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Neuroticism, cognitive ability, and the metabolic syndrome: The Vietnam Experience Study

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Abstract

Objectives: The purpose of this study is to explore the association of neuroticism with the metabolic syndrome, separate components of the metabolic syndrome, and the number of components of metabolic syndrome an individual possesses. The purpose of this study is to examine also the extent to which any associations are accounted for by sociodemographic factors, health behaviors, and cognitive ability. **Method:** Participants were 4208 men drawn from the Vietnam Experience Study. From military archives, and a later telephone interview and psychological and medical examination, sociodemographic, health behavior, cognitive ability, neuroticism, and health data were collected. Neuroticism and cognitive ability were assessed with standardized tests during the medical examination. Presence of the metabolic syndrome was based on body mass index, fasting blood glucose or a diagnosis of diabetes, high blood pressure or taking antihypertensive medication, high-density lipoprotein cholesterol, and triglyceride levels. **Results:** Neuroticism was positively associated with the occurrence of the metabolic syndrome and several of its components in both age-, and sociodemographic- and health behavior-adjusted analyses. Many associations were accounted for by individual difference in cognitive ability. Neuroticism was robustly associated with the number of components of the metabolic syndrome after adjustment. **Conclusions:** Individuals with higher neuroticism scores had a higher prevalence of the metabolic syndrome and a larger number of its components. On the whole, differences in cognitive ability appeared to partially mediate the relationship between neuroticism and the metabolic syndrome.

Keywords: Cognitive ability; The metabolic syndrome; Neuroticism; Socioeconomic status; Health behaviors; Veterans

Introduction

Neuroticism is a personality trait largely characterized by a tendency to experience low moods and emotional lability [1,2]. Neuroticism may be a marker of central nervous system (CNS) excitation, with higher levels leading to biological senescence, thus, increasing susceptibility to disease [3–5]. As such, neuroticism is related to dysregulated hypothalamic–pituitary–adrenal (HPA) axis responses to stress and a reduced antibody response to vaccination [6] and is associated with the presence of symptoms and illnesses including headaches, ulcers, arthritis, and cardiovascular disease [7]. Similarly, individuals with diseases thought to have a psychosomatic component, such as peptic ulcer disease [8] and chronic pain [9], have been found to have high neuroticism

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scores. In a metaanalysis of studies of correlates of neuroticism characteristics, there was evidence of associations with various chronic diseases, particularly proneness to coronary heart disease [10]. Furthermore, in a recent large longitudinal study, higher neuroticism was associated with increased prevalence of musculoskeletal, neurological, gastrointestinal, and cardiovascular conditions 25 years later [11]. Neuroticism and related traits have also been linked to increased mortality [12], although in some studies, these associations appeared to be mediated, at least in part, by sociodemographic and health behavior variables [13,14].

Similarly, lower cognitive ability or intelligence (IQ) has been associated with shorter life spans [15], but research examining neuroticism, IQ, and mortality together has yielded mixed findings. A recent study found that not only did neuroticism and IQ independently predict mortality, but there was also an interaction, such that those with high neuroticism and low cognitive ability experienced the greatest risk of death [16]. It was suggested that this was due to more intelligent individuals having greater emotional or financial resources for dealing with the negative consequences of neuroticism. However, a prior study showed no link between neuroticism and mortality after adjusting for cognitive ability as a potential confounding variable [17]. As neuroticism and cognitive ability have shown a small negative correlation [18], it is important to consider the independent prediction by both variables and their possible interaction in the prediction of health outcomes.

To our knowledge, there are no published studies testing the association between neuroticism and specific syndromes strongly related to mortality, such as the metabolic syndrome. The metabolic syndrome is a cluster of symptoms that markedly increases the risk of cardiovascular and all-cause mortality [19]. It consists of obesity, high triglyceride levels, low levels of high-density lipoprotein (HDL) cholesterol, raised blood pressure, and high levels of fasting blood glucose or a diagnosis of diabetes. There are strong reasons to anticipate a link between neuroticism and the metabolic syndrome. First, neuroticism is positively associated with some of its components including obesity [20] and raised cholesterol levels [21,22]. Second, health behaviors, such as smoking and high levels of alcohol consumption, which are important risk factors for the metabolic syndrome [23,24], are related to higher neuroticism [25,26]. Given that low IQ may be a predictor of the metabolic syndrome, it is also the case that IQ may have an explanatory role in the neuroticism–metabolic syndrome relationship.

The present study examined the association between neuroticism and the metabolic syndrome in Vietnam war-era veterans, with and without adjustment for sociodemographic variables, health behaviors, and cognitive ability. This study also investigated the associations between neuroticism and the individual components of the metabolic syndrome and the number of components an individual possessed. It was hypothesized that higher neuroticism would be associated with increased prevalence of both the metabolic syndrome, its individual components, and the number of components an individual had. The study examined whether cognitive ability was a mediator and/or a moderator of any association between neuroticism and the metabolic syndrome.

Method

Participants, measures, and procedure

Participants were identified retrospectively from data gathered as part of the Vietnam Experience Study, an epidemiological study commissioned by the US congress to investigate the health consequences of the military experiences of Vietnam veterans. Participants were male military personnel drawn from approximately 5 million US Vietnam-era Army veterans whose service files were stored at the National Personnel Records Center [27]. The Centers for Disease Control, Atlanta, had access to US Veteran Administration records and provided the authors with a fully anonymized dataset. Ethical approval for the study was given by various bodies, including the US Centers for Disease Control. Eligibility criteria are published elsewhere, and the final cohort with complete data included 18 313 former military personnel [27–29].

Information on place of service and ethnicity was extracted from the military archives. Ethnic origin was classified as “white,” “black,” or “other,” the latter group comprising Hispanics, Asians, Pacific Islanders, American Indians, and Alaskan Natives. Of those included in the original cohort, 17 867 were considered to be alive on December 31, 1983, and therefore eligible for active follow-up. In 1985, participants were invited to participate in a telephone interview. Of those traced (n=16 349), 15 288 men were able to participate in the 1985 telephone survey (85.6% of those alive on December 31, 1983) [29]. From the telephone survey, household income in midlife (≤$20 000, >$20 000 per year) was determined. Frequency of alcohol consumption (units per week), cigarette smoking habits, and marital status were ascertained using standard questions [30].

In 1986, a random sample of telephone interview respondents (n=6443) were invited to attend a 3-day medical examination with orientation at a single facility in Albuquerque, NM, for which travel expenses and a nominal stipend were paid; 4462 men representative of the original cohort attended (69.3% of those invited). The mean age at medical examination was 38.3 years (range, 31.1–49.0). The final number of participants with complete data after the medical examination was 4256. The mean age at medical examination was 38.3 years (range, 31.1–49.0). From a fasted blood sample, triglycerides and cholesterol fractions were assessed using a Kodak Ektachem 700 autoanalyzer [30]. Serum glucose level was determined with an adaptation of the glucose oxidase–peroxidase–chromogen-coupled system [30]. Blood pressure was measured twice in the