



Research article

Personality and safety citizenship: the role of safety motivation and safety knowledge

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ABSTRACT

Safety citizenship behaviors (SCB) have never been classified following the intended beneficiary of these behaviors. The first aim of this study was to examine Hofmann et al. (2003)'s SCB items in an attempt to identify two dimensions: SCB oriented towards individuals (SCB-I) and SCB oriented towards the organization (SCB-O). Further, by drawing on Christian et al. (2009)'s model of safety performance, we examined how distal (i.e. personality) and proximal (i.e. safety motivation and knowledge) person-related factors are associated with these behaviors. Structural equation modelling realized on a sample of 290 workers from a Belgian pharmaceutical company showed that the broader conscientiousness trait was related to both SCB-I and SCB-O, indirectly through safety motivation and knowledge, as would be predicted by Christian et al. In contrast, the altruism facet was directly related to SCB-I only. Results are discussed and practical implications considered.

1. Introduction

Although workplace safety has significantly improved in the last 100 years (Hofmann et al., 2017), the International Labor Organization (ILO, 2014) estimated that occupational accidents and work-related diseases caused over 2.3 million fatalities, out of which over 350,000 were caused by occupational accidents, and that there were also over 313 million non-fatal occupational accidents leading to more than three days of absence from work.

Research on workplace safety has identified personality traits as linked to workplace accidents, as evidenced by Clarke and Robertson (2005, 2008)'s meta-analyses. But more complex safety performance models (e.g. Christian et al., 2009) advanced that the impact of personality on accidents is indirect through other person-related factors such as safety motivation and behaviors. More precisely, these models consider personality as distal, and safety motivation and knowledge as proximal person-related factors associated with a variety of safety behaviors, including task-related compliance and context-related participation in discretionary safety activities. A recent meta-analysis by Beus et al. (2015) identified conscientiousness and agreeableness as the personality traits most strongly related to unsafe behaviors at work.

In the organizational literature, personality has been shown to have a particularly great influence in the development of safety citizenship or

contextual behaviors (eg. Motowidlo et al., 1997) and the importance of such behaviors in the domain of safety is now widely recognized.

By using Christian et al. (2009)'s framework and the non-safety specific literature on organizational citizenship behaviors (OCB), the aim of this study is to examine how distal (altruism and conscientiousness) and proximal (safety knowledge and motivation) person-related factors relate to contextual safety behaviors, by distinguishing between safety citizenship behaviors oriented towards individuals and towards the organization. We expect these factors to be positively related to safety citizenship behaviors.

1.1. Personality and safety performance framework: the role of safety motivation and safety knowledge

Building on theories of job performance (Borman and Motowidlo, 1993; Campbell et al., 1993), Griffin and Neal (2000) were the first to propose a model of safety behaviors, by distinguishing between antecedents, determinants and task/contextual components of safety performance. Components of safety performance correspond to safety behaviors that individuals perform at work. Based on the definitions of task and contextual performance, these authors distinguished between safety compliance, or “the core safety activities that need to be carried out by individuals to maintain workplace safety” (p.349) and safety

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participation, that are mostly discretionary and regarded as beyond an employee's usual job role. According to Griffin and Neal (2000), "these behaviors may not directly contribute to workplace safety, but they do help to develop an environment that supports safety" (p.349). Their model posits that variability in safety performance is directly determined by safety knowledge, skills and motivation that are thus conceptualized as proximal predictors of safety performance, whereas antecedents of safety performance are distally related to performance through their impact on workers' knowledge, skills and motivation.

Christian et al. (2009) further develop Griffin and Neal's model by postulating the existence of two types of distal antecedents of safety performance: 1) situation-related antecedents including leadership and safety climate, and 2) person-related antecedents, including personality characteristics and attitudes. These factors are supposed to be related to safety performance (i.e. compliance and participation), indirectly through proximal person-related factors: safety knowledge and motivation.

Christian et al. showed that conscientiousness was positively related to safety performance, indirectly through safety motivation and knowledge. However, they also showed that a more accurate model should include a path from safety motivation to safety knowledge, arguing that motivation should lead to knowledge acquisition in many domains, including safety. A recent study by Chmiel et al. (2017) reinforced this view by showing that safety knowledge mediated the relationship between safety motivation and participation. According to these authors, this result is consistent with the idea that employees who know how to improve safety would want to participate in voluntary safety activities to benefit others and their organization and recommended future studies to further explore this idea.

1.2. Personality factors and safety behaviors

Although Christian et al. (2009)'s model posits individual differences such as personality are important predictors of safety knowledge and motivation, Beus et al. (2016) emphasized the lack of empirical research testing these associations. Studies examining the impact of personality on safety mainly focused on their direct links to accidents (eg. Clarke and Robertson, 2005, 2008) or to safety behaviors (eg. Beus et al., 2015).

