International Psychogeriatrics (2007), 19:1, 103–114 © 2006 International Psychogeriatric Association
doi:10.1017/S1041610206003504 Printed in the United Kingdom

Development and validation of the Geriatric Anxiety Inventory

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ABSTRACT

Background: Anxiety symptoms and anxiety disorders are highly prevalent among elderly people, although infrequently the subject of systematic research in this age group. One important limitation is the lack of a widely accepted instrument to measure dimensional anxiety in both normal old people and old people with mental health problems seen in various settings. Accordingly, we developed and tested of a short scale to measure anxiety in older people.

Methods: We generated a large number of potential items *de novo* and by reference to existing anxiety scales, and then reduced the number of items to 60 through consultation with a reference group consisting of psychologists, psychiatrists and normal elderly people. We then tested the psychometric properties of these 60 items in 452 normal old people and 46 patients attending a psychogeriatric service. We were able to reduce the number of items to 20. We chose a 1-week perspective and a dichotomous response scale.

Results: Cronbach's α for the 20-item Geriatric Anxiety Inventory (GAI) was 0.91 among normal elderly people and 0.93 in the psychogeriatric sample. Concurrent validity with a variety of other measures was demonstrated in both the normal sample and the psychogeriatric sample. Inter-rater and test–retest reliability were found to be excellent. Receiver operating characteristic analysis indicated a cut-point of 10/11 for the detection of DSM-IV Generalized Anxiety Disorder (GAD) in the psychogeriatric sample, with 83% of patients correctly classified with a specificity of 84% and a sensitivity of 75%.

Conclusions: The GAI is a new 20-item self-report or nurse-administered scale that measures dimensional anxiety in elderly people. It has sound psychometric properties. Initial clinical testing indicates that it is able to discriminate between

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https://doi.org/10.1017/S1041610206003504 Published online by Cambridge University Press

those with and without any anxiety disorder and between those with and without DSM-IV GAD.

Key words: anxiety, anxiety disorder, aged, aged 80 and over, generalized anxiety disorder, psychological test

Introduction

The prevalence of anxiety symptoms and anxiety disorders has been reported to decline with advancing age (Flint, 1994; Henderson *et al.*, 1998). Despite this decline, anxiety remains one of the most common psychiatric problems experienced by elderly people (Australian Bureau of Statistics, 1998). Yet anxiety symptoms and anxiety disorders in elderly adults remain both under-recognized and under-treated by health professionals (Scogin, 1998), despite their contribution to significant morbidity, loss of functioning, and poorer quality of life (Blazer *et al.*, 1991).

Anxiety disorders are more prevalent in older adults with chronic general medical conditions and are also highly co-morbid with depressive disorders (Beekman *et al.*, 2000; Lenze *et al.*, 2001). Anxiety disorders, however, remain less well studied in elderly adults than other disorders such as depression and dementia. An accurate picture of the true prevalence and incidence of anxiety disorders remains elusive (Krasucki *et al.*, 1998). This may be due in part to methodological factors, such as the use of diagnostic criteria and instruments not validated for use with this group (Fuentes and Cox, 1997), and to response bias during epidemiological surveys (Jorm, 2000). Diagnostic difficulties, including problems of recognizing age-specific symptoms, distinguishing symptoms of chronic physical disorders from the symptoms of anxiety, and the influence of age-related psychosocial issues on presentations of anxiety symptoms in later life have been increasingly discussed in the literature (Palmer *et al.*, 1997). Accurate screening for anxiety symptoms in elderly populations becomes a crucial first step in identifying patients in need of further diagnostic work-up and treatment.

Many screening instruments have been developed to measure the symptoms, distress levels and characteristics of anxiety symptoms; the vast majority of these have been developed in and for young adult populations. Yet the importance of instruments specifically designed for older adults (Yesavage *et al.*, 1983) as well as age-congruent norms (Owens *et al.*, 2000) cannot be underestimated. Some anxiety scales, such as the Beck Anxiety Inventory (BAI; Beck *et al.*, 1988), have normative data for elderly populations. Others, such as the Adult Manifest Anxiety Scale – Elderly Version (Lowe and Reynolds, 2000), have been modified for use with older adults, and a very few anxiety measures, such as the Short Anxiety Screening Test (SAST; Sinoff *et al.*, 1999), have

https://doi.org/10.1017/S1041610206003504 Published online by Cambridge University Press

been specifically designed for use with older adult populations. Instruments to measure anxiety levels can be constructed as clinician-rated or observational in nature (e.g. the Hamilton Anxiety Scale; Hamilton, 1959; Maier *et al.*, 1988) or can be designed as self-report measures [e.g. the State-Trait Anxiety Inventory (STAI); Spielberger *et al.*, 1970; and the Padua Inventory; Sanavio, 1988].

