The mechanism of cognitive reserve in bilingualism

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Research Abstract
? DESCRIPTION (provided by applicant): The search for interventions to maintain cognitive function in aging, particularly in the presence of dementia, is an urgent priority. Yet, despite considerable research effort, the biology of Alzheimer's disease (AD) is still poorly understood

and pharmacological therapies have only modest effects on cognitive ability. There is growing evidence that some lifestyle factors can maintain cognitive functioning in healthy aging and crucially postpone the onset of symptoms in those suffering from dementia. These factors are described as conferring 'cognitive reserve' (CR) and include education, occupational status, socio- economic class, and involvement in physical, intellectual and social activities. Recent studies from Canada, India, the U.K., and the U.S. have reported that bilingualism is a potent source of CR, and that bilinguals maintain better cognitive function in older age and show later onset of symptoms of both AD and amnestic mild cognitive impairment (MCI). However, the mechanisms of CR are largely unknown, making it impossible to exploit their effect for a wider population. The purpose of the present proposal is to identify the mechanism by which CR from bilingualism maintains cognitive function so that it can be used to develop non-pharmacological intervention for cognitive decline. Identification of the mechanism would be groundbreaking in opening new avenues for maintaining cognitive health in older age. The predominant view is that CR operates through a direct effect in which CR slows atrophy and the buildup of neuropathology in affected brain regions leading to a relation between neural integrity and cognitive performance. Our research, however, supports a compensatory effect in which neuropathological changes continue to progress but more intact aspects of brain function supplement impaired functions and permit the person to cope with the pathology. In this case, both the nature and the prognosis of intervention are different from those that follow from the direct effect. Specifically, therapies could be created that simulate compensation. The proposed study will investigate the hypothesis that the key mechanism in this compensation is the fronto-parietal control (FPC) network that is enhanced through bilingual experience. If supported, it will become the basis for a large-scale study investigating the effectiveness of stimulating the FPC to protect cognitive function. Such an intervention would be broadly applicable, beyond bilingualism. We will examine 40 participants in each of 4 groups – monolingual or bilingual and experiencing healthy aging or MCI. Testing will take place over two sessions and include measures of cognitive and executive control functions, three memory tasks that differ in their frontal recruitment, and imaging of structural and functional measures. We believe that the project is practically important as it highlights a non-medical approach to improving cognitive functioning in aging and dementia and may pave the way to the development of appropriate interventions. Thus it is a timely response to an urgent social health problem.

Further information available at:

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