A recent meta-analysis of 69 studies using the Five Factor Model (FFM) framework has been conducted by Beus et al. (2015) to estimate the relationships between personality and safety-related behaviors. They found that agreeableness and conscientiousness were negatively associated with unsafe behaviors. Agreeable individuals are characterized by trust, morality, altruism, cooperation and sympathy, and conscientious individuals by self-efficacy, orderliness, dutifulness, etc. (Goldberg, 1999). Beus et al. (2015) used Barrick, Mount and Li's (2013) theory of purposeful work behavior to explain personality associations with safety behaviors. They argued that agreeable individuals engage less in unsafe behaviors because they are motivated to attain implicit higher goals of communion (Barrick et al., 2013), and because behaving unsafely could compromise their positive relationships with others. Furthermore, the authors argue that conscientious individuals engage less in unsafe behaviors because they are motivated to attain higher goals of achievement (Barrick et al., 2013), and because behaving unsafely is incompatible with these goals. In addition to broad personality traits, Beus et al. (2015) also looked at the influence of particular facets of those traits on unsafe behaviors and showed that altruism and its agreeableness factor did not show significant differences in the way they were related to unsafe behaviors.

1.3. Personality and contextual safety behaviors

In safety performance models, safety participation and compliance are both featured as outcomes. However, recent research is showing that participation is not just 'a good' thing in its own right that benefits the

organization at large, but that it also predicts employees' safety compliance (Chmiel et al., 2017; Neal and Griffin, 2006). Thus, understanding what predicts employee participation is important to understanding how to make workplaces safer. Furthermore, research suggests that variables such as cognitive ability or experience are better predictors of task-behaviors, whereas personality variables are better predictors of contextual behaviors (eg. Motowidlo et al., 1997). For these reasons, we focus in the present research on contextual rather than task-related safety behaviors.

In the safety literature, contextual safety behaviors have been measured in different ways. Griffin and Neal (2000) were the first to measure safety participation, by using a single measure comprising, for example, promotion of the safety program within the organization or helping coworkers when they are working under risky conditions. These contextual safety behaviors are similar to general OCB, defined by Organ (1988) as "individual behaviors that are discretionary, not directly or explicitly recognized by the formal reward system, and that in the aggregate promote the effective functioning of organization" (p.4). On the basis of the work by Van Dyne, Cummings and McLean Parks (1995) and Van Dyne and LePine (1998), Hofmann et al. (2003) created a safety citizenship behaviors (SCB) scale comprising 27 items grouped into 6 dimensions: Helping, Voice, Stewardship, Whistleblowing, Civic virtue and Initiating change.

Some studies have focused on particular dimensions of SCB, such as safety voice (eg. Conchie et al., 2012; Tucker et al., 2008). Furthermore, on the basis of the observation that specific acts of participation have different antecedents in non-safety specific research, other studies have recategorized items developed by Hofmann et al. (2003). For example, based on Van Dyne et al. (1995)'s conceptualization, Conchie (2013) grouped voice and initiating change items into a 'challenge-promotive SCB' (e.g., seeking to move the organization in a new direction). She contrasted this dimension with whistle-blowing redefined as a 'challenge-protective SCB' (e.g. seeking to protect the organization against undesirable behavior). More recently, Curcuruto et al. (2015) sliced SCB into 'prosocial' (helping-stewardship) vs 'proactive' (voice-initiating change) SCB, corresponding to affiliative and change-oriented SCB, respectively (Curcuruto and Griffin, 2018).

In the general literature, another approach distinguishes OCB by the intended beneficiary of these behaviors. Indeed, Williams and Anderson (1991) distinguished between OCB targeted at individuals (OCB-I) vs those targeted at the organization (OCB-O). They defined OCB-I as "behaviors that immediately benefit specific individuals and indirectly through this means contribute to the organization (p. 602). OCB-O are "behaviors that benefit the organization in general" (pp. 601).

SCB have never been classified following the intended beneficiary of these behaviors. As specific acts of participation have different antecedents (eg. Conchie, 2013), the first aim of this study is to examine Hofmann et al. (2003)'s SCB items to identify two dimensions, i.e. SCB oriented towards individuals (SCB-I) and SCB oriented towards organization (SCB-O). We believe that engaging in SCB-I or SCB-O could be determined by different processes, and more specifically that altruism could play a larger role in the prediction of SCB-I, whereas conscientiousness could play a larger role in the prediction of SCB-O. Indeed, if agreeableness and conscientiousness are the FFM personality traits the most strongly related to safety, they also have been identified as strong predictors of OCB (Organ and Ryan, 1995). The meta-analysis by Ilies et al. (2009) linked agreeableness and conscientiousness to OCB-I/OCB-O. These authors showed that agreeableness was more closely related with OCB-I and conscientiousness with OCB-O, and their arguments are in line with the explanation given by Beus et al. (2015) of why conscientious and agreeable individuals engage in safer behaviors. Ilies et al. (2009) argued that conscientious individuals engage in citizenship behaviors because this contribute to their sense of achievement on the job and, more specifically, they engage in OCB-O, rather than OCB-I, because conscientiousness reflects

individual differences in *impersonal* behavioral tendencies. By contrast, agreeable individuals engage in OCB-I, rather than OCB-O, because agreeableness reflects individual differences in *interpersonal* behavioral tendencies, and that engaging in this type of behavior can be one way to maintain an environment characterized by positive interpersonal relationships.

