The Pharmacological Enhancement of Sleep for Memory Improvement

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Country

USA

Title of project or programme

The Pharmacological Enhancement of Sleep for Memory Improvement

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NIH (NIA)

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01/01/2014

Total duration of award in years

3

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)... Brain Disorders... Clinical Research... Clinical Research - Extramural... Dementia... Neurodegenerative... Neurosciences... Sleep Research

Research Abstract

DESCRIPTION (provided by applicant): A growing body of research shows that sleep facilitates the consolidation of memories. For example, the number of sleep spindles (transient neural events in non-rapid eye movement (NREM) sleep, 9-15 Hz) in a post-training sleep period correlates with the magnitude of declarative memory improvement (e.g., conscious, episodic memories), whereas minutes in REM sleep correlate with improvement in non-declarative memories (e.g., unconscious, perceptual or sensorimotor skills). Although these studies report that individual sleep features correlate with improvement in specific memory domains, we do not know if manipulating these sleep features will lead to changes in these precise memory domains. The central aim of this application is to use pharmacological intervention to address the specificity of sleep-dependent memory with respect to 1) sleep feature (i.e., sleep spindles vs. other sleep features), 2) memory domain (i.e. declarative vs. non-declarative), and 3) pharmacological agents (i.e., zolpidem (ZOL) vs. sodium oxybate (SO) vs. placebo). Establishing a link between correlational sleep studies and pharmacological interventions that target precise memory domains will advance our long-term goal of developing pharmacological treatments for memory impairments. We hypothesize that increasing spindles with ZOL will improve declarative, but not non-declarative memory, and decreasing spindles with SO will reduce declarative memory. Strong preliminary data demonstrate the feasibility of the project aim's in the applicant's hands. First, preliminary data from the PI's K01 demonstrates successful pharmacological modulation of sleep spindles (i.e., increased with ZOL and decreased with SO, vs. placebo); and second, pilot data shows that pharmacologically modulating sleep spindles does affect memory performance. Results of our pharmacological intervention on sleep-dependent memory consolidation in healthy young subjects will be leveraged to develop novel treatment approaches for older adults with pharmacologically tailored sleep. Outcomes from these studies will lead to future translational interventions in populations with more severe memory impairment (e.g., dementia and Alzheimer's patients). A compelling observation supports our approach: along with hallmark impairments in declarative memory, older adults and patients with dementia and Alzheimer's also have deteriorated sleep, including a reduced number of sleep spindles. Furthermore, older adults do not appear to benefit from sleep-dependent consolidation as much as younger adults. Yet, cognitive aging treatment strategies do not address the possibility of improving or tailoring sleep to reverse these memory impairments. The proposed studies investigate the hypothesis that pharmacologically boosting sleep spindles in older adults will improve declarative memory, compared with non-declarative memory and placebo. Outcomes of studies will have broad impact given 1) that over 70 million people in the U.S. suffer from disordered sleep at an annual cost of $150 billion; 2) the need to improve treatments for cognitive aging as well as the 5.5 million Americans affected by Alzheimer's at a cost of $200 billion annually; and 3) that improved mechanistic understanding of memory can influence education that costs $1 trillion annually.

Lay Summary

PUBLIC HEALTH RELEVANCE: The proposed research will serve the mission of the National Institutes of Health by expanding the basic science knowledge of memory and in investigating translational approaches to prevention and treatment of conditions that impact memory in clinical and at risk populations (e.g., older adults, dementia and Alzheimer's patients). We will use a widely prescribed drug, zolpidem (Ambien), which is used to treat some of the 70 million Americans that experience abnormal sleep. The results of these studies will allow us to examine the role of drugs on sleep and memory in human subjects that have previously only been

carried out in animal models.

Further information available at:

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Investments > €500k

Member States:
United States of America

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Alzheimer's disease & other dementias

Years:
2016

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N/A

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