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Insomnia in Older Adults with Generalized Anxiety Disorder

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Abstract

Objectives—The purposes of this study are to determine the frequency and severity of insomnia symptoms and related complaints experienced by older adults with GAD and compare them with older adults without GAD; compare insomnia symptoms among older adults with GAD with and without comorbid depression; determine if there are age differences in insomnia severity among people with GAD; and determine if there are differences in insomnia severity between older adults with GAD and older adults diagnosed with insomnia.

Design—Cross-sectional.

Setting—Participants were recruited through primary care clinics, advertisements, and mass mailings.

Participants—110 older adults; 31 with GAD, 25 with GAD and depression, 33 worried well, and 21 with no psychiatric diagnosis.

Measurements—Psychiatric diagnosis, sleep disturbance, and health.

Results—Participants with GAD with and without comorbid depression reported significantly greater sleep disturbance severity than participants with no psychiatric diagnosis and the worried well. There were no differences in sleep disturbances between older adults with GAD only and older adults with comorbid GAD and depression. The severity of sleep disturbance reported by older

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Conflicts of Interest for McCall: Efficacy and Safety of M100907 on Sleep Maintenance Insomnia from Sanofi (2007-8, Amount accruing); Development of the Patient Assessment Questionnaire for Patients with Schizophrenia and Schizoaffective Disorders Receiving Second Generation Antipsychotics from Bristol-Meyers Squibb (2006-7, $188,783); Polysomnographic and subjective assessment of GW679769, 10 and 30 mg, for the treatment of primary insomnia: A randomized, double-blind, parallel-group, placebo-controlled trial from GSK (2006, $56,986; A Phase III randomized double-blind, placebo controlled parallel group multi-center study to assess the long-term efficacy and safety of doxepin HCl in primary elderly insomnia patients with sleep maintenance difficulties from Somaxon (2006, $20,029); Hypnotics in the treatment of psychiatric disorders from Sepracor (2005-9, $112,286) and from Mini Mitter Inc (2005-9, $6,250); Clinical, genetic, and cellular consequences of mutations in Na+, K-ATPase ATP 143 from NINDS (2008-12, $3,561,145), Surrogates of accident risk following trazodone from NIMH (2008-10, $275,000); Hypnotics in the treatment of psychiatric disorders from NIMH (2005-9, $405,000); Consultant for Sealy Inc (2008, $5,000) and Sepracor (2006-8, $3,000); Speakers bureau for GSK (2006-7, $5,000) and Sepracor (2006-8, $10,000); Has given expert testimony related to the subject of this article.

participants with GAD was greater than reports by young and middle-aged participants with GAD, and comparable to reports by older adults with a diagnosis of insomnia.

Conclusions—Ninety percent of older adults with GAD report dissatisfaction with sleep and the majority report moderate to severe insomnia. These findings support the assessment of sleep disturbances within the context of late-life GAD.

Keywords

Anxiety; GAD; insomnia; sleep

Introduction

Sleep disturbances are common in patients with anxiety disorders, particularly Generalized Anxiety Disorder (GAD), as well as in older adults. Within the context of GAD, sleep disturbance is defined as difficulty falling asleep, difficulty staying asleep, or restless sleep (1). It is not surprising, therefore, that up to 75% of patients with GAD have insomnia (2). Self-reports of sleep disturbances among GAD patients have been supported by polysomnographic evidence (3). Patients with GAD and insomnia have impaired sleep initiation and maintenance (4–6), and Saletu-Zyhlarz and colleagues (6) have suggested that this may be the result of CNS hypervigilance and hyperarousal caused by GAD itself. Among patients with anxiety disorders, insomnia occurs more frequently at the same time (39%) or after (44%) the start of an anxiety episode, while only 18% of people report insomnia symptoms prior to the first episode of anxiety (7). Similar findings have been reported in an adolescent sample (8). Nonetheless, insomnia has also been found to be a risk factor for anxiety disorders (9), as patients with insomnia are more than 6 times more likely to have an anxiety disorder than patients without insomnia (10).

