

## The Psychophysiological Study of Emotions Related To Different Psychic Levels

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### General

Modern studies on physiological mechanisms of emotions are mostly focused on the relation between the emotion sign and the brain. To our opinion more detailed study requires more differentiated approach to emotions which are being stimulated in the experiments. According to L.M. Vekker's theory of mental processes (Vekker, 1997) emotions may be divided at least into two groups according to the levels of mentality they touch – lower level, which concerns mainly vital needs and higher, which concerns, for example, ethical values. In the present work we suggest a study of different kinds of emotions and their relationship with electroencephalogram (EEG) spectra peculiarities.

### Experiment

Fifteen healthy volunteers – students – participated in our study. The procedure included watching video clips (1 – 3 minutes each) which excite different emotions. At the same time the EEG from the subject was recorded. We took the equal number of videos which synopsis excites positive and negative emotions. Also each group of videos included two subgroups. First subgroup aimed the lower level emotions. Lower level emotions in mental processes hierarchy are tied to main vital needs. In the case of positive emotions subjects watched, for example, food (attractive looking meat or sweets); in the case of negative ones – scenes of crocodile attacking man or a person's vomiting etc. Higher level emotions according to L.M. Vekker's theory are related with socio-ethical and spiritual feelings. For example, positive emotions of this kind were stimulated by watching humorous scenes and negative – scenes of asocial behavior, theft for example.

Just after experiment subjects were asked to evaluate the differences between the videos according to their feelings by 10-score scale. It was done for all possible pairs of videos. As a result we have got matrix of average distances between videos. Then we applied a cluster analysis to this matrix and obtained three groups of videos. We have found in one group videos, exciting low-level positive emotions, in another – low-level negative emotions and in the third – high-level emotions, both positive and negative. Thus, almost all videos got into the same groups as we implied. Also, for

control, subjects watched clips, which do not excite pronounced emotions.

EEG was recorded during the watching of the clips. Electrodes location on the scalp was according to international system 10-20. We calculated the EEG power in the main band ranges –  $\Delta$ ,  $\Theta$ ,  $\alpha$ ,  $\beta_1$ ,  $\beta_2$ . After that we applied ANOVA to evaluate the differences in the power of EEGs recorded in three states. This was done in every band. ANOVA showed significant ( $p < 0.001$ ) changes of EEG power effected by the factor of the sign of emotion. Then the post-hoc criterion (LSD) was applied. It showed significant differences in the EEG power in different emotional states in different leads.

It was found, that EEG recorded during emotive clips differs from neutral ones in anterior, parietal, posttemporal and occipital leads. Here lower level negative emotions are specified by increasing of the EEG power in the  $\beta_2$  band in anterior sections – leads  $Fp_1$  ( $p < 0.001$ ),  $Fp_2$  ( $p < 0.01$ ), and  $F_3$  ( $p < 0.05$ ). Lower level positive – in the  $\beta_2$  band, lead  $F_3$  ( $p < 0.05$ ).

Emotions from high level of hierarchy differ from low level by greater EEG power in different bands, mainly in occipital, parietal and posttemporal leads.

### Conclusion

In general judging these results one can suppose that stronger, but, at the same time, less complex negative emotions are accompanied by the withdrawal behavior planning function activation that is in turn accompanied by activation of actions programming structures – third functional block, according to A.R. Luria (1973). Simple, low-level emotions invoking is accompanied by the third functional block, but in less grade. Before high-level emotions realization reorganizes behavior it is necessary to make intensive information processing both on verbal and nonverbal levels. This leads to increasing of the second functional block of the brain – the block of the information reception and processing.

We think that further studies of emotions should be held taking in account the level of emotions under study.

### References

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