Besides conscientiousness, we focus on altruism, a facet of the broader agreeableness personality trait, characterized by active concern for others. This choice can be explained by Hogan and Foster (2013)'s work, suggesting that strong relationships can be expected between personality and safety behaviors if the personality characteristics correspond to the type of behavior considered. Indeed, taking one specific safety-related performance dimension at a time they developed predictors using personality facets rather than broad factor scales. It follows therefore that the willingness to engage in behaviors that benefit others should be influenced by individual's altruistic personality specifically, at least as much as the broader agreeableness trait. Moreover, the relationship between altruism and safety behaviors has been mainly investigated in the road safety literature, showing that altruism is negatively related to risky driving behaviors (eg. Chen, 2009; Wong et al., 2010). By contrast, altruism has never been considered in the industrial workplace safety literature.

Thus, we use here an original conceptualization based on the beneficiaries of SCB that seems to be relevant to investigate personality effects. Indeed, as the OCB literature suggests conscientiousness is more important in predicting OCB-O and agreeableness in predicting OCB-I than vice versa, we apply this distinction and prediction to SCB. We focus on the facet of altruism, rather than on its agreeableness trait, thus allowing to potentially maximize the contrast between different personality aspects and different types of SCB, and to compare the mechanisms involved with past research on conscientiousness, in the prediction of relevant SCB. We hypothesize that

- H1. Conscientiousness is more important in predicting SCB-O
- H2. Altruism is more important in predicting SCB-I

Furthermore, as we draw on Christian et al. (2009)'s model suggesting that the impact of personality on safety behaviors involves mediation by safety knowledge and motivation, we also hypothesize that

- H3a. Conscientiousness is positively related to SCB-O through the mediating role of safety motivation and safety knowledge
- H3b. Altruism is positively related to SCB-I through the mediating role of safety motivation and safety knowledge

Figure 1 present our hypothetical model.

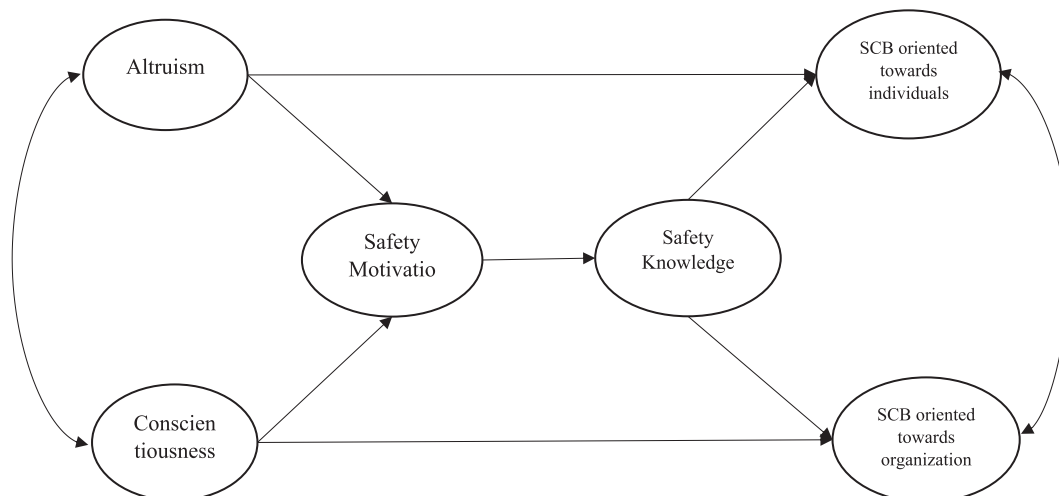


Figure 1. Hypothetical model.

