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SELECTING SAFER EMPLOYEES

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INTRODUCTION

Work-related accidents have a strong, adverse influence on organizations through personal injuries, lost productivity, lawsuits, disability compensation, damaged or destroyed equipment, and waste material (Hansen, 1988). Further, safety should not only be a concern for blue-collar positions. As noted by Sweeney (1995), safety is a relevant performance measure for many different types of positions, e.g., soldiers, police, drivers, pilots, and medical workers, just to name a few. Such work-related accidents are often attributed to two very broad factors: those pertaining to characteristics of the work environment (e.g., culture, work design, ergonomics and equipment design, leadership) and those pertaining to characteristics of the individual (Iverson & Erwin, 1997).

The philosophy of a personnel-selection approach to ameliorating problems associated with safety is based on the strategy of identifying individual characteristics that differentiate among employees likely to be involved in accidents from those who are not likely to be involved. Such a philosophy stems from research dating back to the early 1900's on individual characteristics that predict accidents and other safety-related criteria (Hansen, 1988). Since that time, personnel selection researchers have studied a wide array of individual characteristics believed to impact safety performance in organizations. Examples of such characteristics include personality, motivation, and ability.

In this article, we take a look at some of the existing research on individual characteristics that have been studied as predictors of workplace safety.

Personality has long been thought to be a relevant characteristic for the prediction of workplace safety. One well-researched conceptualization of personality is the Five-Factor Model (FFM), based on the following traits (Goldberg, 1993):

- Conscientiousness: Reliability, thoroughness
- Openness to Experience: Curiosity, creativity
- Extraversion: Talkativeness, assertiveness
- Agreeableness: Kindness, trust, selfishness
- Neuroticism: Nervousness, moodiness

META-ANALYSIS RESULTS

A meta-analysis of the extant research connecting the FFM traits with safety outcomes provides several suggestions (Clarke & Robertson, 2005). First, Neuroticism and Agreeableness appear to be the most consistent FFM predictors of accidents across settings (r =.28 and .61, respectively). Second, Openness to Experience and Conscientiousness also appear to be moderate-strong predictors of safety outcomes, but may not be generalized across all positions (r =.50 and .30, respectively). Finally, Extraversion may not be as strong a predictor of safety outcomes in occupational settings (r =-.09); however, Clarke and Robertson did find that it is related to traffic accidents (r =.24) and, therefore, may be relevant for positions entailing vehicular operation.

Another commonly studied personality trait is Locus of Control. Locus of Control pertains to an individual's orientation regarding the causation of events (Spector, 1988). Individuals may be either internally oriented (i.e., outcomes attributed to one's own actions and behaviors) or externally oriented (outcomes attributed to outside forces, such as authority or chance), with externally-oriented individuals often exhibiting higher accident rates (Hansen, 1988; Arthur, Barrett, & Alexander, 1991). Across a variety of occupations, Locus of Control has been found to predict accident

risk, number of reported accidents, and accident severity (Wuebker, 1986). Furthermore, Jones and Wuebker (1993) found that individuals with an external Locus of Control had average accident-related medical costs over 2.6 times higher than their internally-oriented counterparts.

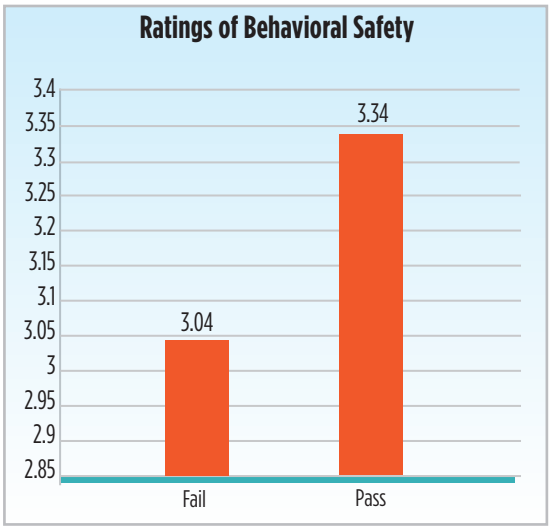
Research has been directed at several ability-based measures. General cognitive ability consistently emerges as a strong predictor of job performance (e.g., Hunter & Hunter, 1984; Schmidt & Hunter, 1998). Interestingly, results have been equivocal regarding the validity of cognitive measures for safety outcomes; some report finding a relationship between the two (Arthur, et al., 1991; Hansen, 1989), while others have yielded weak or non-existent relationships (Hansen, 1989; Conte, 1997). Research on information processing, however, has shown greater promise. A series of studies by Barrett and colleagues (e.g., Mihal & Barrett, 1976; Arthur, Barrett, & Doverspike, 1990) investigated several information-processing measures. Mihal and Barrett (1976) found two measures of field dependence to be predictive of accidents in a sample of utility employees, while Arthur and colleagues (1990) found selective attention to be predictive of vehicular accidents amongst a sample of petroleum-product transport drivers.