Sleep disturbances increase with age. Total sleep time and sleep efficiency (i.e., the percent of time spent sleeping when lying in bed) decreases and the time awake after sleep onset increases during middle age, and sleep efficiency continues to decrease among older adults (11). Older adults also experience changes in their circadian cycle, with earlier bed and wake times (12). Epidemiological studies have documented that up to 45% of older adults report sleep onset or maintenance insomnia (13–14). Despite these findings, little research has examined the frequency and severity of insomnia in older patients with GAD.

Given the increase in sleep problems that occur with age, it is not known if sleep disturbances are more common or equally common among older adults with GAD compared with older adults without GAD. No published studies have examined insomnia among older adults with and without GAD. The primary purpose of this study is to determine the frequency and severity of insomnia symptoms and related complaints in older adults with and without GAD. Furthermore, GAD is frequently comorbid with depression, particularly among older adults. Therefore, a second purpose of this study is to determine whether, among older adults with GAD, insomnia symptoms and related complaints differ between those with and without comorbid depression. A third purpose of this study is to determine if there are age differences in insomnia severity among people with GAD and if there are differences in insomnia severity between older adults with GAD and older adults with insomnia. It is hypothesized that: 1) older adults with GAD will report greater frequency and severity of insomnia symptoms than older adults without GAD; 2) older adults with comorbid GAD and depression will report greater frequency and severity of insomnia symptoms than older adults with only GAD; 3) older adults with GAD will reporter greater frequency and severity of insomnia symptoms than younger and middle-aged adults with GAD; and 4) older adults with GAD will report similar levels of insomnia symptoms as older adults with insomnia.

Methods

Participants

GAD participants—Participants with GAD were part of a larger study of CBT for late-life anxiety. Recruitment for the study is described elsewhere (Brenes et al., under review). Briefly, participants were recruited through primary care clinics, advertisements, and mass mailings. Inclusion criteria for the larger RCT were a DSM-IV principal or co-principal diagnosis of GAD, Panic Disorder, or Anxiety Disorder Not Otherwise Specified (NOS) based on the Structured Clinical Interview for DSM-IV (SCID-IV; 15) and age ≥ 60 years. Exclusion criteria included: 1) current psychotherapy; 2) a DSM-IV diagnosis of alcohol or substance abuse; 3) a diagnosis of dementia or global cognitive impairment operationalized as a score of < 24 of the Mini-Mental Status Examination (MMSE; 16); 4) psychotic symptoms; 5) active suicidal ideation; or 6) any change in psychotropic medications within the last 3 months. In this manuscript, participants with a principal diagnosis of Panic Disorder and Anxiety NOS are excluded from the sample. Participants with GAD were divided into those with coexistent Major Depressive Disorder or Dysthymia (n = 25) and without coexistent depression (n = 31).

Comparison participants—Participants without a current psychiatric diagnosis were included as a comparison group. These participants were recruited in 2 ways. First, participants who were ineligible for the larger RCT because they did not meet the criteria for an anxiety disorder were included in the comparison sample if they had no current diagnosis based on the SCID-IV interview. These participants are referred to as worried well (n = 33). Second, participants approached in primary care clinics who did not indicate anxiety were asked to complete the SCID-IV and assessment measures in order to be included in a comparison group. These participants are referred to as the no diagnosis comparison group (n = 21). Only participants with no current psychiatric disorder were included in this group.

Procedure

All participants completed the SCID-IV to determine diagnostic status. Participants were given the option to complete the SCID-IV either in person or by telephone. Participants completed a battery of questionnaires at home and returned them by mail.

