

Counterproductive Work Behaviour in a Simulated Production Context: An Exploratory Study with Personality Traits As Predictors of Safety-Related Rule Violations

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Abstract

Counterproductive Workplace Behaviour (CWB) is investigated in Organisational Psychology as well as in the area of Human Factors. So far, each of these disciplines has mostly disregarded findings by the other. The present studies integrate findings gained from the two disciplines to investigate the qualities of personality traits that predict safety-related rule violations in a production context. A pilot study was conducted to test a set of personality traits in terms of their predictive qualities regarding the intention to violate a rule. Three traits (integrity subscale: cautiousness, self-interest, injustice sensitivity) emerged as predictors and were applied in a business simulation of a production environment (main study). Cautiousness turned out to be significantly correlated with safety-related rule violations in the production context. Hence, cautiousness should be measured in personnel selection in order to enhance safety and reduce the costs of CWB in organisations.

Keywords: Rule violation; Personnel selection; Counterproductive behaviour; Personality traits; Integrity; Cautiousness; Self-interest; Injustice sensitivity

The relationship between Counterproductive Workplace Behaviour (CWB) and Human Factors research on safety-related rule violations

Enhancing the productivity and wellbeing of people in organisations is the major goal of work and organisational psychologists. Traditionally, organisational psychologists have focused on the investigation of beneficial behaviour, such as motivation or job satisfaction, while less attention has been paid to negative, counterproductive behaviour patterns [1]. According to Sacket [2], CWB is defined as intentional behaviour on the part of an organisational member, which is contrary to the interests of the organisation. Examples of CWB include theft, misuse of information or unsafe behaviour [3]. There are many terms which describe behaviour that is similar to or the same as CWB. In line with some authors who suggest using CWB as generic term [3], in the following, CWB is used as generic term for all concepts which describe deviant behaviour in the work context.

The fact that CWB is assumed to cost organisations billions of dollars every year [4,5] demonstrates that CWB is not an unlikely practice in many organisations. In the past years, CWB has become an important topic in the area of Organisational Psychology as well as in Human Factors research.

The human factors perspective

Human Factors research is concerned with the investigation of the human-system interaction and its effects on performance, user satisfaction and safety [6]. In the area of Human Factors, CWB is mainly considered under the heading of safety-related rule violations and their impact on safety. The violation of safety-related rules is defined as deliberate departures from rules that describe the safe or approved methods of performing a particular task or job [7].

Reason [8] further differentiates between malevolent violations, which are undertaken to damage the system, and non-malevolent violations, which are not committed to harm an organisation.

Malevolent violations occur due to different motivations: Some are committed to compensate for deficiencies in the workplace [8], while others are due to the general human tendency to choose the most comfortable, less effortful behaviour [9]. According to Reason [8], some violations are committed to demonstrate skills in handling difficult risky situations or arouse a thrilling experience.

The organisational psychology perspective

Like rule violations, CWB is affected by different factors. Possible variables that might influence CWB include the safety climate in an organisation [10], and a lack of vocational fit [11]. CWB in general has been measured by several instruments which use peer rating as well as self-rating. Since self-reports were shown to be more valid than external assessments, the self-rating method of measurement is highly recommended [12]. In the area of Organisational Psychology, CWB is investigated under different headings and terms. CWB includes a variety of different behaviour patterns, which are described with different terms and at different levels of abstraction. The following list is not exhaustive; on the contrary, only the terms which are relevant in the context of the investigation at hand are described and defined.

There are terms that are used more or less synonymously with CWB, like employee deviance [13], and terms that describe behaviour which can be categorized as CWB if it occurs in the organisational context but which are not restricted to this area, like antisocial behaviour [14], lying behaviour [15], or imprudent and criminal behaviour [16,17].

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Received July 23, 2014; **Accepted** September 08, 2014; **Published** September 15, 2014

Citation: Heyde AVD, Miebach J, Kluge A (2014) Counterproductive Work Behaviour in a Simulated Production Context: An Exploratory Study with Personality Traits As Predictors of Safety-Related Rule Violations. J Ergonomics 4: 130. doi:10.4172/2165-7556.1000130

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Employee deviance refers to voluntary behaviour that violates significant organizational norms and in doing so threatens the well-being of an organization, its members, or both [13]. Examples of such behaviour include theft, disciplinary problems, substance abuse, property damage or organizational rule-breaking [18]. All of these examples refer to rule-violating behaviour; however, the latter example plays an important role in the context of safety-related rule violations in organisations. Antisocial behaviour can be defined as any behaviour that impairs or aims to impair an organization or its members [14]. According to the authors, examples of antisocial behaviour in organizations are fraud, interpersonal violence, lying or violations of confidentiality.

