Difficulty of discrimination modulates attentional capture by regulating attentional focus

SAWAKI, Risa; KATAYAMA, Jun'ichi

47th annual meeting of the society for psychophysiological research, October 17-21, 2007, Hyatt Regency Hotel, Savannah, Georgia, USA

2007-10

http://hdl.handle.net/2115/30151

conference presentation

47AMSPR4.pdf

Hokkaido University Collection of Scholarly and Academic Papers: HUSCAP
Difficulty of discrimination modulates attentional capture by regulating attentional focus

Risa SAWAKI1, 2 & Jun’ichi KATAYAMA1
1Hokkaido University, JAPAN; 2Japan Society for the Promotion of Science (sawaki@edu.hokudai.ac.jp)

Introduction

P3a reflects the neural response regarding attentional capture for deviant events.

Attentional capture for distractor is enhanced by difficulty of discrimination between standard and target in the three-stimulus oddball paradigm.


Purpose: to elucidate the cognitive mechanism of attentional capture modulation.

Hypothesis: attentional capture is modulated by top-down controlled attentional focus.

Attentional focus and cost-benefit

Spatial attention is tightly focused on a selective location to improve stimulus processing.

BENEFIT: processing facilitation inside attentional focus

COST: processing impairment outside attentional focus

In the difficult task, attention is sharply focused on the central location, and the distractor falls in this attentional focus (A).

>>> Attentional capture enhancement

If so, when distractors are presented in the surrounding location, distractors would fall outside the attentional focus in the difficult task (B).

>>> Attentional capture attenuation

Methods

Participants: 12 students (7m, 5f; 21-26 (M = 23, SD = 1.9) yrs.)

Task: Visual three-stimulus oddball task

Stimuli: To make a quick button press by the right thumb to the target stimuli

S3A: 12 x 12
Duration: 120 ms
Viewing distance: 1 m
Visual angle: frequent circle 1.12° x 1.12°, frequent triangle 1.30° x 1.30°, large rare square 1.12° x 1.12°, small rare circle 0.10° x 0.10°, target rare square 1.72° x 1.72°, surrounding rare square 1.42° x 1.42°.

Target stimuli (circle) were placed with their center 2.12° to the left and right of the vertical meridian, and 2.12° above and below the horizontal meridian.

ERP recording:
EEG: 30 electrode sites, referred to the nose tip
Bandpass: 0.05 - 100 Hz, A/D: 500 Hz (50 Hz offline low-pass filter)
P300 peak: max. pos. pts. 300 - 700 ms at Pz (target), Cz (distractor)

Results & Discussion

Behavior

Figure 1. Reaction time. Easy < Difficult (both conditions)

Figure 2. Hit rate. Easy > Difficult (both conditions)

Figure 3. False positive rate. N.S.

Target P3b Amplitude & Latency:
Amplitude: Easy > Difficult (both conditions)
Latency: Easy < Difficult (both conditions)

>>> Task difficulty was successfully manipulated.

Distractor P3a Amplitude:
Central condition: Easy < Difficult
Surrounding condition: Easy > Difficult

>>> Task difficulty had a contrasting effect on the P3a amplitude between central and surrounding conditions.

Conclusion

Attentional capture for distractor is modulated by top-down controlled attentional focus.

Acknowledgments: Risa Sawaki is now at the Center for Mind and Brain, UC Davis, 267 Cousteau Place, Davis, CA, 95618.