Heliyon

Received:
19 April 2017
Revised:
15 June 2017
Accepted:
16 June 2017

Cite as:
Michelle Ann Toppazzini, Karl Kilian Konrad Wiener. Making workplaces safer: The influence of organisational climate and individual differences on safety behaviour.
Heliyon 3 (2017) e00334.
doi: 10.1016/j.heliyon.2017.e00334

Making workplaces safer: The influence of organisational climate and individual differences on safety behaviour

Michelle Ann Toppazzini [a], **Karl Kilian Konrad Wiener** [b,*]

[a] *Wavelengths Allied Health, 260 Soldiers Point Road, Salamander Bay, NSW, 2317, Australia*

[b] *Charles Sturt University, Locked Bag 588, Wagga Wagga, NSW 2678, Australia*

* Corresponding author.

E-mail addresses: michelle@wavelengths.com.au (M.A. Toppazzini), kwiener@csu.edu.au (K.K.K. Wiener).

Abstract

Current work health and safety practices focus predominately on fostering a safety climate to promote safety behaviours and reduce workplace accidents. Despite the importance of safety climates in accident prevention, recent research has demonstrated that individual factors can also predict work safety behaviour. This study considered the importance of organisational climate together with individual characteristics including differences in personality, impulsiveness, and perceptions of safety within the workplace on safety behaviour. 203 participants consisting of 67 males and 136 females aged 18 to 71 years, completed an online questionnaire. Results revealed that safety behaviour was directly related to safety climate, and conscientiousness. In contrast, neuroticism, and impulsiveness were not significantly related to safety behaviour. The present study findings support previous findings in the literature regarding the importance of safety climate as well as the personality trait of conscientiousness in applying safety behaviours. However, the present study findings did not support previous research in relation to the personality trait of high neuroticism resulting in decreased safety behaviour, nor did not confirm an inverse relationship between high impulsivity and low safety behaviour as theoretical models would suggest. This new finding may warrant further research into the precursors for safety behaviour.

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Keywords: Psychology, Sociology, Industry

1. Introduction

Paramount to workplace safety is the principle of accident or incident prevention. Therefore, any factors that can be identified before an actual incident occurs are of great value. The majority of safety incidents are behavioural, in that they are not the result of environmental or system factors, yet dominant work health and safety practices focus on group level factors. Whilst this is important in establishing a safety culture within an organisation, such practices do not consider the individual factors that may contribute to safety behaviour. This paper examines safety behaviour at an individual level, an area of growing research interest. As organisations seek to refine their safety management systems, they are considering the many variables that contribute to the safety behaviour of the individuals within the group. Such understandings are inherently useful as they can create safer work places that will foster stronger communities.

Presently, work health and safety practices focus predominately on fostering a *safety climate*, in which employees and management work together to create a safe work environment (Zohar et al., 2014). The concept of *safety climate* first introduced by Zohar (1980) 36 years ago, remains central in creating and maintaining safe work environments, and has been shown to be a good predictor of safety behaviour and workplace accidents across industries and cultures (Beus et al., 2016; Christian et al., 2009; Clarke, 2006; Nahrgang et al., 2011).

Safety climate can be defined as the perceptions of the priority and value ascribed to safety within the workplace as reflected in organisational policies and procedures (Seibokaite and Endriulaitiene, 2012; Zohar and Luria, 2005). Perceptions of safety climate are influenced by explicit factors such as a) leadership statements and management actions regarding the importance of safety (Neal and Griffin, 2004), b) leadership responses to identified safety issues, c) the amount of safety training provided relevant to the individual's role, and d) how actively safety behaviours are promoted within the organisation (Clarke, 2010). Perceptions of safety climate are also influenced by implicit factors, such as the importance ascribed to safety over other competing factors like productivity, and work pace (Neal and Griffin, 2004). However, recent research has also emphasised the influence of individual factors such as personality, attitudes, and beliefs in predicting safe working behaviour and workplace accidents (Beus et al., 2015; Henning et al., 2009; Hogan and Foster, 2013).

Human error has been estimated to be the main factor in 80–90% of workplace accidents and incidents (Postlethwaite et al., 2009). Organisations seek to reduce the occurrence of workplace injuries driven by the associated costs, including lost wages, loss in productivity, property and equipment damage, and legal costs

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

(Postlethwaite et al., 2009). The study of human factors, which examines environmental, organisational and job factors, and human and individual characteristics that interrelate and influence work behaviours (Ganguly, 2011), is important in understanding human error in the context of organisational safety. Human factors assists organisations in their attempt to enhance human performance and reduce human error that can lead to workplace accidents.

