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Dark Side Personality and Safety Behaviour

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Abstract

Over twenty-five thousand Americans completed a questionnaire on safety-related behaviour in the work-place which measured six different, but related, safety competencies. They also completed a Dark Side personality measure (Hogan Development Survey). The six safety competencies comprised of two factors which, along with the total score, were the criterion variables. Step-wise regressions indicated that Dark Side traits Excitable, Mischievous and Colourful were related negatively to safety behaviour. In addition, the higher order Dark Side factor "Moving Against Others" was associated with high risk, low safety behaviours. There were interesting and important differences showing very different correlates of the three criterion variables. Problems of method invariance as well the role of individual differences in safety behaviours are discussed.

Key Words: Safety behaviours; Bright-side; Dark-side; personality

The data is available from the second author in SPSS file upon request

Pre-registration did not take place as this was not an experimental study. We mined a data set

Author Contribution: The first author did the analysis and first draft; the second supplied the data and did the final draft

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Accidents are unfortunate, unpredictable, and unintentional interactions with the environment. They occur for many different reasons: one very frequent cause is "human error/incorrect beliefs or actions." People get tired and bored; they take short cuts and ignore safety instructions; they misread dials or do not follow guidelines for machinery or medicine use.

There are two principal ways of looking at the accident problem: error-prone situations and error prone people (Reason, 2008). Earlier Pheasant (1991) distinguished between: *Theory A:* Accidents are caused by unsafe behaviour (and some people are more prone to behave more unsafely than others). Accidents may therefore be prevented by changing the ways in which people behave. This is the concern of primarily of personality and social psychology. This focuses on individuals. *Theory B:* Accidents are caused by unsafe systems of work. Accidents can therefore be prevented by redesigning the working system. This is the approach taken by cognitive psychologists and ergonomists. This focuses on systems.

This study focuses on Theory A explanations. Inevitably accidents are related to personality, situational, and organizational factors (Christian et al., 2009). Studies done over a 100 years ago from First World War munitions factories showed that a small number of people had a disproportionately large share of accidents. The theory of accident proneness (Atwater et al., 1949) is based on identifying *individuals* who have certain characteristics. There are many studies that have attempted to identify individual difference correlates of accidents including perceptual and motor skills, age, job experience, stress-proneness and risk perception (Furnham, 1992).

There are also a number of early studies examining the relationship between personality

(particularly extroversion and neuroticism) and accidents (particularly car accidents: Brand, 1973; Fine, 1963). Despite various methodological difficulties and differences, the results are fairly consistent (Furnham & Saipe, 1993). Studies have focused on all sorts of traits from Type A behavior, risk tolerance to the MBTI personality trait factors (Thanki & Baser, 2019).

Thirty years ago, Booysen and Erasmus (1989) reviewed personality factors associated with accident risk. No fewer than 43 traits (many of them related) were examined and they suggested that two factors were relevant: recklessness (extroversion, domineering, aggressive, sensation-seeking) and *anxiety-depressive* (instability, neuroticism). They then administered a personality questionnaire to nearly 200 bus drivers who were divided into three groups depending on their previous involvement in accidents and the large degree of seriousness of accidents that they had been involved in. Four factors – dominance, carefreeness, emotional sensitivity and shrewdness – were relevant. People with more accidents were more dominant (aggressive) and more carefree (extravert), more neurotic and less shrewd.

Studies continue to be done on the relationship between personality and accidents in different countries and using different measures, particularly in the construction (Pourmazaherian et al., 2017) and oil industries (Rahami-Pordanjani et al., 2013). Others have developed models like Beus and Taylor (2018) who developed a measure of safe and unsafe behaviour

There have however been a number of important meta-analyses on the relationship between personality and workplace safety. Beus, Dhanani and McCord (2015) noted, as predicted, that Agreeableness and Conscientiousness were positively, and Extraversion and Neuroticism negatively, associated with safety-related behavior, with Agreeableness accounting for most and Openness least of the variance. They found safety climate perceptions accounted for most of the variance and concluded: “these results substantiate the value of considering personality traits as key correlates of workplace safety” (p. 481).