2. Method

2.1. Sample and procedure

Self-reported questionnaires were administrated to employees from a Belgian pharmaceutical company and working in departments involved in the preparation of vaccines. The departments participating to the survey were selected by the company's health and safety unit, according to their interest and/or availability. Participants responded to the survey through an online survey link received by email or during collective sessions animated by the researcher. The participation was voluntary, and all workers received a letter jointed to the questionnaires, guaranteeing the confidentiality of their responses and providing the researchers' contact information. The project through which data have been collected has been approved by the ethical committee from the Faculty of Psychology and Education, University of Liege. Together, the survey was proposed to 774 workers and 322 returned questionnaires, a response rate of 41,6%. After eliminating cases with too many missing data, the sample comprises 290 workers. The majority of workers were male (75.86%) and had less than 10 years of organizational tenure (70.35%). Concerning the status, 34.83% were blue-collar workers, 44.48% white-collar workers and 20.69% were managers. Finally, the majority of workers (66.90%) had no hierarchical responsibilities.

2.2. Measures

Altruism and Conscientiousness were measured with items from the International Personality Item Pool (IPIP; Goldberg, 1999), providing free measures of the NEO-PI-R constructs in a public domain (i.e., <http://iPIP.org>). **Altruism** (eg. "Am concerned about others"; $\alpha = .83$) and **conscientiousness** (eg. "Carry out my plans"; $\alpha = .75$) were each measured with 10 items. Respondents were asked to estimate to what extent the items described them, on a five-point Likert-type agreement scale from "strongly disagree" to "strongly agree".

Safety Motivation and Knowledge were measured with items by Griffin and Neal (2000). **Safety motivation** comprised 4 items ($\alpha = .69$), eg. "I feel that it is worthwhile to put in effort to maintain or improve my personal safety" and **safety knowledge** comprised 4 items ($\alpha = .75$), eg. "I know how to perform my job in a safe manner". These items were responded on a 5-point Likert-type agreement scale from "strongly disagree" to "strongly agree".

SCB-I and SCB-O were measured by using items from Hofmann et al. (2003)'s scale. The original scale contained 27 items grouped into 6 dimensions. In order to create two dimensions from the original items, we performed exploratory factor analyses (EFA), on the basis of another

sample, comprising the responses of 536 workers from a public water company. We extracted two factors by using principal components analysis with Varimax rotation. In parallel, we asked 6 external raters, all researchers in organizational psychology, to evaluate if they considered the items were more directly oriented to benefit individuals, the organization or if it was not clear. The results of EFA and external ratings are presented in Table 1. On the basis of these results, we categorized each item into SCB-I or SCB-O dimensions if the following criteria were met: the items loading on one of the two dimensions was higher or equal to .50 (Kline, 2011); the items loadings were higher on one of the two dimensions: ideally, the difference with the loadings on the other dimension should be higher than .20 (Stevens, 2002); the majority of external raters (at least 4/6) considered the item as representing the same dimension as the highest loading. On the basis of these criteria, 15 items were classified into SCB-I (8 items, $\alpha = .92$) or SCB-O (7 items, $\alpha = .91$) dimensions. More precisely, SCB-I comprised 4 items from the original helping dimension (eg. "Assisting others to make sure they perform their work safely") and 4 items from the original stewardship dimension (eg. "Protecting fellow crew members from safety hazards"), whereas SCB-O comprised 1 item from the original helping dimension (eg. "Volunteering for safety committees"), 3 items from the original civic virtue dimension (eg. "Keeping informed of changes in safety policies and procedures") and 3 items from the original initiating change dimension (eg. "Trying to improve safety procedures"). Then, for these 15 items, we realized Confirmatory Factor analyses (CFA) on the basis of our study sample (290 workers from a pharmaceutical company). Table 2 presents the results of

Table 1. Exploratory factor analyses (EFA) of Hofmann's 27 items safety citizenship behaviors scale and researchers' ratings.

	EFA Public water company (n = 536)		Ratings by researchers		
	1	2	Individual	Organization	Both/unclear
Help1	.35	.50		6	
Help2	.66	.23	6		
Help3	.71	.17	6		
Help4	.73	.26	2	2	2
Help5	.80	.22	5		1
Help6	.78	.27	4		2
Voice1	.79	.18	1	3	3
Voice2	.74	.27	1	3	2
Voice3	.67	.21		6	
Voice4	.71	.28	1	2	3
Stew1	.76	.21	6		
Stew2	.72	.13	6		
Stew3	.73	.16	5	1	
Stew4	.65	.12	6		
Stew5	.65	.36	3	3	
Whist1	.61	.32		5	1
Whist2	.71	.29	2	3	1
Whist3	.68	.30	2	2	2
Whist4	.50	.28		6	
Whist5	.56	.38		3	3
CV1	.01	.76	1	5	
CV2	.06	.82	1	5	
CV3	.25	.75	1	4	1
IC1	.42	.70	2	4	
IC2	.48	.62	2	4	
IC3	.48	.62	2	4	
IC4	.52	.50	1	4	1

Note: Extraction method: principal components analysis with Varimax rotation. In *italic* are items violating the conditions (detailed in the manuscript) for classifying them into OCB-I or OCB-O; Help = helping, Stew = stewardship, Whist = whistleblowing, CV = civic virtue, IC = initiating change.

