Poster

TITLE

Personality as a Predictor of Workplace Safety Outcomes

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ABSTRACT

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PRESS PARAGRAPH

This study examined the predictive validity of a personality-based facet-level measure in relation to safety outcomes. Across three studies various facet-level safety scales were predictive of different safety outcomes, such as accidents and workers' compensation claims. Overall the results of this study suggest that it would be beneficial for organizations to use personality-based facet-level measures in proactive ways such as employee selection and training. Using personality-based facet-level measures for selection and training may help organizations encourage safety performance among their employees and reduce safety outcomes that have detrimental personal and organizational consequences.

Personality as a Predictor of Workplace Safety Outcomes

In September 2008, 25 people were killed when a Metrolink commuter train crashed head-on into a Union Pacific freight train in Los Angeles. It is thought that the Metrolink train may have run through a red signal while the conductor was busy text messaging. Wrongful death lawsuits are expected to cost Metrolink $500 million (Akre, 2010).

In November 2006, an enormous fire and explosion occurred at a Massachusetts ink and paint products manufacturing facility. A plant employee caused the explosion by unintentionally leaving the mixing tank heat on when he left the facility after his shift. The explosion damaged several nearby houses and businesses beyond repair. Also, over 300 residents were evacuated from their homes and ten sought medical treatment due to injuries sustained from the blast (U.S. Chemical Safety Board, 2008).

These two incidents highlight the importance and necessity of safe behavior on the job. Although extreme, these critical incidents are examples of how disastrous the outcomes can be when safety behavior guidelines are not followed. Unsafe behavior that results in accidents, injuries, illnesses, etc. is unfortunately a common occurrence in the workplace. The U.S. Department of Labor, Bureau of Labor Statistics (2009) reported that there were over 5,000 fatal work injuries in 2008. Furthermore, safety is critical to organizational success as workplace accidents and injuries adversely affect a company's reputation and profitability. For example, U.S. companies pay over $1 billion per week in costs associated with workplace accidents and injuries such as worker compensation claims, lost productivity, and medical expenses (Liberty Mutual Research Institute for Safety, 2008). Thus, safety behavior is not only important in terms of job proficiency but also in terms of practical implications for organizations.

As illustrated in the critical incidents and Department of Labor statistics, poor safety performance and negative safety outcomes are very costly for organizations and their employees.

Safety performance is "individuals' actions or behaviors exhibited in almost all jobs" in an effort to promote safety and decrease accidents and injuries in the workplace (Burke, Sarpy, Tesluk, & Smith-Crowe, 2002). Safety outcomes are accidents, injuries, illnesses, etc. that occur within the workplace, often as the result of human behavior.

Given the importance and cost of safety performance and outcomes, there is a need for companies to hire employees who can think and act safely. Understanding the relationship between individual difference factors, such as personality, and safety outcomes, may provide insight into tools or solutions organizations can use to promote safety performance and decrease the occurrence of negative safety outcomes.

Safety and Personality

Organizations should pay attention to the "human factors" as they are directly related to safety outcomes (Clarke & Robertson, 2005). For example, one study found that human factors are the primary cause of 95% of driving accidents (Sabey & Taylor, 1980). Examining individuals' personality, one aspect of the human factor, can provide insight into safety performance and outcomes. Some researchers have suggested that personality is the missing link between reducing negative outcomes, such as accidents, and attempts to improve the safety climate (Ulleberg & Rundma, 2003).

Research has found that personality, as measured with Five-Factor Model (FFM) dimensions, is related to safety behaviors in general and within the work setting. Cellar, Nelson, and Yorke (2000) examined personality in relation to vehicular safety among 202 university students. They found that Agreeableness, measured with the NEO-PI, was negatively related to both tickets and driving accidents. Another study found that Conscientiousness, begin careful, thorough, and detail oriented, was negatively related to at-fault motor vehicle accidents (Arthur & Graziano, 1996).

