Memory Age Identity as a predictor of cognitive function in the elderly: A 2-year follow-up study

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ABSTRACT

Background: There is a growing interest in finding psychosocial predictors related to cognitive function. In our previous research, we conducted a cross-sectional study on memory age identity (MAI) and found that MAI might be associated with objective cognitive performance in non-cognitively impaired elderly. A longitudinal study was conducted to better understand the importance of MAI as a psychosocial predictor related to objective cognitive function.
Methods: Data obtained from 1345 Korean subjects aged 60 years and above were analyzed. During the two-year follow-up, subjective memory age was assessed on three occasions using the following question: How old do you feel based on your memory? Discrepancy between subjective memory age and chronological age was then calculated. We defined this value as 'memory age identity (MAI)'. A generalized estimating equation (GEE) was then obtained to demonstrate the relationship between MAI and Korean version-Mini Mental State Examination (K-MMSE) score over the 2 years of study.
Results: MAI was found to significantly ($\beta = -0.03$, $p < 0.0001$) predict objective cognitive performance in the non-cognitively impaired elderly.
Conclusion: MAI may be a potential psychosocial predictor related to objective cognitive performance in the non-cognitively impaired elderly.

1. Introduction

With the increase in life expectancy, we are faced with a graying society. This change in demographics has increased our interest in predicting and preventing cognitive dysfunction, such as dementia. In 2003, Korean studies examining dementia estimated the number of the elderly diagnosed with dementia to be 300,000. It will rise to reach 730,000 in 2020 (Suh, 2002). In this regard, recent researches are actively examining modifying factors to slow the progression of dementia

Many dementia studies have focused on biological or behavioral factors, but there are relatively few studies focusing on psychosocial factors. Psychosocial factors associated with dementia consist of various concepts which are difficult to scale. Nevertheless, researchers have emphasized the importance of psychosocial factors (Kempen et al.,

1999) because they are modifiable in preventing dementia. In our cross sectional study conducted in 2008, we suggested a novel concept of memory age identity (MAI). We defined MAI as the discrepancy between subjective memory age and chronological age. Participants with a negative value of MAI, meaning that they are subjectively confident with their cognitive functions, scored higher on cognitive function tests compared to participants with positive MAI value, meaning that the individual feels poorly about their cognitive functions.

We suggested MAI as an assessable psychosocial predictive factor in predicting objective cognitive functions in the non-cognitively impaired elderly. The association was significant even after adjusting for chronological age, sex, education, smoking, alcohol, depression, and anxiety (Chang et al., 2012).

To the best of our knowledge, no published studies have examined

the associations between MAI and cognitive function in the elderly. A longitudinal study was conducted to better understand the relationship between the two and to determine the potential of MAI as a new predictor of cognitive function in the elderly.

The aim of this longitudinal study was to confirm the findings of our previous report. and to suggest MAI as a novel psychosocial predictor of objective cognitive function in the non-cognitively impaired elderly.

2. Materials and methods

2.1. Subjects

This study was based on baseline data derived from a large prospective study called the Suwon Project(SP) which was a cohort comprising of nonrandom convenience samples of ethnic Koreans aged 60 years and above. In 2008, the total population of Suwon city was 1,280,000, including 98,540 who were aged 60 years and above. Of the 98,540 elders residing in Suwon city, we obtained responses from 2135 with the assistance of Suwon Geriatric Mental Health Center. All subjects completed the study questionnaire including demographic characteristics, history of current and past illnesses, drug history, Korean version of Mini Mental State Examination (K-MMSE), Korean version of Geriatric Depression Scale-Short Form (SGDS-K), Beck Anxiety Inventory (BAI), and subjective memory age based on 'self-perception of age scale' (Montepare & Lachman, 1989). Twenty-two subjects with incomplete data were excluded. In addition, 182 participants were excluded from the study due to the following exclusion criteria: those with a history of significant hearing or visual impairment that rendered participation in the experiment difficult, thyroid disease, liver disease, renal disease, tuberculosis, cancer, those with a history of neurological disorders (e.g., stroke, Parkinson's disease, or active epilepsy), those with a psychiatric illness (e.g., schizophrenia, mental retardation, severe depression, or mania), those taking psychotropic medications, and those with significant alcohol or other substance abuse. We also excluded cognitively-impaired(CI) elderly with a K-MMSE score lower than 17and CI subjects who were unable to understand or answer our questionnaires accurately. A total of 1345 participants were included for final analysis.

On the first year follow-up, 388 subjects (28.8%) were lost to follow-up and 957 subjects (71.2%) remained in the study. On the second year of follow-up, 558 subjects (70.6%) were lost to follow-up. At the end of the two-year study, 399 subjects (29.4%) have completed the questionnaires on all three follow-ups. Among the total of 946 subjects who were lost to follow-up after 2 years, 89 (9.4%) had passed away, 173 (18.3%) were too ill to be interviewed, 157 (16.6%) refused, 247 (26.1%) could not be contacted, and 280 (29.6%) had unknown reasons. All participants gave written formal informed consent for participating in the study. The study was approved by the Institutional Review Board of Ajou University School of Medicine.

