



## The moderation of conscientiousness by cognitive ability when predicting workplace safety behavior

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### ABSTRACT

Research and industry practice emphasize the usefulness of personality-based assessment, particularly measures of conscientiousness, for predicting workplace rule compliance and safety behavior. However, recent research suggests that it may also be valuable to consider potential moderators of the personality – safety relationship. Accordingly, this study uses a field sample ( $N = 219$ ) to examine the degree to which cognitive ability moderates conscientiousness when predicting workplace safety behavior. As hypothesized, we found that those individuals with higher levels of cognitive ability were more likely to demonstrate higher safety behavior regardless of level of conscientiousness. In contrast, conscientiousness was a stronger predictor of safety behavior for individuals with lower levels of cognitive ability. Implications for understanding the way cognitive ability and conscientiousness interact are discussed.

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### 1. Introduction

Workplace safety is a constant concern for organizations across the globe. Occupational injury and fatality statistics demonstrate that this concern is for good reason. For example, Hämäläinen, Takala, and Saarela (2006) estimate that in 1998 there were over 350,000 fatal and 264 million nonfatal occupational accidents worldwide. Likewise, a recent study by the National Safety Council (2006) found that in the United States nearly 5000 accidental fatalities and as many as 3.7 million nonfatal injuries occur in the workplace each year, with estimated direct and indirect costs of these injuries totaling over \$140 billion in wage and productivity losses, property damage, and other associated costs. Some researchers maintain that the total number of workplace injuries may be even higher than previous estimates suggest, since many injuries go unreported (Leigh, Marcin, & Miller, 2004). Furthermore, accidents threaten organizations' integrity, through personal injury, lawsuits, and wasted materials (Hansen, 1988).

Human error is believed to be a factor in as many as 80–90% of work accidents (Hale & Glendon, 1987). Consequently, researchers have sought to identify individual differences that predict safe workplace behavior, as these may assist organizations in identifying applicants who are more likely to work safely on the job. Research and industry practice emphasize the usefulness of personality-based assessment in this regard (Clarke & Robertson, 2005, 2008; Hansen, 1988). Recent meta-analyses (Clarke &

Robertson, 2005, 2008) have shown that Big Five personality dimensions such as emotional stability, agreeableness, and conscientiousness correlate negatively with workplace accidents. Nevertheless, the relationship between Big Five personality dimensions and workplace safety is not fully understood, and Clarke and Robertson (2008) suggest that it may be useful to consider variables that moderate personality – safety relationships. In the current study, we contribute to this growing research literature by examining whether conscientiousness is moderated by cognitive ability when predicting workplace safety behavior. First, we briefly review the relevant literatures on conscientiousness and cognitive ability. Next, we describe the results of a field study involving 219 participants. We conclude by discussing the implications of our findings for research and practice.

#### 1.1. Conscientiousness

Although diverse conceptualizations of personality exist, the Five Factor Model (Digman, 1990) has proven particularly useful for predicting work outcomes, including overall job performance (Barrick & Mount, 1991), counterproductive work behaviors (Salgado, 2002), and organizational citizenship behaviors (Organ & Ryan, 1995). Of the Big Five personality dimensions, conscientiousness may be particularly useful for predicting workplace safety behavior. Barrick and Mount (2000, p. 19) argue that conscientious people “plan and organize their work, and are careful, thorough, and detail oriented [and these traits are] likely to lead to fewer accidents and safety violations”. Empirical research tends to support this line of reasoning. For example, Arthur and Graziano

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(1996) found that conscientiousness was negatively related to at-fault motor vehicle accidents. Likewise, Cellar, Nelson, Yorke, and Bauer (2001) found that conscientiousness was negatively related to work-related accidents. Similarly, Wallace and Vodanovich (2003) reported negative correlations between conscientiousness and both unsafe work behavior and occupational accidents in samples of production workers and military personnel.

In a series of recent meta-analyses, Clarke and Robertson (2005, 2008) found that low conscientiousness correlated moderately ( $\bar{\rho} = .30-.31$ ) with workplace accident involvement. However, these researchers also observed that the corrected correlations were characterized by large standard deviations ( $SD_{\rho} = .29-.33$ ), leading them to conclude that moderators may be operating (Clarke & Robertson, 2008). In the current study, we examine cognitive ability as one such potential moderator. Clarke and Robertson (2005, 2008) also maintain that it may be beneficial for researchers to further examine the role personality plays in predicting not only workplace accidents, but also safety-related behaviors. Thus, in the current study, we adopt supervisor ratings of safety-related behavior as a criterion measure. Finally, Clarke and Robertson (2008, p. 103) suggest that “stronger and more consistent relationships” between personality and safety may be visible at the facet-level of measurement. Indeed, in a recent meta-analysis of conscientiousness facets, Dudley, Orvis, Lebiecki, and Cortina (2006, p. 40) found that narrow facets have incremental validity over global conscientiousness; however, “the degree to which they contribute depends on the particular performance criterion and occupation in question”. Although Dudley et al. found that facet-level and global conscientiousness were negatively correlated with counterproductive work behaviors, they did not specifically examine safety as a performance criterion. Given this, we examine both facet-level and global conscientiousness as predictors of workplace safety behavior.

