Personality and global cognitive decline in Japanese community-dwelling elderly people: A 10-year longitudinal study

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ABSTRACT

Objectives: To examine the longitudinal associations between the big five personality and changes in global cognitive function among community-dwelling elderly people involved in the National Institute for Longevity Sciences - Longitudinal Study of Aging.

Methods: The participants were 594 individuals (age range 60–81 years) and followed for 10 years and tested six times. Personality was assessed by the Japanese version of NEO five factor inventory at baseline. Cognitive function was assessed by the Japanese version of Mini Mental State Examination (MMSE) at all visits. For participants with a baseline MMSE score ≥ 28, logistic generalized estimating equation models estimated the odds ratio (OR) and 95% confidence interval (CI) for MMSE score ≤ 27 at each follow-up visit, according to a 1-SD increase of the baseline personality score. Post hoc analyses were performed for mild cognitive deficits, baseline MMSE score ≥ 24 and ≤27, to estimate the OR and CI for MMSE score ≤ 23.

Results: The adjusted OR for MMSE score ≤ 27 was 0.78 (95% CI, 0.69–0.88), with a 1-SD increase in Openness to Experience score. In post hoc analyses, the adjusted OR for MMSE score ≤ 23 was 0.50 (95% CI, 0.35–0.72) with a 1-SD increase in Conscientiousness score. Relationships between other personality traits and the decline in MMSE score were not significant.

Conclusions: Higher Openness to Experience was associated with a reduction in risk for cognitive decline in community-dwelling older adults. Higher Conscientiousness might also predict lower risk for severe cognitive decline, especially for individuals with mild cognitive deficits.

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1. Introduction

The elderly population is increasing rapidly worldwide. In 1950, Japanese life expectancies were 58.0 years for males and 61.5 years for females. In comparison, Japanese life expectancies in 2014 were 80.50 years for males and 86.83 years for females [1]. It is a great concern for individuals and our society as a whole that we live a longer, healthier, and fuller life.

Cognitive function is an important contributor to living better for elderly people. Many studies have reported positive relationships between global cognitive ability and independent living among older adults [2–5]. However, large individual differences have been observed in age-related changes of cognitive ability [6,7], and there is an urgent need to identify factors contributing to maintaining high levels of cognitive function in elderly people. The present study focused on personality as a factor influencing individual differences in changes of global cognitive function.

Personality traits describe differences in our typical styles of thoughts, feelings, and actions [8]. Personality may become a fundamental factor to influence cognitive maintenance or decline through, for instance, health behavior, cognitively-stimulating activities, and stress coping [9,10]. Personality traits in which people differ have been organized into five basic factors, called the big five model of personality: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness [8]. Neuroticism refers to the tendency to be worrying, temperamental, self-pitying, self-conscious, emotional, and vulnerable. Extraversion refers to the tendency to be affectionate, talkative, active, fun-loving, and passionate. Openness to Experience refers to the tendency to be imaginative, creative, original, curious, and liberal. Agreeableness refers to the tendency to be soft-hearted, trusting, generous, acquiescent, lenient, and good-natured.

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Conscientiousness refers to the tendency to be conscientious, hardworking, well-organized, punctual, and persevering. The big five model of personality has been replicated cross-culturally and has been shown to be relevant for adults of all ages [11].

Some research shows that the big five personality traits in old age may be associated with the risk of developing dementia [12–15]. In recent reviews, Low et al. [16] and Cipriani et al. [17] showed consistent evidence that Neuroticism increased the risk of developing dementia, and Conscientiousness reduced the risk. Extraversion and Agreeableness were not associated with dementia. There is inconsistent evidence on the effect of Openness to Experience, but a review by Cipriani et al. [17] concluded that Openness to Experience may be protective against dementia.

On the other hand, the relationship between personality and cognitive decline among non-clinical or community-dwelling elderly persons remains unclear. For example, higher Neuroticism was associated with the risk of global cognitive decline in some studies [14,18,19], but not in others [20,21]. Higher Openness to Experience and Conscientiousness were associated with cognitive maintenance in some studies [15,18,22], but not in others [23–25]. In a recent meta-analysis of 7 published studies of community-dwelling elderly persons, Luchetti et al. [9] found associations between Neuroticism and Conscientiousness and global cognitive decline, but they pointed out that there are very few studies of the longitudinal associations between personality and cognitive decline. More research involving community-dwelling elderly persons is necessary to examine the longitudinal relationships between personality and subsequent cognitive change to identify those at high risk of cognitive decline and to develop interventions aimed at reducing cognitive decline according to personal traits.

