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Age-related changes in generalized anxiety disorder symptoms

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ABSTRACT

Background: Little is known about the effects of age on the symptoms of anxiety disorder. Accordingly, this study sought to investigate age-related differences in the number and kind of symptoms that distinguish between individuals with and without a diagnosis of generalized anxiety disorder (GAD).

Methods: A sample of 3,486 self-reported worriers was derived from Wave 1 of the National Epidemiological Survey of Alcohol and Related Conditions (NESARC), an epidemiological survey of mental health conducted in the USA in 2001–2002. Participants were stratified into the following age groups (18–29 years, 30–44 years, 45–64 years, 65–98 years), and then divided into diagnostic groups (GAD and non-GAD worriers).

Results: Binary logistic regression analyses revealed that four distinct sets of symptoms were associated with GAD in each age group, and that numerically fewer symptoms were associated with GAD in older adults. Moreover, there were graduated changes in the type and number of symptoms associated with GAD in each successive age group.

Conclusions: There are graduated, age-related differences in the phenomenology of GAD that might contribute to challenges in the detection of late-life anxiety.

Key words: anxiety, GAD, older adult, diagnosis, symptom presentation, assessment

Introduction

Anxiety disorders are among the most highly prevalent mental disorders in older people (Kessler *et al.*, 2005; Bryant *et al.*, 2008; Byers *et al.*, 2010). However, diagnosis and treatment of late-life anxiety – particularly generalized anxiety disorder (GAD) – are challenging due in significant part to an insufficient understanding of age influences on symptom presentation and diagnostic status (Flint, 2005; Wetherell *et al.*, 2005; Bryant *et al.*, 2008; Wolitzky-Taylor *et al.*, 2010; Lenze and Wetherell, 2011a; 2011b; Mohlman *et al.*, 2011).

Previous studies have aimed to identify differences in the manifestation of worry symptoms – both quantitative and qualitative – between younger and older adults. These studies have demonstrated that older adults typically endorse numerically fewer worries relative to younger adults, and that the content of their worries is also distinctive (Basevitz *et al.*, 2008; Gould and Edelstein, 2010; Gonçalves and Byrne, 2013). For instance, Basevitz *et al.* (2008) found that older adults reported less intolerance of uncertainty and less belief in the functional value of worrying than younger adults; Gonçalves and Byrne (2013) found that older adults tend to worry more about the health and welfare of loved ones, whereas younger adults tend to worry more about work and interpersonal relations; and Gould and Edelstein (2010) found that younger adults report having less control over their anxiety. These findings suggest that anxiety symptoms in general, and worry in particular, can manifest differently as a function of age. However, such findings are not particularly informative about the impact of age differences on diagnostic status.

An alternative approach has been to identify differences in symptom presentation between individuals with and without current GAD diagnoses. Older adults with GAD can be differentiated from asymptomatic older adults and older adults with sub-threshold anxiety by higher frequency of worry, uncontrollability of worry, higher levels of distress and impairment, muscle tension, and sleep disturbance (Diefenbach *et al.*, 2003; Wetherell *et al.*, 2003). The observation that muscle tension and sleep disturbance differentiate between older adults with and without GAD is

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perhaps the most clinically informative data, given that the other anxiety symptoms (i.e. excessive and uncontrollable worry, distress and impairment) are integral to a GAD diagnosis. However, it is important to note that muscle tension and sleep disturbance can arise from a variety of causes, including medication use, as well as being part of the physical changes associated with normal aging (Wetherell *et al.*, 2003). Moreover, given the relatively small sample sizes in these studies, it is unclear whether these findings generalize to the population at large. Finally, lack of young adult comparison groups makes it difficult to draw conclusions about age effects. Thus, a better understanding of how age influences symptom presentation and diagnostic status in anxiety is still needed, particularly in terms of differentiating between self-reported worriers with and without GAD across the lifespan.

The purpose of this study was to determine the type and number of symptoms that best predict GAD across the lifespan using a nationally representative dataset. We hypothesized that a distinct set of symptoms would characterize GAD in older adults, and that overall fewer symptoms would characterize GAD in older adults.

