

Does an Angry Salesman Scary the Students of University of Silesia? *Visual ERP Studies*

Karina Maciejewska and Zofia Drzazga

University of Silesia, Institute of Physics, Department of Medical Physics, Katowice, Poland

Keywords: Event Related Potentials, Cognitive Activity, P300.

Abstract: Three visual ERP tasks with oddball paradigm (geometric figures, picture of a nice lady and an angry salesman, a sentence with non logic word) were performed by students of University of Silesia. Few ranges of band-pass filters and artifact correction were examined to evaluate the optimal parameters of data analysis. Shape, latency and amplitude of P300 in the task with a picture of angry salesman as well as in the sentence task did not differ from the simple task with geometric figures. These results indicate that emotional picture or a sentence with illogical word did not affect cognitive activity in studied group of students, probably because the task was not very complex.

1 INTRODUCTION

Cognitive event related potentials (ERP) are voltage fluctuations reflecting the deception and higher-level processing of sensory information (Veiga, 2004). ERP studies have revealed multiple generators including sites in hippocampus and the temporal, parietal and frontal lobes (Heinze, 1999).

In order to maintain reliable results, guidelines for using event-related potentials were published (Duncan, 2009); (Picton, 2000). However all the parameters should be optimized individually for every laboratory (Bayer, 2010); (Groh-Bordin, 2006). As this is preliminary ERP study, we wanted to choose the best recommended technical parameters for our studies as well as compare three visual oddball tasks different in complexity.

2 MATERIAL AND METHOD

2.1 Participants

The experiment was performed among 10 healthy, right-handed, non-smoking students of University of Silesia (5 males and 5 females) using ASA-Lab system (ANT) with ASA v.4.7.1 software.

2.2 Procedure and Stimuli

Three visual oddball paradigm scenarios were performed. The scenarios included: black square on a white background as target and white circle on a black background as standard stimulus in the first scenario; a picture of bad, angry salesman as target and nice woman as standard stimulus in the second scenario and a sentence: "I will not eat this soup, because it is too ..." and two words: "square" as target stimulus and "hot" as standard stimulus. The parameters of the stimuli were: 150ms duration, 5 ms rise/fall, 1000ms interstimulus, 20% target and 80% standard stimulus probabilities.

2.3 Data Analysis

The band-pass filters were used to investigate the proper signal analysis parameters: 0.3-30 Hz, 0.1-40 Hz, 0.3-100 Hz and artifact correction ranges: ± 50 μV , ± 70 μV , ± 100 μV , ± 150 μV , ± 200 μV .

3 RESULTS AND DISCUSSION

0.3-30 Hz band-pass filter, 12 dB/oct filter steepness and ± 100 μV artifacts correction were chosen for comparing results from three visual scenarios.

Fig. 1 presents grand-average ERPs at C3, Cz and C4 electrode site elicited by three different

visual tasks.

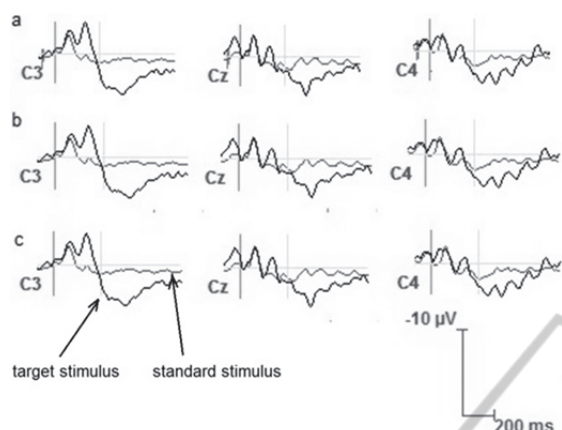


Figure 1: Grand-average ERP signals in an oddball paradigm with geometric figures (a), angry salesman (b) and a sentence (c) task with target and standard stimulus.

The P300 waveform looks different in each electrode site. The signal from C3 is broad and starts after 300 ms from the event. The waveforms from Cz and C4 are more complex and have three local maxima. Interesting is the fact that the P300 is similar in all performed tasks. The values of latencies and amplitudes of P300 waveform were calculated and are presented in Table 1.

Table 1: P300 latencies and amplitudes for grand-average visual oddball ERPs from target stimulus for three tasks.

Task	Electrode	P300 Latency [ms]	P300 Amplitude [μ V]
Figures	C3	344	4.54
	Cz	391	4.56
	C4	352	3.88
Salesman	C3	348	4.79
	Cz	391	4.57
	C4	348	3.88
Sentence	C3	340	4.80
	Cz	391	4.56
	C4	355	3.81

The latencies of P300 at peak maximum are in the range 340 ms – 355 ms at C3 and C4, while at Cz it is about 390 ms. The amplitudes of P300 are in the range 4.54 μ V – 4.80 μ V at C3 and Cz, and about 3.85 μ V at C4. The values are comparable in all tasks. These results indicate that emotional picture of angry salesman did not influence the changes of the processing of sensory information in studied group of students. Latencies and amplitudes of P300 waveform was also not affected by reading illogical word in the sentence task. There were no changes in latency of amplitude of P300, because the task was not very complex.

4 CONCLUSIONS

P300 waveform obtained in visual ERP study with oddball paradigm (target and standard stimulus) registered at C3 was different from those at C4 and Cz positions. It was broad and had higher amplitude than C4 and Cz. The character of signals was independent on kind of task, what seems that the emotions brought out were so weak that they didn't activate the structures in brain responsible for processing the emotional information. However this research requires further studies on more participants.

REFERENCES

- Bayer, M., Sommer, W., Schacht, A., 2010. Reading emotional words within sentences: The impact of arousal and valence on event-related potentials, *International Journal of Psychophysiology* 78.
- Duncan, C. C., Barry R. J., Connolly J. F., Fischer, C., Michie, P. T., Naatanen, R., Reinvang I., Van Petten, C., 2009. Event-related potentials in clinical research: Guidelines for eliciting, recording and quantifying mismatch negativity, P300 and N400, *Clinical Neurophysiology* 120.
- Groh-Bordin, C., Zimmer, H. D., Ecker, U. K. H., 2006. Has the butcher on the bus dyed his hair? When color changes modulate ERP correlates of familiarity and recollection, *NeuroImage* 32.
- Heinze, H. J., Munte, T. F., Kutas, M., Butler, S. R., Naatanen, R., Nuwer, M. R., Goodin, D. S., 1999. Cognitive event-related potentials. In G. Deuschl and A. Eisen, Recommendations for the Practice of Clinical Neurophysiology: Guidelines of the *International Federation of Clinical Physiology (EEG Suppl. 52)*, Elsevier Science B.V.
- Picton, T. W., Bentin, S., Berg, P., Donchin, E., Hillyard, S. A., Johnson, R., J. R., Miller, G. A., Ritter, W., Ruchkin, D. S., RUGG, M. D., Taylor, M. J., 2000. Guidelines for using human event-related potentials to study cognition: Recording standards and publication criteria, *Psychophysiology* 37.
- Veiga, H., Deslandes, A., Cagy, M., McDowell, K., Pompeu, F., Piedade, R., Ribeiro, P., 2004. Visual event-related potential (P300), *Arq Neuropsiquiatr* 62.