Table 2. Confirmatory factor analyses of the 15 items from Hofmann's scale categorized into SCB-I and SCB-O and researcher's ratings.

	CFA Pharmaceutical company (n = 290)		Ratings by researchers		
	SCBI by	SCBO by	Individual	Organization	Both/unclear
Help1	.665			6	
Help2	.658		6		
Help3	.660		6		
Help5	.782		5		1
Help6	.700		4		2
Stew1	.878		6		
Stew2	.827		6		
Stew3	.848		5	1	
Stew4	.722		6		
CV1	.765		1	5	
CV2	.751		1	5	
CV3	.633		1	4	1
IC1	.882		2	4	
IC2	.788		2	4	
IC3	.847		2	4	

Note: Help = helping, Stew = stewardship, CV = civic virtue, IC = initiating change.

CFA. These items were responded on a 5-point Likert-type frequency scale ranging from "never" to "always".

3. Results

3.1. Data analysis

Analyses were conducted using confirmatory factor analyses (CFA) and structural equation modeling (SEM) with MPlus 6, that is, following the two-step process recommended by Anderson and Gerbing (1988). By using the balancing technique (Little et al., 2013), the number of items were reduced to three for each factor. The socio-demographical variables were included as covariates to control their effect in the analyses (Little, 2013). More precisely, the variable age was significantly related to all constructs in the sense that the more the age increases, the more altruism, conscientiousness, safety motivation, knowledge, and safety citizenship behaviors increase. The status was related to safety motivation, altruism and conscientiousness (the higher the status¹, the higher the scores on these constructs). Finally, hierarchical responsibilities were significantly related with SCB-I and SCB-O only: the higher the responsibilities, the more employees engaged in safety citizenship behaviors.

3.2. Measurement models

The hypothesized 6-factor model was found to yield a good fit to the data: $\chi^2(df) = 162.57(120)$, CFI = .984, NNFI = .979, RMSEA = .035. The hypothesized model was significantly better than the alternative models (Table 3).

3.3. Relationship among variables

Table 4 displays the means, standard deviations, Cronbach's alphas, and correlations among variables.

Our hypotheses were tested using SEM. Table 5 presents fit indices for the hypothesized and alternative models. The hypothesized model fit the data well, as indicated by the following indices: $\chi^2(df) = 322.64(186)$,

¹ Manager's status being higher than white collar's status, being itself higher than blue-collar's status.

Table 3. Fit indices for measurement models.

Models	df	χ^2	RMSEA	SRMR	CFI	NNFI	$\Delta\chi^2$ (Δ df)
6-factor model	120	162.57	.035	.040	.984	.979	—
5-factor model (combining ALT and OCB-I)	125	513.73	.104	.105	.850	.817	351.16(5)***
5-factor model (combining CONS and OCB-O)	125	496.75	.101	.118	.857	.825	334.18(5)***
5-factor model (combining OCB-O and OCB-I)	125	522.94	.105	.067	.847	.812	360.37(5)***
1-factor model	135	1334.16	.172	.136	.538	.476	1171.59(15)***

Note. N = 290; SCB-I = Safety Citizenship Behaviors oriented towards Individuals; SCB-O = Safety Citizenship Behaviors oriented towards Organization; χ^2 = Minimum Fit Function Chi-Square; df = degrees of freedom; RMSEA = root-mean-square error of approximation; SRMR = Standardized Root Mean square Residual; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index; $\Delta\chi^2$ = chi-square difference tests. ***p < .001.

Table 4. Descriptive statistics and inter-correlations among variables.

Variables	M	SD	1	2	3	4	5	6
1 Altruism	4.29	.42	.83					
2 Conscientiousness	4.06	.46	.53***	.75				
3 Safety Motivation	4.44	.47	.22***	.26***	.69			
4 Safety Knowledge	4.07	.49	.35***	.43***	.42***	.75		
5 SCB-I	3.55	.82	.29***	.20**	.27***	.43***	.92	
6 SCB-O	2.66	.96	.16**	.22***	.24***	.40***	.51***	.91

Note. N = 290. Correlations among variables are provided below the diagonal and Cronbach's alphas are provided on the diagonal. *p < .05, **p < .01, ***p < .001.

Table 5. Fit indices for structural models.

