



Difference in neural response of defensive behavior by avoidance controllability : role of alpha oscillations

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Abstract

- In the present study, we will analyze the neural response of defensive behavior, focusing on alpha oscillation.
- According to the threat imminence model, the defensive behavior consists of a total of three step (1.Pre-Encounter Defense 2.Post-Encounter Defense 3.Circa-Strike Defense).
- Differences are expected in 2nd step(post-encounter defense; after detecting threat) based on whether or not a person can avoid actively.

Introduction

- In order to survive, humans engage defensive behaviors automatically when they are threatened. Physiological reactions differ when defensive behavior occurs, depending on whether or not it is feasible to actively avoid it.[1]
- When ERD occurs, it is known as focusing attention on stimuli. It is known that the phase of alpha decreases in the occipital region, especially when attention is assigned to visual stimuli.[2]
- Activation of alpha waves represents an active inhibition of sensory information. This idea was further developed and proposed alpha synchronization as a means of inhibition of non-task-related cortical regions.[3]

Research Objective

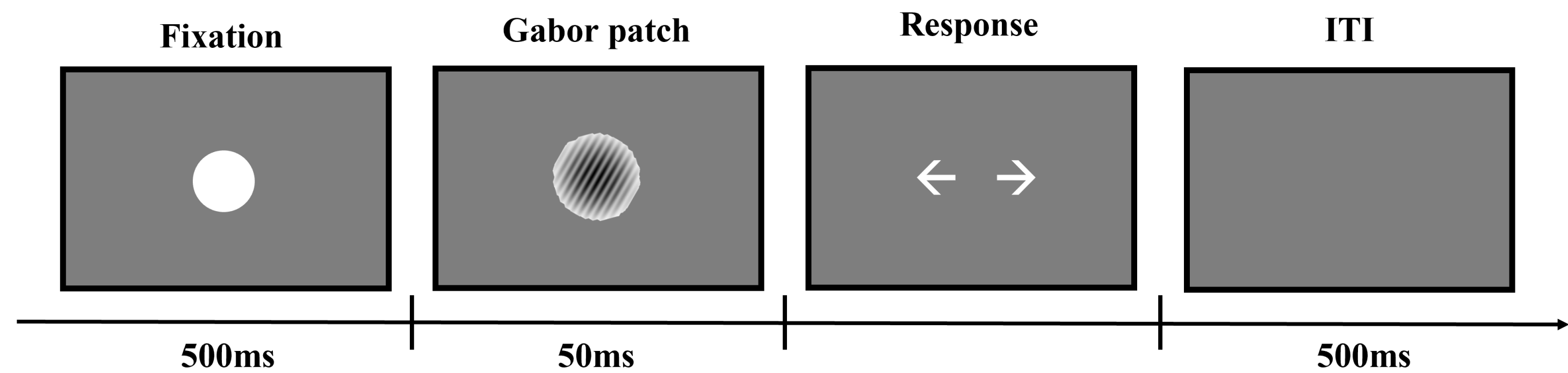
- According to the controllability, this study was proposed to find out what kind of difference there are at each defensive behavior stage. We want to find out what kind of neural response(alpha oscillation) occurs in each stage.