Several studies have examined personality in relation to specific work-related safety behaviors and found that different FFM dimensions predict organizational safety outcomes (Cellar, Nelson, York, & Bauer, 2001; Conte & Jacobs, 2003; Hanson, 1988; Stuhlmacher et al., 2009; Thoresen, Bradley, Bliese, & Thoresen, 2004). Cellar et al. (2004) found that Conscientiousness and Agreeableness were negatively related to self report workplace accidents. Similarly, Clarke and Robertson (2005) conducted a meta-analysis of the Big Five personality factors and accidents in occupational settings. They found that although all of the Big Five scales were related to accident involvement, the negative relationships between accidents and Agreeableness and Conscientiousness were the only ones that generalized across samples.

More recent research by Clarke and Robertson (2008), found that in addition to Conscientiousness and Agreeableness, Neuroticism and Openness are related to accident involvement in the workplace. However, some studies have found a lack of relationship between the FFM and safety behavior. For example, Salgado (2002) found very low observed correlations or no correlation between all of the FFM scales and accidents on the job.

Facet-Level Safety Scales

Although the research on personality and safety has been insightful, Clarke and Robertson (2005) have argued for an examination of the relationships between personality and safety outcomes using personality facets instead of factors. Combinations of narrow personality variables (i.e., facets) consistently exhibit incremental validity over broad personality factors when predicting a range of work outcomes (Casillas, Robbins, McKinniss, Postlethwaite, & Oh, 2009; J. Hogan & Roberts, 1996; Ones, Dilchert, Viswesvaran, & Judge, 2007; Paunonen, 1998; Paunonen & Ashton, 2001; Paunonen, Haddock, Försterling, & Keinonen, 2003; Paunonen & Nicol, 2001; Tett & Christiansen, 2007). Combining facet-level results across personality scales, therefore, improves the prediction of many competencies, including safety-related competencies.

Thus, this study used six facet-level, personality-based safety scales to predict both safety performance and outcomes.

Development of Facet-Level Safety Scales

To develop the facet-level safety scales, researchers identified FFM personality facets based on the Hogan Personality Inventory (HPI; R. Hogan & J. Hogan, 2007) that were both theoretically and empirically related to important safety competencies. The safety competencies were identified through literature reviews and past workplace safety studies (Foster & Hogan, 2005; Foster & Chen, 2007; Lemming, Johnson, & Foster, 2008). Next, researchers developed personality-based algorithms for each competency using the identified facets. This resulted in six facet-level, personality-based safety scales capable of predicting safety performance and outcomes (Hogan Assessment Systems, 2010). Table 1 provides the scale names and definitions. We conducted three different studies using the personality-based safety scales to examine their predictive validity of outcomes from three different organizations. Given the past research we expected that across studies the personality-based safety scales would predict the safety-related outcomes.

Study1

Method

Participants

We collected data from 37 individuals, who assemble small electrical appliances at a small Midwestern manufacturing company. The individuals' tenure ranged from 1 to 17 years, with an average of 6.66 years of employment. Participants did not report other demographic information.

Measures

Safety Scales. Participants completed the HPI, a measure of normal personality characteristics based on the FFM (R. Hogan & J. Hogan, 2007). Using previously constructed algorithms (Hogan Assessment Systems, 2010); we computed scores on the six safety scales and an overall safety score for each participant. We computed overall safety scores by averaging the six safety scale scores.

Safety Outcomes. The organization provided workers' compensation claims data for the sample across the last two years. Seventeen (46%) individuals had filed a claim and 20 (54%) individuals had not filed a claim.

Results and Discussion

In this study, we hypothesized that one or more safety scales would predict workers' compensation claims for a sample of incumbents in the manufacturing industry, such that higher safety scale scores would indicate fewer workers' compensation claims. Table 2 provides descriptive statistics for the safety scales and Table 3 provides the correlations between the safety scales and workers' compensation claims for the sample.

