Psychometric Properties of the Geriatric Anxiety Scale: Comparison to the Beck Anxiety Inventory and Geriatric Anxiety Inventory

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This study explored the convergent and discriminant validity of the Geriatric Anxiety Scale (GAS), a new measure of anxiety symptoms for older adults. The GAS, Beck Anxiety Inventory (BAI), Geriatric Anxiety Inventory (GAI), Beck Depression Inventory, Second Edition (BDI-II), and Geriatric Depression Scale (GDS) were administered to 117 community-dwelling, predominantly White, older adults (62% female; M age = 74.75 years, range = 60 − 89 years; M years of education = 14.97). Scores on the GAS were strongly associated with scores on measures of anxiety and depression, but not associated with scores on measures of reading ability or processing speed. The GAS possesses strong convergent and discriminant validity and shows promise as a measure of anxiety in older adults.

KEYWORDS anxiety, assessment, Geriatric Anxiety Scale, late life, older

Anxiety disorders in older adults are common, with an estimated prevalence rate of 15.3% (Kessler et al., 2005). Sub-syndromal anxiety symptoms in later life are even more widespread than anxiety disorders, with a prevalence ranging from 15% to 52.3% in community samples (Bryant, Jackson, & Ames, 2008). Not only are symptoms of anxiety in older adults common, they also are associated with a diverse array of adverse outcomes including poor physical health, sleep problems, urinary incontinence, and detrimental health behaviors such as smoking, physical inactivity, poor

diet, and alcohol abuse (Mehta et al., 2003; Strine, Chapman, Kobau, & Balluz, 2005). Anxiety disorders may have even more serious implications for health in late life. Van Hout et al. (2004) found that older men with anxiety disorders had an 87% higher risk of mortality over seven years than older men without anxiety disorders, even after controlling for comorbid depression, smoking, alcohol use, and body mass index. In addition, clinically significant anxiety predicts cognitive deficits in areas such as memory and divided attention (e.g., DeLuca et al., 2005; Hogan, 2003). Hence, the availability of tools for the assessment and diagnosis of anxiety symptoms is paramount in older adults. Thorough assessment and accurate diagnosis of anxiety is critical in initiating appropriate treatment. However, tools for assessing anxiety among older adults have only recently been developed. This contrasts with the assessment of depression in older adults, in which clinicians have long utilized the Geriatric Depression Scale (Yesavage et al., 1983).

The present study was intended to investigate the psychometric properties of the Geriatric Anxiety Scale (Segal, June, Payne, Coolidge, & Yochim, 2010), a new measure of anxiety for use with older adults. This was completed by exploring its relationships with the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) and the Geriatric Anxiety Inventory (GAI; Pachana et al., 2007), two measures of anxiety commonly used with older adults. Although the BAI was not designed specifically to be used with older adults, it is often used with this population with some success. Kabacoff, Segal, Hersen, and Van Hasselt (1997) found the internal consistency of the BAI in a sample of older adults to be high ($\alpha = .90$), with moderate concurrent validity with other anxiety measures (.36 to .63). Similarly, Wetherall and Arean (1997) found high internal consistency ($\alpha = .92$) and evidence of discriminant validity of the BAI in a sample of older adult medical outpatients. Although this evidence suggests that the BAI may be reliable and somewhat valid when used with older adults, it was not created specifically to be used among older adults. As a result, it contains many items which address somatic symptoms of anxiety, such as wobbliness in one's legs, feeling dizzy or lightheaded, feeling unsteady, and difficulty breathing. All of these symptoms may be endorsed by older adults for reasons more related to physical health conditions than for reasons related to anxiety. This is problematic because physical health conditions that many older adults experience may lead one to have elevated scores on the BAI when they do not experience non-somatic symptoms of anxiety. In addition, the BAI excludes anxiety symptoms that tend to overlap with symptoms of depression, such as difficulty concentrating, difficulties with sleep, or being easily fatigued. The exclusion of these symptoms is problematic because these are in fact actual symptoms of DSM defined anxiety disorders.