Reason (1997) posits that two dominant approaches in dealing with human error have emerged: a) the person approach, and b) the system approach. The person approach focus on the unsafe acts – error and violations which are attributed to individual characteristics such as inattention, poor motivation, and recklessness (Reason, 1997). The system approach focuses on individual workplace conditions, and on implementing defences based on the understanding that error will always exist (Reason, 1997). The latter focus is more aligned with the concept of safety climate. Rather than regarding one approach over the other, current research appears to indicate that a dual approach will be more useful when it comes to understanding the various factors that contribute to safety behaviour, and that an integration of the two will better serve such understandings.

1.1. Safety climate and safety behaviour

Christian et al. (2009) developed a model of workplace safety that built upon Neal and Griffin's (2004) model which considers safety behaviour measured by safety compliance and safety participation behaviours, within the context of safety climate, safety knowledge, and safety motivation. Christian et al. (2009) included in their model a safety outcomes variable measured by accidents and injuries. This model proposes that the antecedents of safety performance and safety outcomes, comprise of both distal situation-related and distal person-related factors. Distal-situation related factors include safety climate and leadership, whereas distal-person-related factors consist of personality characteristics including conscientiousness, neuroticism, and propensity for risk taking, and job attitudes. In their model these distal factors impacted on proximal person-related factors of safety motivation and knowledge that effect safety performance and ultimately organisational safety outcomes (Christian et al., 2009).

Perceptions of safety climate have been demonstrated to be positively correlated with safety behaviours, and both perceptions of safety climate and safety behaviours, are negatively correlated with workplace accidents (Beus et al., 2010; Neal and Griffin, 2006). Griffin and Neal (2000) proposed that safety behaviour consists of two core dimensions: safety compliance and safety participation which Christian et al. (2009) use in their model of workplace safety. Safety compliance behaviours are vital in maintaining safety in the workplace, and include behaviours such as using the appropriate personal protective equipment, and following

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

standardised operating procedures (Griffin and Neal, 2000). Safety participation does not directly contribute to workplace safety in the manner that safety compliance does, but rather helps develop an environment that supports and fosters safety (Griffin and Neal, 2000). Safety participation behaviours include volunteering to be on safety committees, participating in safety campaigns, and promoting safe working practices amongst co-workers (Nahrgang et al., 2011; Neal and Griffin, 2006; Oz et al., 2013).

H1: *Positive perceptions of safety climate will be related to safety behaviour.*

1.2. Individual characteristics

Research evidence supports the influence of personality traits on work related safety behaviours (Chiaburu et al., 2011; Ucho and Gbande, 2012; Wallace and Chen, 2006), and applying the *five factor model of personality* model in operationalising personality traits namely; *Neuroticism*, *Extraversion*, *Openness to Experience*, *Agreeableness*, and *Conscientiousness*. Whilst all of the five-traits have been demonstrated to have an influence on varying aspects of safety engagement and accident involvement, conscientiousness and neuroticism appeared to contribute more consistently to safe working practices. High consciousness has been shown to predict safety related behaviours (Christian et al., 2009; Clarke and Robertson, 2005; Hogan and Foster, 2013; Wallace and Chen, 2006), and is explained by the characteristics of individuals high on this personality dimension who are typically categorised as being organised, methodical, plan orientated and more likely to comply with procedural processes (Chiaburu et al., 2011). Whereas those low on this trait tend to be more careless, easily distractible, less reliable, and less likely to comply with procedures (Neal and Griffin, 2004).

Of the other Big Five personality traits, individuals high on neuroticism dimension have previously been associated with workplace accidents, injuries (Clarke and Robertson, 2008), errors and rule violations (Seibokaite and Endriulaitiene, 2012) with the former two reflecting the 'compliance' dimension of Griffin and Neal's (2000) theory of safety behaviour. Accident and injury numbers are used as indicative measures of poor safety outcomes. The occurrence of accidents has been found to be related to safety behaviour (Beus et al., 2010), which is also influenced by other factors such as safety climate and individual attributes (Christian et al., 2009; Clarke, 2010; Fogarty and Shaw, 2010). However, accidents can occur even when an employee has complied with safety practices, and therefore accidents themselves are not an accurate measure of safety behaviour. From these findings the research implies that individuals measuring higher in the trait of conscientiousness show safer work behaviours, and that individuals measuring high in the trait of