However, many of these instruments, even those designed specifically for elderly populations, have shortcomings in terms of clinical and/or psychometric utility. These deficiencies fall into three main categories: (1) many inventories (e.g. the Hospital Anxiety and Depression Scale; Zigmond and Snaith, 1983) are found to be poor in detecting anxiety in older samples (Davies *et al.*, 1993); (2) many inventories (e.g. BAI) are less suitable for elderly adults with mild cognitive deficits (e.g. wording of items and/or response sets too long or complex; Pachana *et al.*, 1994); and (3) somatic items in some inventories [e.g. the Goldberg Anxiety and Depression Scale (GADS); Goldberg *et al.*, 1988] fail to reflect the somatic nature of some old adults' manifestations of anxiety disorders (Turnbull, 1989) while resulting in too great an overlap with somatic symptoms of normal aging, co-morbid medical conditions or medication side-effects (e.g. shortness of breath in chronic obstructive pulmonary disorder or cardiac failure, conditions that are relatively prevalent in later life).

In an attempt to overcome the deficiencies of available anxiety self-report measures for this group, a new instrument was designed specifically for use with older people in a range of settings. To maximize clinical utility, the new instrument was designed with the following features: (1) relative brevity (20 items) to minimize fatigue; (2) dichotomous response format for ease of use in the context of poor education or mild cognitive impairment; and (3) minimal somatic symptoms to limit overlap with the symptoms of general medical conditions. The instrument was specifically designed to measure common symptoms of anxiety in the elderly. It was not designed to diagnose specific anxiety disorders, but rather to assess anxiety symptom endorsement across a range of anxiety presentations. We report initial psychometric properties of the scale, data from testing in normal older samples, and pilot data from a small psychogeriatric cohort.

Method

Stage 1 – Development of items

Candidate items were either formulated *de novo* or adapted from existing items and compared with similar items that achieved high sensitivity for detecting anxiety, had the highest correlations with anxiety factors, or were most commonly endorsed by anxious patients in the adult anxiety literature (e.g. Gillis *et al.*, 1995). During this process of selecting item content, a large number of instruments designed to measure anxiety were examined (see Table 1 for a

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Table 1. Extant anxiety questionnaires used in item development

State-Trait Anxiety Inventory (STAI, Speilberger *et al.*, 1970)
Padua Inventory (Sanavio, 1988)
Short Anxiety Screening Test (SAST; Sinoff *et al.*, 1999)
Penn State Worry Questionnaire (PSWQ; Meyer *et al.*, 1990)
Beck Anxiety Inventory (BAI, Beck *et al.*, 1988)
Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983)
Anxiety Screening Questionnaire (ASQ-15; Wittchen and Boyer, 1998).
Adult Manifest Anxiety Scale – Elderly Version (AMAS-E; Lowe and Reynolds, 2000).
Anxiety Control Questionnaire (ACQ; Rapee *et al.*, 1996)
Anxiety Disorders Interview Schedule (DiNardo *et al.*, 1983)
Anxiety Sensitivity Index (ASI; Reiss *et al.*, 1986)
Anxiety Status Inventory (ASI; Zung 1971)
Anxious Thoughts Inventory (ATI; Wells, 1994)
Clinical Anxiety Scale (CAS; Snaith *et al.*, 1982)
FEAR (Krasucki *et al.*, 1999)
Fear Questionnaire (FQ; Marks and Mathews, 1979)
Goldberg Anxiety and Depression Scale (GADS; Goldberg *et al.*, 1988)
Hamilton Anxiety (Rating) Scale (Hamilton, 1959)
Hopkins Symptom Checklist (SCL-90; Derogatis *et al.*, 1973)
Manifest Anxiety Scale (MAS; Taylor, 1953)
Profile of Mood States (POMS; McNair *et al.*, 1971)
Rating Anxiety in Dementia (RAID; Shankar *et al.*, 1999)
Worry Domains Questionnaire (WDQ; Tallis *et al.*, 1994, more widely used version: Tallis *et al.*, 1992)
Worry Scale (Wisocki, 1988)
COPE (Carver *et al.*, 1989)

complete list). From this wide range of instruments, 60 sample items were formulated. These items were chosen to reflect the primary domains covered in existing inventories: fearfulness, worry, metaworry (i.e. worry about worry), cognitions about anxiety, somatic symptoms of anxiety, anxious mood and anxiety sensitivity. These types of items were common across all or almost all extant scales, and broadly reflect anxiety symptomatology without being overly specific to any one type of anxiety disorder. A small number of the chosen items were reverse-scored.

