An Examination of Age-Related Differences in Attentional Control by Systems Factorial Technology

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In this paper, we examined the age-related differences in attentional control and decision process. Previous studies have indicated that age-related cognitive declines may result from (1) general cognitive slowing, or (2) failure in distractor inhibition. To falsify the two possibilities, the present study adopted the systems factorial technology (SFT, Townsend & Nozawa, 1995) and designed two types of tasks: (1) a discrimination task (i.e., participants were required to actively inhibit distractors) and (2) a detection task (i.e., participants were not required to inhibit distractors). Results showed that age-related differences were only observed in the discrimination task but not in the detection task. We further adopted the Poisson parallel interactive model to simulate four possible parameters to characterize the aging effect on information processing, including information accumulation rate $\lambda$, decision criteria $\gamma$, cross-channel interaction $k$, and violation of context invariance $m$. The simulation results suggested that only when combining the decision criteria parameter and the violation of context invariance parameter can capture the signature of capacity differences between age groups. To elaborate, older adults may be more conservative (higher decision criteria) and less efficient at inhibiting distractors (larger violation of context invariance) relative to younger adults, in line with the distractor inhibition account. The major contribution of the present work highlights the importance of violation of context invariance in the estimation of workload capacity. Future works on the workload capacity are recommended to take the violation of context invariance into consideration.