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Testing the limits of cognitive plasticity in older adults: Application to attentional control

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Abstract

Laboratory based training studies suggest that older adults can benefit from training in tasks that tap control aspects of attention. This was further explored in the present study in which older and younger adults completed an adaptive and individualized dual-task training program. The testing-the-limits approach was used [Lindenberger, U., & Baltes, P. B. (1995). Testing-the-limits and experimental simulation: Two methods to explicate the role of learning in development. *Human Development, 38*, 349–360.] in order to gain insight into how attentional control can be improved in older adults. Results indicated substantial improvement in overlapping task performance in both younger and older participants suggesting the availability of cognitive plasticity in both age groups. Improvement was equivalent among age groups in response speed and performance variability but larger in response accuracy for older adults. The results suggest that time-sharing skills can be substantially improved in older adults.

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1. Introduction

In the past few years a number of laboratory-based cognitive interventions have been designed in an attempt to improve specific aspects of cognitive functioning in seniors (see Kramer & Willis, 2003 for a recent review of this literature). In most cases, older and younger adults participated in extensive practice with laboratory-based paradigms that have been used to identify age-related deficits in memory, attention, problem solving, etc. A variety of results have been observed in these training studies. For example, in some studies, older and younger adults showed similar patterns of training benefits. This has been shown for instance in visual-search tasks in which participants must find a target among visual distractors. Both older and younger adults learned to perform visual search tasks at the same rate and both age groups achieved automatized search with extensive practice (Ho & Scialfa, 2002; Scialfa, Jenkins, Hamaluk, & Skaloud, 2000). However, other studies have shown that younger adults, but not older adults, achieve automatized search in tasks that combine visual and memory search (Rogers, 1992; Rogers, Fisk, & Hertzog, 1994). In the memory domain, training programs using different mnemonic techniques have shown positive results in older adults, which suggests that they can benefit from memory training. However, the improvements are typically larger in younger adults (see Verhaeghen, Marcoen, & Goossens, 1992).

Interestingly, some studies have also reported larger training benefits for older than for younger adults. For example, a larger improvement in the performance of older compared to younger adults has been reported in a study involving extensive practice in multiple memory-search tasks (Baron & Mattila, 1989) and in dual-task performance (Kramer, Larish, Weber, & Bardell, 1999). A larger benefit of training in older than younger adults has also been observed in a task that requires preparing for a motor response (Bherer & Belleville, 2004). An interesting feature of these studies was the use of feedback and/or instruction conditions intended to assist the participants in developing effective strategies to better perform and coordinate the tasks. Providing participants with active feedback to encourage the development of effective strategies might be important for older adults to develop greater cognitive skills over the course of training. Indeed, this would appear to be particularly important given previous demonstrations of age-related deficits in metacognitive skills such as self-monitoring and information management (Dunlosky, Kubat-Silman, & Hertzog, 2003; Murphy, Schmitt, Caruso, & Sanders, 1987). Although this hypothesis is appealing, further studies are needed to disentangle the effect of the training protocol compared to mere practice on cognitive functioning in older adults.

Together the studies reviewed above clearly indicate that older adults can learn new skills. Thus, latent cognitive potential (i.e., cognitive reserve) exists even in old age and laboratory-based cognitive training may be an effective approach to develop this potential. However, given the small number of behavioral intervention and cognitive training studies that have been reported, the differences between the methodologies employed, and the fact that not all studies have produced positive results, conclusions remain speculative as to how cognitive vitality can be improved and maintained in old age. Many open questions remain with regard to the potential benefit of cognitive and behavioral interventions: