公益財団法人 国際交通安全学会
International Association of Traffic and Safety Sciences

Effect of aging on post-error behavior

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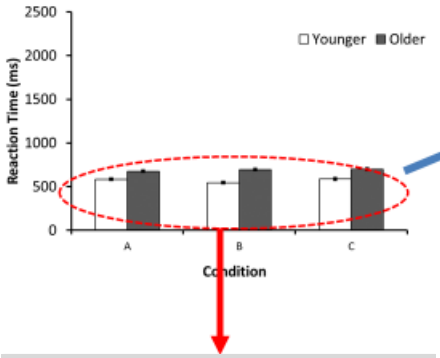
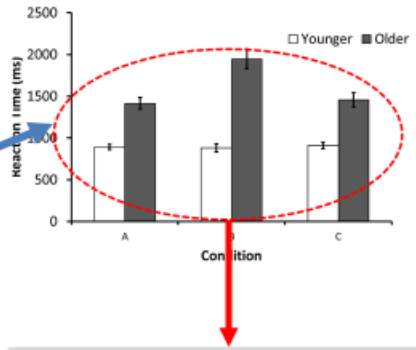
Go reaction time



Corresponds to the time required in stepping on the accelerator upon determining the situation.

Post-error response time



Corresponds to the time required in stepping on the brakes in response to an error.

Do the effects of aging tend to appear easily?

Overview

- In this study, we focused on “response” after an error has occurred and examined whether age-related changes exist there.
- As our method, we targeted 50 young adults and 50 older adults and had them carry out tasks based on the EAT (error awareness task).
- The results of the experiment indicated that post-error response time became relatively longer for the elderly adults and that the effects of aging tend to easily appear in the switching of their post-error reactions.
- Furthermore, a possibility was indicated that the immediately preceding reactions may affect post-error reaction switching.

Research Objective

- With regard to a person's behavior after an error has occurred (post-error behavior), studies have been conducted so far from the viewpoint of whether the person notices (becomes aware) of the error.
- In this study, we focused on post-error "response" and examined whether age-related changes exist there by giving feedback that an error has occurred.

Background

In situations where older adults are involved in accelerator and brake pedal misapplication accidents, they continue stepping on the accelerator even after the pedal misapplication has occurred, and it often leads to a serious accident.

Subjects

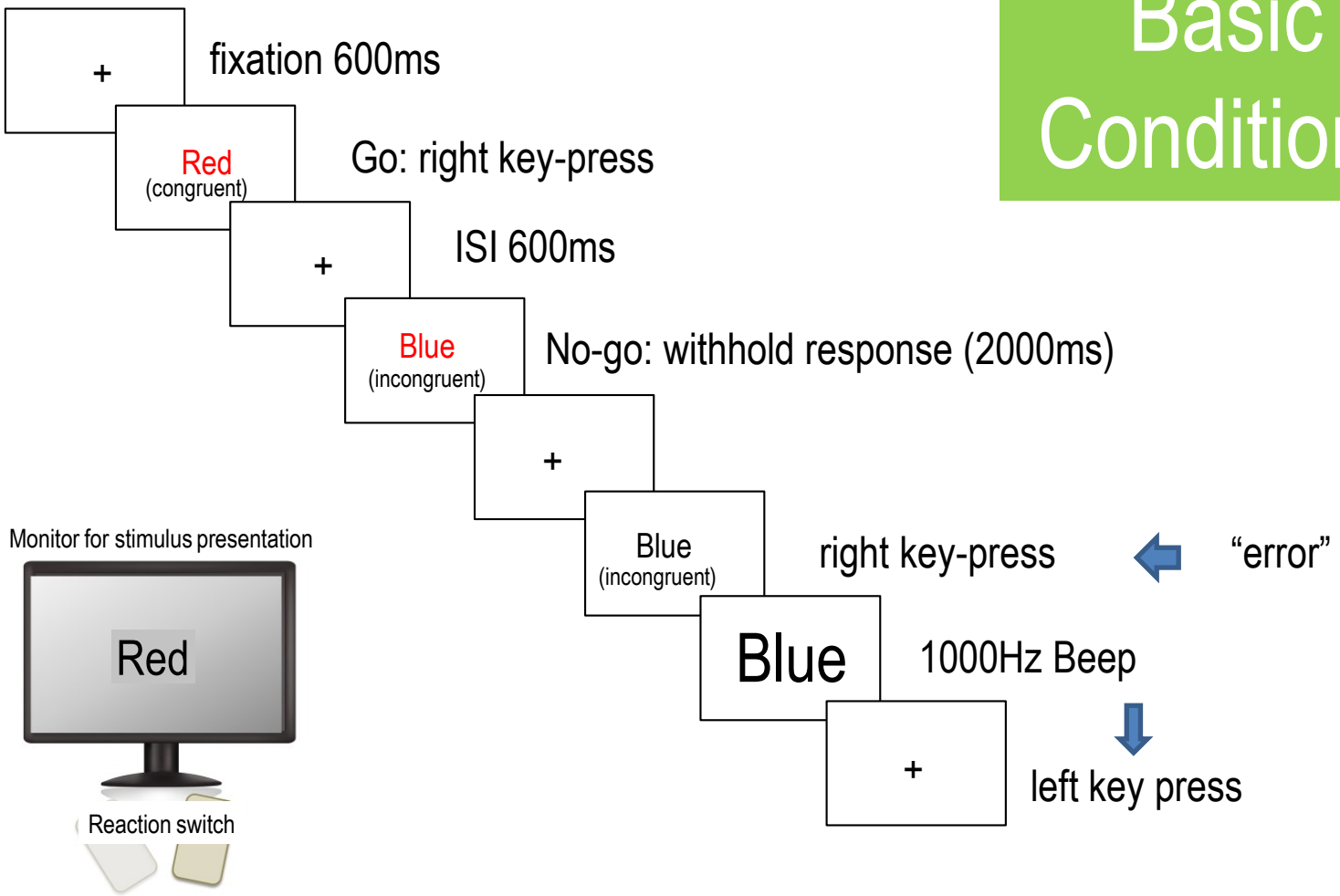
- Fifty young adults (25 men and 25 women; average age: 21.6).