Lying behaviour can be understood as an assertion, the content of which the speaker believes to be false, which is made with the intention to deceive the hearer with regard to that content [15]. As such, lying behaviour involves the act of knowingly giving out wrong information with the intention of misleading another person; behaviour that can harm an organization or even endanger work safety.

Imprudent behaviours can be conceived of as irresponsible acts such as smoking, alcohol consumption and gambling [16]. Similar to criminal behaviours, imprudent behaviours also require little planning, provide immediate gratification, and offer a great deal of excitement [19]. According to Arneklev et al. [17], the difference between the two types of behaviour is that imprudent behaviour is not illegal while criminal behaviour always is.

Integrating the organisational psychology and human factors perspective

The wide range of terms makes it hard to integrate and compare empirical findings. Most researchers have a specialised understanding and have developed their own theories regarding their conception of CWB; hence, the research results pertaining to similar constructs are often not considered [5]. In particular, the research in the different areas of Organisational Psychology and Human Factors have mostly disregarded findings and developments in the respective other area.

When considering these terms and definitions, the link between CWB and safety-related rule violations becomes apparent. CWB involves the violation of certain rules or norms, but rule violations are often, but not necessarily, CWB. Rule violations are associated with the risk of undesired outcomes, but most violations do not result in harm for the organisation [20,21]. If the rule violation is committed in order to handle a new situation, or to achieve other, more important, organisational goals, the violation can even be advantageous for the organisation [21,22]. Taken together, the constructs of CWB and rule violations seem to be closely connected. The connection between these constructs suggests that there are similar processes which determine these behaviours.

Preliminary findings regarding safety-related rule violations

The present investigation assumes a Human Factors-oriented perspective and therefore focuses on the violation of safety-related rules. As such, the Macro ergonomic Framework of Rule-Violations by Alper and Karsh [20] was used as a starting point for the investigations. Alper and Karsh [20] described different levels of factors which influence the decision to violate a safety-related rule. They differentiate between individual factors, such as experience, knowledge, or age; factors which are associated with the work system, such as the task complexity, time demands or department goals; organisational factors, such as organisational policy or social norms; and finally, external,

environmental factors, such as the legislation, or influences of the industry.

Our research concentrated on the investigation of factors which refer to the work system level or the organisational level. Nevertheless, some individual factors, like sex, age, conscientiousness or risky decision-making were measured as control variables, because there are already some findings showing that these factors are valid predictors of rule violations [22,23]. Surprisingly, none of the measured predictors, like conscientiousness or risky decision-making, proved to be significant predictors of the violation of safety-related rules in our investigations. Therefore, the present study aims to identify personality traits that potentially predict rule-violating behaviour which have not yet been investigated in this context.

While the investigation of these correlations is comparatively less common in the area of Human Factors research, in the area of Organisational Psychology and personnel selection, the prediction of CWB on the basis of certain variables, like integrity or certain other personality traits, is quite common [18,24-26]. The empirical findings concerning the correlation between CWB and personality traits should be used to gain new ideas for personality traits that might predict safety-related rule violations in organisations.

Personality traits for predicting safety-related rule violations in the production context

The review of the literature regarding the association between personality traits and various CWB behaviour patterns revealed eight concepts to be promising for the prediction of rule-violating behaviour. Self-control describes the tendency to avoid acts whose negative long-term consequences outweigh current advantages [27]. The general theory of crime proposes that engagement in criminal behaviour is caused by low self-control [28]. These findings are supported by research demonstrating that various criminal and imprudent behaviours can be attributed to low self-control [29]. A more recent investigation in a student sample even found that self-control is associated with the violation of rules [30]. Therefore, self-control was included as one possible predictor.

Integrity is understood as an individual's conformity regarding values, norms and actions [31]. Marcus developed a practice-oriented method of integrity measurement to predict counterproductive behaviour in organisations. Integrity was included in this study because it is a well-established construct for predicting counterproductive work behaviour [32]. Five sub-constructs of integrity [31] were assessed in the current study:

1. Low distribution assesses the strength with which the violation of norms and rules is distributed in daily work settings.
2. Non-rationalization describes the tendency to search for causes that justify unreasonable behaviour.
3. People with high levels of reliability are supposed to work in a structured manner, to keep their word and to control their impulses.
4. Cautiousness describes a person's preference for safe and predictable actions as opposed to risky and exciting situations.
5. Conflict avoidance refers to a person's tendency to avoid conflicts and to pursue a peaceful way of problem solving.