Measures

Insomnia Severity Index—The type and severity of sleep disturbance was assessed using the Insomnia Severity Index (ISI; 17). The ISI is based on DSM-IV criteria for insomnia and consists of 7 questions that assess severity of problems with sleep onset, sleep maintenance, and early morning awakening; dissatisfaction with sleep; interference with daily functioning; impact on quality of life; and worry about sleep problems. Participants rate their level of concern with each symptom on a 5 point Likert scale and responses are summed. The rating of each symptom is made without specific reference to a dimension of time, e.g., how long it took to fall asleep. Scores of 0–7 represent an absence of clinically significant insomnia, 8–14 represents subthreshold insomnia, 15–21 represents moderate clinical insomnia, and 22–28 represents severe clinical insomnia. The ISI has demonstrated good concurrent validity with polysomnographic data and sleep diaries, and is sensitive to change with psychotherapeutic and pharmacological treatments for insomnia (18). The internal consistency of the ISI in this study is .90.

Health—Participants reported if they had they had various disorders that might interfere with sleep. They were then categorized into cardiac disorders (e.g., congestive heart failure, coronary artery disease, heart attacks), endocrine disorders (e.g., diabetes, thyroid disease), gastrointestinal disorders (e.g., Crohn's disease, gastroesophogeal reflux, irritable bowel syndrome), pain (e.g., osteoarthritis, rheumatoid arthritis, back pain, fibromyalgia, and

shingles), and pulmonary disorders (e.g., asthma, chronic obstructive pulmonary disease, emphysema). Participants also listed all medications they were currently taking. Medications were then categorized as benzodiazepines, selective serotonin reuptake inhibitors (SSRIs), other anti-depressant medications (such as, duloxetine), and other sleep aids (such as, zolpidem).

Data Analyses

One way ANOVAs and chi-square analyses were computed to determine if there were any significant differences in demographic or health-related information by diagnosis (no diagnosis, worried well, GAD, GAD and depression). Because the sample size is relatively small and participants were not randomized to diagnostic categories, variables that were different at $p < .10$ were entered as covariates in adjusted models in order to control for potential confounding between groups. We then fit a series of ANCOVA models to determine if there were differences in sleep disturbances by diagnosis. Bonferonni post hoc methods were used for pairwise comparisons between diagnosis groups. A chi-square test was conducted to determine if there were significant differences in categorization of insomnia (none, subthreshold, moderate, severe) by diagnosis. Six post hoc comparisons were then performed between all groups. Third, 2-sample t-tests were used to examine whether insomnia severity as assessed by the ISI differed by age among patients with GAD and whether insomnia severity differed between older adults with GAD and older adults with a DSM-III-R diagnosis of insomnia. These t-tests compared the ISI severity score from the current study with those obtained in 1) a study of early and midlife GAD and 2) a study of late-life insomnia.

Results

Description of the sample

A total of 110 people were in the sample. Participants ranged in age from 60 to 94 years, with a mean age of 70.3 years (SD = 7.4). The sample was well-educated (M = 13.9 years, SD = 2.8) and the majority were women (75.5%). Half were married (49.5%), 32.1% were widowed, 3.7% were never married, and 14.7% were separated or divorced. Although the sample was largely white (77.1%), 15.6% were African American, 6.4% were Native American, and 0.9% were Hispanic. With respect to health, 16.4% reported cardiac diseases, 29.1% reported endocrine diseases, 26.4% reported gastrointestinal diseases, 70.9% reported diseases associated with pain, and 19.1% reported pulmonary diseases. Almost one-third of the sample reported taking benzodiazepines (30.0%); 13.6% reported taking SSRIs; 6.4% reported taking other antidepressant medications; and 6.4% reported taking other sleep aids. Demographic information by diagnosis is presented in Table 1. Differences ($p < .10$) between groups were found for age ($F(3, 108) = 2.36$, $p = .08$), sex (χ^2 (3) = 7.34, $p = .06$), gastrointestinal diseases (χ^2 (3) = 10.35, $p = .02$), pulmonary diseases (χ^2 (3) = 8.81, $p = .03$), and benzodiazepine use (χ^2 (3) = 13.10, $p = .004$). These variables were entered as covariates in ANCOVA models.