In contrast to the development of the BAI, the Geriatric Anxiety Inventory (GAI; Pachana et al., 2007) was designed specifically to assess anxiety in older adults. People who complete this measure are asked to respond *yes* or *no* to statements regarding their experience with anxiety in the past week (e.g., "I worry a lot of the time," "I find it hard to relax"). The internal consistency of scores on the GAI is high ($\alpha = .91$) as is its convergent validity with other anxiety measures (Pachana et al.). In addition, the GAI has proven to be clinically useful. In a study of older home care patients, the GAI demonstrated strong clinical utility in detecting anxiety disorders (Diefenbach, Tolin, Meunier, & Gilliam, 2009). For the stated reasons, the GAI holds promise as a measure of anxiety in older adults, but it possesses some features that some clinicians may not prefer. Similar to the GDS, it has a yes/no response option format. Although this format may help to increase its ease of use among older adults, it also limits the ability of users to indicate gradations of anxiety when responding to items. In addition, 8 out of 20 items on the GAI predominantly measure aspects of worrying, with less emphasis placed on other symptoms of anxiety. This emphasis on worry may limit the measurement of other key aspects of anxiety, including somatic and affective aspects. An instrument that provides more of a balance across these different domains of anxiety and one that also allows users to indicate gradations of symptom severity is still needed.

The Geriatric Anxiety Scale (GAS) was created to meet these challenges. It is a self-report measure designed for use with older adults (Segal et al., 2010). It was created based on the wide range of anxiety symptoms included in the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition* (*DSM-IV-TR*), and is somewhat distinct from other measures of anxiety which do not fully address the complete DSM symptom constellation (e.g., the BAI). Specifically, the GAS assesses somatic, affective, and cognitive symptoms of anxiety, all of which are common in older adults. In addition, each of these symptom domains makes up a subscale of the measure. Separating symptoms by these important clinical domains allows clinicians to determine what symptoms of anxiety (somatic, affective, etc.) are particular challenges for a particular patient. This feature of the measure is paramount, because it allows the clinician to easily gauge whether a patient is experiencing primarily somatic symptoms versus affective or cognitive symptoms, and thus allows the clinician to conclude whether the symptoms are related to a physical health problem instead of an anxiety disorder. In the initial validation study, Segal et al. (2010) found high to very high internal reliability and strong convergent validity of the GAS in both community and clinical samples. However, Segal et al. did not assess the degree of medical problems in their samples. Therefore the degree to which medical problems inflate scores on the GAS remains unknown. This is important to explore as patients may obtain high scores on the GAS because of medical problems as opposed to

anxiety symptoms (e.g., shakiness, stomach aches). Medical problems are known to increase scores on the BAI (e.g., Wetherell & Gatz, 2005) and this potential impact should be explored with the GAS.

The purpose of the current study was to further explore the psychometric properties of the GAS, including its convergent and discriminant validity, as well as its utility. There were several specific hypotheses.

1. Regarding convergent validity, scores on the GAS would be highly correlated with the BAI and GAI, two established measures of anxiety.
2. Additionally, scores on the GAS would correlate significantly with established measures of depression, a construct with some conceptual overlap, but less highly than with scores on purer measures of anxiety.
3. Regarding discriminant validity, scores on the GAS would show weak or non-significant correlations with scores on measures of separate constructs, such as reading ability and processing speed.
4. Regarding utility, the GAS would demonstrate the ability to detect clinically significant anxiety as assessed with the BAI. It was also hypothesized that medical burden would not inflate scores on the GAS.

METHOD

Participants

Data were collected from 117 community-dwelling older adults over the age of 60, as part of a larger study on mental health and cognitive functioning in older adults. Participants were volunteers from the community, recruited from a registry of community-dwelling older adults willing to participate in research. The vast majority of participants were White ($n = 110$), with seven participants being Hispanic American. They had a mean age of 74.75 ($SD = 7.14$, range $= 60$ to 89 years), with 14.97 years of education ($SD = 2.91$), and 62% ($n = 72$) of the participants were female. All participants provided informed consent prior to their participation and they were financially compensated for their time. This study was approved by the university's institutional review board.

Measures

GERIATRIC ANXIETY SCALE (GAS)

The GAS (Segal et al., 2010) is a 25-item self-report measure of anxiety symptoms. Participants are asked to rate symptoms of anxiety by indicating how often they have experienced each symptom during the past week, on a 4-point Likert-type scale that ranges from 0 (*not at all*) to 3 (*all of the time*). Potential scores range from 0 to 75 with higher scores indicting higher levels of anxiety.

BECK ANXIETY INVENTORY (BAI)

The BAI (Beck et al., 1988) consists of 21 self-report items which assess symptoms of anxiety discrete from depression. Participants are asked to respond to each item on a 4-point Likert-type scale ranging from 0 (*not at all*) to 3 (*severe*). Potential scores range from 0 to 63, with elevated scores indicating the presence of severe anxiety.

