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The Suitability of the 0.1 Hz component of Heart Rate Variability for the Assessment of Mental Workload in Real and Simulated Work Situations

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The 0.1 Hz component of heart rate variability (HRV) is considered an attractive and suitable measure of mental strain, and recently this measure has been used for analyzing mental workload in practical situations (e.g. for evaluating the usability of software in office and process control tasks). Based on a closer inspection of the relevant literature and some empirical data from research in public transport operations severe doubts concerning the validity of this measure have been raised (NICKEL et al., 1998; NACHREINER et al., 1999). Results from some recent laboratory research (NICKEL & NACHREINER, 2000; NICKEL, i.p.) furthermore showed unacceptable low sensitivity and diagnosticity for the 0.1 Hz component in measuring mental strain.

Results from two studies in actual and simulated work environments (public transport and process control operation) where the operators have been subjected to emotionally stressing conditions support the interpretation gained from laboratory research that this measure indicates rather emotional strain (or stress reactions related to pacing, time pressure, threat of failure) or general activation (e.g. through time pressure, anxiety, etc.) than task specific mental or especially cognitive strain.

In general, our results strongly suggest that the 0.1 Hz component does not meet conventional psychometric criteria to be used in legal or agreed assessments of mental - and especially cognitive - workload and particularly not for practical purposes, where some occupational risks may be at stake. Whether the 0,1 Hz component of HRV might, however, be suitable for 'fit for duty' monitoring will be discussed on the basis of the results presented.

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