Methods

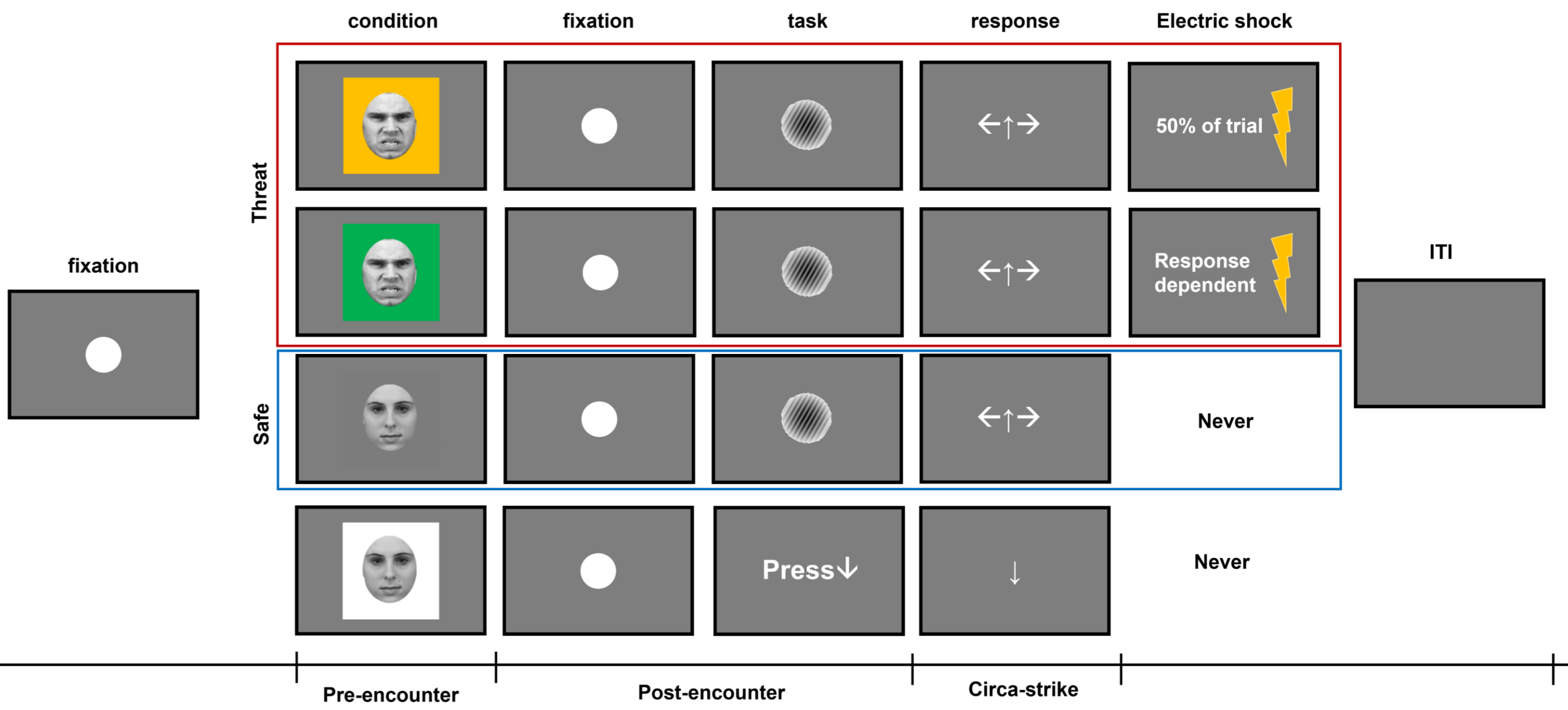
EEG acquisition

EEG data were acquired by the amplifier(Brain Products - actiCHamp) with 32 channel electrodes.