The belief in a just world is a concept that was originally introduced by Lerner [33], who defined it as the belief that we are living in a world

where individuals always get what they deserve. Hafer [34] found that a strong belief in a just world was associated with a decreased use of unjust means to achieve long-term goals. The violation of rules can, to some extent, be regarded as use of unjust means; hence, it is assumed that rule-violating behaviour can be associated with a low belief in a just world.

The sensitivity towards injustice is, according to Schmitt, Maes and Schmal [35], a construct which needs to be assessed from three perspectives: the victim perspective (others are advantaged while oneself is disadvantaged), the observer perspective (observing someone else being treated unfairly from a neutral position), and the perpetrator perspective [35]. The latter perspective is mostly interesting in terms of an individual's tendency to feel guilty about unjustified benefits [35]. Violations may be conducted to acquire (unjustified) benefits; hence, this perspective is also included in the present investigation. Research investigating the effects of this trait suggests that sensitivity towards injustice from the perpetrator's perspective is positively related to prosocial behaviour and negatively related to antisocial behaviour [36].

Self-interest can be described as an action that is "undertaken for the sole purpose of achieving a personal benefit or benefits", such as tangible (e.g. monetary) or intangible (e.g. group status) benefits [37]. Self-interest was included in the current investigation because it was found to influence lying behaviour [38].

Self-responsibility is focused on decision-making processes concerning planning and action regarding an individual's behaviour. An individual acts self-responsibly if important objectives and the achievement of objectives are thoroughly thought through before action is taken [39]. This personality trait was chosen because prior research found that the amount of performed safety observations can be associated with feelings of personal or self-responsibility [40].

Regulatory focus at work refers to the regulatory focus theory [41] which differentiates between promotion-oriented individuals, who aim to achieve desirable outcomes, and prevention-oriented individuals, who aim to avoid undesirable outcomes. Depending on the type of regulatory focus (promotion vs. prevention), individuals tend to apply different approaches which lead to the desired outcomes. The regulatory focus also leads to the occurrence of different error types. Higgins et al. [42] found that Individuals who are promotion-oriented were less likely to make an "error of omission". Furthermore, an "error of commission" was less likely for individuals with a prevention orientation. Wallace et al. [43] applied the regulatory focus theory to work settings and found this theory to be a valid and reliable measure for predicting work outcomes such as productivity or safety performance. More specifically, Wallace et al. [43] found that a promotion focus was positively related to productivity performance but negatively related to safety performance, suggesting that individuals with a promotion focus tend to work quickly rather than accurately and safely. Conversely, individuals with a prevention focus showed a positive relationship with safety performance [43]. It can be assumed that the regulatory focus is also associated with rule violations because the compliance with rules is an integral part of safety performance.

To investigate whether these personality traits are suitable for the prediction of safety-related rule violations in the production context (as a subtype of CWB), two studies were conducted. In the pilot study, merely the intention to violate a rule was investigated, whereas in the main study, concrete behaviour was looked at.

Pilot Study

A web-based pilot study was conducted in order to preselect the personality traits which show the most promise regarding the prediction of safety-related rule violations in the production context (main study). The underlying assumption is that the personality traits which significantly predict rule-violating behaviour in daily life scenarios are also applicable for the prediction of safety-related rule violations in the production context. The pilot study included eight personality traits and their relations to rule-violating behaviour in daily life settings. Personality traits were measured using existing scales. The intention to violate rules in daily life settings was measured applying a self-constructed ten-item instrument, the purpose of which was to mirror the underlying principles of the business simulation production scenario of goal conflicts (used in the main study and which takes 5 hours to complete) in ten small-scaled scenarios.

Method

Overall, 91 participants were recruited (65 female), most of whom (86.8%) were students while the rest were employees or freelancers. The participants were aged between 18 and 50 years ($M = 24.43$; $SD = 6.92$). The study was a questionnaire-based online study which took about 45 minutes to complete. Students were compensated with course credits; the remaining participants did not receive any compensation. The online study was conducted between September and November 2012. It was approved by the local Ethics Committee. Subjects were informed about the purposes of the study and told that they could discontinue at any time (in terms of informed consent). The participants were recruited on the campus of the [name deleted to maintain the integrity of the review process] through flyers and posters, and posts in online forums as well as in online social communities (German student forums such as uni-protokolle.de and forums and social communities of students from different universities).

Predictor variables: As outlined in the theoretical background, seven personality traits were selected to be tested as predictors of rule-violating behaviour: self-control, integrity, belief in a just world, sensitivity towards injustice, self-interest, self-responsibility and regulatory focus at work. Apart from the constructs self-control and regulatory focus at work, all scales used in the study were designed in German. Exemplary items were translated for the purpose of this paper only.