Sleep characteristics

Table 2 presents the findings for the ISI controlling for age, sex, gastrointestinal diseases, pulmonary diseases, and benzodiazepine use. There were significant differences by condition for difficulty falling asleep, difficulty staying asleep, waking up too early, being dissatisfied with current sleep, sleep problems interfering with daily functioning, noticeable sleep problems, and being distressed about sleep problems. Interference with daily functioning was the only item that distinguished the worried well from participants with GAD, while difficulty staying asleep, interference with daily functioning, noticeable sleep problems, and distress caused by sleep problems distinguished the worried well from participants with comorbid GAD and depression. The amount of distress caused by sleep problems distinguished the worried well from the no diagnosis comparison participants. Total sleep score also differed significantly

by group. Post hoc analyses indicated that participants with a diagnosis of GAD with or without comorbid depression reported a greater degree of insomnia symptoms than worried well and no diagnosis comparison participants. There were no significant differences between the no diagnosis comparison group and the worried well, and no differences between GAD participants with comorbid depression and without comorbid depression. Similar findings were obtained for the categorization of insomnia severity (none, subthreshold, moderate, or severe) by diagnosis (χ^2 (9) = 42.40, p < .001; see Table 3). Post hoc individual chi-square analyses were then conducted to determine significant differences by diagnosis. A Bonferonni correction was made and an alpha of .008 (.05/6) was used to judge significance. The no diagnosis comparison participants reported significantly less severe insomnia than patients with GAD with (χ^2 (3) = 25.46, p < .001) and without comorbid depression (χ^2 (3) = 21.23, p < .001); similarly, the worried well participants also reported significantly less severe insomnia than participants with comorbid GAD and depression (χ^2 (3) = 14.52, p = .002). Additionally, because the insomnia categories in Table 3 are measured on an ordinal scale, we used the Cochran-Mantel-Haenszel statistic with mean scores to test whether the mean insomnia scores differed by diagnosis category. This test indicated a highly significant difference in mean insomnia scores between diagnosis groups (χ^2 (3) = 33.27, p < .001), where increasing mean insomnia scores were associated with more psychiatric symptoms (anxiety and depression).

Comparisons of insomnia severity with other studies of adults with GAD and older adults with insomnia

Belanger et al (2) reported a mean ISI total score of 11.5 (S.D. = 5.6) in a sample of 44 young and middle aged adults with a primary diagnosis of GAD. We conducted a t test comparing the mean ISI scores among our participants with GAD with and without comorbid depression with a score of 11.5 in order to determine if there are age differences in self-report insomnia among patients with GAD. We found that older participants with GAD only [t(73) = −2.12, p = .037] and comorbid GAD and depression [t(67) = −3.77, p < .001] had significantly higher mean ISI scores than younger and middle-aged adults with GAD. Similarly, we compared the ISI scores among our participants with GAD with and without comorbid depression with the scores reported by Bastien et al. (18) among their sample of 78 older insomnia patients seeking treatment (M ISI score = 15.4, S.D. = 4.2). We found no significant differences between participants with GAD only [t(107) = 1.08, p = .28] and comorbid GAD and depression [t(101) = − 1.18, p = .24] and older adults with insomnia.

Discussion

Sleep disturbances are common among older adults with GAD, with 52–68% of adults with GAD in this study reporting moderate or severe insomnia and over 90% reporting dissatisfaction with sleep. The most frequently reported type of insomnia was sleep maintenance insomnia, followed by early morning awakening, and initial insomnia. This is consistent with Saletu et al.'s (6) findings of polysomnographic evidence of increased wake times, increased early morning awakenings, and decreased total sleep among a wide age range of patients (24 to 65 years) with GAD. They suggested that one potential mechanism is that CNS hypervigilance and hyperarousal associated with GAD causes insomnia.

ISI scores were lowest among individuals with no diagnosis and highest among individuals with GAD diagnoses (with or without comorbid depression), with the worried well falling in the middle. ISI scores for participants with GAD were similar to those reported by Bastien and colleagues (18) in a sample of older adults recruited for an RCT to treat insomnia (M = 15.4), and higher than the scores of young and middle aged adults recruited for an RCT to treat GAD (M = 11.5) (2) . Thus, older adults with GAD report levels of sleep disturbances similar to those of older adults diagnosed with insomnia and higher than those of young and middle-aged

adults with GAD. This suggests that the increased prevalence in sleep disturbances among nonclinical samples of older adults is present in participants with GAD as well.