Work Safety and Hogan Safety Competencies

There have been many attempts to develop measures and models of workplace safety (Hays et al., 1998). This study used the *Hogan Safety Competencies* (Hogan Assessment Systems, 2009; 2010; 2019) that were developed to help organisations identify job applicants who engage in safe behaviours at work. The Hogan model identifies six competencies thought to be antecedents of safety behavior. The model's corresponding assessment of these six competencies was validated by using both supervisor ratings and actual safety behavior (e.g., accidents).

The six scales of safety-related behaviours are:

- *Compliant:* This component concerns a person's willingness to follow rules. Low scorers may ignore rules; high scorers follow them effortlessly.
- *Strong:* This component concerns handling stress. Low scorers are stress prone, may panic under pressure and make mistakes; high scorers typically remain steady.
- *Poised*: This component concerns anger management. Low scorers may lose their temper easily and make mistakes; high scorers control their temper.
- *Vigilant:* This component concerns focus. Low scorers tend to be easily distracted and may make mistakes; high scorers remain focused.
- *Cautious*: This component concerns risk-taking. Low scorers tend to take unnecessary risks; high scores avoid risky actions.
- *Trainable*: This component concerns trainability. Low scorers tend to ignore training and feedback; high scorers pay attention to training

The assessment manual provides the details of norms, reliability, and validity (Hogan Assessment Systems, 2019). The assessment shows concurrent validity with a range of measures including the IPIP Big 5, NEO-PI-R, 16PF, CPI, JPI-R. The manual also reports on seven unique case studies where the criterion was nearly always a particular safety behaviour.

Although the case study samples were often small because this kind of data is difficult to obtain, there was good evidence of the assessment's predictive validity. In fact, across K = 11 (N = 858) studies, the predictive validities of the 6 safety competencies ranged between .10 (Vigilant) to .22 (Poised) while the overall safety total score had a predictive validity of *r* = .26. In this study, we examined the correlational relationships between the measures 6 safety competencies as well as its factor structure.

Dark Side Personality Variables

This study also examines the relationship between the six safety-related competencies and a measure of potentially dysfunctional (dark-side) personality. This study used the Hogan Developmental Survey now extensively used in organisational research and practice to measure "dark side" personality characteristics (De Fruyt et al., 2009). Various studies have used the HDS and have shown it to be a robust, reliable, and valid instrument (Furnham & Trickey, 2011; Furnham, Hyde & Trickey, 2013; Furnham et al. 2012, 2013, 2014). Of note, these 11 dimensions can be clustered into 3 higher-order dimensions. These three dimensions have been described as Moving Away from others (by maintaining psychological distance and pushing others away), Moving Against Others (by deliberately manipulating and controlling others), and Moving Toward Others (by building alliances with others; see Hogan et al., 2007). In comparison to the Dark Triad (Paulhus & Williams, 2002), the HDS dimensions of Skeptical, Bold, and Mischievous roughly correspond to Machiavellianism, Narcissism, and Psychopathy (Ferrell, 2016). However, the HDS has broader coverage of the dark-side personality space because (a) the Dark Triad largely overlaps with Moving Against tendencies and (b) does not overlap at all with Moving Towards tendencies (e.g., the tendency to micromanage, or to dutifully follow rules; Ferrell, 2016).

The aim of this research was three-fold. First, we aimed to examine the underlying structure of the Hogan Safety Competency scales. Second, we aimed to examine the dark side

personality traits associated with safety competencies. Based on the growing dark side literature we anticipated that Excitable (H1), Bold (H2), Mischievous (H3) and Colourful (H4) would be associated with poor safety behaviour, while Cautious (H5) and Reserved (H6) would be related to more safety behaviour. We also expected that the higher-order dark side dimension "Moving Against Others" would be associated with poor safety (H7) and "Moving Towards Others" would be associated with safety behaviour (H8). No hypotheses were entertained about the structure of the safety competency model or how the dark-side factors would relate to any resulting higher-order components.

