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<tr>
<td>Author(s)</td>
<td>Yamazaki, K.; Katayama, J.</td>
</tr>
<tr>
<td>Citation</td>
<td>2006 Annual CNS Meeting. April 8 - 11, 2006, San Francisco, CA</td>
</tr>
<tr>
<td>Issue Date</td>
<td>2006-04</td>
</tr>
<tr>
<td>Doc URL</td>
<td><a href="http://hdl.handle.net/2115/8295">http://hdl.handle.net/2115/8295</a></td>
</tr>
<tr>
<td>Type</td>
<td>conference presentation</td>
</tr>
<tr>
<td>File Information</td>
<td>06CNS_keiko.pdf</td>
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TIME COURSE OF THE MENTAL IMAGERY GENERATION AND INSPECTION: An ERP study
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Introduction
Mental imagery process: generation, maintenance, inspection, and manipulation
(Kosslyn 1994)

In a previous behavioral study, it was indicated that image generation is a sequential process whereas inspection can be parallel (Kosslyn 1988). Image generation and inspection are neighboring temporally so that ERP is a useful measure to examine the brain activity involved in these processes for their very high time resolution.

Purpose: to investigate the time-course of brain activity related to generating and inspecting images

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 (ON trials) or off (OFF trials) 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”.

Conditions:

**Generation condition**
ISI between Cue and Probe: 100 ms
Both image generation and inspection were needed.

**Inspection condition**
ISI between Cue and Probe: 1500 ms
Only image inspection was needed after the probe.

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

Stimulus:
*Cue stimulus*: a lowercase letter ("c", "g", "h", "i", "t", "t", "s", or "u")
*Probe stimulus*: 5 x 5 grid with an "X" mark probe in one cell

**Results & Discussion**

RT: three-factor interaction was significant

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<tr>
<th>Behavior</th>
<th>Generation condition ON early trials &lt; late trials</th>
<th>OFF late trials &lt; early trials</th>
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<tr>
<td>Inspection condition ON, OFF early trials &lt; late trials</td>
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Generation condition: RT pattern in ON trials supported the previous study that segments of block letters were imaged in the order in which most people draw the letters, but the RT of OFF trials showed an inverse pattern.

Hit rate and F.A. rate: N.S.

**Time course of mental imagery generation and inspection**

The first diverging point between waveforms for the ON trials and OFF trials indicates the time point when different neural activity had started according to whether the trial was ON or OFF.

**The diverging point between ERP waveforms**

The divergence for early trials was earlier than for late trials in the generation condition, although these results were not observed in the inspection condition. Divergence of waveform indicated that image generation had sequential property which was not shared by inspection.

**Conclusion**
RT and ERP results supported that image generation is a sequential process and inspection is not a sequential process.