The operationalization of the predictor variables including the scale description, authors and exemplary items are displayed in (Table 1). Most of the applied scales were shortened; items that fit well into the study's context were selected (an overview of items used can be found in the Appendix). All α -values provided in (Table 1) refer to the reliability measures of the present pilot study.

Criterion: Rule-violating behaviour in daily life situations: Ten items measuring the tendency for rule violations in daily life situations (Table 2) were developed by the authors (for the German Items, see Appendix I). The rule violation instrument was developed as a short and efficient way to measure rule violations in the pilot study. Since the business simulation used in the main study is very time-consuming (taking 5 hours per person), the rule violation instrument was developed to enable a comparatively quick pre test of a large number of personality traits. The purpose was not to develop and validate the rule violation instrument as a new measurement method but rather to use it as a substitute for the comprehensive simulation. This enabled the pilot study to be conducted online with the aim of selecting the

Personality trait	Authors	Scale description	Exemplary items	All items
Self-control	Seipel (1999) (derived from Grasmick et al., 1993)	15 out of 21 items ($\alpha = .67$); 5-point Likert scale (disagree/agree)	"I never allow myself to lose control."	Appendix A
Integrity	Marcus (2006) – Inventory of Work-Related Attitudes and Self-Assessment	5 (35 items) out of 9 (115 items) subscales <ul style="list-style-type: none"> • Low distribution ($\alpha = .67$) • Non-Rationalization ($\alpha = .54$) • Reliability ($\alpha = .64$) • Cautiousness ($\alpha = .76$) • Conflict avoidance ($\alpha = .77$) 5-point Likert scale (disagree/agree)	<ul style="list-style-type: none"> • Low distribution ("Everyone cheats on their tax returns") • Non-Rationalization ("To be successful in one's professional life, one mustn't be too particular about rules and guidelines") • Reliability ("I work on tasks quickly rather than thoroughly") • Cautiousness ("I am sensible rather than adventurous") • Conflict avoidance ("I try to avoid conflict if possible") 	Appendix B
Belief in a just world	Schmitt et al. (1997)	Subscale "ultimate justice"; 6 items ($\alpha = .89$); 5-point Likert scale (disagree/agree)	"Anyone who does wrong will be called to account for it one day."	Appendix C
Sensitivity towards injustice	Schmitt et al. (1997)	Subscale "perpetrator perspective"; 9 items ($\alpha = .90$); 5-point Likert scale (disagree/agree)	"It bothers me if I get something that someone else deserves"	Appendix D
Self-interest	Mohiyeddini & Montada (2004)	8 items ($\alpha = .80$); 6-point Likert scale (disagree/agree)	"I think it is more important to follow my own interests than the interests of others"	Appendix E
Self-responsibility*	Bierhoff et al. (2005)	6 out of 20 items ($\alpha = .39$); 6-point Likert scale (disagree/agree)	"I think everyone can contribute to improving their daily life."	Appendix F
Regulatory focus at work	Solga (in prep.) (derived from Wallace et al., 2009)	6 items (1,3,5,7,9,11) subscale prev. focus ($\alpha = .87$); 5 items (2,4,6,8,10) subscale prom. focus ($\alpha = .70$); 5-point Likert scale (never/always)	"I concentrate on completing work tasks correctly" (prev. Focus)	Appendix G

* Scale was excluded from analysis due to poor reliability levels

Table 1: Operationalisation of the predictor variables.

best predictors of rule-violating behaviour from a number of already validated instruments.

The items of the rule violation instrument explore an individual's intention to violate a rule, guideline or social norm in daily life settings. The instrument consists of ten items in which dilemma situations are described. The dilemma situations address different areas of daily life concerns that are assumed to be commonly experienced by individuals across Europe. As such, the dilemma situations include heterogeneous behaviour concerning sports activities, public and road transport, (illegal) internet activities and general social behaviour. Each situation comprises self-interested goals which are in conflict with different types of rules (e.g. social norm or law) in order to correspond to the behaviour investigated in the main study, as explained below. The rule violation instrument was developed to measure a person's tendency to violate or comply with rules when s/he is exposed to conflicting goals which either suggest complying with or violating a rule or social norm. Since these goal conflicts appear in different contexts, the items represent the various goal conflicts in various social situations. Nevertheless, in order to mirror the simulation context which is used in the main study, the items of the rule violation instrument are congruent regarding the underlying conflict between the individual goal and the rule or norm.