Method

Participants

The participant data come from the Hogan Assessment Systems global data set containing personality data from more than 8 million people. Hogan Assessment Systems is a global test publisher specializing in personality assessment for more than 30 years with clients in 48 countries and assessments in over 50 languages. For the analyses here, we are limited to 30,280 people who completed the Safety since the time of its publication. This includes data from 15,776 Males; 12,779 Females, 1,725 Not Reporting. The sample mean age was 36.88 (SD = 8.90, Med = 36) years. Hogan does not track the country of the test-taker; however, Hogan does track the language the assessment was taken in which, in some cases, can be a proxy for home country. This sample contains data from participants who took the assessment in 1 of 44 languages with sample sizes varying by language (Albanian n = 1; Swedish n = 2,541). Of note, the median n for the 44 languages is 488.5 and no language makes up more than 8.4% of the data set, an indication of the sample's diversity.

Measures

Dark Side Traits. The Hogan Development Survey (HDS: Hogan & Hogan, 2009) contains 168 items measuring 11 behavioural patterns (characteristics) associated with managerial failure and career derailment. These characteristics can be loosely mapped on to the 11 personality disorders identified in the DSM-III (see Hogan, 2007); however, the HDS is designed to capture dysfunction at the sub-clinical level and is not a tool for clinical diagnoses. The 11 dimensions are: Excitable – The tendency to be moody, inconsistent, and easily disappointed; Sceptical – The tendency to by cynical and distrustful of others; Cautious – The tendency to resist change and to be fearful of taking chances; Reserved – The tendency to be socially withdrawn and lacking awareness of others feelings; Leisurely – The tendency to demand autonomy and resist pressure to comply with reasonable requests from others; Bold – The tendency to be unusually self-confident and feel entitled to special treatment; Mischievous – The tendency to take risks, bend the rules, and push the limits; Colourful – The tendency to be overly expressive, dramatic, and attention-seeking; Imaginative – The tendency to think in creative and often unusual ways; Diligent – The tendency to be perfectionist and to hold oneself and others to excessively high standards; Dutiful – The tendency to please others by adhering strictly to rules, social structure, and a reluctance to act independently. All items are rated using a True / False scale and the test-retest reliability of the scales ranges between .64-.75. All scores were normed using Hogan's global norms prior to analyses.

Safety Competency Scales. The safety competency scales (Hogan Assessment Systems, 2009, 2010, 2019), described in the introduction to this paper, are derived from subscales the Hogan Personality Inventory (HPI; Hogan & Hogan, 1995). The HPI is a Big Five-based personality inventory that was explicitly designed to predict job performance. It measures 7 broad scales and 41 subscales, the latter of which were algorithmically combined to create the six safety competencies. These algorithms are available in the Hogan Safety Manual, which is available upon request from Hogan Assessment Systems. All items are rated on a True / False

scale and the test-retest reliability of the safety competency scales ranges between .60-.70. The overall safety score is a simple composite of the six competency scales. All scores were normed using Hogan's global norms prior to analyses.

Results

<< Insert Tables 1 & 2 >>

Table 1 shows the correlations between the six competencies and the Safety total score. All correlations were positive except for the Strong dimension. Each score correlated $r > .57$ with the total score except the Strong dimension.

Table 2 shows the results of a varimax rotated principal components analysis. There were two clear components which accounted for 71% of the variance: Component 1 Eigenvalue 2.62; Variance 42%; Factor 2 Eigenvalue 1.67; Variance 30%. Based on the loadings we labelled the first component was labelled *Observant* – a tendency to stay focused, carefully attend to details, and follow the rules. We labelled the second component *Resilient* – a tendency to handle stress well, remain calm under pressure, and to generally control one's emotions. We created unit-weighted composite variables of these two components (now correlated $r = .11$) for subsequent analyses.

To understand how dark side personality traits are related to safety competencies, we next conducted a series of multiple regressions predicting these two composite variables (Observant and Resilient) and the overall safety score. In each analysis, demographics (age and sex) were entered as control variables and either the eleven dark-side traits (Table 3) or the three higher-order dark side dimensions (Table 4) as the predictors of interest.