To examine whether the safety scales predicted workers' compensation claims, we conducted a linear regression. Results indicated a significant regression model that explained 22% (Adjusted R^2) of the variance, $F(1, 36) = 11.11$, $p = .002$. In support of our hypothesis, Vigilance was a significant predictor of workers' compensation claims, $\beta = -.027$, $p < .01$. Thus, employees who tend to be easily distracted (low Vigilance) were more likely to have filed workers' compensation claims in the past two years compared to employees who tend to be focused (high Vigilance). Individuals who are easily distracted may be more likely to forget to put their safety goggles on or overlook other steps in the process that would protect them from accidents and having to file a workers' compensation claim.

Additionally, we separated the sample into two groups based on their Vigilant score. Those with a score below the average (M = 71.23) were designated to the low safety group. Those with a score above the average were designated to the high safety group. As seen in the Table 4, 73% of individuals with below average Vigilant scores filed a workers' compensation claim, compared to only 27% of those workers with above average Vigilant scores. These results demonstrate that, individuals with low Vigilant scores were seven times more likely to file a workers' compensation claim than employees with high safety scores (see Table 4).

Study 2

Method

Participants

We collected data from 59 individuals at a national forestry manufacturing company. All participants had been working at the company for six months to a year at the time of the study. The sample was mostly male (93.2%) and ranged in age from 18 – 59 (M = 30.90). Almost all participants were White (90%).

Measures

Safety Scales. The same scales described in study 1 were used in study 2.

Safety Outcomes. The organization provided performance data for 41 workers. The performance data were based on supervisor ratings that the organization grouped into high and low performer categories. Thirty-four incumbents were rated as high performers and 7 were rated as low performers. The organization also provided turnover data on the sample. In addition to the 41 incumbents, the organization identified 15 individuals who had left the company. Lastly, the company identified individuals who filed workers' compensation claims; 10% of the total sample had filed a workers' compensation claim.

Results and Discussion

We hypothesized that one or more safety scales would significantly predict all three performance variables: job performance, turnover, and workers' compensation claims. Specifically, we predicted that higher safety scale scores would be related to (a) higher performance ratings, (b) lower turnover, and (c) fewer workers' compensation claims. Table 5 presents the descriptive statistics for the safety scales for the sample. Additionally, Table 6 provides the correlations between each safety scale and outcome.

Performance. To examine whether the safety scales predicted job performance, we conducted a linear regression. Results indicated a significant regression model that explained 11% (Adjusted R^2) of the variance, $F(2, 38) = 3.47$, $p = .04$. Consistent with our prediction, Trainable was a significant predictor of job performance, $\beta = .34$, $p < .05$. This indicates that individuals with higher scores on the Trainable scale are likely to have higher performance ratings. Individuals who are more open to training and willing to admit where they lack knowledge, may be more willing to learn job procedures and thus earn higher performance ratings.

Additionally, we separated the sample into two groups based on their average Trainable score ($M = 69.53$). Those with a score below the average were designated to the low safety group. Those with a score above the average were designated to the high safety group. As shown in Table 7, individuals who are open to and enjoy training and development opportunities are 11 times more likely to be classified as high performers than those who resist training.

Turnover. The organization identified 12 incumbents in the sample who had been let go due to performance or absenteeism and an additional 3 individuals who had voluntarily turned over. To examine whether the safety scales predicted turnover, we conducted a linear regression using both voluntary and involuntary turnover data. Results indicated a significant regression model that explained 12% (Adjusted R^2) of the variance, $F(5, 53) = 2.50$, $p = .04$. In support of

our hypothesis, the Strong scale was a significant predictor of turnover, $\beta = -.30$, $p < .05$, indicating that individuals with higher scores on the Strong scale were less likely to turnover. Individuals with higher scores on the Strong scale are more likely to remain calm under pressure and make decisions in which they are confident. Individuals who panic in stressful situations (lower Strong scores) may be more likely to (a) make mistakes that cause the company to terminate them or (b) quit due to the perceived pressure.

