

## Advancing Our Understanding of Age-Related Changes in Executive Functions: Insights from Neuroimaging, Genetics and Cognitive Neurosciences

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**Abstract :** Executive functions are a critical component of goal-directed behavior, encompassing a diverse set of cognitive processes such as working memory, cognitive flexibility, and inhibitory control. These functions are known to decline with age, but the precise mechanisms underlying this decline remain unclear. This paper provides an in-depth review of recent research investigating age-related changes in executive functions, drawing on insights from neuroimaging, genetics, and cognitive neuroscience. Through an interdisciplinary approach, this paper offers a nuanced understanding of the complex interplay between neural mechanisms, genetic factors, and cognitive processes that contribute to executive function decline in aging. Here, we investigate how different neuroimaging methods, like functional magnetic resonance imaging (fMRI) and positron emission tomography (PET), have helped scientists better understand the brain bases for age-related declines in executive function. Additionally, we discuss the role of genetic factors in mediating individual differences in executive functions across the lifespan, as well as the potential for cognitive interventions to mitigate age-related decline. Overall, this paper presents a comprehensive and integrative view of the current state of knowledge regarding age-related changes in executive functions. It underscores the need for continued interdisciplinary research to fully understand the complex and dynamic nature of executive function decline in aging, with the ultimate goal of developing effective interventions to promote healthy cognitive aging.

**Keywords :** executive functions, aging, neuroimaging, cognitive neuroscience, working memory, cognitive training

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