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THE RELATIONSHIP BETWEEN GENERATION AND INSPECTION OF MENTAL IMAGERY: AN ERP STUDY

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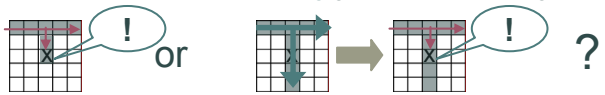
Introduction

Mental imagery process: **generation**, maintenance, **inspection**, and manipulation (Kosslyn 1994)

Whether does inspection occur during generation or after generation?



Purpose : to investigate the relationship between generating and inspecting images, using behavioral and brain activity related to these processes.

Methods

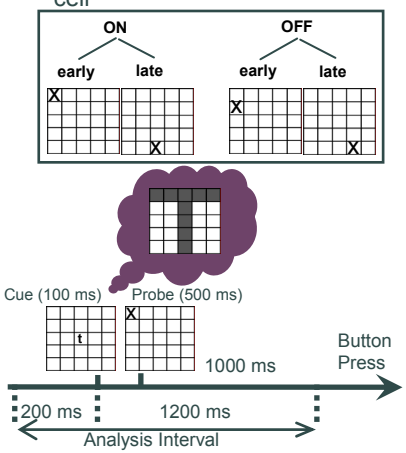
Participants:
12 students: Mean age 25.3 years.

Procedure:
Participants visualized a corresponding uppercase letter to the cue stimulus on the probe grid and decided whether the mark fell on or off the visualized letter as quickly as possible.

Half of the trials were "**early trials**"; when the probes placed on a segment drawn early in the order if they would be drawn on paper, and the other half were "**late trials**".

Recording:
EEG from 25 scalp sites
reference: averaged earlobes
Sampling rate: 200 Hz
band-pass filter: 0.05-30 Hz
Analysis interval: 1200 ms
(with a 200-ms pre-cue baseline)

Stimulus:
Cue stimulus:
"**simple trials**" (T or L)
"**complex trials**" (G or S)
and intermediate (C or U).
Probe stimulus:
5 x 5 grid (visual angle 4.3°)
with an "X" mark probe in one cell

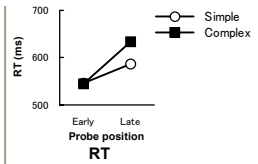


Imagery task and example of the stimulus

Analysis:
ERPs were divided into early range (0-500 ms), and late range (500-1200 ms). Behavioral measure and ERP data were assessed with repeated measures ANOVA (Complexity of cue x probe position).

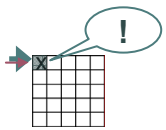
Results & Discussion

Behavior



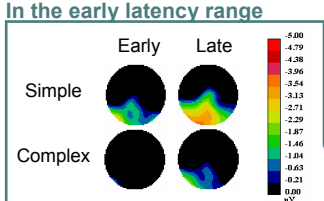
Early trials
Simple ≈ Complex trials
Late trials
Simple < Complex trials

If participants inspected image after the generation was finished, there would have been difference between RT for simple and complex trials in the early trials.
Thus they inspected image during generation in this study.

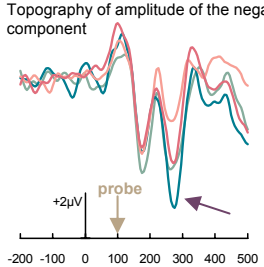


ERP

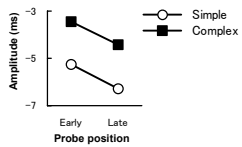
In the early latency range



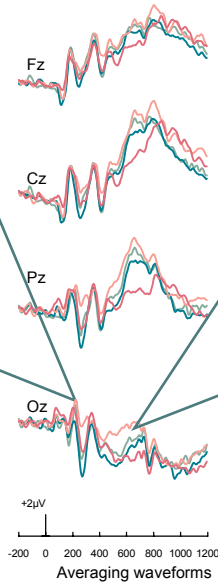
Topography of amplitude of the negative component



Averaging waveforms from -200 ms to 500 ms at the PO7

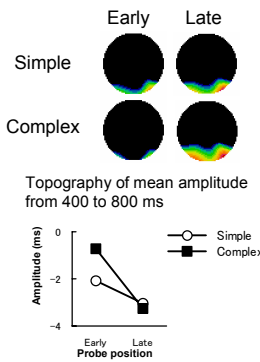


Peak amplitude of negative component



Averaging waveforms

In the late latency range



Topography of mean amplitude from 400 to 800 ms

Mean amplitude at the PO8

In the late latency range
Negative deflection was observed from 400 ms to 800 ms.

Mean amplitude
Early trials: Simple > Complex trials
Late trials: Simple ≈ Complex trials

In the early latency range
Negative component was evoked about 250 ms after the stimulus presentation largest over the left parieto-occipital electrodes .

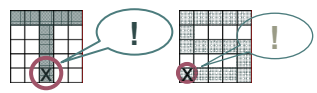
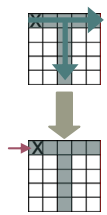
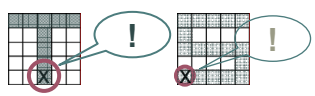
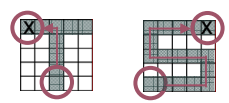
Peak amplitude
Late > Early trials
Simple > Complex trials

Discussion

The ERP effect in the early latency range was not correspond to RT results. Because the cue was presented when attention window to generate and inspect image was staying around late probe position, visual ERP component was enhanced.
The negative deflection in the late latency range is considered to be generation-related brain activity (Farah, 1989). The effect of complexity may reflect vividness of visual representation.

Conclusion

We could generate and inspect mental images simultaneously.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