The content validity of the rule violation instrument was designed to be high, since the propensity to commit rule violations in situations with conflicting goals is measured across different situational contexts and with reference to different rules and norms. Furthermore, the items were rated by a group of ten experts with respect to their closeness to reality and the extent of the dilemma which is experienced regarding each item. Only the items with a high interrater agreement in the expert rating were included in the rule violation instrument. Since the rule violation instrument was designed as a method to measure the criterion of rule violations more efficiently in a pretest, and was not conceived as a new instrument, neither the convergent nor the divergent validity

was determined in the present investigation.

For each situation, the individual has to rate the degree to which s/he would violate the rule on a four-point Likert scale (disagree/agree). Through the use of a four-point scale, the participants are forced to indicate at least a tendency for one decision option (compliance/violation). The full list of items including means, standard deviations, item difficulties and discriminatory powers is presented below (Table 2).

The item difficulties are satisfactory; they are in the middle range and vary between 0.43 (Item 1) and 0.78 (Item 4). The discriminatory power of the items is not satisfactory; most items vary between .23 and .37. The items with a lower discriminatory power than 0.23 (items 1, 2 and 10) were excluded from the score calculation (excluded items are marked in a lighter font in Table 2). As indicator for the reliability consistency of the rule violation instrument, we suggest to consider the discriminatory power values of the items (Table 2).

As the rule violation instrument covers a heterogeneous construct, the calculation of Cronbach's Alpha as an indicator of reliability was not assumed to be applicable. The calculation of retest reliability seems to be more appropriate, but requires two measurement times. Due to the fact that the rule violation instrument was designed not as a new measurement method but merely as a time- and cost-efficient alternative method (to the business simulation) for measuring the criterion in the pretest, only the discriminatory power values of the items (Table 2) are described.

Results

Pearson correlations were calculated to analyse the relationships between the items of the rule violation instrument and the personality traits. The means, standard deviations and correlations are displayed in Table 3. Significant medium-sized negative correlations were found between the rule violation instrument and the scales assessing

	Item	M	SD	p _m	r _{it}
1	I would rather risk being caught speeding than be late for an important appointment.	2.23	.97	.56	-.17
2	Although I have a blood alcohol level of 0.8 per cent (blatantly above the legal limit), I give my injured friend a lift to the hospital.	2.14	1.03	.54	.12
3	Although an opposing player lies injured on the ground due to my foul, I continue the match to make the final score for my team.	2.12	.97	.53	.33
4	I would cross the street when the lights are red in order to catch the bus, even though a family with small children is standing next to me.	3.13	.11	.78	.23
5	I would rather risk missing the last train than get on it without a valid ticket.	2.79	.11	.70	.23
6	I would rather risk failing an important exam than cheat using illegal means.	2.26	1.1	.56	.25
7	Although I notice that I've damaged another car while backing out of a parking space, I drive on (hit and run) so that my insurance doesn't go up.	1.98	1.01	.49	.37
8	Although I suspect the Smart phone (list price 600€) being offered to me by an acquaintance for 200€ is stolen, I buy it	2.23	1.13	.56	.37
9	Since my favourite film is out of stock in the shops, I download it illegally off the internet	2.74	1.22	.69	.37
10	Although I do not feel well, I offer my bus/train seat to a frail person.	1.72	.82	.43	.12

Notes p_m = item difficulty; r_{it} = discriminatory power; items written in a lighter font are not included in the score calculation

Table 2: Means, Standard Deviations, item difficulties and discriminatory powers for items of the rule violation instrument, N=90.

Item	Self-control (Range 1-5)	Injustice sensitivity (Range 1-5)	Self-interest (Range 1-6)	Regulatory focus at work prom. Focus (Range 1-5)	Regulatory focus at work prev. Focus (Range 1-5)	Self-responsibility (Range 1-6)	Belief in a just world (Range 1-6)	+Low distribution (Range 1-5)	+Non-rationalization (Range 1-5)	+Reliability (Range 1-5)	+Cautiousness (Range 1-5)	+Conflict avoidance (Range 1-5)
1	-.01	-.10	.19	.21	.17	.04	.13	.24	.16	.11	.33	.09
2	-.09	.11	.04	.00	-.13	-.27**	-.01	.09	.03	-.17	-.09	-.11
3	-.05	-.36**	.39**	.21*	.11	-.12	-.07	-.04	-.31**	-.13	-.27*	-.16
4	.14	-.26*	.11	.32**	.14	.03	-.17	.07	-.04	-.04	-.44**	-.15
5	-.02	-.12	.12	-.04	.01	.03	-.16	.11	-.09	-.13	-.32**	-.13
6	-.06	-.11	.05	-.17	-.02	.03	-.07	-.26*	-.19	-.11	-.16	-.12
7	-.04	-.39**	.48**	-.10	-.09	-.13	.10	-.02	-.17	-.31*	-.22	.05
8	-.17	-.28**	.18	-.02	-.22*	-.13	-.11	-.02	-.16	-.17	-.21	-.06
9	-.19	-.15	.16	-.14	-.18	-.15	-.14	.03	-.09	-.19	-.16	-.12
10	.14	-.07	.26*	.21	.31**	.04	-.07	.21*	-.01	-.06	.08	
Rule-violation instrument (13) (Range 1-4)	-.11	-.42**	.37**	.10	-.07	-.12	-.16	-.03	-.27*	-.28**	-.45**	

