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Research article

Safety leadership and safety citizenship behavior: The mediating roles of safety knowledge, safety motivation, and psychological contract of safety

Leila Omid

Department of Occupational Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

Email: omidil@sina.tums.ac.ir

Hossein Karimi

Department of Health, Safety, and Environment, School of Health, Tabriz University of Medical Sciences, Tabriz, Iran

Email: shemal.sarooj@yahoo.com

Colin Pilbeam

Safety and Accident Investigation Centre, Cranfield University, Cranfield, UK

Email: colin.pilbeam@cranfield.ac.uk

Saeid Mousavi

Department of Statistics and Epidemiology, School of Health, Tabriz University of Medical Sciences, Tabriz, Iran

Email: saeedmusavi@ymail.com

Gholamreza Moradi*

Department of Occupational Health Engineering, School of Health, Tabriz University of Medical Sciences, Tabriz, Iran

Email: moradig@tbzmed.ac.ir

Corresponding author:

*Corresponding author. E-mail address: moradig@tbzmed.ac.ir (Gh. Moradi)

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Abstract

The relationship between safety leadership and safety citizenship behavior (SCB) is well established in prior research; however, the effects of safety knowledge, safety motivation, and psychological contract of safety (PCS) on this relationship still need to be examined. This study investigated the mediating roles of safety knowledge, safety motivation, and psychological contract of safety in the relationship between safety leadership and SCB. Cross-sectional survey data were gathered from 205 employees in a high-risk industry in Iran. Path analysis showed that safety knowledge, safety motivation, and PCS played mediating roles between safety leadership and SCB. Improving the safety of employees and enhancing safety in organizations can be achieved by considering the significance of safety leadership and enhancing SCB among employees. Creating environments with higher levels of fulfillment of safety obligations between leaders and employees is important in achieving safety goals.

Keywords: Safety leadership; Safety citizenship behavior; safety knowledge; safety motivation; Psychological contract of safety.

1. Introduction

Workers face many risks in steel manufacturing industries due to the nature of the job and a safe working environment is important in such industries (Omidi, Karimi, & Moradi, 2023; Omidi et al., 2022). Stressful work conditions due to a hot and noisy environment, heavy work tasks, and physically demanding work can result in increased risks of accidents and injuries such as burns and crushing injuries. Evidence from some countries revealed that workers in steel manufacturing were subjected to the highest number of accidents and injuries compared to other occupations. Due to high-risk conditions in steel manufacturing plants, personnel safety among metalworkers has become an important consideration for industrial practitioners and safety scientists (Nordlöf et al., 2015). It has been stated in the literature that some factors such as safety leadership (Clarke, 2013; Omidi, Karimi, Pilbeam, et al., 2023; Wu et al., 2011), psychological contract of safety (PCS) (Newaz et al., 2019), safety knowledge, and safety motivation (Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010) can significantly affect the safety status of workers.

Organizational citizenship behavior (OCB) as discretionary behavior is described as employees' voluntary actions outside of the formal requirements of their defined roles that help other workers (Vu et al., 2022). OCB includes behaviors that can improve the organization's effective functioning. Safety citizenship behaviors (SCBs), as a key component of OCB, are the discretionary actions of employees necessary for managing risks in the safety-critical sectors (Dartey-Baah et al., 2020).

One way in which the safety of workers in high-hazard industries can be improved is through the promotion of prevention behaviors such as safety citizenship behavior (SCB) (Meng & Chan,

2020). Some findings suggested that SCB plays an important role in encouraging better participation of workers in workgroups. Also, the importance of SCB in effective risk management in a safety-critical environment has been mentioned in the literature. In addition, the positive effects of SCB on safety performance have been addressed in some work (Curcuruto & Griffin, 2018; Meng & Chan, 2020; Meng et al., 2021). However, safety researchers indicate that there is still a lack of research into the identification of influential factors motivating the SCB at the individual and organizational levels (Meng & Chan, 2020; Meng et al., 2021).

Evidence from a previous study demonstrated that improving safety leadership is associated with better safety performance and can result in reduced numbers of accidents and injuries (Wu, 2008). Safety leadership as an organizational and situation-related factor refers to employees' perceptions of how managers and supervisors behave and achieve organizational goals (Christian et al., 2009). Reports in some studies conducted in high-risk industries revealed a great influence of leadership on behavioral safety. Some researchers showed that the activities of senior managers can directly affect workers' safety behaviors and transformational leadership can lead to the promotion of organizational citizenship behavior. In addition, a positive impact of leaders' organizational citizenship behavior on followers' citizenship behavior is indicated. SCB as a particular kind of OCB is positively influenced by leadership activities (Fisk & Friesen, 2012; Li et al., 2020). The relationship between safety leadership and SCB is influenced by some factors. Li et al. (2020) showed the influence mechanism of safety leadership on SCB through the mediating role of safety attitude.

