated. While sensitivity and specificity scores underline the diagnostic reliability of an instrument, they do not speak to its clinical utility. It is a common misconception that instruments with high sensitivity and specificity will necessarily be clinically useful, particularly for the screening of diseases that have very low prevalence rates. This misinterpretation is often referred to as base-rate neglect (Fischhoff & Bar-Hillel, 1984), and this bias has been shown to be extremely prevalent in clinical settings (Casscells, Schoenberger, & Graboys, 1978; Eddy, 1982). The detection of conditions with low prevalence rates almost always runs the risk of a high proportion of false positives and false negatives, even for instruments with

Table 3
BAI optimal cut scores per diagnoses

	Sensitivity	Specificity	PPV	NPV
<i>Panic disorder</i>				
5.50	.97	.86	.140	.999
7.50	.94	.94	.268	.999
8.50	.89	.97	.411	.997
<i>GAD</i>				
2.50	.89	.59	.065	.994
3.50	.75	.73	.081	.989
4.50	.68	.75	.080	.987
<i>Phobia^a</i>				
3.50	.81	.73	.341	.957
4.50	.73	.75	.335	.941
5.50	.68	.86	.456	.940
<i>Any anxiety diagnosis</i>				
3.50	.84	.65	.333	.951
4.50	.79	.66	.325	.938
5.50	.76	.77	.407	.939

^a The combined prevalence of social and specific phobia is based on Kessler et al. (1994) and Chartier, Walker, and Stein (2003) findings.

near perfect sensitivity and specificity. Nevertheless, we calculated these values for the cut scores, using a simple application of Bayes' Theorem.

The most optimal cut scores and their sensitivity and specificity are presented in Tables 3 and 4. A cut score of 8.5 on the BAI for panic disorder was found to have a sensitivity of .89 and a specificity of .97, suggesting that a score greater than 8 on the BAI will identify 89% of those with a panic disorder and exclude 97% of those without. With a one-year prevalence rate for panic disorder of 2.3% (Kessler et al., 1994), this would yield a positive predictive value (PPV) of the instrument of 41.1% and a negative predictive value of 99.7%. In other words, at this cut score, only 4 out of 10 who were identified as having panic disorder by the test would actually suffer from the disorder, meaning 6 out of 10 would be false positives. Decreasing the cut score would increase sensitivity, but also increase the false positive rate (see Table 3). The cut scores for the rest of the diagnoses as well as for any anxiety diagnosis were not as sensitive and specific as those for panic.

Of the four factors, the subjective factor yielded the highest sensitivity and specificity levels (see Table 4). A cut score of 2.06 was found to have a sensitivity of .89 and specificity of .91, suggesting that a score greater than 2.06 will identify 89% of those with panic disorder and 91% of those without. A cut score of .66 on the *neurophysiological* factor will identify 88% of those with panic disorder and 86% of those without. A slightly higher score on the factor (.71) will identify 91% of those without panic disorder but only 86% of those with panic disorder. On the panic factor, a score of .24 will correctly identify 89% of those with panic disorder

Table 4
Sensitivity and specificity of the cut-off scores for each diagnosis by factor

Diagnostic group	Cut score	Sensitivity	Specificity
<i>Panic disorder</i>			
Subjective	1.63	.97	.81
	2.06	.89	.91
Neurophysiological	0.66	.89	.86
	0.71	.86	.89
	0.94	.83	.92
Panic	0.24	.89	.83
	0.79	.78	.97
Autonomic	0.59	.86	.78
	0.66	.83	.84
	1.19	.69	.92
<i>GAD</i>			
Subjective	.98	.84	0.69
	1.63	.75	0.81
	1.95	.66	0.84
Neurophysiological	.55	.50	.83
	.71	.41	.91
Panic	.24	.46	.93
	.49	.36	.91
Autonomic	.18	.75	.66
	.59	.68	.78
<i>Phobia</i>			
Subjective	0.31	.81	.44
	0.72	.76	.67
	0.98	.73	.69
Neurophysiological	0.66	.73	.86
	0.70	.70	.89
Panic	0.24	.60	.83
	0.49	.41	.91
Autonomic	0.18	.73	.66
	0.59	.68	.78
<i>Any anxiety diagnosis</i>			
Subjective	0.98	.84	.67
	1.63	.79	.79
Neurophysiological	0.23	.71	.74
	0.55	.69	.80
Panic	0.24	.64	.80
	0.49	.51	.88
Autonomic	0.18	.78	.64
	0.59	.72	.76

and 83 of those without. On the autonomic factor a score of .66 will correctly identify 83% of those with panic disorder and 84% of those without. The factor cut scores for the rest of the diagnoses as well as for any anxiety diagnosis were not as sensitive and specific as those for panic disorder.

3. Discussion

The present study examined utility of the BAI and its four factors by determining whether they differ significantly between various anxiety disorders and what the cut scores are for the BAI and its factors for these disorders. The BAI scores of individuals with panic disorder, phobia, GAD, OCD, and no diagnosis were compared. The mean scores across the same diagnostic groups were then compared for the four factors of the BAI as found by Beck and Steer (1991) and confirmed by others. The ROC analysis was used to determine cut scores, their sensitivity, and specificity, for the BAI total score and the factor scores for each diagnostic group except for OCD. The PPV and NPV of these cut scores were calculated.