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

neuroticism display less safe work behaviours. Whilst there is strong support in the research literature for a relationship between safety climate and safety behaviour measured by employee compliance and participation, there appears to be a void in regards to the influence of individual characteristics on safety behaviour when safety behaviour is actually measured rather than operationalised as reports of accidents and injuries. Based on present research evidence it is expected that conscientiousness will be positively related to safety behaviour and neuroticism will show an inverse relationship with safety behaviour. It is hypothesised that:

H2a: *Conscientiousness is directly related with safety behaviour.*

H2b: *Neuroticism is inversely related to safety behaviour.*

Impulsiveness has long been associated with risk taking behaviours and adverse outcomes (Cyders et al., 2009; Dahlen et al., 2005; Eysenck 1993; Stanford et al., 1996). Given that risk taking typically involves an individual not complying with established rules (whether formal or informal), it was anticipated that there would be literature supporting a relationship between impulsiveness and unsafe behaviour in the workplace.

Whilst a literature search did not yield studies directly linking impulsiveness to workplace safety, the relationship between impulsiveness and risk-taking has been empirically established (Auerbach and Gardiner, 2012), and risk-taking was negatively related to safety behaviour (Bosak et al., 2013; Qing-gui et al., 2012; Stolzer et al., 2008). Risk taking behaviour has also been associated with work accidents and injuries, safety incidients, and unsafe work behaviours (Hogan and Foster, 2013; Lind, 2008; Paul and Maiti, 2007; Westaby and Lowe, 2005). Impulsiveness has been associated with a number of risk taking behaviours, including criminal activity, drug use, drink driving, not wearing seatbelts (Stanford et al., 1996), impaired and risky driving behaviour, and reduced perception of traffic signs (Dahlen et al., 2005). Organisations develop systems and procedures specifically to manage and reduce risks within the workplace (Stolzer et al., 2008) and it is proposed that impulsive individuals are likely to be greater risk takers and prone to breaking rules. It is hypothesised that:

H3: *Individuals high in impulsive behaviour will show reduced safety behaviour.*

1.3. Do individual characteristics add to the prediction of safety behaviour beyond safety climate?

Researchers seek to understand individual differences that add to safety behaviour beyond safety climate. Any gains, even those that are minor, are valued especially in industries where there is a higher level of risk. Christian et al. (2009) include

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

individual characteristics as distal person-related factors that influence work safety behaviour. Based on this understanding, this study seeks to examine the individual factors that influence and add to safety behaviour within the workplace. This study will specifically seek to ascertain the contribution of conscientiousness, neuroticism, and impulsiveness, in predicting safety behaviour in addition to safety climate.

Safety climate, conscientiousness, and neuroticism, have all been found to be predictors of safety behaviour in the literature findings (Chen and Chen, 2014; Christian et al., 2009; Clarke, 2006; Clarke and Robertson, 2005; Fogarty and Shaw, 2010; Nahrgang et al., 2011; Neal and Griffin, 2004; Wallace and Chen, 2006; Zohar, 2010). Furthermore, impulsiveness has been empirically linked to risk taking behaviours (Dahlen et al., 2005; Stanford et al., 1996), and risk taking has been associated with unsafe work behaviours (Bosak et al., 2013; Qing-gui et al., 2012; Stolzer et al., 2008).

Previous research has assessed safety climate using measures of accidents to examine safety behaviour. This study will examine a) safety behaviour with self-reports of safety behaviour, not accidents, and b) whether individual differences add to safety climate in predicting safety behaviours in the workplace. The fourth study hypothesis is:

H4: *Accounting for the relationship between safety climate and safety behaviour, individual characteristics of personality and impulsiveness will add to the prediction of safety behaviour.*

2. Method

2.1. Participants

The 203 participants were made up of 67 males and 136 females, with ages ranging from 18 years to 71 years (Mage = 37.8 years). The education categories showed that 46.8% of participants had attained a university degree or higher, 26.6% held a trade certificate or diploma qualification, and 26.6% did not obtain qualifications beyond secondary education. The majority of participants were employed in various sectors including business (22.2%), education (21.2%), services (17.2%), health (15.8%), industry (7.4%), defence (2.5%), farming (1.5%), and others (12.3%). The amount of hours worked ranged from 1–10 (10.3%) to more than 50 hours (5.9%), with most participants indicating they worked full-time between 35–40 hours per week (36.0%).