- Fifty older adults (25 men and 25 women; average age: 71.6); the MMSE was an average of 29.1 points, while the range was 26-30 points.

Experiment Procedure

- We employed a task with changes made to the EAT (error awareness task) (Harty et al., 2013) (this EAT consisted of adding the Go/Nogo Task to the Stroop Task).
- However, a beep sound was made an at the time of error, and visual stimulus was increased in addition, and the participants in the experiment were notified of the error.
- See the figure on the next page regarding the basic conditions.

Basic Conditions



Experiment Conditions

- We set three conditions concerning how to push the switches (see the next page).

- With Condition A as the basis, we changed the number of times the switch was pressed and compared the effects that the differences in reactions had on the errors and post-error responses.

Condition A

Go stimulation (ex. “Red”) Press the right switch once

No-go stimulus (ex. “Red”) Don’t press

Post-error Press the left switch once

Condition B

Go stimulation (ex. “Red”) Press the right switch twice

No-go stimulus (ex. “Red”) Pres the switch once (only)

Post-error Press the left switch once

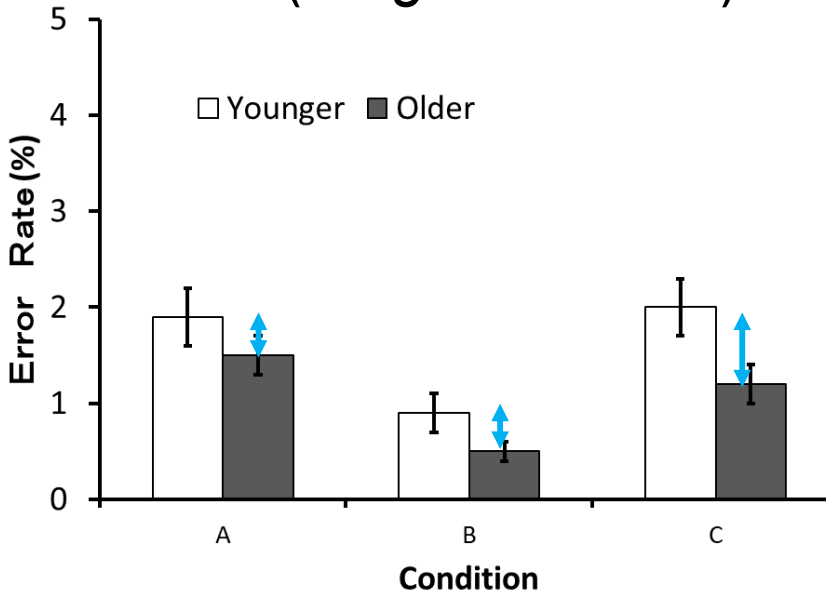
Condition C

Go stimulation (ex. “Red”) Press the right switch twice

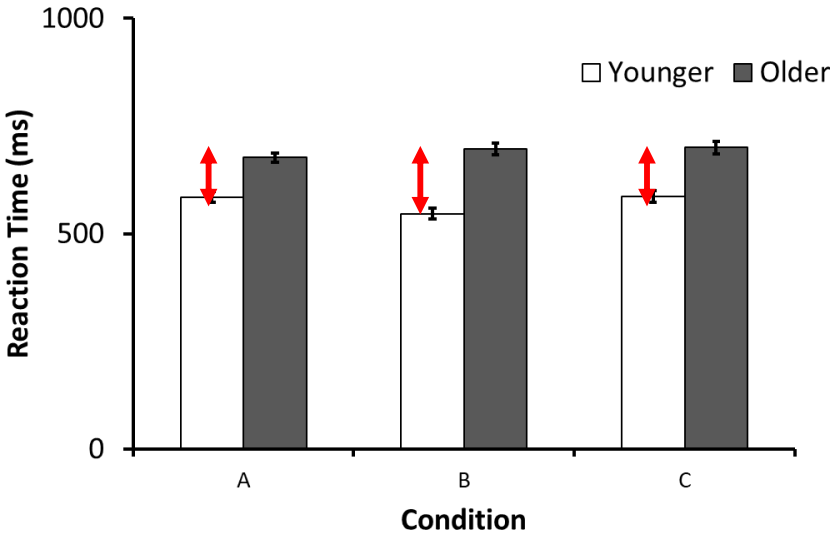
No-go stimulus (ex. “Red”) Don’t press

Post-error Press the left switch once

Error rate (no-go condition)



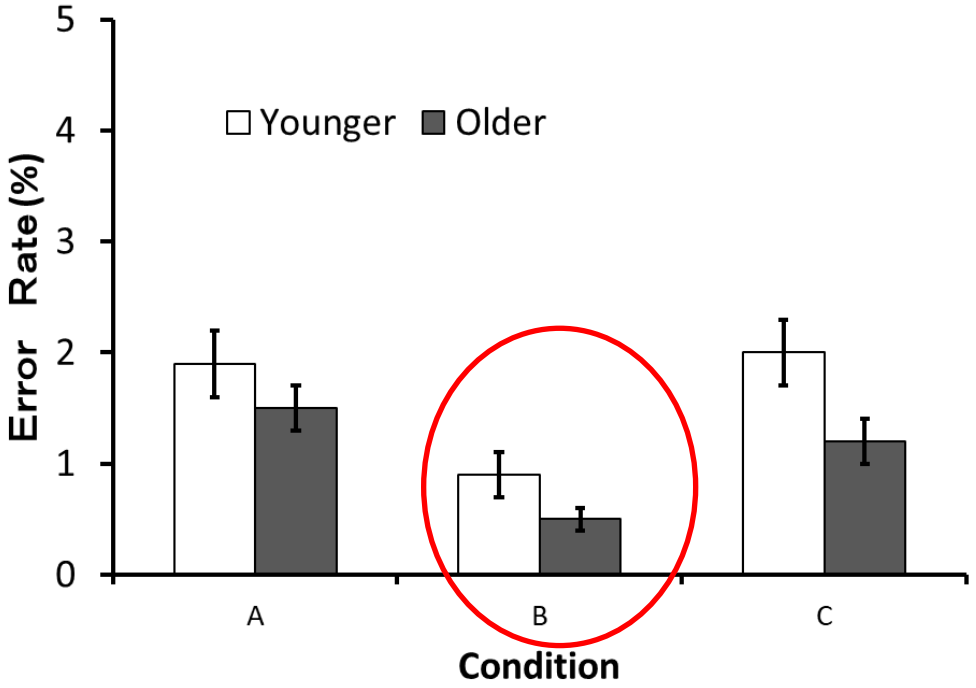
Reaction time (go condition)



Error term is SE
(the same applies hereinafter)

Although the reaction time became longer among the older adults ($p < .01$), the error rate decreased ($p < .05$).