First, we examined whether the BAI total and factor scores differ between five anxiety diagnoses and a control group with no psychiatric disorder. The ANOVA demonstrated that the BAI scores were significantly lower for those without any diagnosis than for those with a diagnosis of any anxiety disorder consistent with other literature (e.g., Beck & Steer, 1991). However, an ROC analysis revealed that while the BAI had acceptable sensitivity, it did not have high specificity in detecting any anxiety disorder. Thus although elevated BAI scores may indicate the presence of pathological anxiety, a significant portion of those who achieve elevated scores will in reality not have an anxiety disorder.

The BAI score was significantly higher for those with a diagnosis of panic disorder than for those with GAD, phobia, or no psychiatric diagnosis at all. This is consistent with the previous findings of Beck and Steer (1991). Sensitivity and specificity of the BAI total score were also shown to be better for detecting individuals with panic disorder than those with other anxiety disorders or any anxiety disorder. An ROC analysis determined that a cut score above 8 will identify 89% of those with a primary diagnosis of panic disorder with or without agoraphobia and 97% of those without, yielding a PPV of 41% and an NPV of 99%. This cut score is different from the one found by Stein et al. (1999) for panic disorder; their study demonstrated similar predictive values at a much higher cut score of 20. However, this was due to the fact that the prevalence rate of panic disorder used in their study was significantly higher than the 2.3% figure (Kessler et al., 1994) used in ours. Recalculating the predictive values of the BAI with the prevalence rate of panic in the general population (2.3%), using the optimal sensitivity (.67) and specificity (.93) found in their study at a cut score of 20, would yield PPV and NPV scores of 20% and 99%, respectively.

Moderate sensitivity and specificity were found for the other three anxiety disorders in our study. Moreover, the cut scores yielded by an ROC analysis were very low, which may present a problem for adequately differentiating those with a disorder from those without. For example, whereas a cut score of 3.5 on the BAI for phobia or GAD appeared to have reasonable sensitivity and specificity and was higher than the mean BAI score for the non-anxious group in our sample, many individuals without a diagnosis of any anxiety disorder scored above 3.5. These findings suggest that the BAI total score is able to adequately detect individuals with panic disorder, but not with any other anxiety disorder. This is consistent with the findings by Cox et al. (1996) who suggest that the BAI is a measure of panic rather than of anxiety in general.

Overall, the mean factor scores for all the anxiety diagnoses were lower than those obtained by Beck and Steer (1990) in the original validity study of the BAI. This may be related to the fact that theirs was an outpatient sample, whereas ours was recruited from a research and treatment center; therefore, our overall sample may not have been as distressed as the sample Beck and Steer used, thus endorsing lower scores on the individual items that comprised the factors.

The MANOVA revealed that all the four factor scores were significantly higher for those with panic disorder than those with other anxiety disorders. This is in part consistent with the previous findings by Beck and Steer (1991) for neurophysiological, subjective, and panic factors of the BAI. Not surprisingly the highest sensitivity and specificity were found for cut scores for panic disorder on all the four factors. This once again supports the conclusions made by Cox et al. (1996) that the BAI is better used as a tool for assessing panic disorder than any other anxiety disorder. This finding also suggests that the four factors may not represent different aspects of “general” anxiety but rather different aspects of panic.

Because only principal diagnoses were used in this study, the MANOVA was re-run using only the participants with one diagnosis of anxiety disorder and no diagnosis at all in order to control for co-morbidity of psychiatric diagnoses. When those with more than one anxiety diagnosis were excluded from the analyses, the differences remained significant only for the subjective factor. This was in part due to the drop in the effect size and the change in the prevalence rates of the anxiety disorders in the group. However, because the BAI is widely used in clinical setting, it is likely that the majority of the individuals presenting in those would have more than one anxiety or other diagnoses.

Overall, the results of this study support the findings made by Cox et al. (1996) that the strongest quality of the BAI is its ability to assess panic symptomatology. The present study also expands on this notion by establishing that the BAI can be used as an efficient screening tool for distinguishing between panic-disordered and non-panic disordered individuals as evidenced by the cut scores obtained. The Cox et al. study raised some important questions, particularly the fact that, if the BAI is more a measure of panic than overall anxiety, why the BAI continues to be used as a measure of overall anxiety. The results of our study demonstrate that a

person with a panic disorder will be considered as more anxious based on the BAI than a person with non-panic-related anxiety disorder. This may be due to the fact that the BAI was created not only to assess anxiety, but also to be largely independent of the symptoms of depression, as assessed by Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) hence excluding those anxiety symptoms that overlap with those of depression. While the BAI has attained significant discriminant validity, it seems to have sacrificed some of its construct validity in assessing overall anxiety. Because of the high overlap of symptoms between anxiety disorders, particularly GAD and major depression (Barlow, DiNardo, Vermilyea, Vermilyea, & Blanchard, 1986), it may be impossible to develop a self-report assessor of overall anxiety that is both independent of depression and comprehensive of all of the aspects of anxiety. Thus, any clinician or researcher using the BAI must be cognizant of its limitations, and should consider that the BAI does not provide a truly valid quantitative assessment of anxiety symptomatology, but rather an appraisal of one aspect of anxiety that may need to be augmented with other forms of data collection, depending on the purposes of and reasons for the assessment.

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