2.2. Materials

Demographic information consisted of questions related to hours worked per week, gender, age, work environment, and education level.

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

2.2.1. Personality traits

The Australian Personality Inventory (API), developed by Murray et al. (2009) is a five-factor model of personality containing 50 items in which participants' rate how accurately each statement applies to themselves on a five point Likert scale. Participants are presented with statements such as "I am always prepared" and "I panic easily", and asked to rate how accurately each statement applies, with 1 indicating the statement was 'very inaccurate' and 5 indicating the statement is 'very accurate' (Murray et al., 2009). Two of the five sub-scales namely neuroticism and conscientiousness were applied in this research, as the Big Five personality dimensions of neuroticism and conscientiousness have been demonstrated to be correlated with workplace accidents and safety outcomes (Christian et al., 2009; Clarke and Robertson, 2008; Hogan and Foster, 2013; Postlethwaite et al., 2009).

2.2.2. Impulsivity ratings

Impulsiveness was measured with the Barratt Impulsiveness Scale (BIS-11), developed by Patton et al. (1995). The BIS-11 consists of 30 self-report items using a 4 point rating s*cale, with* 1 indicating 'Rarely/Never', 2 'Occasionally', 3 'Often', and 4 'Almost Always/Always' (Patton et al., 1995). The BIS-11 contains three sub scales: attentional impulsiveness (e.g. I don't "pay attention"), motor impulsiveness (e.g. I buy things on impulse), and non-planning impulsiveness (e.g. I plan tasks carefully) that together yield an overall total impulsiveness score ranging from 30 to 120, with higher scores indicating higher levels of impulsiveness (Miller et al., 2004). Stanford et al. (2009) recommend that a BIS-11 total score ranging from 52 to 71 should be considered within normal levels for impulsiveness.

2.2.3. Safety climate, compliance, and participation ratings

Perceptions of safety climate (e.g. "Management considers safety to be important"), safety compliance (e.g. "I use all the necessary safety equipment to do my job"), and safety participation (e.g. "I put in extra effort to improve the safety of the workplace"), was measured with 9 of the 12 items (3 subscales) from Neal and Griffin (2006). As per Neal and Griffin's (2006) study overall safety behaviour is measured by combining the subscale scores of safety compliance and safety participation, whereas safety climate is measured with the sole subscale. Items are ranked on a five point Likert scale with 1 indicating 'Strongly disagree', and, 5 'Strongly agree' (Neal and Griffin, 2006). Higher scores indicate either more positive perceptions of workplace safety climate, or higher rates of safety compliance and safety participation for the related domain (Neal and Griffin,

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

2006). Scores for safety compliance and safety participation were combined to yield an overall score for safety behaviour.

2.3. Procedure

The survey study used the Survey Monkey platform and promoted the study through personal email contacts, with the snowballing method through the social networking website Facebook, via the university's online fora, and through 'SONA' system. SONA is a web-based system accessible by first year on-campus and distance education students to participate in research as part of their course requirements. Ethics approval was received prior to the survey being made live online from Charles Sturt University School of Psychology Ethics Committee. This sample methodology was employed in an attempt to capture a broad range of individuals across the population from a variety of industry sectors, as opposed to previous research where samples generally consist of individuals employed within the same organisation or industry sector. The aim in surveying a more general sample was to try and disentangle any confounding variables that may possibly occur in homogenised samples.

The first page of the survey contained an information sheet which informed participants of the purpose of the study, and explained issues related to consent. Consent was obtained by selecting the 'next button' placed after the information statement "By clicking next, you are giving your consent to participate in this study".

3. Results

Data was analysed using the Statistical Package for Social Scientist (SPSS) V 22 software, and was checked for parametric assumptions that were acceptable. The bivariate correlations, means, and standard deviations, between the variables are reported in Table 1. Results showed a significant moderate positive correlation between safety behaviour and safety climate, indicating that individuals who perceived a high safety climate reported higher safety behaviours.

In regards to personality traits a significant, but small positive correlation between conscientiousness and safety behaviour was identified. This indicates that individuals measuring higher in conscientiousness are more likely to engage in safety behaviours. Contrary to the study hypothesis, the correlation between neuroticism and safety behaviour was not statistically significant. Likewise, the relationship between safety behaviour and impulsiveness was not significant. The total BIS-11 mean sample score 60.82 which is within normal levels of impulsiveness, suggesting a floor effect on this measure.