2.2. Assessments and measurements

The protocol in this study adopted K-MMSE as a measuring tool for cognitive function. K-MMSE is a well validated tool for screening cognitive impairment in the Korean population (Kang, Na, & Hahn, 1997). Researchers have suggested cut-off scores of 17/18 for dementia in the Korean community (Kim, Shin, Yoon, & Lee, 2002). The sensitivity and specificity of the cut-off scores are 91% and 86%, respectively (Kim et al., 2002). Cognitively impaired (CI) is defined as those with K-MMSE scores less than or equal to 17 (i.e., K-MMSE scores $\leq$ 17) and the non-cognitively impaired (NCI) as those with K-MMSE scores greater than or equal to 18 (i.e., K-MMSE score $\geq$ 18) (Kim et al., 2002). SGDS-K and BAI (Bae & Cho, 2004; Yook & Kim, 1997) were used to screen depression and anxiety in the elderly.Also, a simple 'yes' or 'no' question was asked to check the health concern of the elderly: Are you worried about your overall health condition? (1) Yes (2) No.

2.3. Definition of MAI

Subjective age refers to a self-perception of aging. Subjective age is typically assessed by the following question: How old do you feel? This question premises that every person can evaluate one's own age subjectively. It is commonly accepted that the discrepancy between subjective age and chronological age is the 'age identity'. However, the concept of subjective age is not that simple. Barak and Schiffman have considered it as a mixed concept with different aging concepts including felt age, subjective physical age, and so on (Barak & Schiffman, 1981). In the subscale of 'self-perception of aging scale' designed by Montepare and Lachman (Montepare & Lachman, 1989) self-perceived subjective 'memory' age is inquired by asking "How old do you feel based on your memory?". In this study we assessed subjective memory age by using this questionnaire based on the subscale of 'self-perception of aging scale'. We then went further on and calculated the discrepancy between the participant's subjective memory age and chronological age. Just as 'age identity' is defined, we defined this value as 'memory age identity (MAI)' (Chang et al., 2012). When the subjective memory age is lower than the chronological age, meaning that the participant perceives their memory function to be better that their peers, MAI is given a negative value. When subjective memory age is higher than the chronological age, meaning that the participant feels that their memory function is worse then that of their peers, MAI is given a positive value.

2.4. Statistical analysis

The associations between MAI and cognitive function during the 2years of follow-ups were analyzed with the GEE model (Zeger, Liang, & Albert, 1988). The regression models were adjusted for age, sex, education, current smoking, currently alcohol drinking, SGDS-K, and BAI in the non-cognitively impaired elderly. The dependency of repeated observations within persons was taken into account for with GEE. (Zeger et al., 1988).The advantage of GEE is that subjects can be included regardless of missing values (Zeger et al., 1988). One of the difficulties of conducting a community-dwelling elderly longitudinal research study is a lost to follow-up. Therefore, considering a statistical method which could manage the missing values of the participants, including subjects in the study who were lost to follow-up, is crucial. A difference with $p < 0.05$ was considered statistically significant. SPSS version 15.0 was used for analysis.

3. Results

The general characteristics of participants are shown in Table 1. Out

Table 1
Characteristics of participants.

	2008 (N = 1345)	2009 (N = 957)	2010 (N = 399)
Age (y): a	76.5 ± 5.9	76.6 ± 5.8	76.4 ± 6.0
Subjective memory age (y): b	65.0 ± 12.6	65.0 ± 13.1	65.1 ± 11.3
Memory age identity: b-a	−11.5 ± 11.9	−11.7 ± 12.1	−11.2 ± 11.3
Education (y)*	3.2 ± 3.2	3.6 ± 3.6	2.1 ± 1.1
Sex (M%)*	23.6%	25.8%	17.3%
Current smoking (%)	9.0%	9.0%	6.3%
Current alcohol drinking (%)	29.1%	28.7%	24.8%
BAI	5.3 ± 5.7	5.4 ± 5.9	5.1 ± 5.2
SGDS-K	3.4 ± 3.4	3.5 ± 3.4	3.3 ± 3.4
Health concern (%)	97.8%	96.7%	99.2%
K-MMSE*	25.1 ± 3.3	25.1 ± 3.4	24.3 ± 3.2

Notes: K-MMSE- Korean version-Mini Metal State Examination; BAI- Beck Anxiety Inventory; SGDS-K- Korean version of the Geriatric Depression Scale-Short Form.
* $P < 0.05$ (tested by ANOVA or χ^2).