Method

Sample

The National Epidemiological Survey of Alcohol and Related Conditions (NESARC) was conducted in 2001–2002 by the U.S. Bureau of the Census and sponsored by the National Institute of Alcohol Abuse and Alcoholism (NIAAA). The NESARC consists of a nationally representative sample of civilian, non-institutionalized adults (age range 18–98 years; $N = 43{,}093$) sampled from all 50 US states and the District of Columbia. The overall response rate was 81%. Face-to-face interviews were conducted by trained lay interviewers using the Alcohol Use Disorder and Associated Disabilities Interview Schedule – DSM-IV version (AUDADIS-IV). African-Americans, Hispanics, and young adults were purposively oversampled, and data were adjusted for oversampling and non-response. Sampling weights were based on census data.

Participants who responded affirmatively to one of two screening questions ("Ever had a 6+ month period during which you felt: (a) tense/nervous/worried most of the time; or (b) very tense/nervous/worried most of the time about everyday problems") were included in this study, because they were further assessed for overall GAD symptoms.

Measures

Twelve-month non-hierarchical GAD diagnoses were obtained with the AUDADIS-IV, based on DSM-IV criteria. Socio-demographic characteristics, including gender, education (some college or higher, completed high school, less than high school), personal income (0–9,999, 10,000–34,999, 35,000+ USD), marital status (married/cohabiting, widowed/divorced/separated, never married), urbanicity (urban, rural), geographic region (Northeast, Midwest, South, West), and self-perceived health (excellent, very good, good, fair, poor) were accounted for in all analyses.

Procedure

Participants were classified into one of the four age groups (18–29; 30–44; 45–64; 65–98 years), and one of the two diagnostic groups (12-month GAD; or No Current GAD diagnosis). Tables 1–4 indicate the distribution of participants across age and diagnostic groups. Self-reported symptoms were compared between diagnostic classes within each age group to assess the features that best differentiate between those with GAD and their age-matched counterparts, which resulted in four sets of binary logistic regression analyses, corresponding to one per age group.

Statistical analyses

All statistical analyses were conducted using Stata 12.0 (Statacorp, 2011). Appropriate survey commands were used to account for the complex survey design of the NESARC. Raw frequencies, weighted proportions, and chi-square tests were calculated within age groups and between diagnostic groups. A series of chi-square tests, comparing the proportion of each symptom between individuals with GAD and non-GAD worriers in each age group only warranted the exclusion of one variable from further analyses: "in worst period, ever found it difficult to stop being tense, nervous, or worried," which perfectly discriminated between diagnostic groups due to this symptom being an integral part of a GAD diagnosis (for proportions of responses to each symptom, see Supplementary Tables S1–S4 available as supplementary material attached to the electronic version of this paper at www.journals.cambridge.org/jid_IPG). Odds ratios (ORs) derived from weighted logistic regression analyses were used to indicate the utility of specific symptoms for predicting GAD group membership within each age group, after controlling for sociodemographic and health variables.

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Table 1. Socio-demographic characteristics of 18–29-year-olds, by current GAD diagnosis

	RAW FREQUENCIES AND WEIGHTED PROPORTIONS					
	GAD ($n = 186$)		CONTROL ($n = 313$)		TEST STATISTIC	SIGNIFICANCE
Sex						
Male	59	35.35	117	41.82	$\chi^2(1) = 1.637$	$p = 0.201$
Female	127	64.65	196	58.18		
Education						
Some college or higher	88	46.44	141	48.23	$\chi^2(2) = 0.5761$	$p = 0.750$
Completed high school	65	34.91	108	34.42		
Less than high school	33	18.65	64	17.35		
Personal income						
35,000+	21	13.09	36	11.88	$\chi^2(2) = 0.0367$	$p = 0.982$
10,000–34,999	76	42.23	130	39.47		
0–9,999	89	44.69	147	48.65		
Marital status						
Married, cohabiting	58	38.31	110	36.43	$\chi^2(2) = 5.4606$	$p = 0.065$
Widowed, divorced, separated	23	9.82	20	6.35		
Never married	105	51.86	183	57.22		
Urbanicity						
Rural	36	19.48	44	15.61	$\chi^2(1) = 2.432$	$p = 0.119$
Urban	150	80.52	269	84.39		
Self-perceived health						
Excellent	42	20.32	77	23.64	$\chi^2(4) = 12.068$	$p = 0.017^*$
Very good	53	33.75	98	33.12		
Good	46	24.62	100	33.55		
Fair	35	16.47	31	7.79		
Poor	9	4.84	7	1.90		

$^*p < 0.05$; Pearson's χ^2-test conducted for all comparisons.