Note: + indicates a subscale of the Integrity Inventory, ** p < .01, * p < .05

Table 3: Means, Standard Deviations and Pearson Correlations for the Criterion and the Predictor Variables, N=91.

sensitivity towards injustice, non-rationalization, reliability and cautiousness (Table 3). These correlations suggest that higher scores on the respective scales assessing the personality traits are accompanied by a lower intention to violate a rule in a daily life setting. A significant medium-sized positive correlation was found between several items and the total score of the rule violation instrument and self-interest.

Regression: A backward regression was conducted to assess which combination of predictor variables (personality constructs) is best able to predict the dependent variable (intention to violate a rule in daily life settings). All predictors which significantly correlated with the rule violation instrument were entered into the model. The weak predictors were removed until only useful predictor variables remained in the model (see Table 4). Therefore, not all of the tested predictors ended up in the model. The results of the backward regression indicated that four predictors explained 42% of the variance ($F_{(4,85)} = 15.17, p < .01$). Significant predictors of rule violations are cautiousness ($\beta = -.41, p < 0.01$), sensitivity towards injustice ($\beta = -.24, p < .05$) and self-interest ($\beta = .22, p < .05$). The Beta coefficient of non-rationalization was not significant ($\beta = -.17, p = .05$). The results indicate that low levels of cautiousness as well as sensitivity towards injustice (perpetrators perspective) are indicators of a high intention to violate a rule in daily

life settings, whereas low levels of self-interest are associated with a low intention to violate a rule in daily life settings (Table 4).

Discussion: The pilot study suggests that cautiousness, sensitivity towards injustice, as well as self-interest are personality predictors of the violation of rules in daily life settings. These results must be interpreted with caution because the criterion validity of the rule violation instrument could not be determined, as no external criterion for the violation of safety-related rules was measured. Due to the fact that this was a pilot study aiming to reveal which personality traits show the most promise regarding the prediction of rule-violating behaviour, the effort was minimized, but further studies should be conducted to determine the validity of the rule violation instrument.

The pilot study revealed cautiousness, injustice sensitivity and self-interest as valid predictors of the intention to violate a rule in daily life situations. The main study aims to investigate whether these personality traits are also suitable for the prediction of actual behaviour in a production work setting.

Main study: The investigation of rule violations in a real work setting

Predictor	B	SE	β	T	p
Cautiousness (Range 1-5)	-.33	.07	-.41	-4.93	.00
Injustice sensitivity (Range 1-5)	-.14	.06	-.24	-2.50	.02
Self-interest (Range 1-6)	.15	.06	.22	2.25	.03
Non-rationalization (Range 1-5)	-.17	.09	-.17	-1.99	.05
R ²		.42			

Table 4: Regression Analysis with Rule-Violating Behaviour (Rule Violation instrument) as Criterion.

is challenging because violations are associated with serious risks and endangerments. Therefore, a business simulation was used to investigate this research question. The business simulation represents the work situation of an operator in a chemical plant. The participants assumed the role of an operator who has the task of starting up the plant each week (48 weeks in total) for one simulated production year. The participants were told that they would be paid for their participation and that their salary would be dependent on their performance level when operating the plant. As operators, they had to decide for every simulated week whether to comply with the rule and start up the plant according to the compulsory and safe 11-step procedure (productive behaviour), which is, however, not as profitable, or to violate the rule, applying a more profitable but unsafe 8-step start-up (work-around) procedure (CWB). Overall, the participants were confronted 48 times with the goal conflict (or dilemma), with a good remuneration on the one hand and safety on the other hand.

The behaviour in this dilemma situation is assumed to be determined by several factors. On the basis of the pilot study results, it can be assumed that cautiousness, injustice sensitivity and self-interest are valid personality predictor variables not only for the intention to violate a rule in a daily life dilemma situation, but also for the actual behaviour concerning safety-related rule violations in a production environment.

