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Stimulus Context Effect on Deviant Target and Non-target: P3 ERP Study
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Introduction

Stimulus Context Effect on Non-target P300:
Difficulty of standard/target discrimination in three-stimulus oddball task

Easy

Difficult

Non-target P300
• small amplitude
• long latency
• central/parietal distribution

Non-target P300
• large amplitude
• short latency
• frontal/central distribution

Katayama & Polich (1998); Sawaki & Katayama (2006)

Do it reflect the enhancement of attentional capture process or inhibition process??

Purpose:
To elucidate whether the discrimination difficulty modulates an attentional capture process or inhibition process.

Attentional capture can occur for target as well as non-target
Discrimination difficulty would influence both target and non-target P300s
Inhibition can occur only for non-target
Discrimination difficulty would influence only non-target P300

Methods

Participants:
12 students (6m, 6f; 20-28 (M = 24.3, SD = 2.9) yrs.)

Task:
Three-stimulus oddball task
To make a quick button press by the right thumb to the target stimuli

Stimuli:
Table 1. Stimulus characteristics for each task condition

<table>
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<th>Discrimination difficulty</th>
<th>Three-category</th>
<th>Two-category</th>
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<tbody>
<tr>
<td>Frequent circle (p = .70)</td>
<td>Standard</td>
<td>Standard</td>
</tr>
<tr>
<td>Rare circle (p = .15)</td>
<td>Target</td>
<td>Target</td>
</tr>
<tr>
<td>Rare square (p = .15)</td>
<td>Non-target</td>
<td>Non-target</td>
</tr>
</tbody>
</table>

Discrimination difficulty: Frequent circle (larger) vs. rare targets

Stimulus characteristics for each task condition

Discrimination difficulty
Three-stimulus oddball task

P300 peak: max. pos. pts. 300 - 700 ms at Pz (target), Cz (non-target)

ERP recording:
EEG: 30 electrode sites, referred to the nose tip
Bandpass: 0.05 - 100 Hz, A/D: 500 Hz (30 Hz off-line low-pass filter)
P300 peak: max. pos. pts. 300 - 700 ms at Pz (target), Cz (non-target)

Results & Discussion

Behavior

Figure 1. Reaction time for target stimuli.
Rare circle: Easy > Difficult (both tasks)
Rare square: Easy < Difficult (two-category)

Figure 2. Hit rate for target stimuli.
Rare circle: Easy > Difficult (both tasks)
Rare square: N.S. (two-category)

Figure 3. FP rate for standard and non-standard stimuli.
N.S.

Figure 4. Grand averaged ERPs (N = 12).
Rare circle: Easy = Difficult (both tasks)
Rare square: Easy < Difficult (two-category)

Figure 5. Topographic maps taken at P300 peak latency.

Figure 6. Mean P300 peak amplitude.

Figure 7. Grand averaged ERPs from target and non-target rare squares, and difference waveforms.

Figure 8. Mean P300 peak latency.

Conclusion
The discrimination difficulty modulates attentional capture for deviant information.