

ABSTRACT

How do people manage everyday situations that involve a cognitive task and sensorimotor activities? The model of selection, optimization, and compensation (SOC-model, P. B. Baltes & Baltes, 1990) proposes that resource limitations induce individuals to select the more important domain of functioning and to invest more resources into it. In old age, reliable sensorimotor performances, like walking or maintaining stability, become increasingly important because older adults are exposed to many risks of falls. And falls may have dramatic consequences in old age. However, keeping body's equilibrium presumably requires a considerable amount of mental resources. How do older and younger adults allocate their mental resources in dual-task situations that involve a sensorimotor and a cognitive component? Is resource allocation under individuals' deliberate control? In this study, 18 young (20.5 – 29.2 years) and 18 older (69.8 – 83.6 years) adults were tested with a dual-task paradigm. In the dual-task condition, participants performed a reaction-time (RT) task, which required quick and accurate manual responses to acoustic stimuli, while they had to maintain balance on a dynamic force platform as it generated unpredictable perturbations. To challenge resources, a difficulty manipulation (single- versus two-choice RT task and light versus strong perturbations) was introduced to the study design. To investigate the individuals' capability to deliberately control resource allocation, participants were instructed to vary their attentional emphasis by focusing on balance, focusing on the RT task, or to perform both tasks equally well. By comparing dual- and single-task performances, the decrement in the performance of one task resulting from concurrent performance of the other task (dual-task cost) was assessed. Although results showed an age-related deficit in dual-task performance over and above age-related decline in single tasks, both age groups were able to deliberately allocate their mental resources. However, deliberate control was more pronounced in the cognitive than in the balance domain, and in the easy than in the difficult condition. Whereas young adults could deliberately control or even risk their balance in the difficult dual-task situation, older adults always protected their stability. The findings give strong support to the SOC-model's assumption of prioritization of balance, the most important domain, over cognitive performance in old age. At the same time, there was ample evidence for older adults' potential to flexibly allocate resources, most notably in the cognitive task. This capacity, however, was severely limited, especially when resource demands of the sensorimotor task increased.