Hypotheses

1. Low rates of safety-related rule violations can be associated with high scores on the cautiousness scale.
2. Low rates of safety-related rule violations can be associated with high scores on the sensitivity towards injustice scale.
3. Low rates of safety-related rule violations can be associated with low scores on the self-interest scale.

Method

Overall, 152 students (38 female) of the Faculty of Engineering of the University of [name deleted to maintain the integrity of the review process] were recruited to participate in the study. The sample was aged between 18 and 33 years (M = 21.32; SD = 2.39). The study took about five hours to complete, including the training of operators. To generate a goal conflict between safety and good remuneration, the participants were told that they will be paid based on their performance in operating the plant. Due to ethical considerations, every participant was compensated with 50 Euros each. The study was conducted between November 2012 and July 2013. It was approved by the local Ethics Committee. The participants were recruited on the campus through flyers, posters, face-to-face contact in lectures and by posts in online forums and in social networks (forums and social communities of students of the city in which the study takes place and of cities in the immediately surrounding areas).

Procedure: First, participants were informed about the purposes of the study and told that they could discontinue at any time (in terms of informed consent). Then, they were introduced to the business simulation [name deleted to maintain the integrity of the review process] [reference deleted to maintain the integrity of the review process]. They learned and were trained on how to operate the chemical plant by applying the two start-up procedures. After the training, the participants had to start up the plant and make their own decisions regarding which procedure to use. After they had completed the year in the business simulation, the predictor's cautiousness, injustice sensitivity and self-interest were measured. At the end of the study, the participants were debriefed and paid.

The criterion variable: After the first quarter of the simulated year, the 8-step procedure was declared as forbidden, because this procedure bears the risk of a deflagration. To underline the severity of the consequence, participants were informed that the compliance with the mandatory procedure would be audited [44]. If a participant violated the mandatory procedure and this was uncovered by an audit, s/he would have to pay a fine, which was to receive no weekly salary for the respective production week. From this point, the participants were in a goal conflict: They had to decide whether they would comply with the rule by using the safe but less profitable 11-step procedure or whether they would violate the rule by using the profitable but unsafe 8-step procedure (CWB). This decision had to be made a total of 36 times (criterion: 0-36 rule violations).

Results

Due to missing values in the data set or the inability to perform the two start-up procedures (measured by the performance in applying the procedures during the training), eight participants were excluded from further analysis. Thus, 144 participants were included in the analysis. Regarding the means and standard deviations, it becomes clear that the participants decided to violate the safety-related rule on average 13 out of 36 trials when starting up the plant (Table 5).

Testing the hypotheses: It was hypothesized that low rates of safety-related rule violations (CWB) can be associated with high scores on the cautiousness scale (H1), high scores on the sensitivity towards injustice scale (H2) and low scores on the self-interest scale (H3). Hypotheses 2 and 3 have to be rejected, as there were no significant correlations of sensitivity towards injustice and self-interest with the amount of rule violations (Table 5). A significant negative correlation was found between cautiousness and violations ($r_s = -.21, p < .05$), supporting hypothesis 1, which predicts that high levels of cautiousness are associated with low rates of safety-related rule violations.

Discussion

The present investigation aimed at forging bridges between the research into CWB in the areas of Organisational Psychology and Human Factors research. Predictors of CWB which are particularly suitable for the identification of applicants who are prone to safety-related rule violations were identified. The integrity subscale

	M	SD	1	2	3
Cautiousness (1)	2.43	.72	-	-	-
Injustice sensitivity (2)	3.53	1.01	-.09	-	-
Self-interest (3)	2.60	.96	.05	-.41**	-
Number of violations (4)	13.33	10.54	-.21*	-.04	.13

Note: **p < .01, *p < .05

Table 5: Means, Standard Deviations and Pearson Correlations, N = 144.

cautiousness is seen as a promising personality trait for predicting rule violating behaviour in daily life situations, as well as the violation of safety-related rules in the production context.

Although it is very effective and time-saving to measure only one predictor, the prediction of behaviour is more reliable if different predictor variables are used. Unfortunately, of the three investigated traits, only one trait (cautiousness) was found to be associated with rule violations in the production context. Further investigations should identify more predictors to ensure a reliable identification of applicants who are not prone to safety-related rule violations. Besides variables investigated in the main study, the pilot study showed further personality traits which correlated significantly with rule violations in daily life settings. Reliability and non-rationalization, which are subscales of integrity, correlated significantly with the criterion, but were not chosen for the main investigation because they explained the same variance as the chosen variables. Nevertheless, these traits may be more suitable for the prediction of safety-related rule violations in the production context. Furthermore, only five out of nine subscales of the integrity questionnaire were applied in the pilot study [27]. However, the remaining four subscales (behavioural intentions, calmness/self-esteem, reliability/forethought and restraint) may also have the power to predict safety-related rule violations in the production context. This should be investigated in subsequent studies.