Models	df	χ^2	RMSEA	CFI	NNFI	$\Delta\chi^2$ (Δ df)	Model Comparison
Hypothetical model	186	322.64	.050	.950	.939	—	—
Alternative model 1 (+Conscientiousness and Altruism to Safety Knowledge)	184	291.45	.045	.960	.952	31.19(2)***	Hypothesized vs. Alternative 1
Alternative model 2 (+ Altruism to SCB-O and Conscientiousness to SCB-I)	182	287.45	.045	.960	.952	4(2) ns	Alternative 1 vs. Alternative 2
Alternative model 3 (+ Motivation to SCB-O and SCB-I)	182	290.44	.045	.960	.951	1.01(2)ns	Alternative 1 vs. Alternative 3
PRUNED model	187	292.48	.044	.961	.953	1.03(3)ns	Alternative 1 vs. pruned

Note. N=290; χ^2 = Minimum Fit Function Chi-Square; df = degrees of freedom; RMSEA = root-mean-square error of approximation; SRMR= Standardized Root Mean square Residual; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index; $\Delta\chi^2$ = chi-square difference tests. ***p < .001.

CFI = .950, NNFI = .939, RMSEA = .050. This model was compared with nested models, adding direct paths from altruism and conscientiousness to safety knowledge (alternative model 1), adding direct paths from altruism to SCB-O and from conscientiousness to SCB-I (alternative model 2), and adding direct paths from safety motivation to SCB-I and SCB-O (alternative model 3). The χ^2 difference between hypothesized and alternative model 1 was significant, showing that alternative model 1 better fit the data than our hypothesized model (χ^2 (dl) = 291.45(184), CFI = .960, NNFI = .952, RMSEA = .045). However, the χ^2 differences between alternative model 1 and alternative models 2 and 3 were not significant, showing that alternative model 1 was the best. As this model presented non-significant paths, we tested a “pruned model”, i.e. a model

removing all these non-significant paths. The χ^2 difference between alternative model 1 and pruned model was not significant, so we kept the most parsimonious model, i.e. the pruned model, also presenting good fit indices: χ^2 (dl) = 292.44(187), CFI = .961, NNFI = .953, RMSEA = .044.

Bootstrap analyses were performed to confirm the mediations (Preacher and Hayes, 2008). Table 6 presents bootstrap results.

The model (See Figure 2) shows that safety motivation is significantly related to safety knowledge (.38, p < .001) and, in turn, safety knowledge is significantly related to both SCB-I (.47, p < .001) and SCB-O (.45, p < .001).

Conscientiousness is not directly related to SCB-O, but is significantly related to safety motivation (.31, p < .001) and to safety

Table 6. Bootstrap.

	Bootstrapping		Percentile 95% CI	
	Effect	SE	Lower	Upper
Indirect effect: x → m → y (simple mediation)				
Conscientiousness → Safety Knowledge → SCB-O	.19	.04	.103	.271
Conscientiousness → Safety Knowledge → SCB-I	.20	.04	.112	.281
Safety Motivation → Safety Knowledge → SCB-I	.18	.05	.081	.275
Safety Motivation → Safety Knowledge → SCB-O	.17	.05	.080	.258
Indirect effect: x → m1 → m2 → y (double mediation)				
Conscientiousness→Safety Motivation → Safety Knowledge → SCB-I	.06	.02	.013	.097
Conscientiousness→Safety Motivation → Safety Knowledge → SCB-O	.05	.02	.013	.092

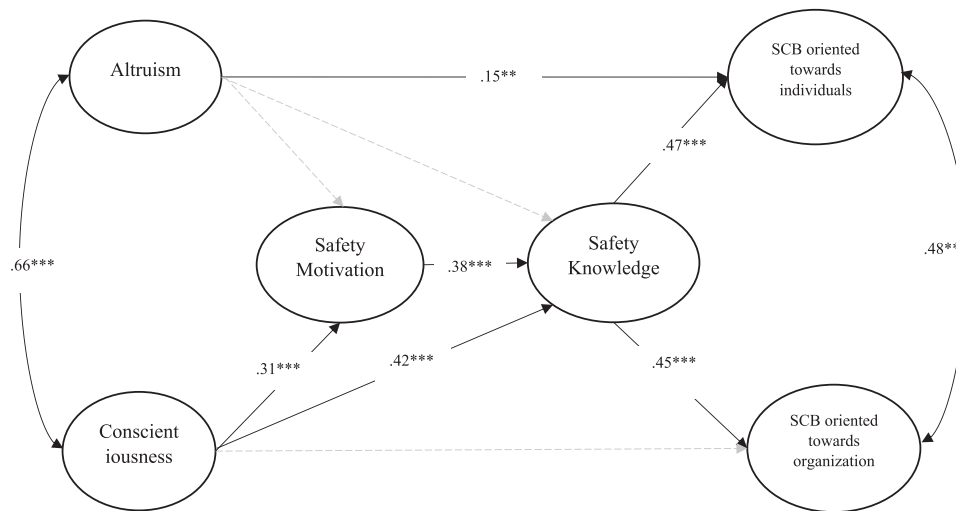


Figure 2. Final Model (pruned model). Note. N = 290 ***p < .001, **p < .01 (completely standardized coefficients).