Total sleep scores on the ISI distinguished the worried well from participants with GAD. This is consistent with Wetherell and colleagues (19) who found that disturbed sleep was one of the strongest discriminators among normal, worried well, and GAD older adults in multivariate discriminant function analyses. Although a large percentage of worried well participants reported they were dissatisfied with their sleep (85%), only 16% had moderate or severe insomnia. Approximately 90% of participants with GAD also reported dissatisfaction with sleep; by contrast 52–68% met criteria for insomnia.

There were no significant differences between participants with GAD with and without comorbid depression on total sleep disturbance scores or on individual items. This suggests that the sleep of older GAD participants is impaired regardless of the presence of a comorbid depression diagnosis. It is not known if sleep disturbance within the context of GAD is a risk factor for depression.

These findings must be interpreted within the context of some limitations. First, the order of occurrence of sleep disturbances and anxiety symptoms are not known. Therefore, we cannot determine if sleep disturbances preceded GAD or vice versa. Second, we do not have objective measures of sleep (e.g., polysomnography) or sleep diaries.

Results of other studies suggest that insomnia within the context of GAD can be successfully treated, and this treatment can have an impact on anxiety severity. Belanger et al (2) found that CBT for GAD produced significant declines in sleep disturbance even though concerns about sleep were not specifically targeted by the intervention. More recently, Pollack and colleagues (20) evaluated the addition of eszopiclone to escitalopram for the treatment of sleep disturbance in adults with GAD. Participants who received eszopiclone and escitalopram demonstrated greater improvements in sleep disturbance than participants who received escitalopram and placebo. Further, participants who received both medications also demonstrated greater reduction in anxiety severity, faster response, and greater likelihood of remission. Thus, treatment of insomnia among people with GAD may result in greater and faster anxiolytic effects.

Given the high rates of sleep disturbance and dissatisfaction with sleep reported by adults with GAD, sleep disturbances should be routinely assessed and treated when warranted among older adults with GAD. Some have integrated sleep management skills into their GAD treatment protocol (21) while others provide a sleep management module only to those with significant sleep disturbances (22). Further research is needed to determine if improvements in sleep mediate the effects of treatment on anxiety severity.

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References

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders 4th edition Text Revision. Washington, DC: American Psychiatric Association; 2000.
2. Belanger L, Morin CM, Langlois F, et al. Insomnia and generalized anxiety disorder: effects of cognitive behavior therapy for GAD on insomnia symptoms. J Anxiety Disord 2004;18:561–571. [PubMed: 15149714]