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Table 1. Summary of Bivariate Correlations, Means, and Standard Deviations for Scores on Safety Behaviour, Safety Climate, Conscientiousness, Neuroticism, and Impulsiveness.

Measure	*1*	*2*	*3*	*4*	*5*	*M*	*SD*	*α*
1. Safety Behaviour						11.72	2.42	.91
2. Safety Climate	.38*					12.00	2.81	.96
3.Conscientiousness	.22*	.19*				37.52	6.43	.84
4. Neuroticism	−0.02	−.10	−.32*			26.39	8.03	.87
5. Impulsiveness	−.10	−.11	−.59*	.31*	–	60.82	9.85	.84

Note. N = 203.
* Bivariate correlation is significant at the 0.01 level (1-tailed).

A hierarchical regression model (depicted in Table 2) was applied to assess the predictive power of each variable of interest on worksafety behaviour.

A three stage hierarchical multiple regression was conducted with safety behaviour as the dependent variable. Safety climate was entered at stage one of the regression and the personality trait variables (conscientiousness and neuroticism) were entered at stage two, and impulsiveness at stage three.

Table 2. Summary of Hierarchical Regression Analysis for Variables predicting Safety Behaviour.

Variable	*B*	*SEB*	*β*	R^2	ΔR^2
Step 1				.144	.144
Safety climate	.326	.056	.379*		
Constant	7.81	.692			
Step 2				.171	.027
Safety climate	.303	.057	.352*		
Conscientiousness	.066	.026	.176*		
Neuroticism	.022	.021	.073		
Constant	5.02	1.37			
Step 3				.172	.001
Safety climate	.303	.057	.352*		
Conscientiousness	.073	.031	.195*		
Neuroticism	.021	.021	.068		
Impulsiveness	.008	.020	.035		
Constant	4.28	2.21			

Note. N = 203.
* $p < .001$.

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

The hierarchical multiple regression revealed that at stage one, safety climate contributed significantly to the regression model, $F\ (1, 201) = 33.78$, $p < .001$) and accounted for 14.4% of the variation in Safety Behaviour. Introducing the personality variables of conscientiousness and neuroticism to the model resulted in a significant model $F\ (3, 199) = 13.70$, $p < .05$. However, in addition to safety climate only conscientiousness was a predictor for safety behaviour.

The inclusion of impulsiveness to the regression model did not predict safety behaviour F (4,198) = 10.28, $P < .001$.

In summary, the findings suggest that safety climate and the individual characteristic of conscientiousness contributed to the prediction of safety behaviour, whilst neuroticism and impulsiveness did not contribute to the model.

4. Discussion

The first hypothesis stated that positive perceptions of safety climate will be directly related to safety behaviour, was consistent with previous findings in the literature (Beus et al., 2010; Christian et al., 2009; Clarke, 2006; Nahrgang et al., 2011; Neal and Griffin, 2004; Neal and Griffin, 2006). This finding emphasises the importance of fostering a safety climate within the workplace, which can significantly impact on employee safety behaviour. By creating and promoting a safety climate within an organisation, employers are sending implicit and explicit messages to employees regarding their expectations in regards to safety behaviour (Neal and Griffin, 2004).

Fostering safety climate is, and still remains the predominate approach in work health and safety practice, largely due to its strong empirical support. Whilst safety climate is of great value in accounting for safety behaviour in the workplace, it is not a sole predictor of safety behaviour. Neal and Griffin (2004) emphasised that safety climate is one of the many antecedents in predicting safety behaviour, along with over variables such as individual characteristics.

4.1. Individual characteristics

The finding that conscientiousness is directly related with safety behaviour supports the findings from previous studies regarding the relationship between this personality trait and safety related behaviours (Clarke and Robertson, 2005; Hogan and Foster, 2013; Seibokaite and Endriulaitiene, 2012; Wallace and Chen, 2006). That is, individuals high in conscientiousness are more likely to comply with safety rules and practices (Clarke and Robertson, 2008). However, the strength of the relationship was weak, and this finding reflects the meta-analytic finds of Christian et al. (2009), who also identified that conscientiousness was weakly related to safety behaviour.

