Electrophysiological Properties of Correct and Incorrect Face-Name Recognition

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Introduction

Face-name association is a requirement in everyday life and even if we are pretty good at it normally, there is often failure to recognize names from faces. Despite its importance, there is still a lot to learn about neural basis of this process.1-12

Face recognition is thought to be an essential cognitive ability that is supported by specific neural structures in ventral temporo-occipital association cortex. People are also generally better at recognizing faces when it is compared to non-verbal material recognition. Face-recognition is thought to be reflecting brain asymmetries in which it shows right hemisphere superiority whereas memory for words is located predominantly in the left hemisphere.13 Although memory for faces and names seems to have different neural pathways, it is possible to see bilateral activity in the early stages of stimulus processing for both faces and names.14 Also it is known from the conducted studies that the retrieval of familiar people’s names and newly learned people’s names activate different brain regions which are respectively the left anterior temporal lobe and a more extended network including the bilateral anterior temporal poles.15 MRI results point out to the activations in ventral occipital association cortex, hippocampus, and frontal association cortex in face-name association learning tasks.16

Methods

Objectives

The aim of the study was to investigate neural basis of face-name association using event-related potentials (ERP’s). Participants

Fifty healthy young adults (22 females, 28 males) participated in the study. They were all university students aged 18 to 26. All participants were right-handed, had normal or corrected-to-normal vision, and had no history of neurological or psychiatric disorders.

Procedure

All of the participants were presented with a 3 phases Face-Name Recognition Task. In the first phase, participants were given total of 40 face stimuli that are digital color photographs of unfamiliar faces. In the second phase, participants were given the same faces in the same order but this time with a name and were asked to learn about them. These two were the learning phases and lasted 160 seconds for each. In the third phase, participants were asked to the same faces and corresponding names, and more were asked to find the correct name corresponding to the face stimulus. Each of the stimuli stayed on the computer screen for 3 seconds with 1 second interval between.

Results

ERP peaks were calculated for correct and incorrect responses separately for each of the electrode locations. Both correct and incorrect FNR responses detected in the same time domains of N100, P200, P300, and N400. Detailed analyses were performed for frontal, central, and parietal electrodes. The N200 and N400 amplitude of incorrect responses were significantly bigger than correct responses for all the electrode locations.

Also for all peaks, the amplitude values of central electrode were bigger than parietal and frontal electrodes, respectively. On the other hand no significant latency differences between correct and incorrect responses were observed for any peaks.

Figure 2: Scalp topography and time latency of ERPs during correct and incorrect face-name-recognition

Conclusions

In this current study, it was aimed to investigate neural basis of face-name association using event-related potentials.

- Results of the study were found consistent with the previous studies that hemispheric differences in the number of regions and spatial extent of activation for names and faces.1,3,6
- It is found consistently with the literature that names activated more left hemisphere regions than right hemisphere regions, on the other hand, faces provided more right hemisphere activations than names.7
- This findings provided evidence to the hemispheric-associated modality-specific processing for faces and names.3,6
- Results also provided evidence to the “N400 effect” and face-name association relation mentioned in the literature.7
- Larger N400 component have been previously found to be associated with difficult integrations which refers to associative interference rather than categorical interference.

References


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