These 60 items were given to a small sample of healthy elderly, and to clinical psychologists and psychiatrists for comment on ease of understanding, age appropriateness of language, and redundancy. The reference group also commented on such dimensions as face and content validity. The final response format, "agree/disagree," was chosen so as to appear less semantically categorical than the "yes/no" format favored in instruments such as the Geriatric Depression Scale (Yesavage *et al.*, 1983). The reference group also favored use of the "agree/disagree" item response format. The item pool was refined and a few items reworded or substituted based on recommendations from this reference

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group. These 60 items were then piloted on two main samples: a large group of healthy community-dwelling elderly enlisted from two different sources and a small outpatient sample of psychogeriatric patients, many of whom had DSM-IV anxiety and depressive disorders. Following this pilot work, a 20-item version of the scale was developed.

Stage 2 – Selection of final items of the Geriatric Anxiety Inventory (GAI) scale and their validation

ITEM TOTAL CORRELATIONS

Responses on the GAI were collected from two samples of older community-dwelling healthy adults drawn from the greater Brisbane metropolitan area: 263 participants (age range 60–90 years; mean age 72.0 years) in a large survey of driving habits and 189 participants (age range 60–88 years; mean age 71.4 years) participating in a study of worry. The samples did not differ on demographics or response characteristics and so were combined to assess the internal consistency of the instrument. The final sample of 452 older adults was 64.4% female with 70% completing high school and/or further education; 56.2% of the sample were married.

Cronbach's α coefficient of the original 60 items was calculated at 0.90. Each item was then correlated with the total scores to identify those 30 items that were most highly correlated with the total score. The final 10 items were discarded to reduce the redundancy of constructs measured, to eliminate long items or those that were potentially problematic across a variety of settings and populations (e.g. those with mild cognitive impairment), and to eliminate the few remaining reverse scored items; items with lower item total correlations were discarded if a choice between two similar items was made. There is a methodological literature (e.g. Green *et al.*, 1993) suggesting that, in factor analyses with questionnaires given to older populations, reverse-scored items often form their own factor, labelled by one author as the "confusion factor." Therefore, we chose to eliminate any reverse scored items to minimize this effect in our target population.

The 20 items that comprise the final version of the GAI are depicted in Table 2. All 20 items had corrected item-total correlations of 0.39 or above, with most above 0.50. The resulting α coefficient for the GAI was 0.91. The GAI total score for this combined initial community sample had a mean of 2.3 (S.D. = 3.8).

Missing data did not affect the initial large community sample, nor did non-response to particular items; it appeared that even the larger and necessarily more redundant 60 items were quite tolerable for elderly adults to complete. The 20-item final scale is well within the recommended minimum number of items for a scale with a single construct (Loewenthal, 2001). Item means for each of the 20 items are also given in Table 2.

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Table 2. Item total correlations

GAI QUESTION		CORRECTED ITEM TOTAL (60)	ITEM MEANS (20)
GAI 1	I worry a lot of the time	0.61	0.16
GAI 4	I find it difficult to make a decision	0.42	0.20
GAI 8	I often feel jumpy	0.48	0.18
GAI 10	I find it hard to relax	0.53	0.13
GAI 11	I often cannot enjoy things because of my worries	0.50	0.07
GAI 12	Little things bother me a lot	0.57	0.21
GAI 17	I often feel like I have butterflies in my stomach	0.59	0.17
GAI 27	I think of myself as a worrier	0.48	0.05
GAI 28	I can't help worrying about even trivial things	0.53	0.11
GAI 29	I often feel nervous	0.38	0.05
GAI 30	My own thoughts often make me anxious	0.57	0.17
GAI 33	I get an upset stomach due to my worrying	0.55	0.14
GAI 34	I think of myself as a nervous person	0.54	0.08
GAI 35	I always anticipate the worst will happen	0.49	0.08
GAI 38	I often feel shaky inside	0.48	0.04
GAI 39	I think that my worries interfere with my life	0.59	0.07
GAI 45	My worries often overwhelm me	0.66	0.12
GAI 47	I sometimes feel a great knot in my stomach	0.49	0.06
GAI 48	I miss out on things because I worry too much	0.46	0.07
GAI 60	I often feel upset	0.51	0.09

GAI, Geriatric Anxiety Inventory.