GERIATRIC ANXIETY INVENTORY (GAI)

The GAI (Pachana et al., 2007) is a 20-item self-report scale. Participants are asked to respond "yes" or "no" to statements regarding their experience with anxiety in the past week. The internal consistency of the GAI is high, $\alpha = .91$, as is its convergent validity with other measures (Pachana et al.). Possible scores range from 0 to 20.

GERIATRIC DEPRESSION SCALE (GDS)

The GDS is a self-report measure (Yesavage et al., 1983), consisting of 30 yes/no questions. Scores range from 0 to 30 and higher scores indicate the presence of more depressive symptoms. The GDS has adequate internal consistency, test-retest reliability, and concurrent validity with diverse measures of depression in diverse populations (Marty, Pepin, June, & Segal, 2011).

BECK DEPRESSION INVENTORY–SECOND EDITION (BDI-II)

The BDI-II (Beck et al., 1996) is a self-report measure containing 21 items which correspond with the DSM-IV criteria for major depressive disorder. Participants are asked to respond on a 4-point Likert-type scale, ranging from 0 to 3. Possible scores on the BDI-II range from 0 to 63, and higher scores indicate higher levels of depression.

COMORBIDITY INDEX (CMI)

This measure is a weighted combination of chronic diseases (Charlson, Pompei, Ales, & MacKenzie, 1987). The Comorbidity Index is a commonly-used measure of medical burden (Deyo, Cherkin, & Ciol, 1992).

WECHSLER TEST OF ADULT READING (WTAR)

The WTAR is a measure of reading ability. Its internal consistency and test-retest reliability are above .90, and it also correlates highly with other measures of reading (The Psychological Corporation, 2001).

Wechsler Adult Intelligence Scale, Third Edition (WAIS-3), Digit Symbol–Coding Test

In the Digit Symbol–Coding subtest (Wechsler, 1997), the participant is asked to copy symbols paired with numbers. The number of correctly written responses is determined as the measure of performance. The Digit Symbol–Coding subtest has an average reliability of .84 across age groups (Wechsler, 1997).

Procedure

The measures in the present study were included in a battery of cognitive tests and mental health questionnaires, which took approximately two hours to complete. Participants were tested in either a research lab at the university or in a testing room at a mental health clinic.

RESULTS

For a measure to have adequate convergent validity, discriminant validity, and utility, it is necessary (but not sufficient) to also have adequate reliability. To determine whether the GAS had adequate reliability, its internal consistency was calculated with Cronbach's alpha, which was appreciably high (.90). The GAS was the most normally distributed of the three anxiety measures (histograms are available from the authors).

Hypotheses 1, 2, and 3 were assessed by calculating correlations among measures of anxiety and depression, subscales of the GAS, demographic variables, the Comorbidity Index, and cognitive measures. Correlations are presented in Table 1. Steiger's Z was used to determine whether correlations were significantly different from each other. The correlation of .61 between the GAS and BAI was significantly lower than the correlation of .74 between the GAS and GDS, Steiger's $Z = -2.04$, $p < .05$. The correlation of .61 between the GAS and BAI was significantly stronger than the correlation of .36 between the GAI and BAI, Steiger's $Z = 3.47$, $p < .01$. Likewise, the correlation of .69 between the GAS and GAI was stronger than the correlation of .36 between the GAI and BAI, Steiger's $Z = 4.29$, $p < .01$. Thus, the GAS correlates more strongly with both of these established measures of anxiety than the established measures correlate with each other. This finding is illustrated in Figure 1.

The BAI was shown to correlate less with measures of depression than the GAS or GAI did. Steiger's Z calculations showed that the correlations that the GAS and GAI had with both the GDS and BDI-II were significantly stronger than the correlations between the BAI and both the GDS and BDI-II, $p < .01$.

TABLE 1 Correlations among GAS, GAI (n = 89), BAI (n = 116), GDS (n = 117), BDI-II (n = 116), and Other Measures

	GAI	BAI	GDS	BDI-II	Age	Educ.	Sex	CMI	WTAR	Coding
GAS	.69**	.61**	.74**	.73**	−.08	−.20*	.06	.34**	−.36**	−.22*
GAI	–	.36**	.75**	.74**	−.19	−.06	.01	.09	−.31**	−.22*
BAI	–	–	.44**	.46**	.04	−.23*	−.09	.29**	−.31**	−.27**
GDS	–	–	–	.87**	−.06	−.12	.05	.22*	−.25**	−.24**
BDI-II	–	–	–	–	−.00	−.11	−.00	.20*	−.31**	−.24*
Age	–	–	–	–	–	−.20*	.08	.07	.05	−.37**
Educ.	–	–	–	–	–	–	.26**	.05	.43**	.14
Sex	–	–	–	–	–	–	–	.24**	.13	−.06
CMI	–	–	–	–	–	–	–	–	−.13	−.17
WTAR	–	–	–	–	–	–	–	–	–	.18

