

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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Abstract

The 0.1 Hz component of heart rate variability (HRV) is described as an attractive and suitable measure of mental strain to be used in analysing mental workload in practical situations. Based on a closer inspection of the relevant literature and some empirical data severe doubts concerning the validity of this measure have been raised. Results from some recent laboratory research further showed unacceptable low sensitivity and diagnosticity for the 0.1 Hz component. Results from two studies in actual and simulated work environments (public transport and process control operations) support the interpretation that this measure indicates emotional strain or general activation rather than task specific mental or cognitive strain. The results strongly suggest that this measure does not meet conventional psychometric criteria to be used in the assessment of mental workload and particularly not for practical purposes where some occupational risks may be at stake.

Introduction

Ergonomic design of work systems and legal regulations in the EU (e.g. OSH directive 89/391 EEC, VDU directive 90/270 EEC) require the evaluation of mental workload. This calls for suitable and practical methods for the assessment of mental workload at the workplace (Nachreiner, 1999) in order to protect workers against any impairing effects (e.g. mental fatigue, monotony, satiation, stress) and to provide for optimal working conditions to promote the well-being of the worker, as well as the reliability and productivity of the work system (Nachreiner, 1998). Since mental workload is directly connected with the impairing effects of work on the operator and with the development of his capabilities and skills, it is one of the criteria for evaluating the quality of system design (Nachreiner, 1995). Due to increasing mechanisation and automation mental workload is becoming increasingly important, a separate standard (EN ISO 10075-1,2, 2000) dealing with "Ergonomic principles related to mental workload" was developed within ISO. Part 1 "General terms and definitions" deals with terminology and general

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