

Influences of the Other's Existence on the Psychological Time Estimation in Visual Cognition Tasks

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1. Introduction

A previous study found that we tend to underestimate the time duration in operating a personal computer with a VDT (visual display terminal).¹⁾ In addition, they reported that there is a negative correlation between the performance of memory task and estimated time duration.

We are interested in what factors affect the subjective time estimation during the conduct of the visual cognition task by the use of VDT display. In this study, we especially attended to the effects of the other's existence on the time estimation because there is a report that the other's existence affects the temporal aspect of the cognition task, such as Simon effect.²⁾

In this study, we examined how the types in the existence of other person would affect the estimated time in conducting the task of Simon effect. By examining the relationship between the estimated time and the reaction time in the Simon effect task, we will discuss whether the processing of the time estimation would be independent of the processing for the visual cognition task. Moreover, we will propose the condition for the working environment which enables us to accurately estimate time duration without declining the performance of the cognition task.

2. Experiment

2.1 Equipment

Experiment was conducted in a closed room (**Fig. 1**). We presented the stimuli on a 17" CRT display (TATUNG, C7BZR,) that was controlled by a computer (SONY, VGC-M22B).

2.2 Procedure

Observers took part in the experimental sessions which were planned to investigate the Simon effect. After the whole trials, they estimated how long time they had spent in conducting the experiment. We measured the veridical time duration of the experiment, and the reaction time in the Simon effect task for each observer.

In order to examine the Simon effect, a red or green circle (diameter of 8.0 arc deg) was presented at the right or left side in the display 750 ms after the observer's key pressing.

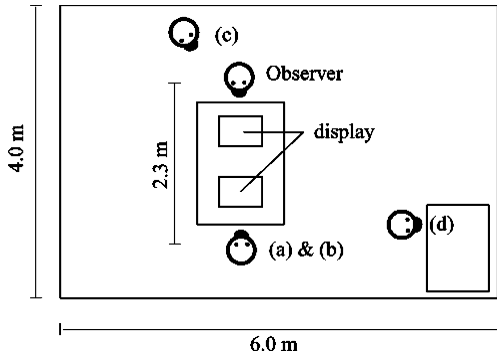
Observers were instructed to press a key with their right hand if the circle was red, and with their left hand if the circle was green, as soon as possible. There were four conditions (**Table. 1**), and each of them was presented 100 times in random orders for an observer.

We prepared the following five conditions to examine the influence of the others' existence on the time estimation and Simon effect (**Fig. 1**).

a) Competitor. Observers were instructed to try to conduct the task with shorter reaction time and fewer errors than the other person who

Table 1 Relationship between the stimulus position and hand for reaction in each condition.

| Condition | Stimulus position | Stimulus | Reaction |
|-----------|-------------------|----------|------------|
| Valid | left | green | left hand |
| | right | red | right hand |
| Invalid | left | red | right hand |
| | right | green | left hand |

**Fig. 1** Configuration of the room. The position of the other person varied in each condition.

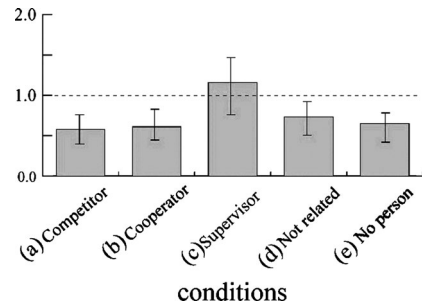
conducted the same task in front of the observer.

b) Cooperator. Observers were instructed that the averages of the reaction time and error number from both the observer and the other person, had to be shorter than the level which was set at the beginning of the experiment.

c) Supervisor. The experimenter behind the observer checked the reaction time and the error in each block, and instructed the observers to conduct with shorter reaction time and with more accuracy.

d) The other who are not related to the task. Although there was a person in the room, he conducted some paper works that were not related to the observer's task.

We prepared a **control condition e)** in which the observer conducted the task in the room without any other person.

**Fig. 2** Rate of the estimated time to the physical time.

2.3 Observer

There were 25 observers (20–23 years old, 14 males and 11 females), and they were divided into each of the five conditions. Before the time estimation, they were never instructed that this experiment is related to the psychological time.

3. Results

Fig. 2 shows the rate of the estimated duration to the veridical duration. The value smaller than 1.0 indicates that the duration was underestimated. Fig. 2 implies that the observers tended to underestimate the time duration in all the conditions except for the Supervisor condition. In other words, in the Supervisor condition, the duration was the most accurately estimated among the five conditions.