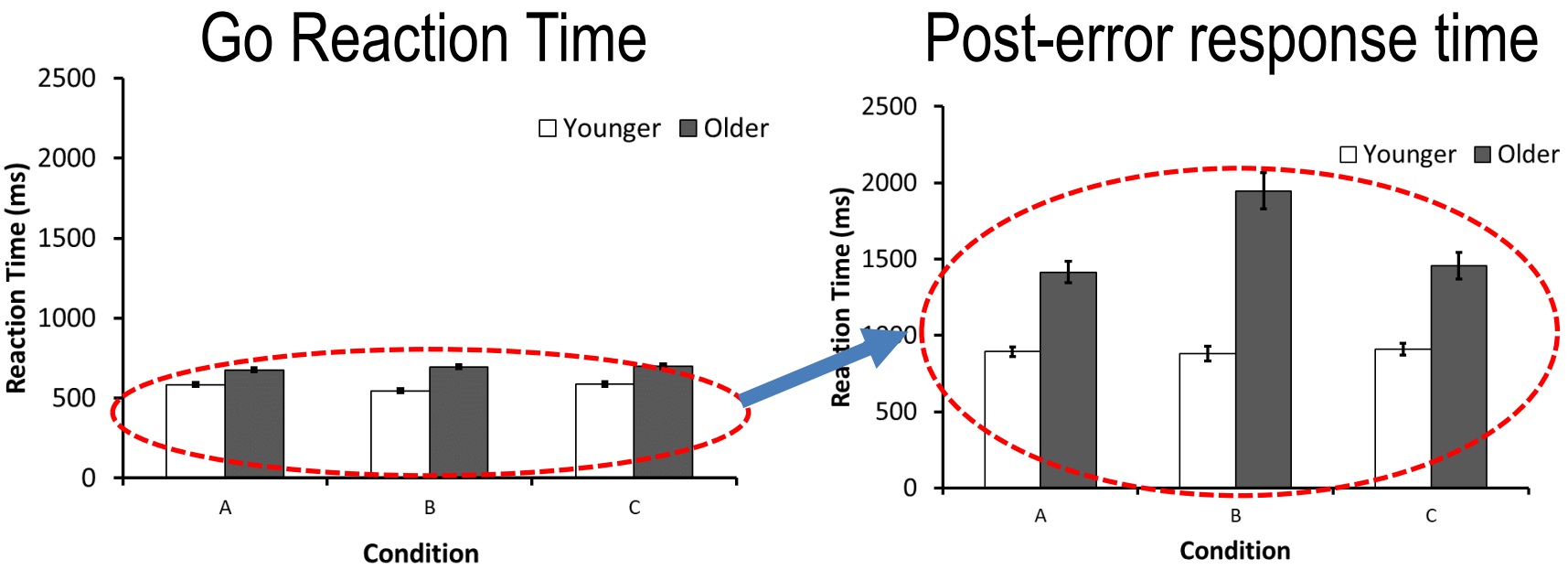
⇒ The older adults place priority on “accuracy” in their strategy.



The least errors occurred under Condition B throughout both groups ($p < .05$).

⇒ Condition B required pressing the switch twice if the color and characters matched and once if they did not match.

Unlike Condition A and Condition C, it was not necessary to completely suppress the reaction against no-go stimulus; as a result, there is a possibility that there were few errors throughout both group

