

Behavioral and neurophysiological study of subject's personality traits under recognition of sentences about self and others

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Motivation and Aim: One of the key problems of modern cognitive research is the development of the objective methods for test task assessment and correlation of their results with participant's personality traits. This problem is particularly acute during the study of behavioral reactions while doing neurolinguistic tasks under different conditions [1]. Thus follow: the problem of composing implicit test tasks [1, 2] (in which a participant cannot deliberately give misleading responses) and the problem of using instrumental and mathematical methods of studying participant's reactions [3]. This work is aimed at the second problem.

Methods and Algorithms: Study of behavioral responses to emotional phrases, describing aggression and anxiety of either participant themselves or unrelated strangers, was conducted using EEG, HRV (with EDR estimations; Fig. 1), Face Image Analysis (Fig. 2), Mental Chronometry. Analysis employed Data Science approaches (including Permutation Approach).

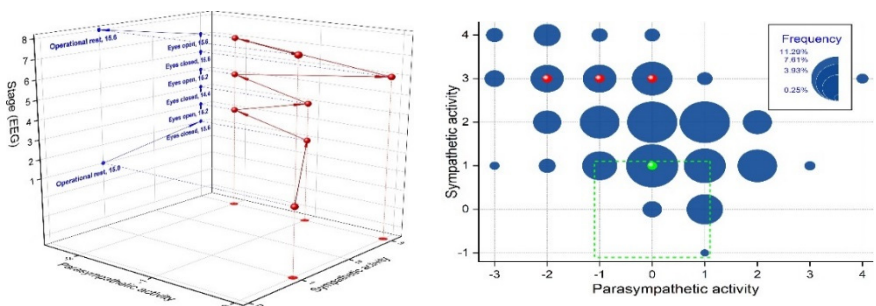


Fig. 1. Sympathovagal activity during resting state EEG of a student participant. Left: “individual trajectory” Sympathovagal activity by stages of a resting state EEG (blue color, numbers – EDR/min; Electrocardiogram Derived Respiration.); stages: 1 (before “start” command); 2, 4, 6 (eyes closed); 3, 5, 7 (eyes open), 8 (after “stop” command). Right: Sympathovagal activity of a participant and in the statistical population (1000 sampling units), based on Permutation Approach based on the results of 178 students of this age. Sympathovagal activity: –3 (significant decrease), –2 (moderate), –1 (slight), 0 (balance); +1 (slight increase), +2 (moderate), +3 (significant). Blue circles: share in the statistical population; green ball – Sympathovagal activity during stages 1 and 8, red balls – stages 2–7; area outlined by green dotted line – Sympathovagal balance range

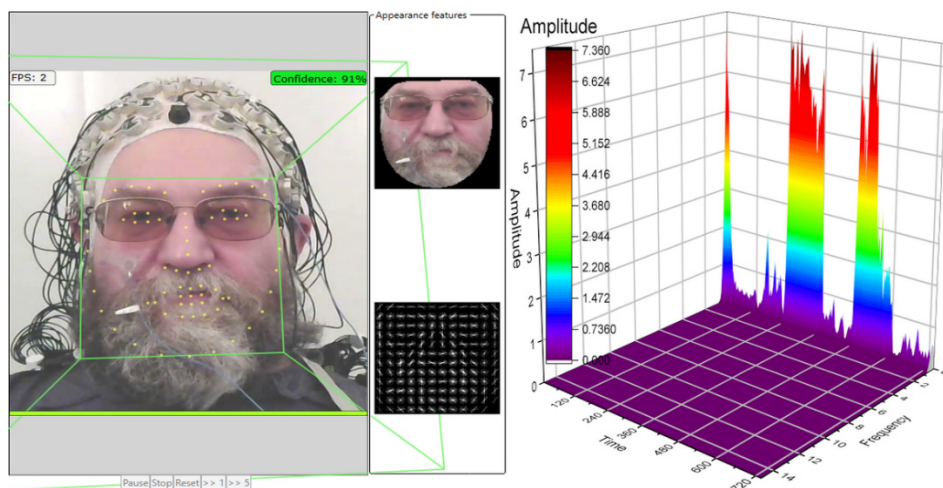


Fig. 2. Face Image Analysis during resting state EEG by one of the authors (left), STFT-analysis of his face muscles in time (right). Deliberately chosen for additional interference (sunshades, beard)
 1 point on the timescale equals 120 sec, on the frequency scale – 2 Hz
 0–120, 240–360 and 480–600 sec – eyes closed (high activity of face muscles)
 120–240, 360–480 and 600–720 sec – eyes open (low activity of face muscles)

Results: Developed an Intelligent Database for neurolinguistic tasks that allows to conduct analyses based on features of the data of instrumental methods itself. New results, obtained with the help of the Intelligent Database, have shown high efficiency of a complex of instrumental methods, adapted by authors for neurolinguistic tasks.

Conclusion: The authors' approach allows to unite opportunities of personalized approach and individual typological data with advantages of estimates based on statistical populations studied factors in neurolinguistic experiments.

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