The initial assumption that there are similar processes and influencing factors which determine rule violations in the different contexts has to be reconsidered. The fact that only one of three investigated personality traits seems to be suitable for the prediction of rule violations both in daily life settings and in the production context suggests that rule-related decisions are influenced by the context in which the decision has to be made. It appears to make a difference whether the decision making concerning the violation of rules has to be made in the private or in the professional sector.

Limitations

Although a business simulation was used, the investigation was experimental in nature, meaning that it may be subject to a comparatively lower power in terms of generalising the findings to an organisational context on a 1:1 basis. In this regard, it may be asked whether the behaviour in organisational settings is comparable with the behaviour of the participants in the study at hand. Violating a rule in a simulation environment might differ from violating a rule in a true organisational setting because participants are aware that the consequence associated with their rule-violating behaviour (deflagration) is only a fictitious one.

The deficit regarding the external validity is one limitation of the main study. Nevertheless, the lacking external validity can be assumed to be compensated by the high internal validity associated with this type of experimental investigation [45]. Besides the fact that relations can best be identified in experimental settings [45], it is very difficult to investigate rule violations in organisational settings. The issue of rule violations is a sensitive one, and the management and industrial council have to allow the collection of person-related data, including the measurement of certain personality traits as well as the person-related recording of rule violations. As a result, the investigation of rule violations in organisations, as it is proposed in the study at hand, is virtually impossible from both an ethical and an internal validity perspective.

However, the experimental setting is not necessarily

disadvantageous: Stone-Romero [45] pointed out that the findings gained in experimental settings are highly valuable because the internal validity is high and the relations found in the experimental setting can be generalised to field settings (such as the organisational setting). A further limitation concerns the sample, which consisted only of students with the respective educational background and age range. Although the participants were engineering students (the same education as the people who work in such plants), the external validity of the results has to be verified. In this regard, an (ideally longitudinal) field study is needed to prove whether the identified personality trait is, in fact, a good predictor of safety-related rule violations in the organisational context.

The participants in both studies were recruited not only personally (main study), but also via online forums and social communities (pilot study, main study) in which the study was announced. It might be argued that due to the investigation method of the pilot study and the recruitment procedures of both studies, the samples are not representative and that certain traits and experiences might be overrepresented. As there is evidence that online and paper-and-pencil data collection can generally be seen as equivalent [46], and as predominantly student forums and communities were used for recruitment, it can be assumed that there are no fundamental differences between the participants recruited online and those recruited face-to-face. Hence, the authors assume that the samples are representative for the considered student population.

Conclusions

The present study considered deviant behaviour from various angles. The Organisational Psychology perspective and the Human Factors perspective were combined in order to gain new insights. The associations between CWB and personality traits were used to generate ideas for personality predictors of the violation of rules and norms in daily life settings as well as in the organisational context. In summary, it can be stated that the assumption that both CWB and rule violations are determined by the same factors was partially confirmed. Injustice sensitivity, self-interest and cautiousness are associated with CWB as well as the intention to violate a rule in daily life settings. With regard to rule-violating behaviour in the production context, cautiousness remained as a common predictor.

The outcomes show that interconnecting the findings from the different areas of Organisational Psychology and Human Factors offers a valuable resource to generate new ideas for the investigation of deviant behaviour in the respective other area. Future investigations should use this option more intensively in order to gain a better interdisciplinary understanding of the research topic of CWB and rule violations, respectively.

If further investigations replicate the findings of an association between cautiousness and safety-related rule violations, cautiousness should be used in the selection and development process of employees in general to prevent CWB. However, it should be used in particular for employees who work in high-risk settings, such as the production context, to prevent safety-related rule violations. Previous safety management regarding the "Human Factor" has been concerned with the prevention of unsafe acts mostly in terms of industrial engineering and ergonomics. The measures of personnel selection are not yet used consistently. In the future, the measures of personnel selection should not only be used to improve performance, but should also be applied to enhance safety. As Kamp and Krause [47-49] suggested, the identification of employees who are especially prone to rule violations

should be an integral part of safety management measures in every organisation.

Acknowledgement

This investigation was conducted as part of a project funded by the "Deutsche Forschungsgemeinschaft DFG" (project ID: (German Research Council): KL 2207/2-1).

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