The purpose of the present study was to examine the longitudinal associations between the big five personality traits and changes in global cognitive function over a 10-year follow-up period among community-dwelling elderly people. The important characteristics of this study included the following. (1) The participants were followed for a maximum of ten years and tested six times. This duration is relatively longer than previous studies. (2) To measure global cognitive function and personality, the Mini-Mental State Examination (MMSE) [26] and the NEO five factor inventory (NEO-FFI) [8], which are standardized cross-culturally and used worldwide, were used. (3) Recently, it has been pointed out that personality traits are correlated with cardiometabolic risk factors, which are known to be associated with cognitive decline [27]. Therefore, we adjusted our statistical model for not only psychosocial but also physical covariates—including leisure time physical activity and cardio-metabolic risk factors (body mass index, systolic blood pressure, diastolic blood pressure, glucose, HDL-cholesterol, and triglyceride)––to examine independent associations between personality and cognitive decline. (4) Curtis et al. pointed out that some previous findings may be overestimated by the influence of participants with mild cognitive impairment at baseline [10]. Therefore, participants with suspected cognitive impairment at baseline were excluded in this study. In addition, post hoc analyses were performed for mild cognitive deficits.

2. Methods

2.1. Participants

The data for this study were collected as part of the National Institute for Longevity Sciences - Longitudinal Study of Aging (NILS-LSA). The NILS-LSA is a Japanese population-based prospective cohort study of normal aging and age-related diseases. The participants were age- and sex-stratified random samples selected from the neighborhood of the Institute (Obu City and Higashiura Town in Aichi prefecture, Japan). Wave 1 of the NILS-LSA was conducted from November 1997 to April 2000 and included 2267 participants (1139 men 1128 women; age range 40–79 years). Participants have been followed-up every two

years, Wave 2 (April 2000–May 2002), Wave 3 (May 2002–May 2004), Wave 4 (June 2004–July 2006), Wave 5 (July 2006–July 2008), Wave 6 (July 2008–July 2010), and Wave 7 (July 2010–July 2012). When participants could not attend the follow-up investigations (due to moving out, death, or other personal reasons), new age- and sex-matched subjects were randomly recruited from the same residential area. The study protocol was approved by the Committee on Ethics of Human Research of the National Center for Geriatrics and Gerontology. Written, informed consent was obtained from all subjects. Details of the NILS-LSA have been reported elsewhere [28].

The baseline participants of this study were people who completed the Wave 2 examination, because MMSE data (explained below) of the NILS-LSA were available at Wave 2 and the subsequent waves. In addition, the following individuals were excluded: a) ≤59 years at baseline, because the MMSE was assessed only in elderly participants (age ≥ 60 years); b) did not participate in at least one follow-up survey because longitudinal analyses required a minimum of two valid scores per individual; c) had MMSE score ≤ 27 classified as cognitive decline (details are explained below) or missing MMSE data at baseline; or d) had missing data on personality or control variables at baseline. Based on these criteria, the participants for this study were 594 individuals (Fig. 1). Mean age at baseline was 68.23 years (SD = 5.63 years, age range = 60–81 years), with 48.82% of the sample being women.

Table 1 shows follow-up participation details. The mean follow-up duration from baseline to final assessment was 8.01 years (range = 1.96–11.32 years). The average number of follow-up measurements (Wave 3 to Wave 7) was 3.82 per participant (range = 1–5). A total of 2,268 cumulative observations from 594 participants were analyzed in this study.

2.2. Measures

2.2.1. Cognitive function (baseline and all follow-up surveys)

Cognitive function was assessed by the Japanese version [29] of the MMSE [26]. The MMSE is a brief measure of global cognition and screening test for dementia, which is the most commonly administered test in clinical and research settings. Trained clinical psychologists and psychology graduate students administered the test through Wave 2 and Wave 7. The score range of the MMSE is from 0 to 30, with a higher score indicating better cognitive function, positively-skewed. Although the traditional MMSE cut off score for cognitive impairment is 23/24 [26], a cut-off score of 27/28 was used in the main analyses for following reasons. First, the elderly participants of NILS-LSA (age ≥ 60 years) were relatively highly educated, 60.14% of men and 50.89% of women
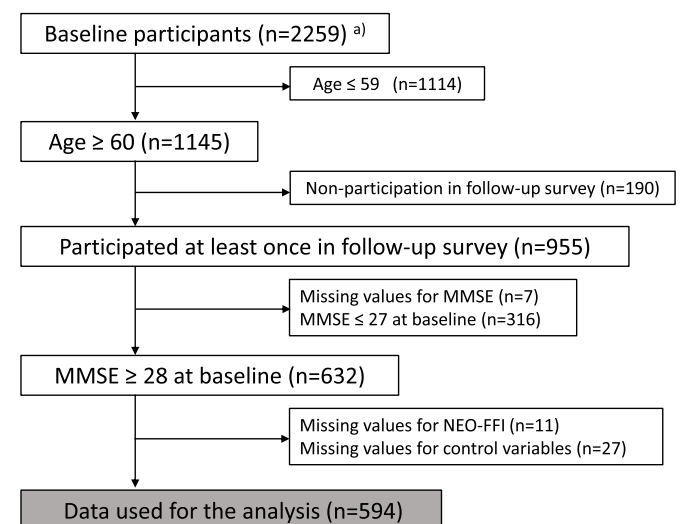

Fig. 1. Study sample for the analysis. a) Wave 2 of the NILS-LSA is the baseline in this study.