knowledge (.42, $p < .001$). The mediating role of safety motivation and safety knowledge (double mediation) between conscientiousness and SCB-O is significant (indirect effect: .05, 95% CI = [.013; .092]). Moreover, the mediating role of safety knowledge between conscientiousness and SCB-O is significant (indirect effect: .19, 95% CI = [.103; .271]). The same mediations also significantly explain SCB-I (indirect effect: .06, 95% CI = [.013; .097] for the double mediation through safety motivation and knowledge; indirect effect: .20, 95% CI = [.112; .281] for the simple mediation through safety knowledge). These results lead us to **reject hypothesis 1**, as conscientiousness is not more strongly related to SCB-O than SCB-I and to **confirm hypothesis 3a**, as the mediations by safety motivation and safety knowledge are significant. These findings for conscientiousness are consistent with those for the same personality factor presented by Christian et al. (2009).

Concerning **altruism**, the only significant relationship is the direct one between altruism and SCB-I, leading us to **confirm hypothesis 2**. The paths from altruism to safety motivation and to safety knowledge are not significant, leading us to **reject hypothesis 3b**.

Our final model explains 33% of variance in SCB-I and 28% of variance in SCB-O, showing that person-related factors account for significant variance in explaining SCB.

4. Discussion

This study had two aims: first, from Hofmann et al. (2003)'s scale, we distinguished between SCB-I and SCB-O; second, by drawing on Christian et al. (2009)'s model, we examined how distal and proximal person-related factors are associated with these behaviors.

Factor analyses and evaluation by external raters showed that the SCB-I dimension comprised mainly items from helping and stewardship, similar to the 'prosocial' dimension created by Curcuruto et al. (2015). SCB-O comprised one item from helping and items from civic virtue and initiating change. For the voice and whistleblowing items, results showed that it was not clear whether these items are more targeted at individuals or at the organization and they were therefore not included in SCB-I nor SCB-O dimensions.

Results of our structural model replicate Chmiel et al. (2017)'s finding that safety motivation leads to SCB through safety knowledge, and go one step further by confirming that workers who know how to improve safety engage in SCB-I and SCB-O.

Models of safety performance conceptualized personality as distal person-related factors having an indirect influence on safety behaviors via proximal person-related factors. As studies testing these associations are missing in the literature, the second aim of this paper was to examine

them. Specifically, we showed that conscientiousness was related to both SCB-I and SCB-O, only indirectly through safety motivation and knowledge. This result is consistent with Christian et al. (2009)'s findings that safety motivation and knowledge mediate the relationship between conscientiousness and safety performance. Moreover, altruism was only directly related to OCB-I. This result challenges Christian et al. (2009)'s postulate that personality effects on safety behaviors are only indirect through knowledge and motivation, raising the possibility that a facet-based approach may provide a more fruitful way to understand and predict the relationships between personality and safety behaviors.

A plausible explanation of these results can be found in the **level of specificity of the constructs** considered. By referring to the compatibility principle (Ajzen, 1988) postulating that the relationship between two constructs should be strongest when both are matched in specificity and generality, Beus et al. (2015) suggested that relevant facet-level personality traits may have stronger relationships with domain-specific safety-related behaviors relative to the broader personality traits. However, contrary to this assumption, these authors found that altruism and its agreeableness factor did not show significant differences in the way they were related to unsafe behaviors. By distinguishing safety behaviors by the intended beneficiary of these behaviors, the present study focused on more specific dimensions than previous studies examining the associations between personality and safety behaviors and between personality and non-safety specific OCB-I and OCB-O (Ilies et al., 2009). Following this interpretation, the direct path from the specific personality facet of altruism to the safety-specific citizenship behaviors targeted at individuals may be due to the similar degree of specificity of these constructs. By contrast, as conscientiousness is a broader personality-trait, its non-significant direct relationship with SCB-O may be due to a mismatch between the degrees of specificity of these constructs.

The same interpretation could be used to explain the relationships between personality variables and safety motivation and knowledge. The measures of safety motivation and knowledge used in the present research were relatively general and asked about the importance workers place on safety and the general knowledge they have, respectively, without clearly specifying their nature. Thus, the significant relationships between conscientiousness and safety motivation and knowledge may be partially due to the compatibility between their degrees of generality, and the non-significant relationships between altruism and safety motivation and knowledge may be partially due to the fact that the former is specific, whereas the latter are more general.

