Instructions for use

Title
Task Difficulty Modifies the Visual Distraction Effect on P300 ERP

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Citation
The 46th Annual Meeting of the Society for Psychophysiological Research

Issue Date
2006-10

Doc URL
http://hdl.handle.net/2115/15865

Type
conference presentation

Note
10/25-29, 2006. the Hyatt Regency Hotel, Vancouver, BC, CANADA. Poster Session 2・Friday, October 27, 2006 : 85

File Information
06SPR_JK.pdf

Hokkaido University Collection of Scholarly and Academic Papers : HUSCAP
INTRODUCTION

Background:
ERPs as a tool for evaluating cognitive ability of children with develop. disorder:
- seeking out the appropriate paradigm
- A kind of simulation for interpreting the result pattern just difficult for them or they show specific characteristics

Distraction effect:
- deteriorating performance caused by orienting attention to unexpected deviation in task-irrelevant stimulus property
e.g., tonal frequency change in duration discrimination task
- size change in shape discrimination task
- Enhancement of the P300 amplitude

Purpose:
to examine the effect of task difficulty on the visual distraction

METHODS

Participants:
13 students (m/f = 6/7, 20 – 28 (mean = 24.2) yrs.)

Stimuli:
Table 1. The stimuli used in this experiment

<table>
<thead>
<tr>
<th></th>
<th>Easy</th>
<th>Difficult</th>
</tr>
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<tbody>
<tr>
<td>Go (50%)</td>
<td>Freq. (42%)</td>
<td>Dev. (8%)</td>
</tr>
<tr>
<td>No-go (50%)</td>
<td>Freq. (42%)</td>
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Go: r = 1.00 cm (3.14 cm²) No-go Easy: r = 1.50 cm (7.07 cm²) No-go Diff: r = 1.15 cm (4.15 cm²)

viewing distance: 1 m
2 conds. X 3 blocks X 200 stimuli
SOA: 1200 ms, dur.: 120 ms random order; on white background

Task:
to make a quick button press by the right thumb to the Go stimuli, regardless of the color

ERP recording:
EEG: 30 electrodes, referred to the nose tip
bandpass: 0.05 - 100 Hz, A/D: 500 Hz, 30 Hz offline low-pass filter
low-pass filtering (8 Hz, FIR zero-phase, -24 dB) after averaging
P300 peak: max. pos. pts. 300 - 700 ms at CPz (Go) or FCz (Nogo)

RESULTS & DISCUSSION

Behavioral Data:
Table 2. Performance data for each condition (mean & SD)

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<tr>
<td>RT (ms)</td>
<td>317(77)</td>
<td>340(83)</td>
</tr>
<tr>
<td>Ht (%)</td>
<td>98.0(3.6)</td>
<td>97.6(6.4)</td>
</tr>
<tr>
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<td>6.3(5.9)</td>
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• RT: Easy < Diff, Freq. < Dev.
• Hit rate: Easy > Diff.
• FP rate: n.s.

Distraction effect:
• Difficulty manipulation was successful
deteriorating performance caused by orienting attention to unexpected deviation in task-irrelevant stimulus property
• No effect of task difficulty on RT distraction
• Enhancement of the P300 amplitude

Fig.2. Grand averaged and difference ERPs (N = 13).
Fig.3. P300 amplitude for each condition.
Fig.4. Scalp distribution of P300s.

P300:
- Go stimulus elicited centro-parietal P300, whereas No-go stimulus elicited fronto-central P300 in both conds.
- The amplitude of these P300s were smaller in the Difficult condition.
- These P300s were enlarged to the deviant stimulus.
- 2 Difficulty X 2 Go/No-go X 2 Stim. ANOVA
  - Main effects of Diff, Go/No-go, and Stim
  - 3-way interaction
  - Go: both Easy & Diff.: Dev. > Freq.
  - No-go: both Easy & Diff.: Dev. > Freq.
  - but the effect was small in Easy condition
- P300 distraction effect was smaller in No-go of Easy condition.

Fig.5. Schematic illustration for size discrimination task.

CONCLUSION

- No-go stimulus in the easy condition showed the small distraction effect on P300.
- This stimulus required shorter processing time for the task.
- >> P300 distraction effect is related to the later part of the processing.

Task Difficulty Modifies the Visual Distraction Effect on P300 ERP
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