

# Chapter 11

## Games and Other Training Interventions to Improve Cognition in Healthy Older Adults

**Elizabeth M. Zelinski**  
*University of Southern California, USA*

### **ABSTRACT**

*Many of the cognitive declines in healthy aging are moderated by experience, suggesting that interventions may be beneficial. Goals for aging outcomes include improving performance on untrained tasks, remediating observed cognitive declines, and ensuring preservation of functional ability. This selective review evaluates current progress towards these goals. Most research focuses on untrained tasks. Interventions associated with this outcome include games and exercises practicing specific cognitive skills, as well as aerobic exercise, and modestly benefit a relatively narrow range of cognitive tasks. Few studies have directly tested improvements in tasks on which individuals have been shown to experience longitudinal decline, so this goal has not been realized, though remediation can be examined rather easily. Little work has been done to develop psychometrically strong functional outcomes that could be used to test preservation of independence in everyday activities. Virtual reality approaches to functional assessment show promise for achieving the third goal.*

### **INTRODUCTION**

A very wide range of cognitive processes, including speed, working memory, executive functions, memory, linguistic abilities, and knowledge are affected in old age. However, longitudinal age declines in cognition tend to be gradual but typically not statistically significant until about age 60 (see Schaie, 2005). The relative amount of decline varies by cognitive domain, with a correlation of about  $-.33$  for age and episodic memory, and  $-.50$  for age and speed (e.g., Verhaeghen & Salthouse, 1997). A few domains like language, remain stable until after the 70s (McGinnis & Zelinski, 2000), though declines in sensory

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and perceptual processes may create functional impairments such as difficulties in communication (e.g., Schneider & Pichora-Fuller, 2000).

Although many of the declines associated with age may be due to degenerative physiological processes, recent evidence also points to the effects of certain moderators of performance that affect the extent to which age changes may be observed. These inform the basis of interventions to enhance cognitive processes in healthy older adults, that is, the majority of older persons, who do not develop dementing diseases or cognitive impairment, but who experience “normal” aging declines.

### **Cohort Differences**

Substantial increases in reasoning and related abilities in people of different generations when compared at the same ages (e.g., Schaie, 2005), suggest that changes in the cognitive environment may affect some abilities that have been observed to decline with age. Zelinski & Kennison (2007) evaluated two birth cohorts of people aged 56-82, one born on average in 1908 and the other born on average in 1924 on reasoning, spatial ability, list recall, text recall, and vocabulary. The more recently born cohort had better scores at age 74 on all tests except for vocabulary, even though that group did show declines on all tests with age. The explanation for the observed cohort differences was that the skills associated with better performance are reinforced by the broader social culture and these affect scores into old age (Zelinski & Kennison, 2007).

### **Education**

In samples representing the population of older American adults, education is a better predictor of performance on cognitive tasks than either health or depression, even though these are both important covariates of performance (Zelinski & Gilewski, 2003). Education is used as an index of cognitive reserve, the capacity for maintaining high levels of cognitive performance in the face of negative brain changes associated with medical conditions or normal aging, due to compensatory processes. Cognitive reserve is protective of decline even in dementia, whereby highly educated individuals reach the threshold of functional deficit for diagnosis with much more brain damage than those with low levels of education (Stern, 2006).

### **Cognitive Engagement**

Recent policy statements from the scientific community indicate that cognitive engagement is important for protection against cognitive decline in aging. The NIH Consensus Development Conference Statement on Preventing Alzheimer’s Disease and Cognitive Decline (Davidglus, et al., 2010) suggested that “increased involvement in cognitive activities in later life may be associated with slower cognitive decline and lower risk for mild cognitive impairment” (p.10). A review of modifiable risk factors for cognitive decline and dementia from the World Dementia Association suggested that a healthy diet and lifelong learning/cognitive training may be protective (Baumgart, et al., 2015). Finally, the Institute of Medicine, in its report on cognitive aging (IOM, 2015), suggested that individuals should take actions that “promote cognitive health, including be socially and intellectually engaged, and engage in lifelong learning.”

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