3. Papadimitriou GN. Linkowski: Sleep disturbance in anxiety disorders. Int Rev Psychiatry 2005;17:229–236. [PubMed: 16194794]
4. Arriaga F, Paiva T. Clinical and EEG sleep changes in primary dysthymia and generalized anxiety: a comparison with normal controls. Neuropsychobiology 1990;24:109–114. [PubMed: 2135064]
5. Papadimitriou GN, Kerkhofs M, Kempenaers C, et al. EEG sleep studies in patients with generalized anxiety disorder. Psychiatry Res 1988;26:183–190. [PubMed: 3237912]
6. Saletu-Zyhlarz G, Saletu B, Anderer P. Nonorganic insomnia in generalized anxiety disorder. 1. Controlled studies on sleep, awakening and daytime vigilance utilizing polysomnography and EEG mapping. Neuropsychobiology 1997;36:117–129. [PubMed: 9313244]
7. Ohayon MM, Roth T. Place of chronic insomnia in the course of depressive and anxiety disorders. J Psychiatr Res 2003;37:9–15. [PubMed: 12482465]
8. Johnson EO, Roth T, Breslau N. The association of insomnia with anxiety disorders and depression: exploration of the direction of risk. J Psychiatr Res 2006;40:700–708. [PubMed: 16978649]
9. Breslau N, Roth T, Rosenthal L, et al. Sleep disturbance and psychiatric disorders: a longitudinal epidemiological study of young adults. Biol Psychiatry 1996;39:411–418. [PubMed: 8679786]
10. Ford DE, Kamerow DB. Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? JAMA 1989;262:1479–1484. [PubMed: 2769898]
11. Ohayon MM, Carskadon MA, Guilleminault C, et al. Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: developing normative sleep values across the human lifespan. Sleep 2004;27:1255–1273. [PubMed: 15586779]
12. Vaz Fragoso CA, Gill TM. Sleep complaints in community-living older persons: A multifactorial geriatric syndrome. J Am Geriatr Soc 2007;55:1853–1866. [PubMed: 17916123]
13. Foley DJ, Monjan AA, Brown SL, et al. Sleep complaints among elderly persons: an epidemiologic study of three communities. Sleep 1995;18:425–432. [PubMed: 7481413]
14. Reid KJ, Martinovich Z, Finkel S, et al. Sleep: a marker of physical and mental health in the elderly. Am J Geriatr Psychiatry 2006;14:860–866. [PubMed: 17001025]
15. First, MB.; Spitzer, RL.; Gibbon, M., et al. Structured Clinical Interview for DSM-IV-TR Axis I Disorders-Patient Edition (SCID-I/P). New York: Biometrics Department, New York State Psychiatric Institute; 2002.
16. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189–198. [PubMed: 1202204]
17. Morin, CM. Insomnia: psychological assessment and management. New York: Guilford Press; 1993.
18. Bastien CH, Vallieres A, Morin CM. Validation of the Insomnia Severity Index as an outcome measure for insomnia research. Sleep Med 2001;2:297–307. [PubMed: 11438246]
19. Wetherell JL, Le Roux H, Gatz M. DSM-IV criteria for generalized anxiety disorder in older adults: distinguishing the worried from the well. Psychol Aging 2003;18:622–627. [PubMed: 14518822]
20. Pollack M, Kinrys G, Krystal A, et al. Eszopiclone coadministered with escitalopram in patients with insomnia and comorbid generalized anxiety disorder. Arch Gen Psychiatry 2008;65:551–562. [PubMed: 18458207]
21. Stanley MA, Beck JG, Novy DM. Cognitive-behavioral treatment of late-life Generalized Anxiety Disorder. J Consult Clin Psychol 2003;71:309–319. [PubMed: 12699025]
22. Wetherell JL, Sorrell JT, Thorp SR, et al. Psychological interventions for late-life anxiety: a review and early lessons from the CALM study. J Geriatr Psychiatry Neurol 2005;18:72–82. [PubMed: 15911935]

Table 1

Demographic characteristics of the sample.

	No diagnosis (n = 21)	Worried well (n = 33)	GAD (n = 31)	GAD and depression (n = 25)	p value
Age, mean (S.D.)	73.2 (8.8)	71.0 (6.6)	69.9 (7.3)	67.6 (6.7)	.08
Education, mean (S.D.)	14.1 (2.8)	14.4 (3.4)	13.7 (2.6)	13.4 (2.4)	.56
% Males	33.3	36.4	9.7	20.0	.06
Marital status					.59
% Never married	9.5	3.0	0.0	4.0	
% Married	61.9	42.4	50.0	48.0	
% Widowed	28.6	33.3	30.0	36.0	
% Divorced/separated	0.0	21.3	20.0	12.0	
Race					.39
% White	90.5	68.8	80.6	72.0	
% African American	9.5	25.0	12.9	12.0	
% Native American	0.0	6.3	6.5	12.0	
% Hispanic	0.0	0.0	0.0	4.0	
Health					
% Cardiac diseases	19.0	12.1	12.9	24.0	.60
% Endocrine diseases	33.3	21.2	25.8	40.0	.43
% Gastrointestinal diseases	9.5	18.2	29.0	48.0	.02
% Pain	61.9	69.7	67.7	84.0	.38
% Pulmonary diseases	14.3	6.1	22.6	36.0	.03
Medications					
% Benzodiazepines	4.8	24.2	35.5	52.0	.004
% SSRIs	9.5	6.1	12.9	28.0	.12
% Other anti-depressants	0.0	6.1	3.2	16.0	.12
% Other sleep aids	4.8	3.0	6.5	12.0	.56

Table 2

Adjusted differences on the ISI by diagnosis.