Results

Socio-demographic characteristics of the sample

The total sample of self-reported worriers consisted of 3,486 participants. The 18–29-year-old subgroup consisted of 499 participants ($M_{age} = 24$; 61% female), the 30–44-year-old subgroup consisted of 1,031 participants ($M_{age} = 38$; 64% female), the 45–64-year-old subgroup consisted of 1,319 participants ($M_{age} = 53$; 61% female), and the 65–98 subgroup consisted of 637 participants ($M_{age} = 75$; 71% female). Eighty-four percent of the total sample had completed a high school education, with 54% having completed at least some college. Seventy percent reported having a personal annual income of less than $35,000, and 78% of participants lived in an urban region. The overall marriage distribution was as follows: 56% married or cohabiting; 27% widowed, divorced or separated; and 16% never married. Sixty-nine percent of the sample reported that their health was good, very good, or excellent. A total of 988 participants, representing slightly more than one quarter of this screen positive sample, had a 12-month GAD diagnosis. See Tables 1–4 for participants' sociodemographic characteristics stratified by age and diagnostic groups.

Number of symptoms

A set of binary logistic regression analyses was conducted within each age group, with GAD group membership (coded GAD, 1, no GAD, 0) as the outcome variable and GAD symptoms as the predictor variables (See Table 5 for summary of analyses and Supplementary Table S5 (available online) for full analyses). These revealed that fewer symptoms differentiated between individuals with and without GAD in each successively older age group. In the 18–29-year-old group seven symptoms distinguished between diagnostic groups, in the 30–44-year-old group six symptoms distinguished between diagnostic groups, in the 45–64-year-old group five symptoms and one sociodemographic variable distinguished between diagnostic groups, whereas in the older adult (65–98-year-old) group only three symptoms and one sociodemographic variable differentiated between those with and without GAD.

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Table 2. Socio-demographic characteristics of 30–44-year-olds, by current GAD diagnosis

	RAW FREQUENCIES AND WEIGHTED PROPORTIONS					
	GAD ($n = 347$)		CONTROL ($n = 684$)		TEST STATISTIC	SIGNIFICANCE
Sex						
Male	86	27.86	245	40.72	$\chi^2(1) = 12.86$	$p = 0.000^{***}$
Female	261	72.14	439	59.28		
Education						
Some college or higher	198	54.90	422	61.37	$\chi^2(2) = 2.56$	$p = 0.278$
Completed high school	105	31.87	176	26.96		
Less than high school	44	13.23	86	11.67		
Personal income						
35,000+	110	29.56	262	38.36	$\chi^2(2) = 4.92$	$p = 0.085$
10,000–34,999	126	36.59	237	33.60		
0–9,999	111	33.85	185	28.03		
Marital status						
Married, cohabiting	161	58.98	345	64.14	$\chi^2(2) = 3.89$	$p = 0.143$
Widowed, divorced, separated	117	25.67	190	19.68		
Never married	69	15.35	149	16.18		
Urbanicity						
Rural	70	21.98	114	18.86	$\chi^2(1) = 1.93$	$p = 0.165$
Urban	277	78.02	570	81.14		
Region						
Northeast	70	19.20	130	18.17	$\chi^2(3) = 1.46$	$p = 0.692$
Midwest	91	29.06	161	25.24		
South	118	30.44	251	35.57		
West	68	21.31	142	21.01		
Self-perceived health						
Excellent	54	15.02	162	24.83	$\chi^2(4) = 42.52$	$p = 0.000^{***}$
Very good	71	22.83	211	31.23		
Good	92	24.14	170	25.27		
Fair	80	21.77	92	11.76		
Poor	50	16.24	48	6.90		

$^{***}p < 0.0001$; Pearson's χ^2-test conducted for all comparisons.