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Contrary to previous empirical findings, neuroticism was not significantly related to safety behaviour. This finding is inconsistent with the findings of Christian et al. (2009); Clarke and Roberston (2008); and Seibokaite and Endriulaitiene (2012). The inconsistent finding could be attributed to the way the authors operationalised safety behaviour - as reports of accidents, injuries, and incidents, rather than examining one's perception of safety climate, and actual safety behaviour (e.g. compliance with safety procedures). Actual accident statistics do not measure safety behaviour, but rather whether an accident occurred without considering the safety aspects. Accidents can occur even when an employee has complied with safety practices and procedures. Furthermore, some workplaces are inherently more at risk of workplace accidents and injuries due to environmental conditions in which they operate. Given these differences in operationalising safety behaviour may have accounted for the conflicting findings.

An alternate view is that neuroticism is only related to reports of accidents and injuries, and not the actual occurrence of accidents and injuries themselves. For example, a person higher in neuroticism may be more likely to report an accident, injury, or adverse safety event in which they were involved, than an individual measuring higher in conscientiousness. Conscientious individuals tend to be achievement orientated (Richardson and Abraham, 2009) and therefore may be reluctant to report safety incidents in which they were involved due to possible negative repercussions. Whereas individuals measuring higher in the trait of neuroticism tend to be predisposed to worry and anxiety (Servaas et al., 2014) and may therefore be more likely to report due to potential negative outcomes of not reporting (e.g. if they require medical attention, or time off to recover from injury). One can conclude from these findings that unsafe behaviour might result in accidents for both conscientious and anxious individuals, however the neurotic individual is more likely to report adverse events.

Based on theoretical understandings, and empirical support for the relationship between impulsiveness and risk-taking behaviours, it was hypothesised that individuals high in impulsive behaviour would exhibit reduced safety behaviour. However, considering that the total BIS-11 mean sample score showed a floor effect, that is fewer than 60 participants endorsed impulsiveness in the normal range suggests that this sample population was overall low on impulsiveness. This suggests that the inconsistent finding may be due to the absence of elevated impulsiveness in the sample.

4.2. The contribution of individual characteristics

This study sought to understand the individual factors and environmental factors that influence safety behaviour in the workplace. Although the environmental factor of safety climate was shown to be the strongest predictor of safety

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

behaviour, it is still meaningful to consider the influence of the personality trait of conscientiousness on work safety behaviour. However, beyond this factor, neuroticism and impulsivity did not contribute to safety compliance and participation. Considering that safety climate and personality traits only predicted 17.1% of the variance in safety behaviour, suggests that there are other contributing factors that warrant further examination including the safety management systems that organisations have in place, and possibly other individual characteristics related to compliance and participation.

4.3. Limitations and future directions

Generalisability of study findings may be limited as the majority of participants in this study were highly educated and predominately employed in business, education, and service sectors. Future research should include target samples from a broader demographic. Another limitation associated with this study is the use of self report scales. Future studies could include different measures of safety behaviour, such as supervisor ratings of safety behaviour, to overcome potential bias.

In order to further clarify the impact of impulsiveness on safety climate, future studies should consider this variable in replicating studies. In this study, impulsiveness was not sufficiently elevated to predict safety climate. Impulsiveness was considered an important variable especially since previous studies demonstrated that impulsiveness was associated with risk taking behaviour, which has been empirically linked to workplace accidents.

4.4. Conclusion

This study supports the importance of safety climate within an organisation, and to encourage safety behaviours amongst employees. Conscientiousness was shown to have a predictive influence on safety behaviour, although this correlation was found to be weak. Contrary to this study expectations, impulsiveness and neuroticism did not predict safety behaviour. Overall, the study suggests that there remains a void in our understanding of the impact of personality measures and potentially other factors that may predict safety behaviour. A greater understanding of factors predicting safety behaviour would assist organisations in creating and maintaining safer workplaces.

Declarations

Author contribution statement

Michelle A. Toppazzini: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

http://dx.doi.org/10.1016/j.heliyon.2017.e00334
2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Karl Wiener: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Competing interest statement

The authors declare no conflict of interest.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Additional Information

No additional information is available for this paper.

References

Auerbach, R.P., Gardiner, C.K., 2012. Moving beyond the trait conceptualization of self- esteem: the prospective effect of impulsiveness, coping, and risky behavior engagement. Behav. Res. Ther. 50 (10), 596–603.

