

Measuring Event-related Potentials Evoked by Desire to Eat by Using Independent Component Analysis

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Abstract— In this study, we proposed a new experimental design and conducted experiments to measure event-related potentials (ERPs) evoked by desire to eat when watching the food image. Electroencephalography (EEG) were measured while five subjects were presented images with which the subjects had feeling of "want to eat", images with feeling of "don't want to eat", and images of standard stimuli. ERP waveforms obtained from components of independent component analysis (ICA) showed a positive component around 600ms from the stimulus onset were observed around occipital region in both conditions of watching food images.

I. INTRODUCTION

Renato et al. confirmed the activation of the brain when watching food images using fMRI [1]. Nakajima et al. quantify "likes and dislikes" for the appearance of food images by an area measure of P300 [2]. However, there have been still a few EEG studies on food. Thus, in this study, we proposed a new experimental design and conducted experiments to measure ERPs evoked by desire to eat when watching the food image. ERP waveforms obtained from components of independent component analysis (ICA) [3] were investigated.

II. METHODS

Experiments to measure ERPs were conducted on five adult subjects. Since the emotions aroused by watching food images can vary from subject to subject, each subject was asked to select 15 images of foods with which the subject had feeling of "want to eat" and another 15 images with which the subject had feeling of "don't want to eat" or "cannot eat" (treated as "don't want to eat") prior to the ERP experiment. These 30 images in total were used as target stimuli. As standard stimuli, 90 images were created by dividing the image of target stimuli into squares and shuffling the squares. Electroencephalography (EEG) were measured while each subject was presented the 120 images in total. In each trial, after a rest period of 0.8s and then showing a fixation point during 1s, a target stimulus was presented during 2s or a standard stimulus was presented during 1s. The images of stimuli were presented in random order. After the presentation of the target stimuli, the subject evaluated feeling of "want to eat" by pressing a key. The measurement of EEG was conducted three times for each subject by a 32-channel EEG recorder (EMOTIVE, EPOC Flex). After a band-pass filter with frequency bandwidth from 1 to 40 Hz was applied, the data were segmented into 1500ms epochs, beginning at 500ms

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prior to stimulus onset. Epochs with remarkable artifacts were removed visually and then ICA (EEGLab on MathWorks Matlab) were applied for removing other artifacts. Then, averaged waveforms of epochs of each ICA components in each subject were obtained.

III. RESULTS

Figure 1 shows typical averaged waveforms of an ICA component in each condition in a subject. A black line, a gray line, and a dashed line indicate averaged waveforms in the conditions of "want to eat", "don't want to eat", and standard stimuli respectively. In both conditions of watching food images, ERPs with a positive component around 600ms from the stimulus onset were observed. The ERPs were distributed around occipital region on the scalp map (not shown). The similar ERPs were observed in the other subjects. An area measure defined as area from 400ms to 700ms in the condition of "want to eat" was smaller than one in the condition of "don't want to eat" in 4 subjects and the opposite trend was shown in the other 1 subjects.

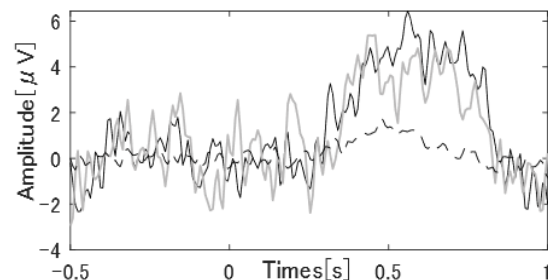


Figure 1. Averaged waveforms of an ICA component.

IV. DISCUSSION & CONCLUSION

We speculated that the ERP response, positive component around 600ms, elicited by watching food images reflects a brain response related to the desire to eat, although difference between the conditions was not shown clearly. Increasing number of subjects and statistical test were required in the future works.

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