Types of symptoms

Inspection of the binary logistic regression findings further revealed that a qualitatively different set of symptoms predicted GAD group membership in each age group. In the 18–29-year age group, "got tired easily" (OR = 2.08; 95% CI: 1.03 – 4.18), "had tense, sore, or aching muscles" (OR = 4.62; 95% CI: 2.48 – 8.61), "became so restless you fidgeted, paced, could not sit still" (OR = 0.33; 95% CI: 0.14 – 0.77), "felt keyed up or on edge" (OR = 2.98; 95% CI: 1.27 – 6.99), "felt irritable" (OR = 2.38; 95% CI: 1.01 – 5.59), "had trouble falling/staying asleep" (OR = 2.28; 95% CI = 1.18 – 4.41), and "had dry mouth" (OR = 3.09; 95% CI = 1.24 – 7.70) best distinguished between self-reported worriers with and without GAD.

In the 30–44-year age group, "got tired easily" (OR = 2.22; 95% CI: 1.27 – 3.90), "had tense, sore, or aching muscles" (OR = 1.67; 95% CI: 1.08 – 2.57), "had trouble concentrating/ keeping mind on things" (OR = 2.14; 95% CI: 1.17 – 3.91), "felt irritable" (OR = 2.26; 95% CI: 1.22 – 4.22); "had difficulty swallowing/felt like lump in throat" (OR = 0.50; 95% CI: 0.28 – 0.87), and "had trouble catching breath, felt like smothering" (OR = 2.65; 95% CI: 1.44 – 4.88) best distinguished between self-reported worriers with and without GAD.

In the 45–64-year age group, "got tired easily" (OR = 1.92; 95% CI: 1.14–3.22), "often felt keyed up or on edge" (OR = 1.74; 95% CI: 1.02 – 2.97), "had trouble falling/staying asleep" (OR = 2.71; 95% CI: 1.64 – 4.47), "forgot what talking about/mind went blank" (OR = 2.06; 95% CI: 1.34 – 3.18) and "urinated frequently" (OR = 1.69; 95% CI: 1.10 – 2.59) best distinguished between self-reported worriers with and without GAD.

In the 65–98-year age group, low personal income (OR = 3.51; 95% CI = 1.07 – 11.43), "had trouble concentrating/keeping mind on things" (OR = 3.57; 95% CI = 1.62 – 7.89), "felt dizzy/lightheaded/like might faint" (OR = 3.02; 95% CI = 1.37 – 6.70), and "often had nausea,

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Table 3. Socio-demographic characteristics of 45–64-year-olds, by current GAD diagnosis

	RAW FREQUENCIES AND WEIGHTED PROPORTIONS					
	GAD ($n = 356$)		CONTROL ($n = 963$)		TEST STATISTIC	SIGNIFICANCE
Sex						
Male	104	31.82	357	40.88	$\chi^2(1) = 7.06$	$p = 0.008^{**}$
Female	252	68.18	606	59.12		
Education						
Some college or higher	185	54.19	579	60.88	$\chi^2(2) = 8.83$	$p = 0.012^{*}$
Completed high school	99	30.47	244	26.93		
Less than high school	72	15.34	140	12.18		
Personal income						
35,000+	99	27.55	361	40.60	$\chi^2(2) = 26.26$	$p = 0.000^{***}$
10,000–34,999	103	28.14	327	31.15		
0–9,999	154	44.31	275	28.26		
Marital status						
Married, cohabiting	148	57.76	462	63.60	$\chi^2(2) = 5.56$	$p = 0.062$
Widowed, divorced, separated	161	34.60	406	30.10		
Never married	47	7.64	95	6.29		
Urbanicity						
Rural	89	27.74	208	24.74	$\chi^2(1) = 1.723$	$p = 0.189$
Urban	267	72.26	755	75.26		
Region						
Northeast	63	15.36	173	17.85	$\chi^2(3) = 3.06$	$p = 0.383$
Midwest	74	24.06	237	27.80		
South	133	36.43	318	30.98		
West	86	24.14	235	23.36		
Self-perceived health						
Excellent	30	8.73	170	18.69	$\chi^2(4) = 67.46$	$p = 0.000^{***}$
Very good	47	16.97	231	24.05		
Good	73	21.60	230	25.55		
Fair	107	26.91	193	18.27		
Poor	99	25.78	139	13.44		

$^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.0001$; Pearson's χ^2-test conducted for all comparisons.

upset stomach, felt like vomiting or diarrhea" (OR = 0.39; 95% CI = 0.16 – 0.98) best distinguished between self-reported worriers with and without GAD.