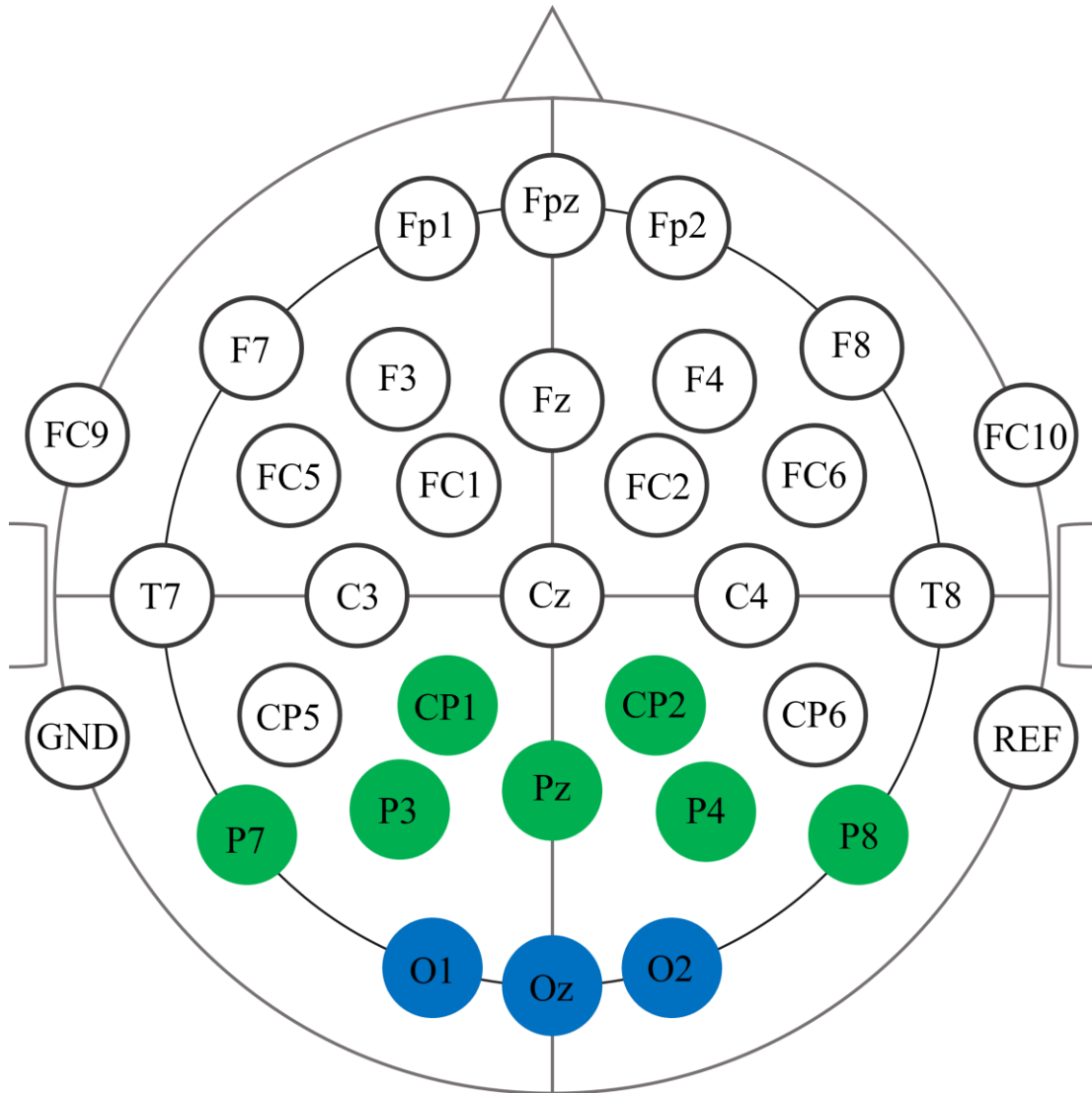
Pre – experiment



Main – experiment

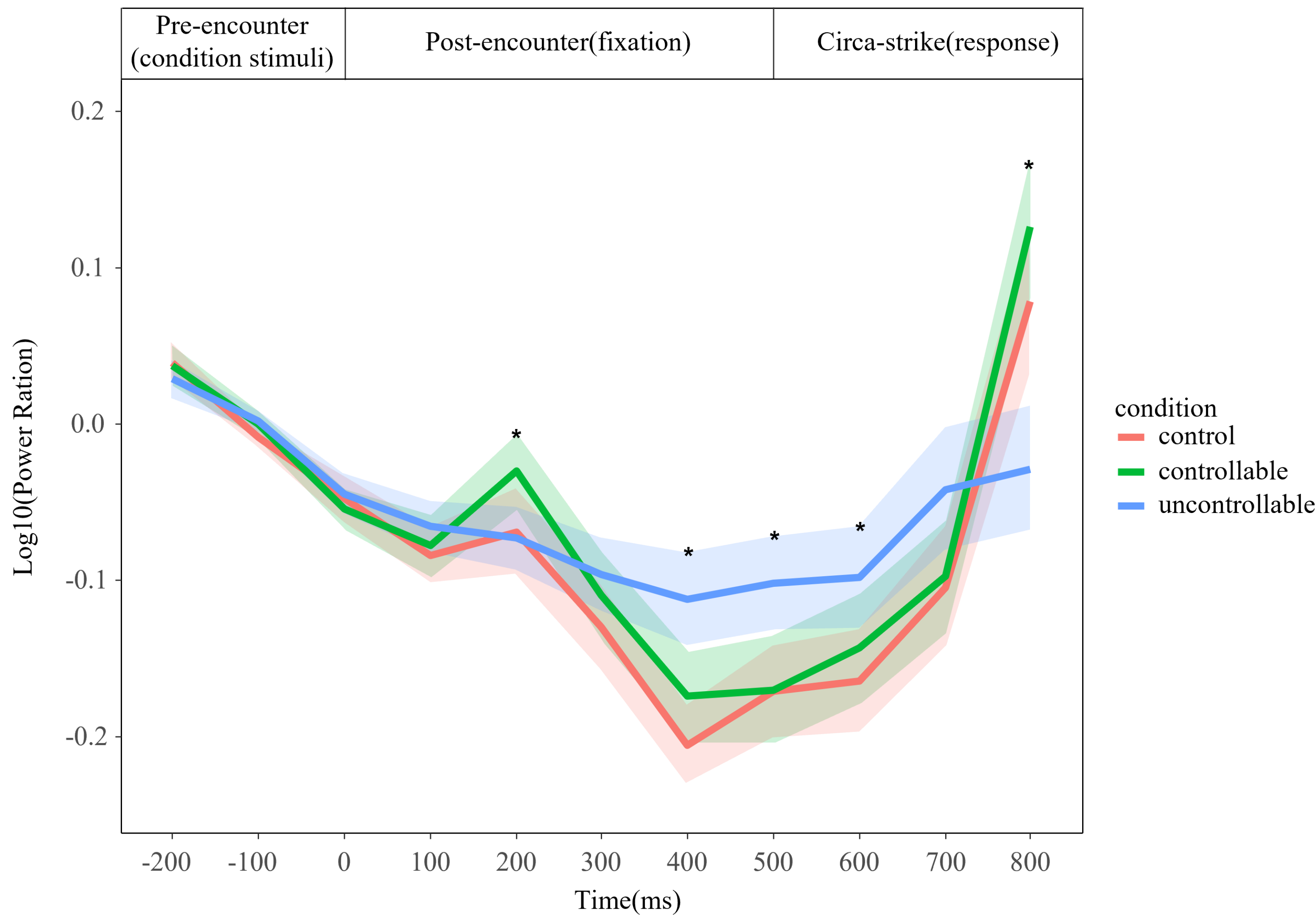


Target analysis brain area : parietal area and occipital area

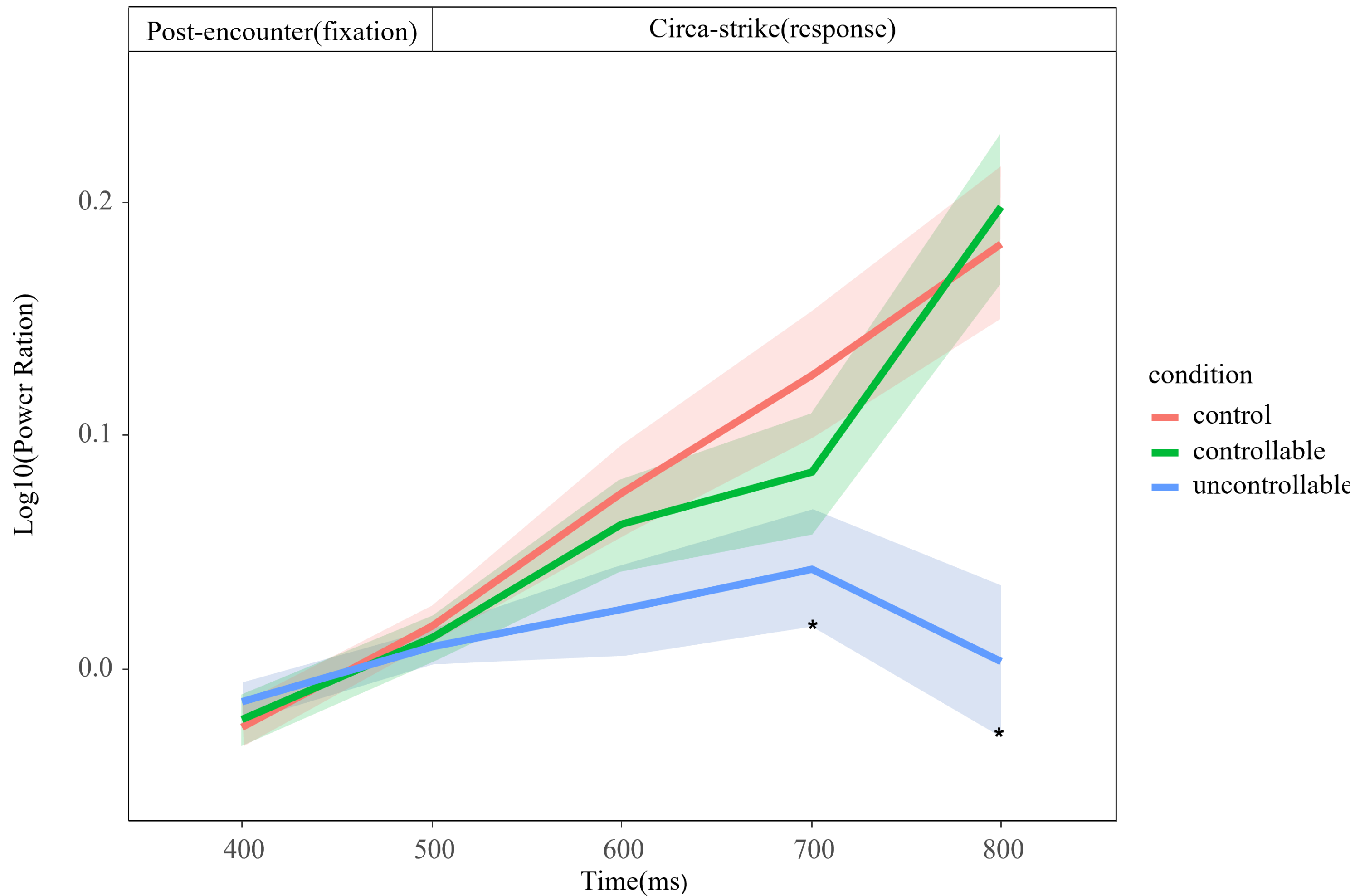


Results

An example time frequency analysis (channel : O2)



An example time frequency analysis (channel : P8)



Discussion

- In both uncontrollable, active avoidance situations, ERD occurs, so allocating resources to grasping external situations.
- Switch to ers in active avoidance where you need to make a selection; engage in internal activities. However, in Uncontrollable, erd is maintained, no internal activity occurs.
- Not clear about the uncontrollable situation, butlt can be seen that a controllable situation follows a top-down decision-making process.
- Using these things, you can design a way to reduce damage from threats.

Reference

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- [2] Cooper, N. R., Croft, R. J., Dominey, S. J., Burgess, A. P., & Gruzelier, J. H. (2003). Paradox lost? Exploring the role of alpha oscillations during externally vs. internally directed attention and the implications for idling and inhibition hypotheses. *International journal of psychophysiology*, 47(1), 65-74
- [3] Ray, W. J., & Cole, H. W. (1985). EEG alpha activity reflects attentional demands, and beta activity reflects emotional and cognitive processes. *Science*, 228(4700), 750-752.

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