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Scared to Death: Results from the Health, Aging, and Body Composition Study

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Abstract

Objective—The purpose of this study is to determine if anxiety is associated with mortality and if race moderates and depression mediates this relationship.

Method—Participants are 3,015 adults aged 70 to 79 years.

Results—Anxiety symptoms were significant predictors of all-cause, cardiovascular, and noncardiovascular mortality among blacks but not whites. Depression was not related to mortality.

Conclusions—Although the mechanisms that underlie the relationship between anxiety and mortality are unknown, routine assessment of anxiety symptoms in clinical practice, particularly in black older adults, seems prudent.

Keywords

anxiety; mortality; race; depression

Introduction

The impact of depression and anxiety on physical health has received increased attention. Both have been associated with negative health outcomes, and depression has also been linked with increased risk of mortality. Findings from studies examining the association between anxiety and non-suicidal mortality have been less consistent. As briefly summarized by others,¹ several studies provide evidence that anxiety is a risk factor for mortality, while others have found no relationship.

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There exist several explanations for the contradictory findings. Studies have varied greatly with regard to the type of anxiety assessed (e.g., phobic versus generalized), instruments used to measure anxiety, follow-up period (ranging from months to 16 years), type(s) of mortality examined (e.g., all-cause versus cardiac-related), and sample size and population characteristics (e.g., such as gender and race distribution; community versus patient-oriented). The current work aims to minimize some of these limitations by using a large biracial community-based sample of men and women followed over several years in order to examine the relationship between anxiety symptoms and mortality (all-cause, cardiovascular, and noncardiovascular mortality) and to examine race as a moderator and depression as a mediator of this relationship.

Methods

Study Population

The Health Aging and Body Composition study consists of 3,075 high functioning men and women aged 70 through 79 years. The sample used in the current study is limited to the 3,015 persons for whom baseline anxiety assessments were present.

Mortality

Deaths were ascertained by proxy report and were confirmed by obtaining death certificates. An independent adjudication committee reviewed all available information (death certificate, hospital records, and proxy reports) to determine immediate and underlying causes of death. Cohort follow-up for death was 97% complete. For the purposes of this analysis, deaths are divided into cardiovascular and noncardiovascular mortality.

Anxiety

Anxiety symptoms were assessed with three questions from the Hopkins Symptom Checklist.² Participants indicated whether they felt nervous or shaky, tense or keyed up, and fearful. Participants who reported that they experienced all three symptoms at least “a little” were considered anxious.

Demographics

Demographic information, including age, gender, race (white, black), marital status (married, not married), years of education, income (< \$25,000, ≥ \$25,000), and site (Pittsburgh, Memphis) was obtained.

Health-related characteristics

Diseases—Disease prevalence (cancer, cardiovascular disease, congestive heart failure, coronary heart disease, diabetes, peripheral artery disease, pulmonary disease, stroke) was based Effects of Anxiety on Mortality⁶ on a combination of medical treatment and reported diagnosis. Self-reported vision and hearing impairment were also assessed.

Medications—A dichotomous variable was created to represent whether or not a participant was using an anxiolytic (barbiturates or benzodiazepines) or anti-depressant (monoamine oxidase inhibitors, tricyclics, selective serotonin reuptake inhibitors, trazodone, bupropion, and venlafaxine) medication.

Body mass index—Body mass index (BMI) was calculated as body weight in kilograms divided by height in meters squared (kg/m^2).

Lifestyle factors—Participants indicated if they never, formerly or currently smoked. Pack per year history of smoking was also assessed. Physical activity was measured as the total kilocalories expended per week on recreational and daily activities.

Physical function—Physical function was assessed by the time it took participants to walk 6 meters.

Depression—Depression was assessed with the Center for Epidemiologic Studies-Depression Scale.³ Participants who scored 16 or greater were considered to have high depressive symptoms and be at high risk for depression.

Statistical analyses

A series of Cox regression analyses were conducted to determine the unadjusted and adjusted relationships between anxiety symptoms and mortality, with time to all-cause mortality as the dependent variable. Participants who were alive at the 7-year follow-up were censored at that time. Model 1 presents the unadjusted relationship between anxiety and mortality. In Model 2, the relationship between anxiety and mortality was examined after adjusting for demographic information. The third model adjusts for both demographic and health-related information (diseases, medications, BMI, smoking status, physical activity, physical function). The interaction between anxiety and race was included in this model. Finally, depression was examined as a possible mediator in Model 4; thus, demographics, health-related information, and depression were included in Model 4. All models were calculated separately for 3 mortality outcomes: all-cause, cardiovascular, and noncardiovascular mortality.

