Exploring Cognitive Aging Using Refernce Ability Neural Networks

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Country

USA

Title of project or programme

Exploring Cognitive Aging Using Refernce Ability Neural Networks

Source of funding information

NIH (NIA)

Total sum awarded (Euro)

€ 6,587,539.45

Start date of award

01/09/2011

Total duration of award in years

6

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

Acquired Cognitive Impairment... Aging... Alzheimer's Disease... Alzheimer's Disease including Alzheimer's Disease Related Dementias (AD/ADRD)... Behavioral and Social Science... Bioengineering... Brain Disorders... Clinical Research... Clinical Research - Extramural... Dementia... Epidemiology And Longitudinal Studies... Neurodegenerative... Neurosciences

Research Abstract

PROJECT SUMMARY: This study focus on the optimal functional and structural imaging characterization of the cognitive aging and preclinical Alzheimer’s disease (AD). It has been repeatedly demonstrated that performance across the age span on large batteries of diverse cognitive tests can be parsimoniously represented by a set of four reference abilities: episodic memory, perceptual speed, fluid ability, and vocabulary. Based on these findings, it has been argued that cognitive aging research should try to understand how aging impacts performance of this small set of reference abilities than focus on specific tasks. In contrast, neuroimaging researchers typically evaluate age differences in neural activation associated with the performance of a single specific task that may or may not be fully representative of these reference abilities. We have begun to identify the latent brain networks associated with each of the four reference abilities across adulthood. While undergoing functional imaging, we tested large group of healthy adults aged 20 to 80 with a series of 12 cognitive tasks that represent the four reference abilities (3 per construct). Using unique expertise in spatial covariance and other analyses of the fMRI imaging data, we have derived preliminary versions of the latent spatial, brain-wide fMRI networks that are associated with the latent cognitive structure of the reference abilities across adulthood. Successful identification of these “”reference ability neural networks”” may lead to a paradigm shift in research on the neural bases of age differences in cognition by focusing on the broad and replicable aspects common to several tasks rather than the possibly idiosyncratic features of individual tasks. We now propose to follow up this group at 5 years in order to begin to delineate how expression of these networks changes with aging and with the onset of mild cognitive impairment and AD. We will use multimodal imaging to evaluate potential mediators of age and dementia-related differences in the utilization of the networks. These include change in brain volume and cortical thickness; white matter hyperintensity burden; integrity of white matter tracts; resting CBF; and the default network. Importantly, we will use PET to assess amyloid burden. The proposed study will develop a completely new and more focused imaging approach to the study of cognitive aging and preclinical AD. It has the potential to provide key insights into the nature and causes of the neural changes that underlie cognitive aging and to more accurately describe the preclinical phase of AD.

Lay Summary

NARRATIVE: Cognitive aging across the lifespan has profound implications for the health, quality of life and productivity of society. The superimposed risk of Alzheimer’s disease increases with more advanced age. The proposed research program constitutes a major reevaluation of the methods and goals of the study of cognitive aging that should provide major new, integrative, and perhaps simplifying, insights into the neural basis of the most important and central features of cognitive aging and into the preclinical brain changes leading up to AD..

Further information available at:

Types:
Investments > €500k

Member States:
United States of America

Diseases:
Alzheimer's disease & other dementias

Years:

2016

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