Beus, J.M., Dhanani, L.Y., McCord, M.A., 2015. A meta-analysis of personality and workplace safety: addressing unanswered questions. J. Appl. Psychol. 100 (2), 481–498.

Beus, J.M., McCord, M.A., Zohar, D., 2016. Workplace safety: a review and research synthesis. Organ. Psychol. Rev. 6 (4), 352–381.

Beus, J.M., Payne, S.C., Bergman, M.E., Arthur Jnr, W., 2010. Safety climate and injuries: an examination of theoretical and empirical relationships. J. Appl. Psychol. 95 (4), 713–727.

Bosak, J., Coetsee, W.J., Cullinane, S.J., 2013. Safety climate dimensions as predictors for risk behavior. Accid. Anal. Prev. 55, 256–264.

Chen, C., Chen, S., 2014. Measuring the effects of safety management system practices, morality leadership and self-efficacy on pilots' safety behaviors: safety motivation as a mediator. Saf. Sci. 62, 376–385.

Chiaburu, D.S., Oh, I., Berry, C.M., Li, N., Gardner, R.G., 2011. The five-factor model of personality traits and organizational citizenship behaviors: a meta-analysis. J. Appl. Psychol. 96 (6), 1140–1166.

Christian, M.S., Bradley, J.C., Wallace, J.C., Burke, M.J., 2009. Workplace safety: a meta- analysis of the roles of person and situation factors. J. Appl. Psychol. 94, 1103–1127.

 http://dx.doi.org/10.1016/j.heliyon.2017.e00334

2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Clarke, S., 2006. The relationship between safety climate and safety performance: a meta-analytic review. J. Occup. Health Psychol. 11, 315–327.

Clarke, S., 2010. An integrative model of safety climate: linking psychological climate and work attitudes to individual safety outcomes using meta-analysis. J. Occup. Organ. Psychol. 83, 553–578.

Clarke, S., Robertson, I., 2005. A meta-analytic review of the Big Five personality factors and accident involvement in occupational and non-occupational settings. J. Occup. Organ. Psychol. 78, 355–376.

Clarke, S., Robertson, I., 2008. An examination of the role of personality in work accidents using meta-analysis. Appl. Psychol.: Int. Rev. 57 (1), 94–108.

Cyders, M.A., Flory, K., Rainer, S., Smith, G.T., 2009. The role of personality dispostions to risky behavior in predicting first-year college drinking. Addiction 104, 193–202.

Dahlen, E.R., Martin, R.C., Ragan, K., Kuhlman, M.M., 2005. Driving anger, sensation seeking, impulsiveness, and boredom proneness in the prediction of unsafe driving. Accid. Anal. Prev. 37, 341–348.

Eysenck, S.G.B., 1993. The I7: development of a measure of impulsivity and its relationship to the superfactors of personality. The Impulsive Client: Theory, Research and Treatment, , pp. 134–152.

Fogarty, G.J., Shaw, A., 2010. Safety climate and the theory of planned behavior: towards the prediction of unsafe behavior. Accid. Anal. Prev. 42, 1455–1459.

Ganguly, S., 2011. Human error vs. workplace management in modern organizations. Int. J. Res. Manag. Technol. 1 (1), 13–17.

Griffin, M.A., Neal, A., 2000. Perceptions of safety at work: a framework for linking safety climate to safety performance, knowledge, and motivation. J. Occup. Health Psychol. 5 (3), 347–358.

Henning, J.B., Stufft, C.J., Payne, S.C., Bergman, M.E., Mannan, M.S., Keren, N., 2009. The influence of individual differences on organizational safety attitudes. Saf. Sci. 47, 337–345.

Hogan, J., Foster, J., 2013. Multifaceted personality predictors of workplace safety performance: more than conscientiousness. Hum. Perform. 26 (1), 20–43.

Lind, S., 2008. Types and sources of fatal and severe non-fatal accidents in industrial maintenance. Int. J. Ind. Ergon. 38, 927–933.

Miller, E., Joseph, S., Tudway, J., 2004. Assessing the component structure of four self-report measures of impulsivity. Pers. Individ. Differ. 37 (2), 349–358.

 http://dx.doi.org/10.1016/j.heliyon.2017.e00334

2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Murray, G., Judd, F., Jackson, H., Fraser, C., Komiti, A., Pattison, P., Robins, G., 2009. Personality for free: psychometric properties of a public domain Australian measure of the five-factor model. Aust. J. Psychol. 61 (3), 167–174.

