Functional Brain Networks: Individual Integrity in Aging and Dementia

https://neurodegenerationresearch.eu/survey/functional-brain-networks-individual-integrity-in-aging-and-dementia/

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Funder

ZonMw

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Country

The Netherlands

Title of project/programme

Functional Brain Networks: Individual Integrity in Aging and Dementia

Source of funding information

ZonMw

Total sum awarded (Euro)

€ 1,500,000

Start date of award

01/09/13

Total duration of award in years

6.0

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

FMRI | Dementia | Neuroimaging | Functional Brain Connectivity.

Research Abstract
The number of dementia patients will steeply increase in the next decades. Individual dementia biomarkers are strongly needed for i) early (differential) diagnosis in the stages preceding

significant
cognitive loss, ii) marking disease stage and monitoring disease course and possible treatment effects, and iii) guidance for drug development targeting the early phase of the disease. The discovery
of an early biomarker is considered the holy grail in dementia research.
With magnetic resonance imaging (MRI), both brain structure, anatomical connections and functional
brain networks can be studied. Functional brain networks are likely one of the first features of the brain
to decline in early dementia. However, the other two MRI dimensions provide complementary information about brain integrity along the disease course. Based on my previous studies, I expect that
different (early) stages in dementia and different dementia types can each be characterized by a combination of MRI-derived features, contained in a ‘multivariate multidimensional MRI biomarker’.
In this project I will first apply various cutting edge analysis techniques on these three MRI dimensions. I will determine the combination of MRI features with maximal classification accuracy of
individual patients according to disease severity and dementia type. Next, I will evaluate the sensitivity
of this biomarker for early diagnosis and prediction of future decline rate using longitudinal studies in
1) patients with a mild cognitive impairment due to Alzheimer’s disease and patients with preclinical Alzheimer’s disease
2) asymptomatic mutation carriers, destined to develop frontotemporal lobe dementia
3) a large middle-aged and elderly population of non-demented individuals that is followed for incidence of Alzheimer’s disease
I envision that these innovations will lead to an early individual MRI biomarker that contributes to the
quality of early dementia diagnosis, is useful for monitoring of disease course and treatment, and will
provide new leads for drug development studies

Types:
Fellowships

Member States:
Netherlands

Diseases:
Alzheimer's disease & other dementias

Years:
2016

Database Categories:
N/A

Database Tags:
N/A