<< Insert Tables 3 & 4 >>

Table 3 shows the simultaneous regression coefficients of all dark side personality traits onto the total safety score and the two composite scores. The demographic variables indicated that females more than males, and older rather than younger, participants were safer overall

though these two variables accounted for less than 2% of the variance. The dark side personality traits accounted for just under 40% of the variance. Considering the regression with the total safety score as the criterion variable it was clear that whilst nearly all results were significant eight dark side traits were related to safety behaviour. Five were negative indicating that those traits would be associated with all the consequences of poor safety rule following: Colourful, Mischievous, Excitable, Cautious and Imaginative, and three with safety rule following: Reserved, Bold and Diligent. This confirmed H1 to H4 and H6, but the opposite result occurred for H5.

These regressions were repeated for the two composite variables. The difference between the regression for Observant and the total safety score was more of magnitude than direction, except for Cautious which was positively associated with being Observant. The regression for Resilient showed broadly similar loadings except for gender (males scored higher) and Excitable and Cautious was most clearly negatively related to being Resilient.

Table 4 shows the regression of the higher-order dark side dimensions onto the three scores. The demographic variables indicated that females more than males, and older rather than younger, participants were safer though these two variables accounted for less than 2% of the variance. For the overall safety score the regression showed older people were more safety oriented. It also showed that people scoring higher on “Moving Against Others” and “Moving Away from Others” were less likely to be safety conscious while those who tended to “Moving Toward Others” were more safety conscious. The three higher order factors accounted for around a quarter of the variance. This confirms H7 and H8.

The results for the other two regressions showed some interesting differences. For the Observant composite, both “Moving Away” and “Moving Toward” were positively associated while “Moving Against” was strongly negatively associated with this criterion variable. For

the third regression onto the Resilient composite, the Moving Away factor was negatively associated, and the other two "Moving Against" and "Moving Away" were positively associated.

Discussion

Rather than replicate many findings in the area of personality and safety by examining bright side (or "normal") personality trait correlates of safety this study examined dark side (subclinical personality) correlates of safety behaviour. It appears to be one of the very few papers to do so.

Another unique aspect of this study lay in the identification of various, but related, safety competencies, based on six dimensions. Thus, rather than having a single, accident-prone trait, the Hogan measures suggests six related competencies that have an identifiable higher order structure. The results here suggest that these six competencies have a higher-order structure with Compliant, Vigilant, and Cautious people being highly *Observant* and Strong, Stable, and Trainable people being highly *Resilient.*

The results of this study confirmed many findings in the literature: males are less safety conscious than females; older people are more safety conscious than younger people. The results of the regression were in line with most, but not all hypotheses. It indicated that three of the five "Moving Away from Others" traits, particularly Excitable and Cautious, were negatively related to overall safety rules, while being Reserved was positive related and Leisurely essentially unrelated. One counter-intuitive finding occurred for the dark side trait Cautious. Cautious is defined as concerning risk aversion, fear of failure, and avoiding criticism. Typically, high scorers are reluctant to take risks regardless of the actual risk involved. As such, one might expect people scoring high on the dark side trait of Cautious to have higher scores on safety competencies, but that was not the case here. It is possible that

such individuals are overly cautious to the point of freezing up in critical situations and being unable to respond appropriately.

Among the Moving Against Others scales, three of the four (particularly Mischievous: which encompasses anti-social tendencies) were negatively associated with safety. It is not clear why Bold (narcissistic tendencies) would be positively associated with safety behaviours unless they reinforced the positive reputation of the individual.

The two "Moving Towards Others" scales showed opposite patterns. Diligent individuals (obsessive perfectionists) were more likely to be safety conscious, while surprisingly those who were Dutiful (rule abiding and lacking autonomy) were not though the effects were very small. Of importance here, these findings could not have been identified using a narrower measure of dark-side personality based on the Dark Triad.