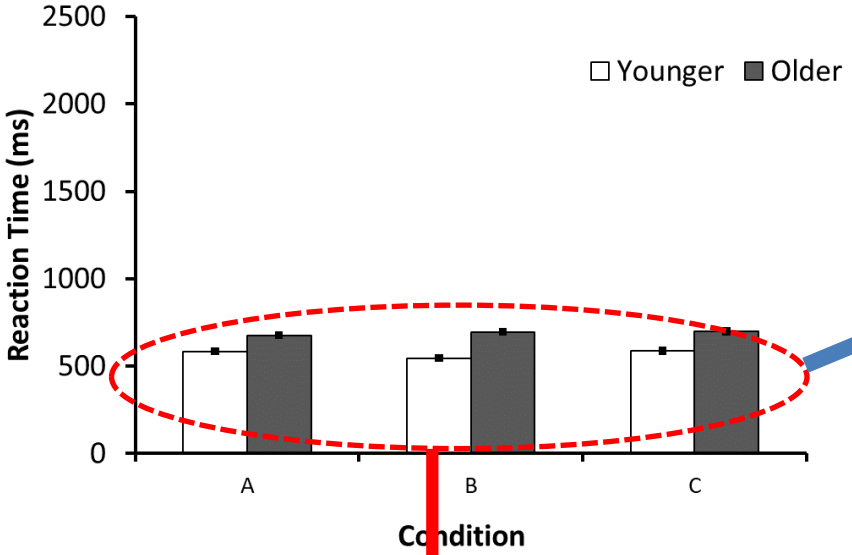


Comparing post-error response time (until the left switch is pressed after the error sign appears) with the reaction time toward the go stimulus (until the right switch is pressed after stimulus presentation), the post-error response time became longer in older adults.

⇒ In older adults, the response time after the error sign appeared was relatively slower than the go reaction time that is accompanied by judgement on the color and character of the stimulus.

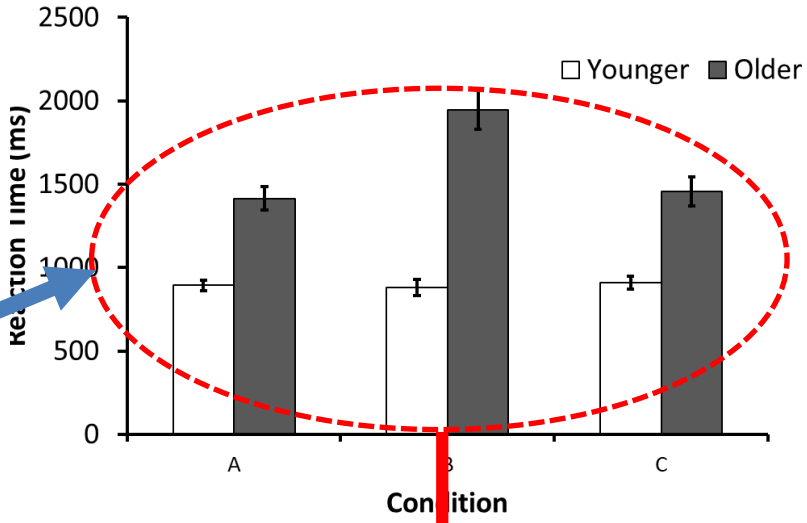
⇒ Effects of aging tend to appear more easily in the switching of post-error reaction.

