EARLY VISUAL COMPONENT OF ERP REFLECTED THE MENTAL IMAGERY GENERATION AND INSPECTION

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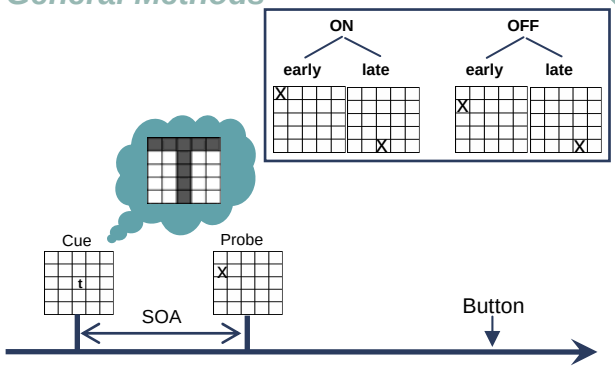
Introduction

Mental imagery: perceptual experience in the absence of sensory stimulation.

Previous studies mainly focused on the visual cortex engaging in visual imagery (Kosslyn et al., 1995). However, the time-course of visual imagery is not clear.

Our purpose is to investigate the timing of visual activity during visual mental imagery.

General Methods



Procedure:

Participants visualized a corresponding uppercase letter to the cue stimulus on the probe grid and decided whether the probe mark, "X", fell on or off the visualized letter as quickly as possible. (ON/OFF choice RT task; equal probability)

Half of the trials were "**Early trials**"; when the probe marks 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
ERP: only ON trials were reported.

Analysis:

repeated measures ANOVAs (Condition x Trial).

= Exp. 1 =

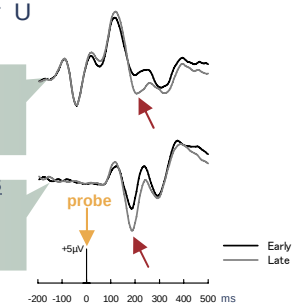
Purpose: to investigate whether ERP reflects visual image generation and inspection.

Stimulus: C, G, H, I, L, T, S, or U

SOA:

Generation condition: 200 ms
Both image generation and inspection were needed.

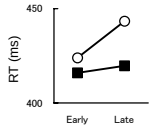
Inspection condition: 1600 ms
Only image inspection was needed after the probe.



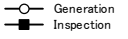
Grand average waveform at the PO7

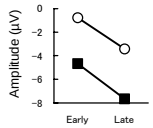
RT: Early < Late trials
Segments of block letters were imaged in the order in which most people draw the letters.

ERP: N200 Amp.:
Negative component was observed in early latency range largest over the left parieto-occipital electrodes.
Inspection > Generation condition
Late > Early trials
Was N200 not affected by image generation?



RT





Peak Amplitude of N200

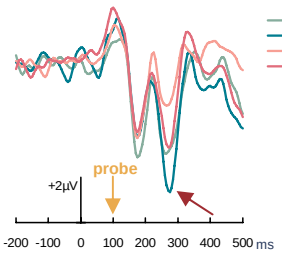
= Exp. 2 =

Purpose: to investigate whether N200 effect is related to image generation process?

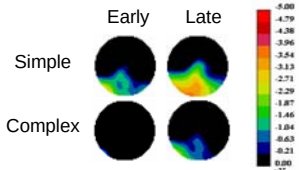
Complexity of the letter = the number of segments to be generated.

Stimulus: "**Simple condition**" (T or L),
"**Complex condition**" (G or S)
and intermediate (C or U)

SOA: 100ms



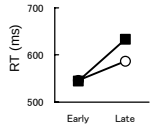
Grand average waveforms at the PO7



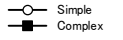
Topography of amplitude of N200

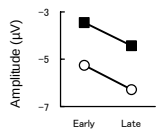
RT: In the Early trials
Simple ≈ Complex condition
In the Late trials
Simple < Complex condition
The number of segments to be generated were successfully manipulated.

ERP: N200 Amp.:
Late > Early trials
Simple > Complex condition
N200 was affected by the number of segments to be generated.



RT





Peak amplitude of N200

= Discussion =

What did the N200 effects reflect?

Exp. 1: Inspection > Generation, Exp. 2: Simple > Complex
Inspection condition: generation was finished
Simple condition: fewer segment than in the complex trials
N200 reflected vividness or intensity of representation?

Exps. 1 & 2: Late > Early
Attention window to generate and inspect image was staying around late probe position when probe stimulus was presented?
N200 reflected attentional effect to the visual ERP component.

Conclusion

Both imagery generation and inspection processes are involved in visual areas activated in early latency range.

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