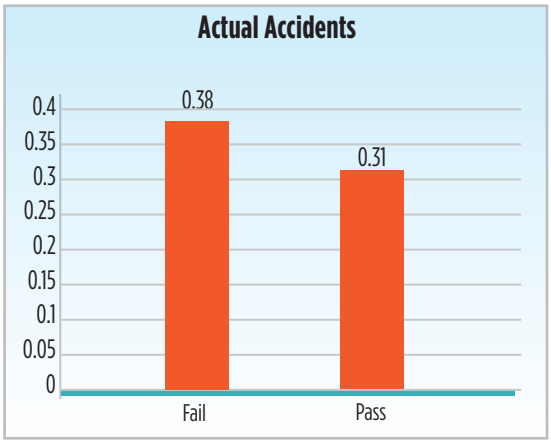
A third cognitive variable that has been studied in the safety literature is cognitive failure, described as "...a breakdown in cognitive functioning that results in a cognitively based mistake or error in task execution that a person should be normally capable of completing" (Martin, 1983, cited in Wallace & Vodanovich, 2003). In two studies, Wallace & Vodanovich (2003) found that cognitive failure predicted accidents and unsafe work behavior and demonstrated incremental validity beyond Conscientiousness. Another study found that cognitive failure significantly differentiated amongst individuals who had received citations for causing accidents, had received hospitalization following injuries, and who had been injured during falls (Larson, Alderton, Neideffer, & Underhill, 1997).

Aside from personality and ability, researchers have begun exploring other potential predictors of safety outcomes. Biographical data (biodata) is a measurement method that elicits information regarding an individual's past history and experiences, including previous jobs, extracurricular activities, and the like (Mael, 1991). Several biographical variables have been commonly researched, namely experience, education, and prior safety behavior. For instance, Conte (1997) found that a safety-specific measure of biodata predicted safety incidents in a sample of train operators. However, results investigating other biographical variables, such as tenure, have been inconsistent; some authors report positive relationships (Hansen, 1989; Frone, 1998), some report negative relationships (Siskind, 1982), and still others have found no discernible relationship (Liao, Arvey, Butler, & Nutting, 2001).

Building on this research base, in 2001 Select International developed the Select Safety Orientation scale, a short measure comprising both personality statements and scenarios placing candidates into realistic situations where they are instructed to rate the appropriateness of various ways of handling the situations. The personality measures were directed at measuring individual characteristics related to risk taking, locus of control, personal responsibility, and thrill seeking. The situational scenarios placed candidates in situations where they were faced with competing priorities for productivity and safety.

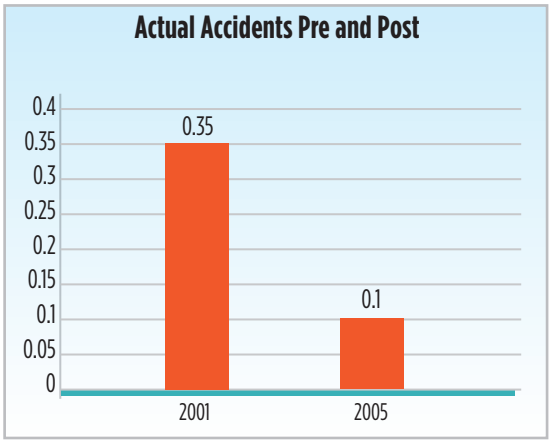
As part of a larger study, the Safety Orientation scale was administered to a group of 384 existing production employees from 14 facilities of a large U.S.-based manufacturing company. Supervisor ratings of behavioral safety and a measure of accident frequency over the prior year were collected as criterion measures. Scores on the Safety Orientation scale were then correlated with these criteria. The correlation between the Safety Orientation scale and safety ratings was positive and statistically significant ($r=.23$, $p < .001$). Accident data is often non-normally distributed and skewed (e.g., Hansen, 1989; Arthur et al., 1990); here, the data fit is what is referred to as a Poisson distribution. As such, correlation coefficients do not provide an adequate measure of association. However, we established a cutoff score for use in selecting individuals into the production positions. A comparison of those who passed versus failed the Safety Orientation scale is displayed in the following two graphs.





