How Cognitive Aging Affects the Relationship between Attention and Error Repetitions

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Elderly people using IT-based equipment often show repetitions of the same erroneous operations (Harada & Akatsu, 2003). Investigating this phenomenon is important for making usable designs for the elderly, and also interesting because cognitive aging has some specific effects on inhibition from the past experiences when selecting one from plural response candidates. Research to identify factors of the phenomena with a simpler kanji-selection task (Harada & Suto,2004) have found that 1) adding stimulus complexity, especially spacious randomness, is necessary, 2) under a dual-task condition, even university students showed error repetitions, however, 3) old people with low scores in attention-tests showed no differences from high-scoring participants.

In order to know what aspects of attention affect error repetition, Suto & Harada (2006) added two more conditions, the reverse- and the task switching- condition. The results showed young adults displayed error repetition only under the task switching condition. In this paper, these two conditions were investigated using elderly participants.

Exp 1: the Reverse Condition

Under the reverse condition, participants were instructed to select 'the KANJI that is not correct but a homophone'. Because this decision requires double-negation, error repetition may be observed if high task complexity is the important factor of the phenomena.

Participants: Sixteen voluntary participants from a temporary agency for seniors participated in the study. They were all healthy and their age ranged from 65 – 77.

Apparatus, Stimuli, and Procedures : Tablet-PCs with LCD monitors were used. Forty-eight sets of 2 sentences and 4 candidates (a target, a lure, and two words with different pronunciation) were used; the meanings of the sentences distinguished the target from the lure. Each participant performed a 2-block experiment of 24 trials, under the reverse- and the control condition. In a trial, a context sentence with a target pronunciation was presented after the eye-fixation point (*), and after participants pushed the *next* button, four candidates were presented. If participants made a mistake, the same trial was repeated until a correct answer was chosen or repeated 3 times, although participants were told that repetitions would happen randomly.

Results and Discussion: Figure 1(a) shows the percentage of error repetition in two conditions, and a two-way ANOVA only showed the main effect of repetition [$F(2, 30) = 33.57$, $p<.01$]. The main effect and the interaction of the task condition were not significant. As with young participants, the error repetition did not increase when the task required more attention resources.

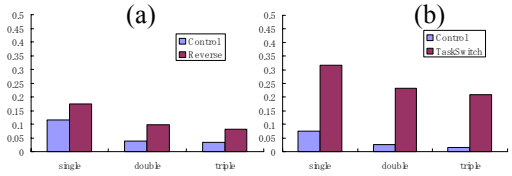

Figure 1. Proportion of error in Exp 1(a) and Exp.2(b).

Exp 2: the Task Switching Condition

Under the task switch condition, each trial started with a marker that instructed which was to be selected, with 'right', 'wrong' or '*', meaning "the same as the previous one". With these changes, load of goal maintenance was added. Other procedures were the same as in Exp.1. 16 other volunteers participated (age range 65 – 78).

Results and Discussion: The results are shown at Figure 1(b). A two-way ANOVA showed a significant effect of the task condition [$F(1, 15)=55.75$, $p<.01$], and the error repetition [$F(2, 30)=17.90$, $p<.01$], and their interaction was marginally significant [$F(2, 30)=2.82$, $p<.10$]. Load addition of goal maintenance increased error repetition among older participants as young people.

General Discussion

Two experiments with elderly participants showed the same result as with young adults, and this indicated that attentional loads of goal maintenance are one of the basic factors for error repetition. In addition, in detailed analysis of error repetitions under the task switching condition, young adults showed more slips with both 'right' and 'wrong' trials, although older participants showed continuous errors only with 'wrong' trials. This implied that task complexity was effective only for older people. The roles of attention and inhibition in error repetition should be examined more extensively, especially the aspects of commonality irrespective of age and of the changes that accompany cognitive aging.