

## 【Grant-in-Aid for Scientific Research (S)】

### Humanities and Social Sciences (Social Sciences)



Title of Project : Lifestyle and Brain Function: Inquiry in Psychological Science into Successful Aging

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Research Project Number : 16H06325 Researcher Number : 70216539

Research Area : Social Science

Keyword : Life-span development, Maintaining cognitive function, Plasticity, Lifestyle, Brain imaging

#### 【Purpose and Background of the Research】

Lifestyle is one of major factors for maintaining older adults' cognitive function. The purpose of this study is to delineate the mechanism that lifestyle affects maintenance of cognitive function in old ages. To this end, this study focuses on brain regions a) which are more subject to age-related deterioration and b) which tend to compensate for other regions' deterioration.

Older adults' cognitive function declines in acquiring new knowledge, both in speed (speed of processing) and consolidation (memory). As for brain aging, structural deterioration is observed as gray matter shrinkage (especially in the basal ganglia, cerebellum, hippocampus, and prefrontal cortex (PFC)) and white matter changes related to demyelination, while functional aging is often characterized as overactivation in the PFC. With these facts in mind, we will investigate effects of a few activities such as physical and musical exercise to clarify relations between their effects on behavior and those on brain.

#### 【Research Methods】

This project includes intervention studies and master's studies. The intervention studies examine effects of training for relatively short period up to a year, while the master's studies investigate effects of life-long training/experiences.

The project will cover different types of training or lifestyle such as sensorimotor experiences, skill learning, and social exchanges, and their outcomes



Figure 1. An example intervention study

will be measured in various cognitive functions, such as multisensory integration, gait control, motor imagery, executive function, working memory, and episodic memory. In addition to behavioral performances in cognitive tasks, we will measure functional brain activation and anatomical brain structure.

#### 【Expected Research Achievements and Scientific Significance】

Our previous works indicate that a possible mechanism that training affects cognitive function is that training decreases the processing load on the PFC, perhaps by activating other weakened regions for which the PFC tends to compensate. We will pursue this hypothesis and focus on "training of subcortical structures". We expect original findings based on our unique point of view. The results will advance understanding of lifespan brain plasticity and provide guiding principles to better survive the super-aged society.

#### 【Publications Relevant to the Project】

- Kawagoe, T., ...Sekiyama, K. (2015). Brain activation during visual working memory correlates with behavioral mobility performance in older adults. *Front. Aging Neurosci.*, 7:186.
- Nishiguchi, S., Yamada, M., ... Sekiyama, K., ... Tsuboyama, T. (2015). A 12-Week Physical and Cognitive Exercise Program Can Improve Cognitive Function and Neural Efficiency in Community-Dwelling Older Adults: A Randomized Controlled Trial. *J. Ame. Geriatrics Soc.*, 63, 1355-1363.

【Term of Project】 FY2016-2020

【Budget Allocation】 101,800 Thousand Yen

#### 【Homepage Address and Other Contact Information】

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