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Performance of the Goldberg Anxiety and Depression Scale in older women

SIR—The exact nature of the relationship between anxiety and depression in older people remains unclear, as evidence suggests that older adults are more likely than younger adults to manifest mixed anxiety and depression [1–4]. There is a frequent co-occurrence of anxiety and depression in older people in community-based studies, clinical settings and in institutions [5,6]. Data also suggest that the distinctive features of anxiety and depression become less pronounced with increasing age [7], and that the experience of anxiety and depression may in fact differ qualitatively with increasing age [8].

The Goldberg Anxiety and Depression Scale (GADS) is an 18-item self-report symptom inventory that was developed by Goldberg and colleagues from 36 items in the Psychiatric Assessment Schedule [9]. The GADS has been used in several studies of community-dwelling older adults [10]. McKinnon *et al.* (1994) [7] administered it to 832 older community-dwelling residents from Canberra, Australia (mean age = 76 years, SD = 4.9). Latent trait analyses demonstrated that the GADS items defined two correlated dimensions of anxiety and depression, with a third sleep disturbance factor also detected [7]. Christensen *et al.* (1999) [8] used structural equation modelling and found anxiety and depression to be highly correlated but distinct entities.

More recently, Schoevers *et al.* (2003) [11] evaluated a sample of 4051 older community-dwelling persons living in Amsterdam. Using clinical psychiatric diagnoses [12] they demonstrated support for a single continuous-scale variable comprising both generalised anxiety disorder and depression, with mixed anxiety-depression representing the most severe end of the continuum.

We aim to extend previous work with the GADS by exploring the relationship between anxiety and depression in a large-scale national population sample of older Australian women.

Methods

Participants

Participants were selected from the older cohort of The Australian Longitudinal Study on Women's Health (ALSWH), which has been running since 1996. Characteristics of the participants have been described elsewhere [13]; details of attrition over time (in this age group mainly through death or frailty) have been given by Lee *et al.* (2005) [14]. This analysis is based on data from the third survey of the older cohort conducted in 2002 when the women were aged 75–80 years.

Measures

The GADS score is based on responses of 'yes' or 'no' to nine depression and nine anxiety items, asking how respondents have been feeling in the past month. Goldberg *et al.* (1988) considered patients with anxiety scores of 5 or more or with depression scores of 2 or more as having a 50% chance of a clinically important disturbance [10].

General mental health was measured using the Australian standard version of the Medical Outcomes Study SF-36, a widely used measure of self-reported health [15,16]. Five items from the general mental health sub-scale (MH) were used in this analysis [17]. The anxiety items used from this scale were 'Have you been a very nervous person?' and 'Have you felt calm and peaceful?' The depression items were 'Have

you felt so down in the dumps that nothing could cheer you up?', 'Have you felt down?' and 'Have you been a happy person?'. Responses are coded from 1 to 6 and summed to give separate scores for anxiety and depression. Participants with scores in the top deciles for anxiety and depression separately were arbitrarily considered to meet criteria for these conditions.

Self-reported medical conditions and medications prescribed were also incorporated. These included responses to the questions such as: 'In the last 3 years have you been diagnosed with or treated for . . .', followed by a list of conditions which included 'anxiety/nervous disorder' and 'depression'.

Data analyses

The dimensionality of responses to the GADS was examined using latent trait analysis for binary responses performed using NOHARM87 [18]. This method was also used by Goldberg *et al.* [9] and Mackinnon *et al.* [7]. Factor loadings from latent trait analysis can be interpreted in a similar way to loadings obtained from conventional factor analysis for continuous-scale responses, and factor loadings can be similarly rotated to assist interpretation [19].

Exploratory analysis forcing one, two and three dimensions was conducted. The two- and three-factor solutions were rotated using the PROMAX method [19]. Confirmatory analysis was performed with the nine anxiety and nine depression items proposed by Goldberg *et al.* [9], set to load on separate but correlated factors with item loadings on the alternative factor set to zero. Goodness-of-fit of the latent trait models was summarised by the root mean square of residuals and Tanaka's index [20]. For the root mean square of residuals, zero indicates a perfect fit and larger values indicate poorer fit. The reverse is true for Tanaka's index zero, with values exceeding 0.8 considered an acceptable fit. Cronbach's alpha was used to assess the extent to which items could be regarded as measuring a single latent variable.

