

# **A Comparison of Heart Rate Variability Measures for Mental Stress Detection**

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Mental stress is one of the well known major risk factors for many diseases such as hypertension, coronary artery disease, heart attack, etc. Conventionally, detecting mental stress in an individual is performed by interviews and/or questionnaires. A number of researchers have studied heart rate variability (HRV) measures to establish quantitative indices from physiological signals such as RR interval time series signal or heart rate signal for detecting mental stress in individuals. However, these assessments have not been widely accepted since they have not been studied thoroughly. In this study, we have investigated various promising heart rate variability measures for detecting mental stress by using ultra short term HRV analysis which is useful for mobile applications. A number of HRV measures were investigated, for example, Mean of heart rates (mHR), Mean of RR intervals (mRR), Standard deviation of heart rates (SDHR), Standard deviation of RR intervals (SDRR), Coefficient variation of RR intervals (CV), Square root of the mean of the sum of the squares of differences between adjacent RR intervals (RMSSD), Number of pairs of RR intervals with differences more than 20 ms and 50 ms in percentage to all RR intervals (pRR20, pRR50), Power spectrum of very low frequency (VLF), Power spectrum of low frequency (LF), Power spectrum of high frequency (HF), Sympathetic modulation index (SMI), Vagal modulation index (VMI), Sympathovagal balance index (SVI), etc. Experiments involved 60 segments of RR interval time series signals during mental stress and non-mental stress states. Results revealed that the following HRV measures: mRR, mHR, SMI, VMI, normalized LF, and difference between normalized LF and normalized HF were effective features for mental stress state and non-mental stress state classification. These findings provide useful information for further investigation to define an index for detecting mental stress from HRV in individuals.