Discussion

The most salient findings of this study are as follows. First, among screen positive worriers a distinct set of symptoms predicted GAD in each age group. Second, numerically fewer symptoms predicted GAD in older adults compared to all other age groups. Third, changes in the type and number of symptoms that predicted GAD occurred gradually across the lifespan. The results underscore important age differences in GAD symptom presentation, and further suggest that such differences in the degree and kind of symptoms that distinguish between self-reported worriers with and without GAD can be invoked to explain some of the challenges surrounding the detection of late-life GAD.

In the 65-year and older age group, (i) difficulty concentrating and keeping mind on things, and (ii) feeling dizzy, lightheaded, or like fainting were positive predictors of GAD, and (iii) had nausea, upset stomach, felt like vomiting or diarrhea was a negative predictor of GAD. Moreover, a sociodemographic variable, low personal income was a positive predictor of GAD in older adults. At first glance, these findings are apparently at odds with a previous study by Wetherell *et al.* (2003), which suggested that sleep disturbance and fatigue are useful for distinguishing between older adults with and without GAD. The results of the present study demonstrate that these symptoms have utility for distinguishing between individuals with and without GAD in the other age groups, but not in the older adult group. Upon closer examination of the Wetherell *et al.* study, however, we conclude that both sets of findings are compatible. Wetherell and colleagues found that sleep disturbance and fatigue distinguished between the sub-syndromal

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Table 4. Socio-demographic characteristics of 65–98-year-olds, by current GAD diagnosis

	RAW FREQUENCIES AND WEIGHTED PROPORTIONS					
	GAD ($n = 99$)		CONTROL ($n = 538$)		TEST STATISTIC	SIGNIFICANCE
Sex						
Male	17	18.31	144	30.39	$\chi^2(1) = 4.075$	$p = 0.044^*$
Female	82	81.69	394	69.61		
Education						
Some college or higher	25	31.46	201	38.00	$\chi^2(2) = 6.96$	$p = 0.031^*$
Completed high school	31	33.14	167	33.91		
Less than high school	43	35.40	170	28.09		
Personal income						
35,000+	11	15.33	116	22.47	$\chi^2(2) =$	$p = 0.000^{***}$
10,000–34,999	32	29.10	234	42.37	17.2834	
0–9,999	56	55.58	188	35.16		
Marital status						
Married, cohabiting	26	37.50	189	48.74	$\chi^2(2) = 2.9475$	$p = 0.224$
Widowed, divorced, separated	68	57.80	326	47.15		
Never married	5	4.70	23	4.11		
Urbanicity						
Rural	23	23.52	116	23.7	$\chi^2(1) = 0.1369$	$p = 0.711$
Urban	76	76.48	422	76.3		
Region						
Northeast	21	15.85	110	21.37	$\chi^2(3) = 1.2913$	$p = 0.731$
Midwest	24	26.31	137	27.10		
South	38	38.18	182	31.06		
West	16	19.66	109	20.47		
Self-perceived health						
Excellent	4	5.43	50	8.70	$\chi^2(4) = 25.241$	$p = 0.000^{***}$
Very good	9	12.75	103	20.00		
Good	21	22.31	169	32.75		
Fair	33	28.35	130	24.05		
Poor	32	31.15	86	14.50		

$^*p < 0.05$; $^{***}p < 0.0001$; Pearson's χ^2-test conducted for all comparisons, unless $n \leq 5$ for a given cell (Fisher's exact).

and asymptomatic groups, but did not distinguish between GAD and sub-syndromal groups. In the present study, the control group is more akin to the sub-syndromal group in the Wetherell *et al.* study than to the asymptomatic group. In our study, only participants who answered affirmatively to one of the screening questions (indicating that they worried frequently in the past six months) were included in the final sample, and all participants who did not subsequently receive a GAD diagnosis were included as controls. Participants who did not endorse one of the screening questions (i.e. asymptomatic participants) were not assessed on the anxiety portion of the diagnostic interview, and therefore could not be included in our study.

