Examining the Influence of Different Attentional Demands and Individuals’ Cognitive Failure on Workload Assessment and Psychological Functioning

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ABSTRACT

Attentional demands and individuals’ cognitive failure are hypothesized to be determinant factors for workload assessment and job analysis, although previous researches have focused merely on one aspect of attentional demands. The objective of this study was to investigate the degree to which various attentional paradigms would be demanding to the participants with different levels of cognitive failure. A total of 24 participants within three groups of low, medium, and high cognitive failure questionnaire (CFQ) scorers completed two 15-min and one 60-min tasks representing three paradigms of “divided”, “selective”, and “sustained” attention. The participants were undergraduate male students from the University of UOEH, Japan. Outcomes were measured in subjective workload, stress-arousal and anxiety level, along with performance measures. Accordingly, MANOVA and Post Hoc Tukey-test analyses between variables showed that the divided attention task created a higher workload with a better arousal level, while an increased level of frustration with a decreased level of arousal was induced by the sustained attention task. Confirming the proposed model of cognitive failure in this study, greater workload with worse psychological functioning and performance breakdown was found among the high CFQ scorers. These findings have important implications for conducting workload analysis researches in real-world or laboratory settings; focusing on attentional demand and cognitive failure may be an effective way to alleviate stress.

Keywords: Attentional demand, Cognitive failure, CFQ, Stress, Arousal, Workload

INTRODUCTION

Attentional demand

A critical aspect of designing systems for the dynamic or static work situations is the amount of visual and cognitive attention required to complete a task, which is termed “attention demand” [1]. In dynamic environments like driving, piloting, control room operating, industrial inspection and medical monitoring, the safety and health aspects of attention demand are paramount, as failing to adequately address attention demand issues in those jobs may lead to poor usability, user confusion, and loss of revenue [1, 2]. For static environments such as desktop computing and VDT works, attention demand is more important for usability issues than for safety issues.

Considering the resource theory of the attention, different aspects of attention may be investigated with three main paradigms [2, 3]: (a) Selective attention, in which participants must respond to the same stimuli, or stimulus properties, whilst ignoring others; (b) Divided attention, in which participants must perform two (or more) tasks simultaneously, such as driving and flying; and (c) Sustained attention, in which participants must maintain the focus of attention over a relatively long