## 1.2. Cognitive ability

Cognitive ability has been found to be an excellent predictor of multiple work-related outcomes such as the acquisition of job-related knowledge, training performance, and overall job performance (Schmidt & Hunter, 1998). Gottfredson (1997, p. 79) argues that cognitive ability has “pervasive utility in work settings because it is essentially the ability to deal with cognitive complexity, in particular, with complex information”. Although cognitive ability is the best predictor of overall job performance (Schmidt & Hunter, 1998), little research has examined its role in predicting counterproductive work behaviors (Dilchert, Ones, Davis, & Rostow, 2007), such as unsafe work behavior. Early research by Henig (1927) suggested that lower cognitive ability was related to increased accident proneness in a sample of male vocational students. More recently, using a large sample of police officers, Dilchert et al. found that cognitive ability was negatively related ( $r = -.20$ ) to counterproductive behaviors targeting organizational resources, operationalized in part by at-fault car accidents. In sum, research on cognitive ability and safety has been sparse, and more research is needed to understand the relationship between these variables.

When predicting employee safety behavior, it may be particularly beneficial to consider both cognitive ability and conscientiousness in tandem. Cognitive ability and conscientiousness show little correlation with one another (Judge, Jackson, Shaw, Scott, & Rich, 2007), which indicates the potential for incremental validity over and above the use of either predictor alone. Furthermore, no previous studies have examined whether cognitive ability moderates the relationship between conscientiousness and workplace safety behavior. It is possible that individuals with high cognitive ability work safely regardless of their level of

conscientiousness. Conversely, conscientiousness may be a stronger predictor of workplace safety behavior for individuals low in cognitive ability. We examine these possibilities in the current study.

Related research supports this pattern of results. Wallace and Vodanovich (2003) examined the interaction between conscientiousness and cognitive failure (e.g. Broadbent, Cooper, Fitzgerald, & Parkes, 1982) when predicting safety behavior and workplace accidents. Cognitive failure, which they describe as “a breakdown in cognitive functioning that results in a cognitively based mistake or error in task execution that a person should normally be capable of completing”, was found to predict both lower safety behavior and higher accident rates, especially when individuals were low in conscientiousness (Wallace & Vodanovich, 2003, p. 316). Larson, Alderton, Neideffer, and Underhill (1997, p. 29) also found that high cognitive failure scores were related to increased accidents, “a finding in agreement with other research showing that many accidents result from distractibility, poor selective attention and mental error”.

Using two military samples, Perkins and Corr (2006) found that assessment centre ratings were negatively correlated with neuroticism, but only in individuals with lower cognitive ability. Perkins and Corr maintain that cognitive buffering may be the causal mechanism explaining these results. Individuals with greater cognitive ability have more cognitive resources (such as working memory), which in turn allows them “to absorb the cognitive load imposed by anxiety and still leave sufficient resources to attend to the task” (Perkins & Corr, 2006, p. 48). Similarly, individuals with low cognitive ability may have fewer cognitive resources available to address unsafe situations when they arise. However, if such individuals are highly conscientious, their carefulness and detail orientation may help direct their available cognitive resources toward safety-relevant behavior. Carefulness and detail orientation may be less important predictors of safety for those high in cognitive ability.

## 2. Method

### 2.1. Sample

Participants were 219 incumbent employees (82%) and vocational trainees (18%) who were part of a larger test validation study. The sample group was 52% male, 72% white, and aged between 17 and 68 years (mean age = 34.2, SD 13.98). Participants were drawn from multiple organizations and industries (e.g., construction, healthcare, education/testing, manufacturing,) and held diverse occupations (e.g. carpenter, licensed practical nurse, program clerk, welding student).

### 2.2. Predictor variables

#### 2.2.1. Personality

Conscientiousness was measured using the WorkKeys Talent Assessment (WTA; ACT, 2007), a facet-level personality assessment designed to predict work-relevant outcomes. The WTA measures personality along 12 facets, with each mapping to one of the Big Five dimensions. The test is comprised of 165 self-descriptive statements to which respondents indicate their degree of agreement using a six-point scale ranging from Strongly Disagree to Strongly Agree. The WTA conscientiousness scale has been shown to correlate highly ( $r = .79$ ) with the conscientiousness scale of John and Srivastava's (1999) Big Five Inventory, a well-established measure of the Big Five (Oh et al., 2009).

Three WTA scales (Carefulness, Discipline, and Order) are facet-level indicators of conscientiousness:

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