Although we acknowledge that inclusion of an asymptomatic control group could have provided for more thorough comparisons, we do not believe that the absence of an asymptomatic group is a major limitation of this study. Clinical decisions involving asymptomatic adults are typically straightforward. Difficult GAD diagnoses most often rely on the clinician's ability to distinguish between individuals with pathological and non-pathological anxiety, rather than between individuals with pathological anxiety and those with a relative absence of anxiety symptoms. For this reason, we believe that these findings are of particular clinical significance. A second issue concerns the fact that we did not control for co-morbid psychiatric conditions. We believe that future studies, designed specifically to address issues related to co-morbidity, would be better suited to account for such variables.

The present results demonstrate two novel ways in which age impacts the presentation of GAD symptoms and diagnostic outcomes. We believe that these results are particularly interesting in light of a heretofore unresolved question regarding late-life anxiety. It has been widely observed that

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Table 5. Summary of binary logistic regression analyses showing symptoms that significantly distinguished between self-reported worriers with and without GAD in each age group

18–29-YEAR-OLDS: ODDS RATIO (95% CI)	30–44-YEAR-OLDS: ODDS RATIO (95% CI)	45–64-YEAR-OLDS: ODDS RATIO (95% CI)	65–98-YEAR-OLDS: ODDS RATIO (95% CI)
1. Got tired easily: 2.08 (1.03–4.18)*	1. Got tired easily: 2.22 (1.27–3.90)**	1. Got tired easily: 1.92 (1.14–3.22)*	1. Had trouble concentrating/keeping mind on things: 3.57 (1.62–7.89)**
2. Had tense, sore, or aching muscles: 4.62 (2.48–8.61)***	2. Had tense, sore, or aching muscles: 1.67 (1.08–2.57)*	2. Had trouble falling/staying asleep: 2.71 (1.64–4.47)***	2. Felt dizzy/lightheaded; like might faint: 3.02 (1.37–6.70)**
3. Felt keyed up or on edge: 2.98 (1.27–6.99)*	3. Had trouble concentrating/keeping mind on things: 2.14 (1.17–3.91)*	3. Forgot what talking about/mind went blank: 2.06 (1.34–3.18)***	3. Had nausea, upset stomach, felt like vomiting, or diarrhea: 0.39 (0.16–0.98)*
4. Felt irritable: 2.38 (1.01–5.59)*	4. Felt irritable: 2.26 (1.22–4.22)*	4. Felt keyed up or on edge: 1.74 (1.02–2.97)*	
5. Had trouble falling/staying asleep: 2.28 (1.18–4.41)*	5. Had trouble swallowing/felt like lump in throat: 0.50 (0.28–0.87)*	5. Urinated frequently: 1.69 (1.10–2.59)*	
6. Had dry mouth: 3.09 (1.24–7.70)*	6. Had trouble catching breath/felt like smothering: 2.65 (1.44–4.88)**		

*$p = 0.05$; **$p = 0.01$; ***$p = 0.001$.
Note: Results of full binary logistic regression analyses can be found in Supplementary Table S5 (available online).

prevalence estimates of anxiety disorders and the frequency of anxiety symptoms decrease into older adulthood (e.g. Kessler *et al.*, 2005; Gonçalves and Byrne, 2013). However, sub-threshold anxiety symptoms (in the absence of a disorder) are highly prevalent, and individuals with sub-threshold anxiety symptoms are similar to threshold symptom groups in terms of shared health characteristics (Bryant *et al.*, 2008; Grenier *et al.*, 2011). It remains unclear whether decreases in the prevalence of disorders and the frequency of symptoms reflect age-related reductions in pathological anxiety, or whether these trends reflect the absence of age-appropriate criteria for older adults. We endorse the latter view, and believe that under-diagnosis of GAD in older adults could be partly attributed to the observations that older adults tend to endorse fewer symptoms compared to younger adults, that fewer symptoms are associated with GAD in older adults, and that these symptoms are qualitatively different to those observed in younger adults.

We will pursue these findings by investigating whether older adulthood is also associated with a lower threshold of symptoms required to meet the disability/distress criterion. If a lower magnitude of symptoms accounts for clinically significant disability and/or distress in older adults, it would suggest that late-life anxiety disorders are more highly prevalent than previous estimates suggest. Further, it would stress the need to develop age-appropriate criteria for older adults.

Conflict of interest

None.

Description of authors' roles

B.M. performed statistical analyses. All authors were involved in the conception and planning of the study, and contributed to writing and editing the paper.

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