Cognitive and personality variables of operators: individual characteristics and process control performance

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Abstract

Two studies analysing the relationships between operator characteristics and process control performance were conducted in order to replicate and extend earlier research by Burkolter et al. (2007, 2009). The first study (N = 41) examined the link between general mental ability (GMA), cognitive flexibility and conscientiousness on the one hand, and performance in a simulated process control task on the other. GMA correlated significantly with diagnostic performance and knowledge, while cognitive flexibility and conscientiousness were not related to performance. The second study (N = 50) incorporated working memory capacity, set-shifting and decision-making as well as the personality variables Need for Cognition (NFC) and perfectionism. Working memory capacity and set-shifting were related to diagnostic performance, while decision-making (risky decisions) was associated with both system control and diagnostic performance. Moreover, NFC and declarative knowledge were significantly correlated. Confirming earlier results, GMA exhibited relations to diagnostic performance and declarative knowledge. Practical implications as well as implications for future research are discussed.

Introduction

The present studies aim to continue and extend previous research results, which addressed relationships between individual characteristics and performance in early stages of skill acquisition (see Burkolter et al., 2007, 2009; Kluge et al., submitted).

Altogether, these studies form part of a comprehensive research programme that links cognitive requirements of process control tasks to training. When designing training, it is necessary to analyse the cognitive requirements of a task (e.g. through cognitive task analysis) in order to derive training objectives and criteria (Burkolter et al., 2007). However, the amount of learning and the training results might be limited by individual characteristics. Therefore, the overriding research question focuses on which aspects of process control performance are affected by training, and how training can best support learning and performance with respect to individual characteristics. Our underlying assumption is that process control performance is composed of a dynamic interplay between cognitive processes and

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