Workers' Compensation Claims. To examine whether the safety scales predicted workers' compensation claims, we conducted a linear regression. Results indicated a significant regression model that explained 7% (Adjusted R^2) of the variance, $F(2, 56) = 3.08$, $p = .05$. Partially supporting our hypothesis, Cautious and Vigilant were significant predictors of workers' compensation claims, $\beta = -.42$ and $\beta = .41$, respectively, $p < .05$. These findings indicate that individuals with higher scores on the Cautious scale are less likely to file a workers' compensation claim. Thus, individuals who tend to take unnecessary risks (low Cautious) may be more likely to sustain an injury, resulting in filing a workers' compensation claim. However, contrary to our prediction, individuals with higher scores on the Vigilant scale were more likely to file a workers' compensation claim. This finding was in contrast to our hypothesis as individuals high in Vigilant are typically focused and attentive. Perhaps these individuals are focused to the extent that they are unable to monitor other risks while completing the task at hand, thus, becoming more likely to have accidents or injuries resulting in filing a workers' compensation claim.

Study 3

Method

Participants

We collected data from 194 bus operators in a large, West Coast metropolitan transportation organization. The sample was 74% male and 26% female. The age of the sample ranged from 23 to 64 (M = 44.33, SD = 8.3). About half (48%) of the sample was African American, 29% was Hispanic/Latino, 15% was White, and 5% was Asian. Tenure ranged from 1 year to 34 years, with an average tenure of 15 years (SD = 7).

Measures

Safety Scales. The same scales described in study 1 were used in study 2.

Safety Outcomes. The transportation organization provided us with objective driver criteria, which included: (a) accident data for each employee's driving tenure, (b) rule violations over the past four years, and (c) workers' compensation claims filed. Base rates for individuals with accidents, rule violations, and workers' compensation claims were 12%, 69%, and 77%, respectively.

Results and Discussion

In this study, we examined how the personality-based facet-level safety scales predicted three outcomes: accidents, rule violations, and workers' compensation claims. We predicted that one or more safety scales would significantly predict all three safety outcome variables, such that higher safety scores would predict to fewer (a) accidents, (b) rule violations, and (c) workers' compensation claims. Table 8 presents the descriptive statistics for the safety scales for the sample. Additionally, Table 9 provides the correlations between each safety scale and outcome.

Accidents. The organization provided data on the total number of accidents (passenger and traffic accidents) for each employee. Specifically, 170 incumbents had no accidents during their tenure and 24 incumbents had one or more accidents during their tenure. To examine whether the safety scales predicted accidents, we conducted a linear regression. Results indicated a significant regression model that explained 5% (Adjusted R^2) of the variance, F(3,

190) = 3.56, p = 01. Consistent with our hypothesis, Compliant was a significant predictor of total accidents, β = -.25, p < .01. This indicates that individuals who tend to follow traffic rules and regulations (higher Compliant) were less likely to have traffic and passenger related accidents.

Rule Violations. Sixty incumbents had no rule violations and 134 incumbents had 1 to 10 violations over the past four years. To examine whether the safety scales predicted rule violations, we conducted a linear regression. Results indicated a significant regression model that explained 4% (Adjusted R^2) of the variance, F(2, 191) = 3.91, p = .02. In support of our hypothesis, Cautious was a significant predictor of rule violations, β = -.18, p < .01, suggesting that individuals with higher scores on the Cautious scale were less likely to have major rule violations. Employees who tend take careless risks (lower Cautious) were more likely to have documented rule violations than bus operators who tend to weigh the consequences before taking risks (higher Cautious).