Results

Numbers of respondents

Of the 12,432 women initially recruited into the study, 90% (10,434) who were eligible responded to Survey 2 and 85% (8,647) responded to Survey 3. Most of the data reported here are from the 7,264 women who completed all 18 GADS items (1,383 or 16% missed at least one of these items).

Responses to GADS items

The percentage of women responding with a 'yes' to GADS items ranged from 7 to 62%; the percentage missing any one item ranged from 2 to 4%.

Latent trait analysis

Results from exploratory and confirmatory latent trait analysis are shown in Table 1. For the one-dimensional solution all items had moderate to high loadings. The two-dimensional solution suggested that 15 anxiety and depression items formed one factor, and 3 sleep-related items formed the other factor. The correlation between these two factors was 0.60. The three-dimensional solution suggested that 4 anxiety items formed one factor, 11 depression (and anxiety) items formed a second factor and 3 sleep-related items formed a third factor. There was high correlation (0.76) between the first two dimensions, and moderate correlation between these and the sleep-related dimension (0.45 and 0.46). For all exploratory analyses of the GADS items relating to 'headaches or neck aches', 'lost weight/poor appetite' and 'waking early' had the lowest loadings (below 0.5).

All models fit the data very well. Improvements in fit from the one- to the two-dimensional, and from the two- to the three-dimensional solutions were not substantial. High correlations between factors for the higher-order solutions support the optimality of the one-dimensional solution.

The confirmatory latent trait solution fitted almost as well as the one-dimensional solution from the exploratory analysis (Table 1). Thus, the confirmatory analysis did not support the separation of the anxiety and depression sub-scales. There was substantial correlation between the various GADS sum scores. For example, the sum score of all items was highly correlated with the anxiety sub-scale (0.93) and the depression sub-scale (0.89).

GADS versus other measures of anxiety and depression

More women met the criteria for both anxiety and depression (13.1%) using the GADS compared with self-reported doctor diagnosis (1.9%), medication usage (4.3%) or SF-36 sub-scale (5.4%) (see Table 2). For anxiety alone, there was poor agreement between GADS and the other measures with kappa values of −0.13 to 0.28; for depression alone also agreement was poor with values of 0.02 to 0.10.

Discussion

This study provides support for the proposition that anxiety and depression in older women may be viewed as a unitary construct. Anxiety and depression dimensions of the GADS were highly correlated, suggesting they measure the same or very similar concepts. Our results confirm those of McKinnon *et al.* [7] who assessed the GADS in a smaller sample of older Australian males and females, but differ from those of Goldberg *et al.* [10] who found high sensitivity for both the anxiety and depression scales in a much younger sample of medical patients in the United Kingdom using clinical criteria as the gold standard.

Our data adds further support to speculation that there are qualitative differences in the expression and co-morbidity of anxiety and depression in later life. Previous studies have shown that older adults are more likely than younger adults to manifest a mixture of anxiety and depression [1–4] while the

Table 1. Exploratory and confirmatory latent trait analyses of GADS: factor loadings for 1, 2 and 3 dimensions for the Goldberg anxiety and depression scale, for $n = 7,264$ women who responded to all 18 items in Survey 3 (loadings greater than 0.40 are shown in bold)