CONCURRENT VALIDITY

This final 20-item version of the GAI was compared with other measures: the GADS, STAI, BAI, Penn State Worry Questionnaire (PSWQ; Meyer *et al.*, 1990), and the Positive and Negative Affect Schedule (PANAS; Watson *et al.*, 1988). These measures were chosen to provide relevant information on concurrent validity with the GAI. Sample 1 received the GADS and the STAI State Anxiety subscale; sample 2 received the BAI, the PSWQ and the PANAS. Correlations for these are given in Table 3. All these measures were significantly correlated with the GAI in the expected directions, suggesting that the GAI has good concurrent validity.

Stage 3 – Clinical testing of items: further validation

GERIATRIC PSYCHIATRY SAMPLE

The GAI was further tested on a clinical sample consisting of a consecutive series of 46 old people with a mean age of 78.8 years (SD 6.7; range 66–94) attending a community geriatric psychiatry service. Thirty-four (74%) participants were female and 36 (78%) lived in their own homes. The remainder lived in retirement

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Table 3. Correlations of the 20-item Geriatric Anxiety Inventory (GAI) with related measures for two separate samples

SAMPLE	MEASURE	PEARSON CORRELATION COEFFICIENT	*p*-VALUE
Sample 1 ($n = 263$)	GADS-Anxiety	0.57	< 0.001
	STAI-Anxiety	−0.44	< 0.001
Sample 2 ($n = 189$)	BAI	0.63	< 0.001
	PSWQ	0.70	< 0.001
	PANAS-Negative	0.58	< 0.001
	PANAS-Positive	−0.34	< 0.001

GADS, Goldberg Anxiety and Depression Scale; STAI, State-Trait Anxiety Inventory; BAI, Beck Anxiety Inventory; PSWQ, Penn State Worry Questionnaire; PANAS, Positive and Negative Affect Schedule.

villages, aged hostels or nursing homes. All participants were white, English-speaking and free of clinically significant cognitive impairment. Their mean Mini-mental State Examination (MMSE; Folstein *et al.*, 1975) score was 28.1 (SD 1.6; range 25–30). Most participants were either married (28.3%) or widowed (43.5%). Their educational background was mixed, with 47.8% having had high school education or better. DSM-IV diagnoses were established using the Mini-International Neuropsychiatric Interview version 5.0.0 (Sheehan *et al.*, 1998). Eleven (23.9%) participants met diagnostic criteria for a current anxiety disorder, of whom eight (17.4%) had Generalized Anxiety Disorder (GAD). Ten participants met diagnostic criteria for current Major Depressive Disorder (MDD), of whom six had comorbid GAD. Concurrent measures administered included the state component of the STAI (Spielberger *et al.*, 1970) and the GADS (Goldberg *et al.*, 1988). Mean (S.D., range) scores on these scales were: STAI-State 36.3 (13.2, 20–70) and GADS 2.9 (3.4, 0–11).

The mean GAI score for this geriatric psychiatry patient sample ($N = 46$) was 5.22 (S.D. 5.83). Patients meeting DSM-IV criteria for any current anxiety disorder ($N = 11$) achieved a mean GAI score of 10.64 (S.D. 5.87) whereas patients meeting DSM-IV criteria for current GAD ($N = 8$) achieved a mean GAI score of 10.75 (S.D. 6.27). GAI score was not related to age ($r_p = -0.12$, $p = 0.42$), gender [$F(1, 44) = 0.59$, $p = 0.45$] or cognitive function ($r_p = 0.08$, $p = 0.61$). Test–retest reliability was assessed by asking participants to complete the scale again 1 week later ($r_p = 0.91$, $p < 0.0000$). Inter-rater reliability was assessed by having a second rater score the GAI on the basis of an audiotape of participant responses ($r_p = 0.99$, $p < 0.0000$). Concurrent validity was assessed using Pearson product-moment correlations between the GAI and the other two measures of anxiety: GAI × STAI-S ($r_p = 0.80$, $p < 0.0000$);

