

Unobtrusive Monitoring of ECG and EEG During Mild Stress Stimuli

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Aims: This study is part of a research project aiming to build a model for quantifying an individual wellness status through unobtrusive measurements of psychophysical parameters and self-reported data. In particular, we focus on the evaluation of the individual response to mild stress stimuli.

Method: The experimental setup included the EG05000 Medlab Five Channel Module and the Muse 2 Headband for ECG and EEG activity monitoring, respectively. Data were recorded from seven subjects in two different conditions: at rest for five minutes (T0) and during stress stimulation (T1) provoked by the congruent Stroop colour word test. During the test, the font colour always matched the displayed colour name, the time limit to answer each question was set to two seconds and the test lasted for two minutes.

Results: The parameters analysed from the ECG signals were NN, SDNN, LF, HF, and LF/HF. The median value of the NN is 820.66 ms in T1 and 926.98 ms in T0. The HRV parameters have smaller variability in T1 than in T0. The most important feature extracted from the EEG is the power

asymmetry from the left and right normalized alpha band power (APA). The APA was significantly smaller in T1 (median value = -0.35) than in T0 (median value = 0.27) with $p = 0.01$. Median (and IQ range) of the parameters listed above are given in Table I.

Conclusion: The results show increased heart rate and changes of the brain activity in the stress condition. This is consistent with a “fight or flight” response in accordance with literature. Therefore, the methodology applied in this study can be used to monitor the individual wellness status in conditions of mild stress stimuli.

TABLE I
RESULTS SUMMARY

<i>Parameter</i>	<i>T0</i>	<i>T1</i>
<i>NN (ms)</i>	926.98 (248.73)	820.66 (325.11)
<i>SDNN (ms)</i>	47.939 (69.29)	42.40 (70.31)
<i>LF</i> (normalized unit)	79.09 (69.93)	54.86 (47.65)
<i>HF</i> (normalized unit)	20.91 (69.93)	45.14 (47.65)
<i>LF/HF</i>	3.78 (5.59)	1.22 (2.68)
<i>APA</i>	0.27 (0.65)	-0.35 (0.28)