Note. GAS = Geriatric Anxiety Scale; GAI = Geriatric Anxiety Inventory; BAI = Beck Anxiety Inventory; GDS = Geriatric Depression Scale; BDI-II = Beck Depression Inventory, Second Edition; Educ. = Years of Education; CMI = Comorbidity Index; WTAR = Wechsler Test of Adult Reading; Coding = Wechsler Adult Intelligence Scale, Third Edition, Digit Symbol–Coding subtest.
*$p < .05$, **$p < .01$.
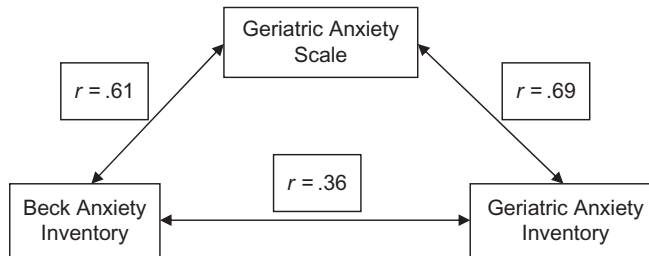
FIGURE 1 Correlations among the Geriatric Anxiety Scale, Beck Anxiety Inventory, and Geriatric Anxiety Inventory.

Correlations between the three subscales of the GAS (Cognitive, Somatic, and Affective) and the BAI and GAI are presented in Table 2. The GAS Somatic subscale correlations with the BAI and GAI were equivalent in magnitude, $p > .05$. The GAS Cognitive subscale correlated significantly more strongly with the GAI than with the BAI, Steiger's $Z = -2.55$, $p < .05$. The GAS Affective subscale correlated more strongly with the GAI than with the BAI, Steiger's $Z = -2.12$, $p < .05$.

The Comorbidity Index correlated with both the GAS ($r = .34$) and BAI ($r = .29$) but not with the GAI ($r = .09$). The GAS Somatic subscale correlated more strongly with the Comorbidity Index than did the GAS Affective subscale, Steiger's $Z = 1.98$, $p < .05$, as shown in Table 2.

To test Hypothesis 4 and assess how well the GAS detects clinically significant anxiety, we assessed what scores on the GAS were obtained from participants who had clinically significant symptoms of anxiety, as assessed with the BAI. According to scoring guidelines for the BAI (Beck et al., 1993), scores of 8 or higher indicate the presence of clinically significant anxiety.

TABLE 2 Correlations between GAS subscales and the Beck Anxiety Inventory ($n = 116$), Geriatric Anxiety Inventory ($n = 89$), and Comorbidity Index ($n = 115$)

	GAS somatic	GAS cognitive	GAS affective	CMI
BAI	.61**	.53**	.45**	.29*
GAI	.43**	.74**	.65**	.09
CMI	.38**	.28**	.22*	–

Note. GAS = Geriatric Anxiety Scale; CMI = Comorbidity Index; BAI = Beck Anxiety Inventory; GAI = Geriatric Anxiety Inventory.
*$p < .05$, **$p < .01$.
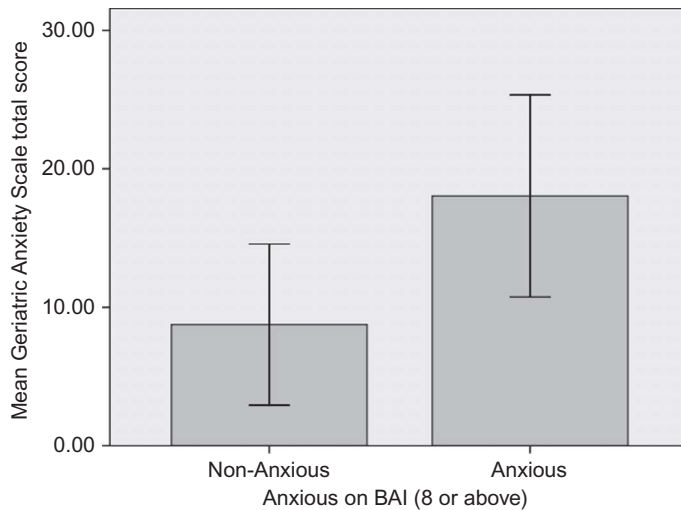
FIGURE 2 Scores on the Geriatric Anxiety Scale among those with and without significant anxiety symptoms on the Beck Anxiety Inventory (error bars: $+/-1$ *SD*).

