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Lecture

Cognitive Reserve: epidemiology, pathology and neuroimaging

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Abstract

Reserve is a heuristic attempting to explain individual differences in cognition, function or clinical status in relation to cognitive aging and brain disease. The concept of reserve suggests that various aspects of life experience may allow some people to cope with progressing aging and Alzheimer's disease (AD) pathology better than others. Reserve may encompass at least three different constructs. Brain reserve refers to the neurobiological capital (numbers of neurons, synapses, etc.). It is conceptualized as a form of neurobiological hardware or individual variation in the structural characteristics of the brain. The term cognitive reserve refers to cognitive processes and may include properties such as the adaptability, efficiency, capacity, flexibility etc. of networks of brain regions and interactions thereof. It is conceptualized as a form of neurobiological software. Brain maintenance is conceptualized as reduced development over time of age-related brain changes and pathology leading to individual differences in decline of brain morphology over time reflecting the basic notion that the brain is modifiable based on life experience. Epidemiological evidence suggests that higher occupational attainment and education, as well as increased participation in intellectual, social and physical aspects of daily life are associated with slower cognitive decline in healthy elderly and may reduce the risk of incident AD. There is also evidence from structural and functional imaging studies that subjects with such life experiences can tolerate more AD pathology before showing signs of clinical dementia. It has been hypothesized that such aspects of life experience may result in functionally more efficient cognitive networks and therefore provide different aspects of reserve that delay the onset of clinical manifestations of dementia. It is also possible that their effect is mediated by their association with lower exposure to environmental insults or other more 'health conscious' lifestyle. Alternatively, they may be markers of innate capacities that also protect from cognitive decline and dementia. Definitions of cognitive reserve, brain reserve and brain maintenance are not static. Similarly, ways in which these constructs are best estimated, approached and studied are also evolving. In this presentation we review some of the relevant literature of the noted associations between markers of reserve and neurodegeneration and discuss the possible mechanisms that may explain these associations.