

システム要因技術による注意制御における年齢差の検討

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An examination of age-related differences in attentional control by systems factorial technology

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Introduction

In our daily life, we operate in a high-workload environment forcing us to divide attention between multiple sources of information to make decisions. Among the few available aging studies that used the redundant-target task, the redundancy gain (RG) has been found to be larger for older adults than younger adults. This phenomenon might be explained by two well-known aging hypotheses: the general cognitive slowing framework or the distractor inhibition account. We followed Ben-David et al.'s (2014) study and designed two tasks: the discrimination-type redundant-target task and the detection-type redundant-target task. Through the experiments, the results enable us to understand the age-related differences in redundant-target signal processing and further tease apart the two well-known aging hypotheses. We applied Systems Factorial Technology (Townsend & Nozawa, 1995) to investigate the age-related differences in workload capacity, a theory-driven model-based index of the relative processing efficiency when the redundant targets are presented simultaneously to when a single target is presented alone.

Method & Simulation

14 younger and 18 older adults participated in Experiments 1 and 3, and 15 younger and 13 older adults participated in Experiments 2 and 4. The stimuli for each experiment are shown in Figure 1. Participants were required to discriminate target X from distractor O in Experiment 1. In Experiment 2, participants were required to discriminate either target shape X or target color green. Experiment 3

were the same as those in Experiment 2 except target color was defined as red. Experiment 4 was a simple detection task which participants were required to detect a light dot. To propose a processing account to explain the age-related differences, we conducted a simulation study extending Johnson et al.'s (2010) Poisson parallel interactive model shown in Figure 2. Results and Discussion

The capacity results are shown in Figure 3. In Experiments 1-3, we concluded that older adults had a larger workload capacity and a larger or equivalent log-transformed RG effect than younger adults. In contrast, in Experiment 4, the age-related differences in workload capacity were eliminated. The simulation results suggested that the general slowing effect occurred because the older adults were more conservative in making decisions and the capacity differences occurred because the older adults were less effective and efficient in inhibiting distractor.

References

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