Go Reaction Time



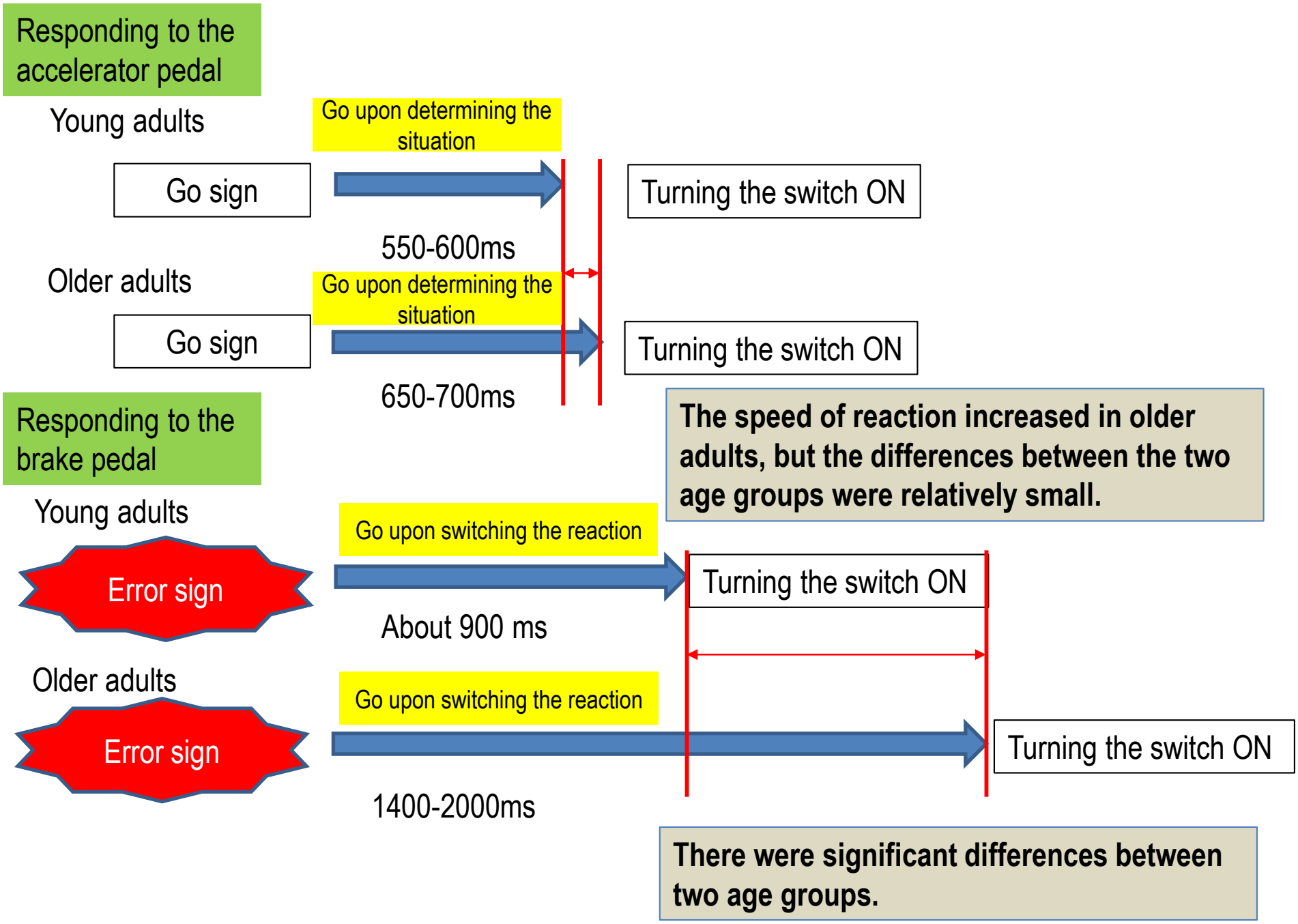
Corresponds to the time required in stepping on the accelerator upon determining the situation.

Post-error response time

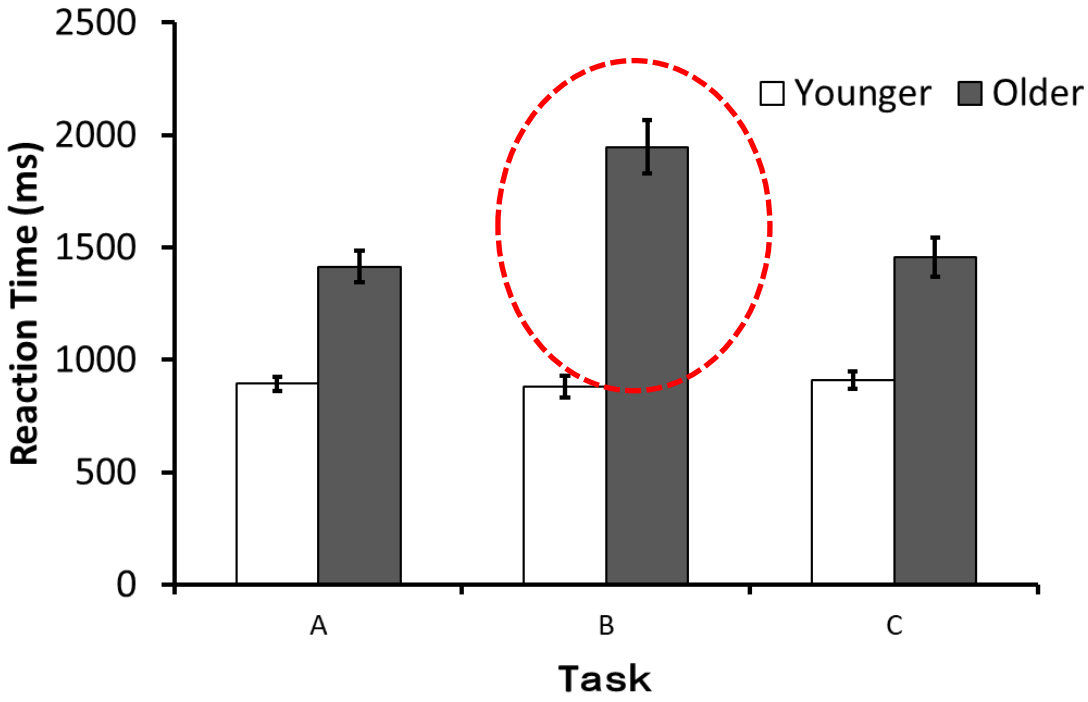


Corresponds to the time required in stepping on the brakes in response to an error.

