

# Neuropathology for disrupted multiscale activity control in Alzheimers disease

<https://neurodegenerationresearch.eu/survey/neuropathology-for-disrupted-multiscale-activity-control-in-alzheimers-disease/>

## Principal Investigators

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## Institution

BRIGHAM AND WOMEN'S HOSPITAL

## Contact information of lead PI

### Country

USA

## Title of project or programme

Neuropathology for disrupted multiscale activity control in Alzheimers disease

## Source of funding information

NIH (NIA)

## Total sum awarded (Euro)

€ 1,327,674.31

## Start date of award

01/09/2015

## Total duration of award in years

2

## 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)... Basic Behavioral and Social Science... Behavioral and Social Science... Brain Disorders... Dementia... Epidemiology And Longitudinal Studies... Neurodegenerative... Neurosciences... Sleep Research

## Research Abstract

DESCRIPTION (provided by applicant): Early diagnosis of Alzheimer's disease (AD) or identification of the risk for AD is important for better outcomes for individuals with AD and their caregivers. Using novel concepts and methods derived from modern statistical physics and nonlinear dynamics, PI's recent studies show that human motor activity exhibits not only rhythms at certain fixed time scales (e.g. circadian rhythms at ~24 hours), but also robust fractal fluctuations with similar temporal structure and statistical properties at different time scales. These fractal patterns are independent of environmental conditions and persist from seconds up to 24 hours, indicating an intrinsic multiscale activity control. More importantly, PI and his colleagues show that multiscale activity control (MAC) is degraded with aging and further degraded in AD, and that the degree of the degradation is strongly associated with amyloid plaques (a hallmark of AD), and can better predict circadian dysfunction as compared to traditional measures of circadian rhythmicity. These results provide strong evidence that MAC is physiologically important, likely reflecting integrity and adaptability of the motor activity control system. The goal of this project is to test the ability of MAC to predict cognitive decline and the risk for AD in elderly subjects. To achieve this goal, PI and his team propose to perform a longitudinal study using the unique database of 1727 participants (53-103 years old), collected in the Rush Memory and Aging Project (MAP) – a longitudinal, epidemiologic clinical-pathologic cohort study of common chronic conditions of aging with an emphasis on decline in cognitive and motor function and risk of AD. The specific aims are 1) to determine the longitudinal effects of aging and Alzheimer's disease on multiscale activity control; 2) to determine prospectively the ability of multiscale activity control to predict the risk of cognitive decline and Alzheimer's disease incidence; 3) to identify neurodegeneration in brain that contribute to disrupted multiscale activity control in older subjects. Achieving these aims will define the temporal profile of the degradation in motor activity control and its relationship with neurodegeneration in the brain during the development of AD. The proposed MAC measures may serve as a cost-efficient, reliable tool to predict the risk of AD and to monitor the progression of the disease.

### **Lay Summary**

**PUBLIC HEALTH RELEVANCE:** The goal of this project is to test whether multiscale activity control, a recently revealed novel dynamic control in motor activity fluctuations, can be used as a cost-efficient, reliable tool to predict cognitive decline and the risk of Alzheimer's disease (AD) in elderly individuals. Earlier diagnosis of AD or identification of the risk for AD provides individuals the opportunity to receive more efficient treatments and therapies, as well as to engage in financial and long-term care planning, which can lead to better outcomes for individuals with AD and their caregivers.

### **Further information available at:**

#### **Types:**

Investments > €500k

#### **Member States:**

United States of America

#### **Diseases:**

Alzheimer's disease & other dementias

#### **Years:**

2016

**Database Categories:**

N/A

**Database Tags:**

N/A