In the same vein, it's possible that the construct of safety motivation reflects a type of motivation that does not match with altruism. Altruism

can be considered as a form of unconditional kindness (Fehr and Gächter, 2000), and then, attitudes and behaviors resulting from altruism should be disinterested and not influenced by any expectations in return, except personal satisfaction. In other words, altruistic personality is driven by intrinsic motivations. However, Neal and Griffin (2006) defined safety motivation as a 'willingness to exert effort to enact safety behaviors and the valence associated with those behaviors' (p.947). These authors draw on Expectancy-valence theory (Vroom, 1964) to suggest that employees would be motivated to participate in safety activities if they believe that these behaviors would lead to valued outcomes. Based on their finding of a reciprocal relationship between safety motivation and safety participation over time, suggesting that carrying out this type of behavior has positive motivational consequences, Neal & Griffin argued that workers engaging in discretionary safety activities probably receive positive reward and encouragement for that, motivating them to carry out further activities. Thus, according to this conceptualization, and if we refer to the continuum of motivation in Self Determination Theory (Deci and Ryan, 2000), safety motivation may reflect a more controlled form of motivation to engage in safe behaviors, in comparison with inherently autonomous motivation fostered by altruism.

4.1. Limitations and future research directions

A first limitation concerns the use of self-reported data. However, the Harman's single factor test suggested that our data were not replete with common method bias as the results of confirmatory factor analyses indicated that a single-factor model showed a poor fit to the data (Podsakoff et al., 2003). Another limitation is the cross-sectional design of our research, preventing us from making causal inferences among the variables. Future studies should longitudinally validate these effects but also try to replicate them in other work contexts. Indeed, these results concern a specific company (pharmaceutical sector), in a specific country (Belgium).

Furthermore, as the few studies linking personality to safety behaviors mainly focused on the influence of broad personality trait on relatively general types of safety behaviors and consistently with Beus et al. (2015) acknowledgment that personality facets may have different effects on safety behaviors compared to the personality factor they belong to, we recommend future studies to have a look at the direct and indirect influences of personality facets on safety behaviors, by respecting the compatibility principle (Ajzen, 1988). More specifically, in the continuity of the present study, we recommend to further investigate how altruism, but also other particular facets of the agreeableness trait, may influence SCB through specific types of motivation, such as intrinsic motivation. Furthermore, as the broad conscientiousness trait was significantly related to the relatively general constructs of safety motivation/knowledge, it seems to be worthwhile to also consider the way particular facets of conscientiousness could be related to SCB-I and SCB-O, directly and indirectly through specific types of motivation. This is in line with Conchie (2013)'s study showing that specific types of motivation differentially influence the relationships between safety-specific transformational leadership – a distal situation-related factor – and specific dimensions of SCB.

4.2. Conclusion and practical implications

This study distinguished, for the first time, SCB-I and SCB-O and showed that the personality facet of altruism related directly to SCB-I only, whereas the broader personality trait of conscientiousness related to both SCB-I and SCB-O, only indirectly through safety motivation and knowledge. These findings indicate practical implications.

First, results indicate that workers considering safety as important acquire more safety knowledge, leading them to engage more in SCB-I and SCB-O. Companies willing to increase these behaviors should organize sensitization sessions about the importance of safety and safety

training sessions to improve knowledge. Second, given the importance of altruism and conscientiousness in the emergence of SCB, organizations should take into account these personality aspects while elaborating and implementing safety management practices. Wachter and Yorio (2014) report a series of safety management practice often adopted by companies. For some of these practices, it can be important to take personality aspects into account. For example, 'hiring for safety' consists of hiring employees more likely to behave safely and to consider safety as an important aspect of work. If SCB are expected of them, it can thus be appropriate to examine how altruist and conscientious potential recruits are. Another practice is 'safe task assignment' or task-employee matching. It could be worthwhile to attribute tasks corresponding to higher order goals of individuals: if individuals are highly altruistic, they should be more motivated by higher order goals of communion (Barrick et al., 2013) and should be assigned to jobs in teams, where tasks are interdependent and where cooperation and SCB-I are particularly important; if individuals are highly conscientious, they should be more motivated by higher order goals of achievement (Barrick et al., 2013) and should be assigned to jobs highly challenging.

One way to evaluate if workers will match their potential future jobs during the selection process, is through the elaboration of situational judgement tests (SJT), defined by McDaniel et al. (2007) as "personnel selection instruments that present job applicants with work-related situations and possible responses to the situations" (p.63). SJT could be developed specifically (Lothe et al., 2012) to evaluate if candidates are likely to engage in SCB in particular contexts and if their actions are appropriated and in line with organization's expectations. It could be also useful to use such SJT during safety trainings, in order to evaluate if workers consider SCB as a privileged way of action in their professional practice and to guide them in this way. Specifically, in our sample, as younger employees have lower SCB scores, we recommended to improve the organizational socialization process (eg. onboarding), in order to promote these safety citizenship, to go beyond the mere communication of basic safety rules. This could be done by using SJT or through role plays, during selection process or later through specific trainings.

Declarations

Author contribution statement

J. Laurent, N. Chmiel, I. Hansez: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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