Do the effects of aging tend to appear easily?


Responding to the accelerator pedal
Young adults
Go upon determining the situation
Go sign
Turning the switch ON
550-600ms
Older adults
Go upon determining the situation
Go sign
Turning the switch ON
650-700ms
Responding to the brake pedal
The speed of reaction increased in older adults, but the differences between the two age groups were relatively small.
Young adults
Go upon switching the reaction
Error sign
Turning the switch ON
About 900 ms
Older adults
Go upon switching the reaction
Error sign
Turning the switch ON
1400-2000ms
There were significant differences between two age groups.

Post-Error Response Time



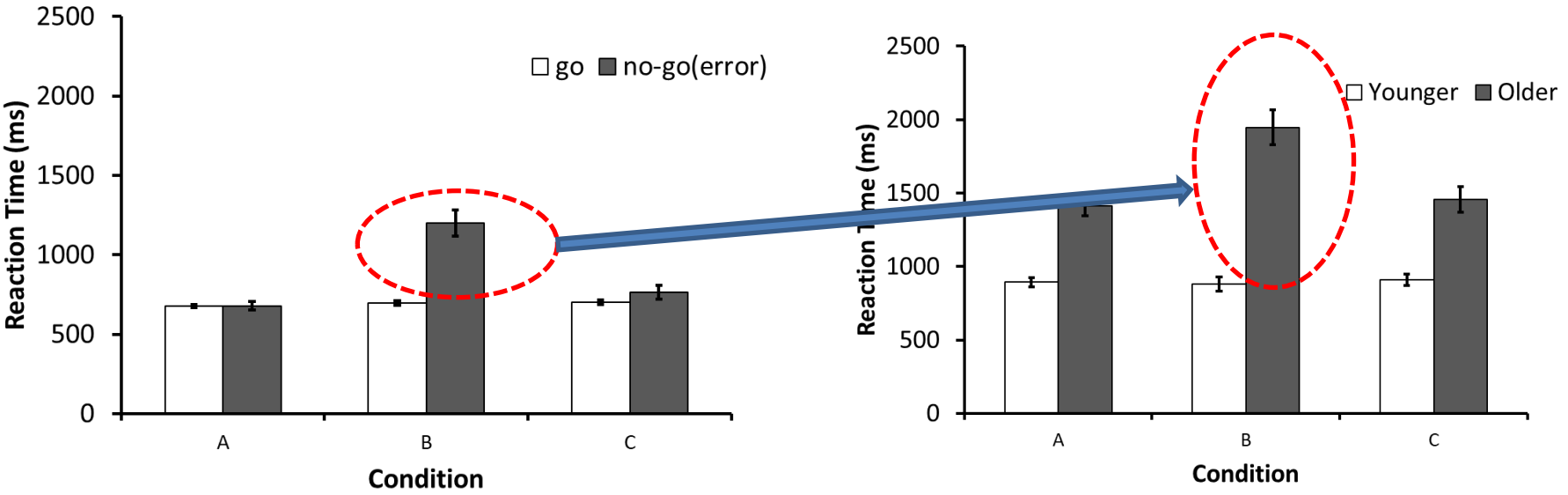
Response to an error under Condition B tended to be delayed only among the older adults. ($p < .05$)

⇒ Condition B required pressing the switch twice if the color and characters matched and once if they did not match.

⇒ There is a possibility that they hesitated in responding.