When the regressions were repeated on the two higher-order safety composites the results were broadly similar. For the first composite labelled Observant, Reserved and Cautious people scored highest, and Mischievous and Colouful people lowest. This regression accounted for over half the variance in Observant competency scores. However, the regression onto the second composite Resilient showed that Bold and Diligent people scored highest and Excitable cautious people lowest.

Overall the results that were perhaps most surprising were the loadings of Cautious and Bold on the safety scores. In all analyses those who scored high on Bold (narcissism) scored highly on these safety measures.

Like all others this study has limitations. Whilst we had a very large representative sample completing well established a validated tests, we had the relatively common problem of common method variance, namely self-report data. This often exaggerates the relationship between the variables and could in part account for the very high amounts of variance

accounted for by the regression models. Ideally, we would have liked to have actual accident data (which is often very problematic and skewed) or judgments of safety competencies completed by a knowledgeable peer rather than the participant themselves.

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Table 1. Correlations among Six Safety Competencies and Overall Safety Score

Competency	1	2	3	4	5	6	7
Compliant							
Strong	-.11						
Poised	.59	.39					
Vigilant	.56	-.29	.19				
Cautious	.59	-.37	.20	.77			
Trainable	.20	.23	.30	.17	.16		
Overall Safety	.78	.24	.73	.66	.64	.57	

Note. N = 30,280. All correlations statistically significant at $p < .001$.

Table 2. Principal Component Analysis of Six Safety Competencies

Competency	M	SD	Comp 1	Comp 2
Compliant	48.87	28.69	**.74**	.45
Strong	51.60	29.48	-.52	**.71**
Poised	46.58	27.79	.23	**.84**
Vigilant	51.03	28.60	**.88**	.06
Cautious	49.72	28.89	**.91**	.02
Trainable	48.79	28.73	.13	**.61**

Table 3. Multiple Regression with three Safety Outcome Variables and HDS Predictors.

	Overall Safety $F_{(13, 26,545)}$ = 1,529 Adj. R = .65		Observant $F_{(13, 26,545)}$ = 2,199 Adj. R = .72		Resilient $F_{(13, 26,545)}$ = 1,599 Adj. R = .66	
	b	β	b	β	b	β
Age	.11	.06***	.61	.07***	.03	.00
Gender	1.09	.03***	9.84	.07***	-3.29	-.03***
Excitable	-.15	-.24***	-.13	-.05***	-.80	-.35***
Sceptical	-.04	-.07***	-.05	-.02***	-.20	-.09***
Cautious	-.10	-.15***	.18	.06***	-.75	-.32***
Reserved	.09	.15***	.42	.15***	.13	.06***
Leisurely	-.01	-.02***	.02	.01	-.09	-.04***
Bold	.09	.15***	.11	.04***	.41	.19***
Mischievous	-.16	-.26***	-.65	-.25***	-.30	-.14***
Colourful	-.20	-.33***	-1.03	-.39***	-.16	-.07***
Imaginative	-.07	-.12***	-.41	-.16***	-.01	-.01
Diligent	.07	.13***	.08	.03***	.36	.17***
Dutiful	-.03	-.05***	-.07	-.03***	-.11	-.05***

Note. N = 26,559. *** = p < .001. Gender coded Male = 1, Female = 2.

Table 4. Multiple Regression with Higher-Order Dark Side Predictors

	Overall Safety		Observant		Resilient	
	$F_{(5, 26,553)}$ = 1,830		$F_{(13, 26,545)}$ = 4,145		$F_{(13, 26,545)}$ = 2,015	
	Adj. R = .51		Adj. R = .66		Adj. R = .52	
	b	β	b	β	b	β
Age	.09	.05***	.55	.07***	-.01	.00
Gender	-.35	-.01	6.33	.04***	-8.43	-.07***
Moving Away	-.04	-.21***	.11	.14***	-.35	-.52***
Moving Against	-.09	-.44***	-.54	-.64***	.03	.04***
Moving Towards	.05	.13***	.10	.06***	.21	.15***

Note. N = 26,559. *** = $p < .001$. Gender coded Male = 1, Female = 2.