There were 28 participants who obtained BAI scores of 8 or higher, and 88 with scores below 8. Participants with BAI scores of 8 or above scored significantly higher (mean GAS total score = 18.04, SD = 7.30) on the GAS, $t (114) = 6.90$, $p < .001$, than those who had scores below 8 on the BAI (mean GAS total score = 8.75, SD = 5.82), with a large effect size (Cohen's d = 1.41). The distributions of scores obtained by participants in both groups are depicted in Figure 2. This finding adds support to Hypothesis 4.

Last, each item of the GAS was correlated with the BAI, BDI-II, and GDS total scores to determine the extent to which GAS items were associated more with symptoms of anxiety or symptoms of depression. The BAI was chosen as the corresponding measure of anxiety, because of the greater variance on this measure compared to the GAI. The results are presented in Table 3. GAS items that correlated significantly with the BAI but not with one or both depression measures include "My heart raced or beat strongly," "My breath was short," "I felt like things were not real or like I

TABLE 3 Correlations between Geriatric Anxiety Scale (GAS) items with the Beck Anxiety Inventory (BAI), Beck Depression Inventory–Second Edition (BDI-II), and Geriatric Depression Scale (GDS)

Item	BAI	BDI-II	GDS
GAS #1: My heart raced or beat strongly.	.28**	.10	.07
GAS #2: My breath was short.	.41**	.17	.10
GAS #3: I had an upset stomach.	.31**	.39**	.40**
GAS #4: I felt like things were not real or like I was outside of myself.	.23*	.19*	.12
GAS #5: I felt like I was losing control.	.30**	.50**	.51**
GAS #6: I was afraid of being judged by others.	.21*	.43**	.45**
GAS #7: I was afraid of being humiliated or embarrassed.	.28**	.48**	.54**
GAS #8: I had difficulty falling asleep.	.38**	.31**	.39**
GAS #9: I had difficulty staying asleep.	.44**	.39**	.47**
GAS #10: I was irritable.	.30**	.40**	.47**
GAS #11: I had outbursts of anger.	.32**	.34**	.42**
GAS #12: I had difficulty concentrating.	.44**	.64**	.67**
GAS #13: I was easily startled or upset.	.23*	.37**	.38**
GAS #14: I was less interested in doing something I typically enjoy.	.39**	.54**	.58**
GAS #15: I felt detached or isolated from others.	.22*	.54**	.67**
GAS #16: I felt like I was in a daze.	.38**	.49**	.47**
GAS #17: I had a hard time sitting still.	.20*	.27**	.22*
GAS #18: I worried too much.	.42**	.51**	.64**
GAS #19: I could not control my worry.	.35**	.54**	.53**
GAS #20: I felt restless, keyed up, or on edge.	.42**	.51**	.40**
GAS #21: I felt tired.	.33**	.52**	.54**
GAS #22: My muscles were tense.	.30**	.22*	.10
GAS #23: I had back pain, neck pain, or muscle cramps.	.29**	.19*	.20*
GAS #24: I felt like I had no control over my life.	.30**	.44**	.52**
GAS #25: I felt like something terrible was going to happen to me.	.32**	.29**	.25**

Note. ($N = 116$).
*$p < .05$, **$p < .01$.

was outside of myself," and "My muscles were tense." All but these four items also correlated with both the BDI-II and GDS, and all items correlated significantly with the BAI.

DISCUSSION

This study found that the GAS holds promise as a reliable and valid measure of anxiety among older adults. In this sample of community-dwelling older adults, the GAS was found to have internal consistency of .90, and correlated significantly with the BAI ($r = .61$) and GAI ($r = .69$), two other established measures of anxiety. Additionally, the GAS was found to correlate with both the BAI and the GAI, more than the BAI and GAI correlated with each other, as depicted in Figure 1. This finding suggests two things: First, the

GAS may measure symptoms of anxiety that are assessed by both the BAI and GAI, and second, both the BAI and GAI may not measure symptoms of anxiety as comprehensively as the GAS. The GAS was also the most normally distributed of the three anxiety measures, which increases its utility in studies of anxiety among older adults as it captures a wider range of anxiety symptoms and can meet statistical assumptions of normality.