		Exploratory 1D	Exploratory 2D		Exploratory 3D			Confirmatory 2D	
		Unrotated	Promax 1	Promax 2	Promax 1	Promax 2	Promax 3	Anxiety	Depression
	Anxiety								
A	Have you felt keyed-up or on edge?	**0.75**	**0.67**	0.13	**1.03**	−0.17	0.01	**0.78**	0
B	Have you been worrying a lot?	**0.76**	**0.66**	0.15	**1.04**	−0.19	0.03	**0.79**	0
C	Have you been irritable?	**0.68**	**0.63**	0.08	**0.63**	0.10	0.02	**0.70**	0
D	Have you had difficulty relaxing?	**0.79**	**0.52**	0.36	**0.69**	−0.02	0.29	**0.82**	0
E	Have you been sleeping poorly?	**0.67**	−0.12	**1.07**	0.06	0.00	**0.97**	**0.69**	0
F	Have you had headaches or neck aches?	0.45	0.36	0.12	−0.03	**0.41**	0.13	**0.46**	0
G	Have you had any of the following: trembling, tingling, dizzy spells, sweating, diarrhoea or needing to pass urine more often than usual?	**0.57**	**0.53**	0.08	0.00	**0.54**	0.10	**0.58**	0
H	Have you been worried about your health?	**0.70**	**0.70**	0.03	0.18	**0.55**	0.03	**0.71**	0
I	Have you had difficulty falling asleep?	**0.56**	−0.14	**0.92**	0.00	0.01	**0.85**	**0.58**	0
	Depression								
J	Have you been lacking energy?	**0.78**	**0.81**	0.01	−0.25	**1.05**	0.06	0	**0.85**
K	Have you lost interest in things?	**0.72**	**0.87**	−0.16	0.32	**0.57**	−0.15	0	**0.78**
L	Have you lost confidence in yourself?	**0.70**	**0.89**	−0.20	0.29	**0.61**	−0.18	0	**0.76**
M	Have you felt hopeless?	**0.78**	**0.89**	−0.12	0.35	**0.57**	−0.11	0	**0.84**
N	Have you had difficulty concentrating?	**0.64**	**0.72**	−0.07	0.25	**0.50**	−0.06	0	**0.69**
O	Have you lost weight due to poor appetite?	**0.46**	**0.49**	−0.03	0.11	0.40	−0.02	0	**0.49**
P	Have you been waking early?	0.38	0.04	**0.43**	0.07	0.05	**0.39**	0	0.39
Q	Have you felt slowed down?	**0.74**	**0.79**	−0.02	−0.29	**1.04**	0.05	0	**0.80**
R	Have you tended to feel worse in the mornings?	**0.55**	**0.50**	0.07	−0.14	**0.65**	0.10	0	**0.58**
Root mean squares of residuals			0.0082			0.0041			0.0116
Tanaka index of goodness-of-fit			0.9882			0.9969			0.9761
Factor correlations 1 and 2			0.60			0.76			0.83
Factor correlations 1 and 3						0.45			
Factor correlations 2 and 3						0.46			

Table 2. Prevalence of anxiety and/or depression using the GADS and other measures for $n = 7,264$ women who responded to all 18 items in Survey 3

Measure	Neither (%)	Anxiety only (%)	Depression only (%)	Both—anxiety and depression (%)
GADS	51.1	1.3	34.5	13.1
Doctor diagnosis	90.1	3.3	4.7	1.9
Medication use	91.3	2.4	2.1	4.3
SF-36 MH[a]	84.5	3.1	6.7	5.4

[a] For SF-36 MH data were only available for $n = 7,197$ women.

distinctive features of anxiety and depression may become less pronounced with increasing age [7].

Another potential explanation for the high correlation between anxiety and depression in the GADS could be the higher prevalence (13%) of a possible mixed anxiety-depression syndrome in our sample relative to other samples. Schoevers *et al.* [11] found a prevalence of mixed anxiety-depression of only 1.8% in older community-living residents using standardised psychiatric interviews; this is more similar to our results using criteria other than GADS. Alternatively, the thresholds of the GADS scores may have been set too low as they were based on 'having a 50% chance of a clinically important disturbance' [10]. The higher prevalence of depression than anxiety based on either GADS or the SF-36 sub-scale is as expected, although depression is more common at all ages in women than men, and the results may not be generalisable to older males.

The range of scores exhibited on the GADS, and the small proportion of missing data further support the use of the GADS as an acceptable instrument to measure anxiety

and depression among older women but it cannot distinguish between these two conditions.

Key points

- Anxiety and depression in older women may be viewed as a unitary construct.
- There are qualitative differences in the expression and co-morbidity of anxiety and depression in later life.
- The GADS is an acceptable instrument that can distinguish between older women with and without mental health problems.

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Conflicts of interest

None.

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Rapidly progressive Alzheimer's disease and elevated 14-3-3 proteins in cerebrospinal fluid

SIR—A 74-year-old Scottish male was admitted to a university hospital after being found on the floor of his home, following a 5-week history of vomiting, difficulty preparing meals, weight loss, loss of interest in hobbies, decreased mobility, impaired driving skills and myoclonus. His family and friends were adamant that his cognition and function were normal until 5 weeks earlier. His past medical history included hypertension, hypercholesterolaemia and Meniere's disease. He had no known family history of any disease. He emigrated to Australia over 40 years ago, but revisited the United Kingdom