Results

Anxiety symptoms were present in 3.3% of the sample (3.6% of whites; 3.0% of blacks; 2.9% of men; 3.7% of women) and number of symptoms did not differ by race. Two hundred seventeen whites (12.1%) and 212 blacks (16.5%) died over the course of 7 years. Only 1 participant committed suicide. The mortality rate per 1,000 person years was highest for anxious blacks (73.49 per 1,000 person years) compared with blacks with low anxiety (26.79 per 1,000 person years) and with whites (anxious-19.80 per 1,000 person years; nonanxious-19.51 per 1,000 person years).

Cox proportional hazard models were constructed to evaluate the independent association of anxiety with all-cause mortality and an interaction between race and anxiety was tested. Because this interaction was significant (Wald's $\chi^2=4.33$; $df=1$; $p<.04$; $HR=2.91$; 95% CI, 1.06–7.98), these models were rerun separately for each race. Table 1 presents the results of the analyses for whites and blacks. Among whites, anxiety was not associated with mortality in the unadjusted model. However, anxiety was a risk factor for mortality among blacks, and remained significant after adjustment for sociodemographic variables (Model 2). Although the risk was reduced with the inclusion of health and disease-related variables to the model (Model 3), anxiety remained a risk factor for mortality among blacks. Depression was then examined as a possible mediator of the effect. The relationship between anxiety and mortality was attenuated but remained significant; however, depression itself was not a significant predictor of mortality (Wald's $\chi^2=0.13$; $df=1$; $p=.72$; $HR=0.87$; 95% CI, 0.40–1.88).

Analyses were repeated with cardiovascular and noncardiovascular mortality as the outcomes. Again, anxiety was unrelated to either cardiovascular or noncardiovascular mortality among whites. Among blacks, however, anxiety was a significant predictor of both cardiovascular and noncardiovascular mortality in the unadjusted models and in the models adjusted for sociodemographic factors. As with all-cause mortality, the hazard ratios were reduced with the inclusion of health and disease-related variables, but remained significant for cardiovascular

mortality. When depression was entered into the model, the relationship between anxiety and cardiovascular mortality remained significant. The relationship between anxiety and non-cardiovascular mortality was not significant after the inclusion of disease-related factors.

Discussion

Older black but not white adults with symptoms of anxiety exhibited substantially higher mortality over a seven-year period than expected for a given set of sociodemographic characteristics and health and disease-related factors, relative to their counterparts with no or low anxiety symptoms. Although some previous studies found that disease-related variables accounted for the observed relationship between anxiety and mortality, in the current study the relationship between anxiety symptoms and mortality was reduced, but remained significant after accounting for several contributing factors, specifically, BMI, cardiovascular disease, congestive heart failure, coronary heart disease, diabetes, peripheral artery disease, smoking, physical activity, physical functioning, and depression.

Other biological and behavioral pathways may link anxiety and mortality. Anxiety is associated with increased sympathetic nervous system arousal, which can lead to a number of outcomes that could directly impact mortality such as impaired platelet activity, impaired immune functioning, diminished heart rate variability, and increased ventricular arrhythmias.⁴ Behaviorally, anxiety may result in poorer health behaviors that contribute to mortality, such as increased smoking, decreased physical activity, decreased compliance with medical recommendations, and decreased use of screening or preventive health care⁵, although it should be noted that decreased physical activity and BMI were unrelated to anxiety in this study.

To our knowledge, this is the first study to report racial differences in the association between anxiety symptoms and mortality. Although a greater proportion of the Blacks in this study were females, gender does not account for the racial differences as both black males and females with symptoms of anxiety had higher rates of mortality than whites (data not shown). One possible explanation for these findings relates to racial differences in seeking and receiving medical and mental health care, as blacks are less likely to receive appropriate care for health problems.⁶ Alternatively, the meaning and impact of anxiety symptoms may differ between blacks and whites.⁷⁻⁸ Although the analyses in the current study did adjust for both educational attainment and income, they may not have captured the full meaning of SES. Other possible explanations include differences in environmental exposures and lifestyle.⁷

Depression was examined as a mediator, thereby addressing a significant limitation of previous research. In the current study, depression was not a mediator of the effect of anxiety on mortality. This is in contrast to previous studies, and may be due to the low prevalence of depression in the current study. Nonetheless, these findings suggest that the relationship between anxiety and mortality is independent of depression.