	No diagnosis	Worried well	GAD only	GAD and depression	df	F	p	Post hoc
Difficulty falling asleep								
M (SD)	0.79 (0.29)	1.13 (0.21)	1.69 (0.22)	1.75 (0.25)	3, 95	2.72	.049	No sig. diff.
% moderate/severe problems	21.1%	25.0%	58.6%	64.0%				
Difficulty staying asleep								
M (SD)	1.11 (0.24)	1.66 (0.17)	2.26 (0.18)	2.51 (0.21)	3, 97	7.34	< .001	1 vs. 3 1 vs. 4 2 vs. 4
% moderate/severe problems	21.1%	60.6%	83.3%	88.0%				
Difficulty waking up too early								
M (SD)	1.04 (0.29)	1.58 (0.21)	2.14 (0.21)	2.41 (0.25)	3, 96	4.62	.005	1 vs. 3 1 vs. 4
% moderate/severe problems	36.8%	51.5%	73.3%	75.0%				
Dissatisfied								
M (SD)	1.68 (0.26)	2.38 (0.20)	2.77 (0.20)	2.97 (0.23)	3, 99	4.84	.003	1 vs. 3 1 vs. 4
% moderate/severe problems	50.0%	84.4%	90.3%	92.0%				
Interference								

	No diagnosis	Worried well	GAD only	GAD and depression	df	F	p	Post hoc
M (SD)	0.81 (0.24)	1.36 (0.18)	2.18 (0.18)	2.41 (0.22)	3, 100	9.79	< .001	1 vs. 3 1 vs. 4 2 vs. 3 2 vs. 4
% moderate/severe problems	23.8%	36.4%	77.4%	84.0%				
Noticeable								
M (SD)	0.54 (0.22)	0.88 (0.17)	1.28 (0.17)	1.82 (0.20)	3, 100	6.19	.001	1 vs. 4 2 vs. 4
% moderate/severe problems	9.5%	18.2%	45.2%	76.0%				
Distressed								
M (SD)	0.23 (0.23)	1.42 (0.18)	2.08 (0.18)	2.68 (0.21)	3, 100	19.67	< .001	1 vs. 2 1 vs. 3 1 vs. 4 2 vs. 4
% moderate/severe problems	9.5%	45.5%	67.7%	88.0%				
Total ISI score								
M (SD)	6.63 (1.28)	10.41 (0.98)	14.35 (0.99)	16.53 (1.17)	3, 100	12.20	< .001	1 vs. 3 1 vs. 4 2 vs. 3 2 vs. 4
% moderate/severe insomnia	4.8%	16.1%	51.6%	68.0%				

Note. 1 = no diagnosis; 2 = worried well; 3 = GAD; 4 = GAD and comorbid depression; analyses were adjusted for age, gender, gastrointestinal diseases, pulmonary diseases, and benzodiazepine use.

Table 3

Level of insomnia severity by anxiety diagnosis.

	No diagnosis (n = 21)	Worried well (n = 33)	GAD (n = 31)	GAD and depression (n = 25)
No clinically significant insomnia (ISI score 0–7)	66.7%	30.3%	9.7%	4.0%
Subthreshold insomnia (ISI score 8–14)	28.5%	48.5%	38.7%	28.0%
Moderate clinical insomnia (ISI score 15–21)	4.8%	15.1%	48.4%	56.0%
Severe clinical insomnia (ISI score 21–28)	0%	6.0%	3.2%	12.0%
Moderate or severe clinical insomnia (ISI score 15–28)	4.8%	21.1%	51.6%	68.0%

Note. χ^2 (9) = 42.40, p < .001.