We conducted the one way analyses of variance for the estimated times. The factor was the type of other's existence. There was a significant main effect for the type of other's

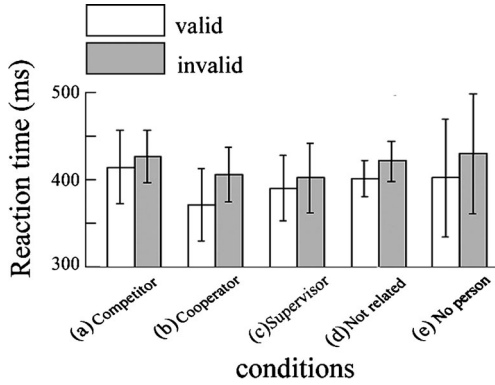


Fig. 3 Result of reaction time.

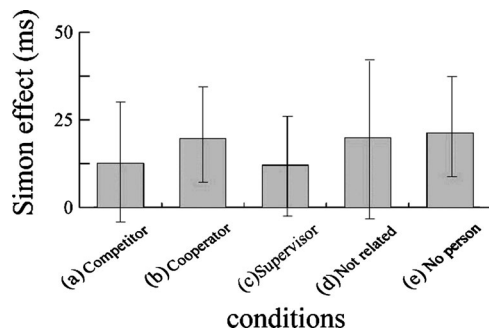


Fig. 4 Result of Simon effect.

existence [$F(4,16)=2.871, p<.01$]. HSD tests showed that there was a significant difference in the estimated time only between the Supervisor condition and the other four conditions.

Fig. 3 shows the reaction time in each condition. There was no significant difference among the conditions. Fig. 4 shows the averages of the Simon effect which was defined by the difference in the reaction times between valid and invalid conditions. There was positive Simon effect in all of the conditions. However, there was no significant difference among the five conditions. Fig. 5 shows the frequency of the correct response in the Simon effect task. There was no significant difference among the five conditions.

The correlation between the extent of the Simon effect and estimated time duration was

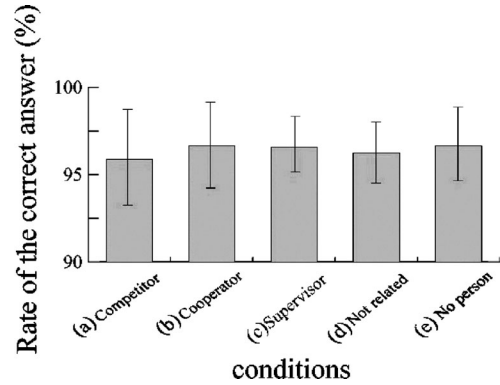


Fig. 5 Rate of the correct answer.

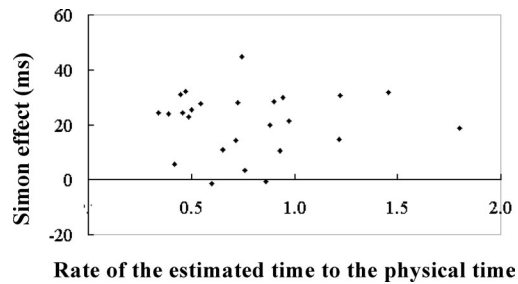


Fig. 6 The correlation between the Simon effect and the estimated time.

not significant [$r=-1.66, N=25$] (Fig. 6). These results indicate that other's existence has no consistent influence on the performance in cognitive task used in this study although it has effects on the time estimation.

4. Discussion

There was a significant effect of the other's existence on the time estimation although it had no consistent effect on the reaction time as well as the extent of the Simon effect. The processing for the visual cognition task would be independent of the processing which underlies the time estimation in conducting the task. The processing for the time estimation would be more sensitive to the other's existence than the processing for the visual cognition task is.

How the time estimation was affected by the

other's existence? The supervisor would give the observer tension and anxiety during the task. Those mental states would increase the tempo of the internal clock³⁾ of the observer which would cause the overestimation of the subjective time during the task.

We are proposing that, in the working environment with a supervisor, the operator would be able to avoid the underestimation of the time without declining the performance of the visual cognition task. Future studies should examine how the existence of the supervisor enables the operator to avoid the underestimation of the duration. It would be worth investigating the relationship between the time estimation and the tension, as well as anxiety, caused by the existence of the

supervisor.

References

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