The results above show that individuals who passed the Safety Orientation scale were rated significantly higher on behavioral safety by supervisors (F=10.52, df=1,317, p < .001) and had fewer accidents (0.31 to 0.38), although this relationship was not statistically significant.

The positive results of this study led us to subsequently include the Safety Orientation scale in the selection process for production employees. In 2005, a follow-up study was conducted to evaluate the performance of the overall selection process and to ascertain the impact on accident occurrence. A comparison of accidents over a one-year period between those hired using the new selection process (including the Safety Orientation scale) and the original baseline sample revealed that accidents had decreased significantly (t=218, df=328, p < .05). In fact, as shown in the graph below, accident rates decreased by slightly more than 70%. While it's not possible to determine what percentage of this change is attributable directly to the Safety Orientation scale, it's fair to assume that it did play a meaningful role.



Improving safety in organizational settings is a function of leadership, organizational culture, training, and as we have seen here, individual characteristics of the people in those jobs. The research to date shows that there are a number of individual difference characteristics that are related to safety behaviors. Measuring and reducing accidents is challenging because accidents are actually rare events. They can, however, have severe consequences for the individuals and organizations involved, both directly and indirectly.

It's clear that accidents and exposure to accidents can be reduced by using effective pre-employment screening techniques. Given that no two jobs are exactly alike, it is often the case that what predicts performance, however defined, for one position may not be effective at doing so in another.

The choice of the appropriate pre-screening solution should involve a systematic approach undertaken by individuals specializing in such work. Improved screening, along with training and increased commitment by organizations to improve their safety culture can go a long way to making the workplace a safer place for everyone.

REFERENCES

Arthur, W. J., Barrett, G. V., and Alexander, R. A. (1991). Prediction of vehicular accident involvement: A meta-analysis. Human Performance, 4, 89-105.

Arthur, W. J., Barrett, G. V., and Doverspike, D. (1990). Validation of an information-processing-based test battery for the prediction of handling accidents among petroleum-product transport drivers. Journal of Applied Psychology, 75, 621-628.

Clarke, S., and Robertson, I. T. (2005). A meta-analytic review of the big five personality factors and accident involvement in occupational and non-occupational settings. Journal of Occupational and Organizational Psychology, 78, 355-376.

Conte, J. M. (1997). Time orientation, biodata, and personality predictors of multiple performance criteria. Unpublished doctoral dissertation, The Pennsylvania State University (pp. 1-168).

Goldberg, L. R. (1993). The structure of phenotypic personality traits. American Psychologist, 48, 26-34.

Hansen, C. P. (1988). Personality characteristics of the accident involved employee. Journal of Business and Psychology, 20, 345-365.

Hansen, C. P. (1989). A causal model of the relationship among accidents, biodata, personality, and cognitive factors. Journal of Applied Psychology, 74, 81-90.

Hunter, J. E., and Hunter, R. F. (1984). Validity and utility of alternative predictors of job performance. Psychological Bulletin, 96, 72-98.

Iverson, R. D., and Erwin, P. J. (1997). Predicting occupational injury: The role of affectivity. Journal of Occupational and Organizational Psychology, 70, 113-128.

Jones, J. W., and Wuebker, L. J. (1993). Safety locus of control and employees' accidents. Journal of Business and Psychology, 7, 449-457.

Larson, G. E., Alderton, D. L., Neideffer, M., and Underhill, E. (1997). Further evidence on dimensionality and correlates of the cognitive failures questionnaire. British Journal of Psychology, 88, 29-38.

Liao, H., Arvey, R. D., Butler, R. J., and Nutting, S. M. (2001). Correlates of work injury frequency and duration among firefighters. Journal of Occupational Health Psychology, 6(3), 229-242.

Mael, F. (1991). A conceptual rationale for the domain and attributes of biodata items. Personnel Psychology, 44, 763-792.

Mihal, W. L., and Barrett, G. V. (1976). Individual differences in perceptual information processing and their relation to automobile accident involvement. Journal of Applied Psychology, 61, 229-233.

Schmidt, F. L., and Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. Psychological Bulletin, 124, 262-274.

Siskind, F. (1982). Another look at the link between work injuries and job experience. Monthly Labor Review, 105(2), 38-40.

Spector, P. E. (1988). Development of the work locus of control scale. Journal of Occupational Psychology, 61, 335-340.

Wallace, J. C., and Vodanovich. (2003). Workplace safety performance: Conscientiousness, cognitive failure, and their interaction. Journal of Occupational Health Psychology, 8, 316-327.

Wuebker, L. J. (1986). Safety locus of control as a predictor of industrial accidents and injuries. Journal of Business and Psychology, 1, 19-30.