Nahrgang, J.D., Morgeson, F.P., Hofmann, D.A., 2011. Safety at work: a meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. J. Appl. Psychol. 96 (1), 71–94.

Neal, A., Griffin, M.A., 2004. Safety climate and safety at work. In: Frone, M.R., Barling, J. (Eds.), The Psychology of Workplace Safety. American Psychological Association, Washington, DC, pp. 15–34.

Neal, A., Griffin, M.A., 2006. A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels. J. Appl. Psychol. 91 (4), 946–953.

Oz, B., Ozkan, T., Lajunen, T., 2013. An investigation of professional drivers: organizational safety climate, driver behaviours and performance. Transp. Res. 16, 81–91.

Patton, J.H., Stanford, M.S., Barratt, E.S., 1995. Factor structure of the Barratt Impulsiveness Scale. J. Clin. Psychol. 51 (6), 768–774.

Paul, P.S., Maiti, J., 2007. The role of behavioral factors on safety management in underground mines. Saf. Sci. 45, 449–471.

Postlethwaite, B., Robbins, S., Rickerson, J., McKinniss, T., 2009. The moderation of conscientiousness by cognitive ability when predicting workplace safety behavior. Pers. Individ. Differ. 47, 711–716.

Qing-gui, C., Kai, L., Ye-jiao, L., Qi-hua, S., Jian, Z., 2012. Risk management and workers' safety behavior control in coal mine. Saf. Sci. 50 (4), 909–913.

Reason, J., 1997. Managing the Risks of Organizational Accidents. Ashgate, Aldershot.

Richardson, M., Abraham, C., 2009. Conscientiousness and achievement motivation predict performance. Eur. J. Pers. 23 (7), 589–605.

Seibokaite, L., Endriulaitiene, A., 2012. The role of personality traits, work motivation and organizational safety climate in risky occupational performance of professional drivers. Balt. J. Manag. 7 (1), 103–118.

Servaas, M.N., Riese, H., Ormel, J., Aleman, A., 2014. The neural correlates of worry in association with individual differences in neuroticism. Hum. Brain Map. 35, 4303–4315.

 http://dx.doi.org/10.1016/j.heliyon.2017.e00334

2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Stanford, M.S., Greve, K.W., Boudreaux, J.K., Mathias, C.W., Brumbelow, J.L., 1996. Impulsiveness and risk-taking behavior: comparison of high-school and college students using the Barratt Impulsiveness Scale. Pers. Individ. Differ. 21 (6), 1073–1075.

Stanford, M.S., Mathias, C.W., Dougherty, D.M., Lake, S.L., Anderson, N.E., Patton, J.H., 2009. Fifty years of the barratt impulsiveness scale: an update and review. Pers. Individ. Diff. 47, 385–395. doi:http://dx.doi.org/10.1016/j.paid.2009.04.008.

Stolzer, A.J., Halford, C.D., Goglia, J.J., 2008. Safety Management Systems in Aviation. Ashgate Publishing Limited, Aldershot, United Kingdom.

Ucho, A., Gbande, A., 2012. Personality and gender differences in compliance with safety behaviour among factory workers of Dangote Cement Company, Gboko. Ife PsychologIA 20 (2), 134–141.

Wallace, C., Chen, G., 2006. A multilevel integration of personality, climate, self-regulation, and performanc. Pers. Psychol. 59, 529–557.

Westaby, J.D., Lowe, J.K., 2005. Risk taking orientation and injury among youth workers: examining the social influence of supervisors, coworkers, and parents. J. Appl. Psychol. 90 (5), 1027–1035.

Zohar, D., 1980. Safety climate in industrial 0rganizations: theoretical and applied implications. J. Appl. Psychol. 65 (1), 96–102.

Zohar, D., 2010. Thirty years of safety climate research: reflections and future directions. Accid. Anal. Prev. 42, 1517–1522.

Zohar, D., Huang, Y.H., Lee, J., Robertson, M.M., 2014. A mediation model linking dispatcher leadership and work ownership with safety climate as predictors of truck driver safety performance. Accid. Anal. Prev. 62, 17–25.

Zohar, D., Luria, G., 2005. A multilevel model of safety climate: cross-level relationships between organization and group-level climates. J. Appl. Psychol. 90 (4), 616–628.

 http://dx.doi.org/10.1016/j.heliyon.2017.e00334

2405-8440/© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).