

Psychophysiological investigation of vigilance decrement: boredom or cognitive fatigue?

Pattyn N, Neyt X, Henderickx D, Soetens E.

Department of Cognitive & Biological Psychology, Vrije Universiteit Brussel, Pleinlaan, 2, 1050 Brussel, Belgium. npattyn@vub.ac.be

Abstract

The vigilance decrement has been described as a slowing in reaction times or an increase in error rates as an effect of time-on-task during tedious monitoring tasks. This decrement has been alternatively ascribed to either withdrawal of the supervisory attentional system, due to underarousal caused by the insufficient workload, or to a decreased attentional capacity and thus the impossibility to sustain mental effort. Furthermore, it has previously been reported that controlled processing is the locus of the vigilance decrement. This study aimed at answering three questions, to better define sustained attention. First, is endogenous attention more vulnerable to time-on-task than exogenous attention? Second, do measures of autonomic arousal provide evidence to support the underload vs overload hypothesis? And third, do these measures show a different effect for endogenous and exogenous attention? We applied a cued (valid vs invalid) conjunction search task, and ECG and respiration recordings were used to compute sympathetic (normalized low frequency power) and parasympathetic tone (respiratory sinus arrhythmia, RSA). Behavioral results showed a dual effect of time-on-task: the usually described vigilance decrement, expressed as increased reaction times (RTs) after 30 min for both conditions; and a higher cost in RTs after invalid cues for the endogenous condition only, appearing after 60 min. Physiological results clearly support the underload hypothesis to subtend the vigilance decrement, since heart period and RSA increased over time-on-task. There was no physiological difference between the endogenous and exogenous conditions. Subjective experience of participants was more compatible with boredom than with high mental effort.