

Comprehensive Longitudinal Probabilistic Atlas of the Brain of Older Adults Without Dementia

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Country

USA

Title of project or programme

Comprehensive Longitudinal Probabilistic Atlas of the Brain of Older Adults Without Dementia

Source of funding information

NIH (NIA)

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01/09/2016

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1

The project/programme is most relevant to:

Alzheimer's disease & other dementias

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Acquired Cognitive Impairment... Aging... Alzheimer's Disease... Alzheimer's Disease including Alzheimer's Disease Related Dementias (AD/ADRD)... Biomedical Information Resources... Biomedical Information Resources and Informatics Research... Brain Disorders... Clinical

Research Abstract

ABSTRACT A comprehensive digital atlas representative of the brain of older adults without dementia has not been constructed. An overwhelming number of brain magnetic resonance imaging (MRI) studies are now focusing on older adults without dementia to elucidate the role of brain characteristics in the mechanisms supporting cognitive health or leading to cognitive decline, with an ultimate goal to develop strategies for prevention of cognitive impairment. Human brain atlases consisting of MRI templates and semantic labels serve a critical role in neuroimaging, by mainly facilitating spatial normalization and automated segmentation for the purposes of voxel-wise, region-of-interest, and network analyses. Increasing the sensitivity and specificity of neuroimaging research on older adults without dementia requires an atlas with a comprehensive set of high- quality templates representative of the brain characteristics of the individuals under investigation, and detailed labels accurately mapping brain regions of interest. However, such an atlas has not been constructed for the brain of older adults without dementia. Available templates of the aging brain have been generated for only few MRI modalities (mainly T1-weighted MRI), several include information from demented individuals, almost all are based on small numbers of persons with a wide age-range, some are of low quality, none includes data on the individual participants, all are missing important information pertinent to aging, and all lack detailed gray and white matter labels. Thus, there is a major gap in neuroimaging tools substantially limiting the accuracy and increasing the complexity of MRI investigations in the critical group of non-demented older adults. The objective of the proposed work is to develop a high-quality, comprehensive, longitudinal, probabilistic atlas of the brain of older adults without dementia. We have recently developed and released the NIH-funded IIT Human Brain Atlas (v.4.1) for the young adult brain in ICBM-152 space, rapidly attracting attention for its comprehensive set of brain templates, state-of-the-art diffusion tensor and high angular resolution diffusion imaging (HARDI) templates, probabilistic gray matter labels, and probabilistic HARDI connectivity-based white matter labels. Furthermore, we have already collected multimodal brain MRI data on a large number of well- characterized older adults without dementia through our work in longitudinal, epidemiologic clinical-pathologic cohort studies of aging at Rush Alzheimer's Disease Center. Therefore, we propose to leverage our a) expertise in brain atlas development, and b) available multimodal MRI data on a large community cohort of well-characterized non-demented older persons, in order to develop a high-quality, multi-channel, longitudinal, probabilistic atlas of the brain of older adults without dementia. Successful completion of this work will bring forth a powerful set of resources that will substantially increase the accuracy and reduce the complexity of MRI investigations in the critical group of older adults without dementia. The new resources will have long-term implications in prevention of cognitive impairment and promotion of healthy aging and quality of life.

Lay Summary

PROJECT NARRATIVE The objective of the proposed project is to develop a high-quality, comprehensive, longitudinal, probabilistic atlas of the brain of older adults without dementia. Successful completion of this work will bring forth a powerful set of resources that will substantially increase the accuracy and reduce the complexity of MRI investigations in the critical group of older adults without dementia. Therefore, we anticipate that the new resources will be instrumental in efforts to elucidate the role of brain characteristics in the mechanisms

supporting cognitive health or leading to cognitive decline in old age, and will have long-term implications in prevention of cognitive impairment and promotion of healthy aging.

Further information available at:

Types:

Investments > €500k

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United States of America

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Alzheimer's disease & other dementias

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