Workers' Compensation Claims. Forty-four incumbents had no workers' compensation claims and 150 incumbents had 1 or more workers' compensation claims during their tenure. To examine whether the safety scales predicted workers' compensation claims, we conducted a linear regression. Results indicated a significant regression model that explained 4% (Adjusted R^2) of the variance, F(2, 191) = 3.72, p = .03. Supporting our hypothesis, Cheerful was a significant predictor of workers' compensation claims, β = -.20, p < .01, indicating that individuals with higher scores on the Cheerful scale were less likely to file workers' compensation claims. In other words, bus operators who tend to become easily angered (lower Cheerful) were more likely to file workers' compensation claims compared to those who tend to control their tempers on the job (higher Cheerful).

General Discussion

As researchers have called for studies that investigate the relationship between personality facets (as opposed to factors) and safety outcomes (Clarke & Robertson, 2005), our primary goal in conducting these studies was to demonstrate the predictive validity of the six personality-based facet-level safety scales. The results, across all three studies, demonstrated that different facet-level safety scales were predictive of various safety-related outcomes. In study 1, Vigilance was a significant predictor of workers' compensation claims. In study 2, performance, turnover, and workers' compensation claims were best predicted by Trainable, Strong, and Cautious and Vigilant, respectively. Lastly, in study 3, accidents, rule violations, and workers' compensation claims were best predicted by Compliant, Cautious, and Cheerful, respectively. These results support previous research that demonstrates the link between personality and safety outcomes (Arthur & Graziano, 1996; Cellar et al., 2000; Conte & Jacobs, 2003; Hanson, 1988; Stuhlmacher et al., 2009; Thoresen, Bradley, Bliese, & Thoresen, 2004); however it extends this literature by examining this relationship at the facet level instead of the factor level.

By studying personality-facets and safety outcomes across industries and jobs, we were better able to understand this relationship. For instance, all three studies examined workers' compensation claims as a safety criterion. Study 1 collected data from a manufacturing company and found that Vigilant was the best predictor. In study 2, analyzing data from a forestry manufacturer, the Cautious and Vigilant scales were most predictive of workers' compensation claims. However, in contrast to study 1, in study 2 Vigilant had a positive relationship with the outcome. In study 3, with data from a transportation company, the Cheerful scale was most predictive of workers' compensation claims. These differences may highlight the need to examine moderators of the relationship between facet-level personality predictors and safety outcomes, such as industry or job tasks.

Practical Implications

The criteria examined in these studies (i.e. workers' compensation claims, turnover, accidents) can be costly for organizations. Thus, it is beneficial to examine ways in which predictive measures of safety, such as the facet-level personality measure used here, can be used by organizations to promote safety performance and lower the occurrence of negative safety outcomes.

One way employers can be proactive about their employees' safety behavior is through personnel selection. Specifically, measures of safety competence, such the measure used in this study, can be used to screen in individuals for jobs in which safety behavior is important. For example, Jones and Wuebker (1998) found that using a personality-based safety scale for selection reduced accidents and injuries across 8 manufacturing plants. Using a personality-based facet-level measure can help organizations identify applicants who are likely to stay calm under pressure, follow safety guidelines, remain focused, control their tempers, avoid unnecessary risks, and be open to on-the-job safety training.

Training and development opportunities are another way that employers can be proactive about employees' safety behavior. Personality-based measures can also be used to identify weaknesses in the current workforce and where training is needed. Training on targeted safety behaviors and providing feedback on these behaviors has been found to reduce accident rates over time (Komaki, Barwick, & Scott, 1978). Tailoring training interventions according to individuals' personality characteristics can help to reduce negative safety outcomes and improve employees' safety performance (Ulleberg & Rundmo, 2003). Neal and Griffin (2006) found that over time, improvements in safety behaviors resulted in fewer accidents, likely improving the livelihood of employees and saving the organization money.

Conclusion

This study examined the predictive validity of a personality-based facet-level measure in relation to safety outcomes. Across three studies various facet-level safety scales were predictive of different safety outcomes, such as accidents and workers' compensation claims. Overall the results of this study suggest that it would be beneficial for organizations to use personality-based facet-level measures in proactive ways such as employee selection and training. Using personality-based facet-level measures for selection and training may help organizations encourage safety performance among their employees and reduce safety outcomes that have detrimental personal and organizational consequences.