As hypothesized, the subscales of the GAS were found to measure the domains they were designed to assess. The Somatic subscale correlated more strongly with a measure of medical burden (the CMI) than did the Affective subscale. The Cognitive and Affective subscales correlated more with the GAI than with the BAI, which was expected since the GAI assesses symptoms of worry more than physical symptoms of anxiety. Therefore, utilizing the subscales of the GAS, a clinician can determine if a patient is predominantly experiencing somatic, cognitive, or affective symptoms of anxiety. This may help clinicians rule out other disorders and physical health conditions. For example, if a patient predominantly reports Affective symptoms as opposed to Somatic symptoms, the clinician can be confident diagnosing an anxiety disorder as opposed to other health concerns.

One relative weakness of the GAS was that it correlated strongly with measures of depression. The GAS correlated more strongly with the GDS ($r = .74$) than it did with the BAI ($r = .61$). Likewise, many items on the GAS correlated more strongly with measures of depression than they did with the BAI, as demonstrated in Table 3. However, it is important to note that there is a strong conceptual overlap between anxiety and depression, especially in later life (Beekman et al., 2000). In Segal et al.'s (2010) study, the GAS correlated .78 with the GDS in a community sample and .73 with the GDS in a clinical sample. Out of the three anxiety measures in the current study, the BAI was shown to correlate the least with measures of depression ($r = .44$ and $r = .46$), suggesting that it may tap into unique symptoms of anxiety more than the GAS or GAI. It is possible the BAI has better divergent validity from symptoms of depression. This is consistent with Wetherell and Arean (1997), who found discriminant validity between the BAI and measures of depressive symptoms through a factor analysis. Taken together, these results suggest that the BAI measures a construct distinct from depression, and the GAS may not be as useful as the BAI in differentiating symptoms of depression from symptoms of anxiety. However, the BAI omits integral symptoms of anxiety that are also symptoms of depression, such as fatigue, difficulty concentrating, and sleep disturbance. This is problematic because overlapping symptoms are still of interest to a clinician. Even though the GAS measures symptoms of anxiety that are also common to depression, it still provides useful information to the clinician. Because the GAS is based on DSM symptoms of anxiety, it can help clinicians arrive at an accurate diagnosis of an anxiety disorder and thus aid in clinically appropriate treatment.

Whereas the GAS did not have strong divergent validity in differentiating anxiety from depression in this sample of older adults, it was found to have sufficient divergent validity in its lack of relationships with non-mental health variables. Specifically, scores on the GAS did not correlate with age or sex, and its correlation with education was similar in magnitude to the correlation between the BAI and education. (The GAI, GDS, and BDI-II did not correlate with education.) The correlations between the GAS and measures of reading ability and processing speed, two constructs presumed to be unrelated to the GAS, were similar in magnitude to other measures' correlations with these constructs. That is, the GAS, BAI, GAI, GDS, and BDI-II all correlated weakly with reading ability and processing speed. Thus, the GAS measures constructs distinct from non-mental health variables, adding to its validity for measuring symptoms of anxiety.

Both the GAS and BAI correlated with medical burden, whereas the GAI did not. There are several possible explanations for this finding. The GAI was purposely created to exclude somatic symptoms of anxiety that overlap with medical conditions common in older adults (Pachana et al., 2007). Alternatively, it is possible that medical problems cause anxiety that is best detected by the BAI or the GAS (Mueller, Yochim, Kane, & Zumas, 2009). Third, it is possible that the GAS and BAI tap into the symptoms of anxiety that manifest physically, whereas the GAI does not.

One important future direction for research is that this study should be replicated in clinical samples. This study was completed in a sample in which the majority of participants did not have clinically significant anxiety. The measures could perform differently in a sample of patients with clinically significant anxiety and/or depressive symptoms. Research is also needed to compare the clinical utility of the GAS, BAI, and GAI in detecting clinically significant anxiety as in the studies by Diefenbach et al. (2009) and Pachana et al. (2007). Samples with diagnosed anxiety disorders are needed to conduct these analyses. Furthermore, research should also be conducted in samples of people from other ethnic groups to assure that the GAS remains valid and reliable in other populations of older adults.

In sum, the GAS is a valid and reliable measure of anxiety in older adults. It has high reliability and convergent validity with other mental health measures, although its weakness lies in its overlap with measures of depression. As both clinically significant anxiety and anxiety symptoms themselves are common in older adults, tools to aid in the accurate assessment and diagnosis of this condition are especially necessary.

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