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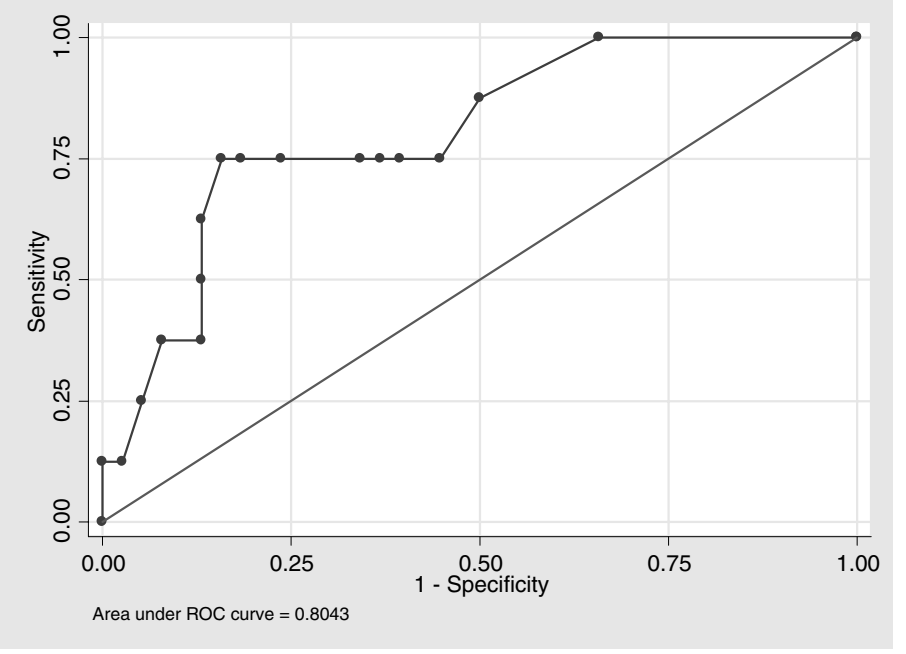


Fig. 1. Receiver operating characteristic (ROC) analysis: 20-item Geriatric Anxiety Inventory (GAI-20) × DSM-IV Generalized Anxiety Disorder (GAD) diagnosis.

GAI × GAS ($r_p = 0.70$, $p < 0.0000$). The ability of the GAI to discriminate between patients with and without any anxiety disorder [$F(1, 44) = 16.87$, $p = 0.0002$] and with and without GAD in particular [$F(1, 44) = 10.56$, $p = 0.0022$] was found to be good. However, there were insufficient participants with either MDD in the absence of GAD or GAD in the absence of MDD to perform a discriminant analysis between participants with only one of these disorders.

Stage 4 – Clinical cut-offs, sensitivity and specificity

We undertook a receiver operating characteristic (ROC) analysis to identify the optimum GAI-20 cut-point to distinguish geriatric psychiatry patients with GAD from those patients without GAD. The area under the ROC curve was 0.80 (95% confidence interval 0.64–0.97) and the optimum cut-point was 10/11 (see Fig. 1). This cut-point correctly classified 83% of patients with a sensitivity of 75% and specificity of 84%. A similar ROC analysis to identify the optimum GAI-20 cut-point to identify patients with any anxiety disorder (not shown) found an optimum cut-point of 8/9, which correctly classified 78% of patients with a sensitivity of 73% and a specificity of 80%.

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Conclusions and recommendations

We have described the development and initial clinical testing of a new brief self-report scale to measure anxiety symptoms in elderly people. Our preliminary data indicate that the 20-item GAI has sound psychometric properties both in normal older people and in a sample of older patients of a geriatric psychiatry service. In developing the GAI, we had the specific intention that it would prove suitable for the measurement of the normal range of anxiety found in community-residing elderly people and also the pathological range of anxiety commonly seen in patients attending geriatric psychiatry services. We believe that the GAI is appropriate for these purposes.

Although GAI score is not significantly related to age or gender, the main limitations to the generalizability of our findings are the relatively small size of our clinical cohort and the ethnic homogeneity of all of our samples.

Further testing of the GAI on a larger sample of psychogeriatric patients, as well as patients in long-term care facilities, patients with dementia of mild severity, and also older people with general medical conditions commonly associated with anxiety symptoms, is required before the instrument can be more generally recommended for clinical practice. However, the promising psychometric properties of the scale and the positive pilot data in our clinical cohort suggest that the GAI could prove useful to mental health professionals working with a range of older people.

Conflict of interest

None.

Description of authors' roles

This paper was jointly conceived and written by N. A. Pachana and G. J. Byrne. All authors made an equal contribution to the statistical design of the studies, and to collecting and analyzing the data.

Acknowledgments

This research was partially supported by grants from the University of Queensland and also in part by participants from the 50+ Registry of the Australasian Centre on Ageing, The University of Queensland, and patients from the Geriatric Psychiatry Service, Royal Brisbane and Women's Hospital.

https://doi.org/10.1017/S1041610206003504 Published online by Cambridge University Press

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