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Table 1 Safety Competencies and Definitions

Competency	*High scores will …*
Compliant	Conform to organizational guidelines and will be less likely to defy organizational authorities or ignore company rules
Strong	Exhibit confidence in their work and will be less likely to make mistakes by panicking under pressure
Cheerful	Display emotional control while working and be less likely to make mistakes by losing their temper
Vigilant	Remain attentive while performing repetitive tasks and will be less likely to make mistakes because of boredom
Cautious	Perform work carefully, avoiding unnecessary risk and will be less likely to make mistakes by taking excessive risks
Trainable	Remain open to new training/development and will be less likely to overestimate their own competence due to arrogance

Table 2

Study 1: Descriptive Statistics for the Safety Scales

Safety Scale	**Mean**	**SD**
Compliant	51.47	28.03
Strong	30.74	24.96
Cheerful	32.74	29.39
Vigilant	71.29	26.28
Cautious	76.26	22.86
Trainable	36.03	31.63
Overall Safety	49.82	18.38

Note. $N = 37$; Based on percentile scores.

Table 3

Study 1: Observed Correlations between Safety Scores and Safety Outcomes

	Compliant	**Strong**	**Cheerful**	**Vigilant**	**Cautious**	**Trainable**	**Overall Safety**
Worker Compensation Claims	-.12	.13	.05	-.46*	-.42*	-.14	-.22

Note. $N = 37$; * = $p < .05$.

Table 4

Study 1: Odds Ratio of Vigilant Competency Score Compared to Workers' Compensation Claims

Vigilant Score	Safety Outcome: Workers' Compensation Claims		
	Claim	No Claim	Odd Ratio
Below Average	11	4	7.33
Above Average	6	16	

Table 5

Study 2: Safety Scale Descriptive Statistics

Safety Scale	**Mean**	**SD**
Compliant	79.07	18.82
Strong	58.05	25.38
Cheerful	82.22	19.55
Vigilant	69.24	22.00
Cautious	72.58	22.00
Trainable	69.53	24.21
Overall Safety	71.85	13.22

Note. $N = 59$; Based on percentile scores.

Table 6

Study 2: Observed Correlations between Safety Scores and Safety Outcomes

	Compliant	**Strong**	**Cheerful**	**Vigilant**	**Cautious**	**Trainable**	**Overall Safety**
Job Performance	.16	.13	.20	.34*	.03	.36*	.34*
Turnover	-.15	-.20	-.19	-.19	-.14	-.18	-.29*
Worker Compensation Claims	.09	.01	.00	.15	-.08	.08	.06

Note. $N = 59$; * = $p < .05$.

Table 7

Study 2: Odds Ratio: Trainable Safety Scale and Job Performance

	Performance Rating			
Trainable Score	Bottom Performer	Top Performer	Total	Odds Ratio
Average and Below	6	12	18	11
Above Average	1	22	23	
Total	7	34	41	

Table 8

Study 3: Descriptive Statistics for the Safety Scales

Safety Scale	**Mean**	**SD**
Compliant	53.06	30.68
Strong	28.08	21.52
Cheerful	44.79	31.69
Vigilant	68.55	26.64
Cautious	66.82	26.10
Trainable	50.97	30.93
Overall Safety	52.13	18.44

Note. $N = 59$; Based on percentile scores.

Table 9

Study 3: Observed Correlations between Safety Scores and Safety Outcomes

	Compliant	**Strong**	**Cheerful**	**Vigilant**	**Cautious**	**Trainable**	**Overall Safety**
Passenger and Traffic Accidents	-.18*	-.03	-.11	.01	-.03	.06	-.08
Major Rule Violations	-.15	-.08	-.10	-.12	-.18*	-.06	-.17*
Worker Compensation Claims	-.09	-.05	-.11	.02	-.06	.06	-.06

Note. $N = 59$; * = $p < .05$.