Comparison of Reaction Times at the Time of an Error

Post-error response time

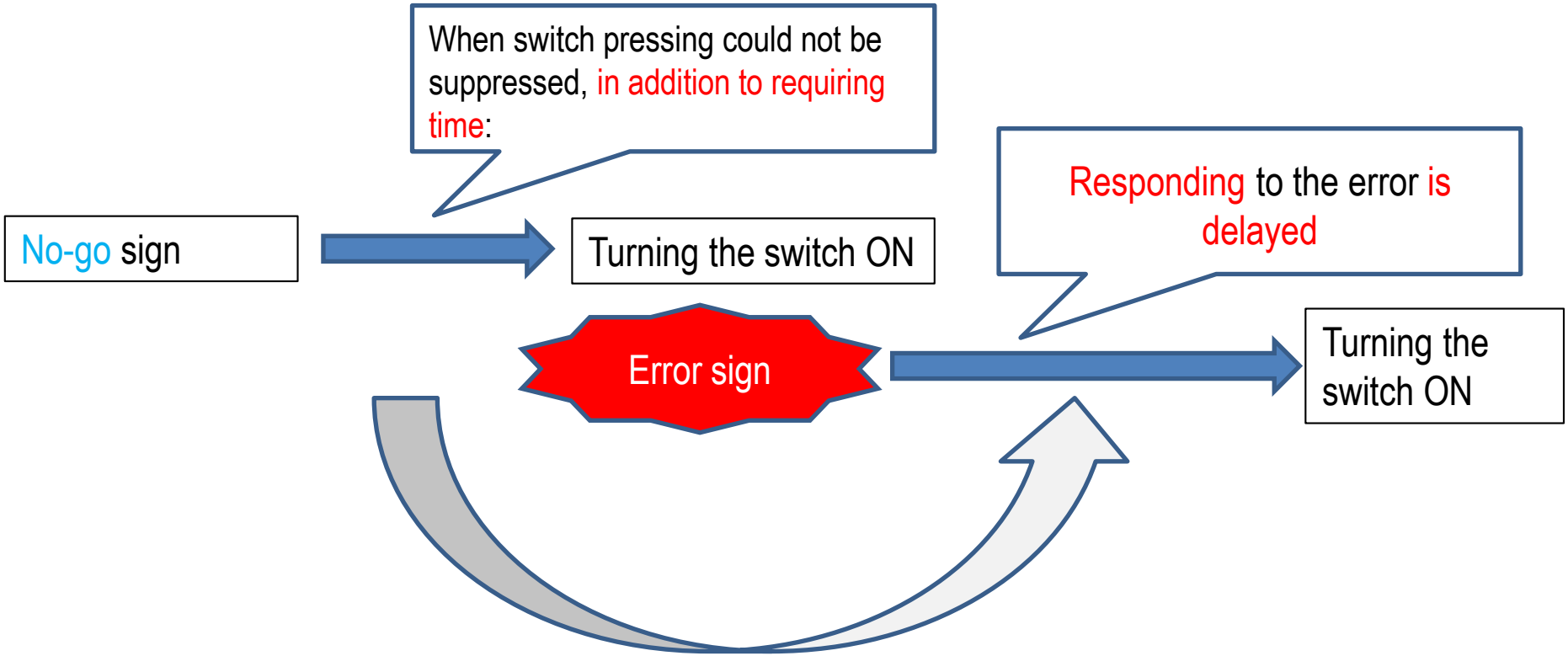


So, as a post-hoc analysis, we compared the reaction times (until the right switch is inadvertently pressed after stimulus presentation) at the time of an error.

⇒ It was indicated that in addition to requiring time to react, and if that reaction resulted in an error, switching the reaction to pressing the left switch was delayed.

⇒ There is a possibility that immediately preceding reactions may affect the post-error reaction switching.

Among the older adults…



Immediately preceding reactions tend to easily indicate carry-over effects on post-error response.

Characteristics of Errors

- Significant age-related changes were not observed in the tendency of errors.

- The older adults tend to easily adopt a strategy prioritizing accuracy, while young adults tend to adopt that prioritizing speed.

Post-Error Response

- Among the older adults, the delay in post-error response time became more pronounced in general.

  ⇒ The effects of aging tend to appear more easily in the switching of post-error reactions.

- Error signs were identical under all conditions, but among the older adults, post-error response was delayed when they required time in reacting.

  ⇒ There is a possibility that immediately preceding reactions may have affected post-error response.

References

Harty, S., O'Connell, R. G., Hester, R., & Robertson, I. H. (2013). Older adults have diminished awareness of errors in the laboratory and daily life. *Psychology and Aging*, 28(4), 1032–1041.