These results must be interpreted in light of study limitations. First, the rates of anxiety symptoms were lower in this study than others which may represent an underreporting of anxiety and because the number of black participants was relatively small (N= 38), the results of this study need to be replicated in other samples. Future studies of anxiety and mortality should specifically examine racial differences. Although the presence of different diseases was controlled for in the analyses, disease severity was not.⁹ Finally, baseline anxiety symptoms may have been the result of some preexisting disease process. Although this cannot be ruled out as a possibility, the presence of different diseases was controlled in survival analyses.

This study highlights the important role that psychological processes have on physical health. Although these results need to be replicated, the current findings suggest that it behooves clinicians to assess and treat symptoms of anxiety, particularly in black older adults. Further

research is needed to elucidate the mechanisms that explain the relationship between anxiety and mortality.

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References

1. van Hout HP, Beekman AT, de Beurs E, et al. Anxiety and the risk of death in older men and women. *Br J Psychiatry* 2004;185:399–404. [PubMed: 15516548]
2. Derogatis LR, Lipman RS, Rickels K, et al. The Hopkins Symptom Checklist (HSCL): a self-report symptom inventory. *Behav Sci* 1974;19:1–15. [PubMed: 4808738]
3. Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385–401.
4. Mussleman DL, Evans DL, Nemeroff CB. The relationship of depression to cardiovascular disease: Epidemiology, biology, and treatment. *Arch Gen Psychiatry* 1998;55:580–592. [PubMed: 9672048]
5. Bonnet F, Irving K, Terra JL, et al. Anxiety and depression are associated with unhealthy lifestyle in patients at risk of cardiovascular disease. *Atherosclerosis* 2005;178:339–344. [PubMed: 15694943]
6. U.S. Department of Health and Human Services. Mental health: A report of the Surgeon General- Executive Summary. Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health; 1999.
7. Davey Smith G, Neaton JD, Wentworth D, et al. Mortality differences between black and white men in the USA: Contribution of income and other risk factors among men screened for MRFIT. *Lancet* 1998;351:934–939. [PubMed: 9734939]
8. Jones-Webb R, Yu X, O'Brien J, et al. Does socioeconomic position moderate the effects of race on cardiovascular disease mortality? *Ethn Dis* 2004;14:489–1996. [PubMed: 15724767]
9. Denollet J, Brutsaert DL. Personality, disease severity, and the risk of long-term cardiac events in patients with a decreased ejection fraction after myocardial infarction. *Circulation* 1998;97:167–173. [PubMed: 9445169]

Table 1

Unadjusted and adjusted predictors of mortality by race and type of mortality.

	All cause mortality			Cardiovascular mortality			Noncardiovascular mortality		
	HR	95% CI	P	HR	95% CI	P	HR	95% CI	P
White									
1. Anxiety: unadjusted	1.01	0.50–2.05	.97	---	---	---	1.47	0.72–2.99	.29
2. Anxiety: adjusted for sociodemographics	.82	0.36–1.85	.63	---	---	---	1.17	0.52–2.67	.70
3. Anxiety: Model 2 and disease	.67	0.29–1.54	.35	---	---	---	0.96	0.41–2.25	.93
4. Anxiety: Model 3 and depression	.75	0.31–1.79	.51	---	---	---	0.97	0.40–2.38	.95
Black									
1. Anxiety: unadjusted	2.73	1.62–4.62	<.001	3.41	1.48–7.89	.004	2.41	1.23–4.74	.01
2. Anxiety: adjusted for sociodemographics	2.86	1.68–4.87	<.001	3.68	1.56–8.65	.003	2.48	1.26–4.90	.009
3. Anxiety: Model 2 and disease	2.49	1.35–4.58	.003	3.40	1.30–8.92	.02	2.07	0.92–4.63	.08
4. Anxiety: Model 3 and depression	2.28	1.17–4.45	.02	2.92	1.01–8.44	.048	1.96	0.81–4.71	.13

Note: Because there were no cardiovascular deaths among whites high in anxiety, the models did not converge.

All p values are based on Wald's χ^2 . Model 1 df=1; Model 2 df=7; Model 3 df=21; Model 4 df=22.