Safety knowledge and safety motivation are two person-based antecedents of safety outcomes and safety performance (Christian et al., 2009). A recent study by Laurent et al. (2020) showed significant associations among safety knowledge, safety motivation (as person-related factors), and SCB. Previous results have also suggested a significant association between employees' safety citizenship behaviors and high-quality relationships with supervisors (Christian et al., 2009). More specifically, psychological contract as another important individual-level factor is based on perceived mutual obligations between workers and supervisors and is considered an important factor in explaining how workers attach meaning to a supervisor's behavior (Newaz et al., 2019; Sparrow, 1998). Psychological contract can significantly influence organizational citizenship behaviors (extra-role behaviors) (Restubog et al., 2008).

Steel manufacturing industries are generally considered hazardous sectors, complex socio-technical systems, and high-technology industries. However, the steel industry is a labor-intensive industry, and behavior or a process that is responsible for the accident occurrence is very important (Verma et al., 2014). To improve safety in safety-critical industries, the importance of safety leadership, PCS, and safety citizenship behavior have been identified (Meng & Chan, 2020; Newaz et al., 2019). Laurent et al. (2020) showed the significance of the SCB, safety knowledge, and safety motivation in enhancing the safety behavior of workers and organizational-level safety. In addition; safety leadership, safety knowledge, safety motivation, PCS, and SCB as important safety constructs have been found to have positive impacts on safety performance. This study aims to provide a better understanding of the relationships between safety leadership (employees' perceptions of safety leadership) and SCB through the mediating effects of safety knowledge, safety motivation, and PCS using path analysis. In addition, the effects of leadership styles (active transactional and transformational leadership) on the two distinct classes of SCBs including affiliative and change-oriented SCBs were considered.

2. Literature review and hypothesis development

2.1. Safety Citizenship Behavior (SCB)

The concept of SCBs derives from organizational citizenship behavior. Organizations require employees who are proactive in initiating improvements in the safety of the workplace and participating in safety. SCBs go beyond safety compliance and can influence the overall safety of an organization through accident prevention measures and risk management. These behaviors involve acts helping protect coworkers' safety, endeavors to prevent workplace accidents, improvements in the organization's safety systems, and improvements in safety conditions (Curcuruto & Griffin, 2018). SCB as an important safety construct can have a significant positive impact on the personal safety of employees (Meng & Chan, 2020; Omid et al., 2024). SCBs can lead to improvement in workplace safety through behaviors such as helping co-workers, enhancing safety programs, whistleblowing on those who violate safety, suggesting changes for promoting safety, demonstrating initiative, and protecting co-workers from the consequences of workplace incidents. SCBs as a multidimensional construct refer to employee discretionary and prosocial activities that go above and beyond the formal reward system and can lead to promotion in the effective functioning of the organization. Citizenship behaviors have been conceptualized based on the principle of reciprocity. According to this concept, employees tend to reciprocate a high-quality relationship with their supervisor and engage in behaviors valuable to the organization e.g. safety. Safety in high-risk industries is greater when employees comply with safety rules and display safe working behaviors (Curcuruto et al., 2019; Dida et al., 2009; Hofmann et al., 2003).

Recently, SCB has been shown to comprise two distinct forms consisting of affiliative- and change-oriented behaviors. Affiliative-orientated behaviors include prosocial and cooperative activities that are focused on the protection of coworkers' health and safety and supporting accident and injury prevention (Curcuruto & Griffin, 2018). Affiliative SCB is related to four types of behaviors including helping, stewardship, civic virtue, and whistleblowing. These are also important in strengthening social relations within groups and organizations. Helping is related to some behaviors such as volunteering for safety committees, helping teach safety procedures to new workers, and helping other workers learn about safe work practices. Stewardship refers to behaviors like protecting other workers from safety hazards, taking action to stop safety violations, and taking action to protect other workers from risky situations. Civic virtue and whistleblowing are associated with some behaviors such as reporting safety violations, following safe working procedures, attending safety meetings, and keeping informed of changes in safety policies and procedures (Curcuruto & Griffin, 2018; Hofmann et al., 2003). Affiliative SCBs are related to affective psychological mechanisms such as affective organizational commitment and are negatively associated with micro-injury events and property damage (Curcuruto & Griffin, 2018).

Change-oriented behaviors are focused on proactively improving organizational systems through the voluntary actions of employees. These may include activities such as problem-solving, enacting organizational change, engaging in peer-to-peer communication, and improvement through the generation of ideas and are associated with two types of behaviors consisting of safety voice and initiating a safety-related change. Change-oriented behavior and its two dimensions (safety voice and initiating a safety-related change) could be considered as SCBs targeting the care of an organization or could lead to improvement in organization-level safety (Curcuruto et al., 2019). Safety voice includes behaviors such as safety-related recommendations, encouraging other workers to get involved in safety, and expressing opinions

on safety matters. Safety-related changes are related to some behaviors such as trying to change the way the job is done to make it safer, trying to improve safety procedures, and making suggestions to improve safety (Hofmann et al., 2003). Change-oriented citizenship is negatively related to lost-time injuries and positively related to near-miss reporting (Curcuruto et al., 2019; Curcuruto & Griffin, 2018; Hofmann et al., 2003).

2.2. Safety leadership

Leadership is defined as a process whereby a leader influences their followers' behaviors in performing activities and achieving a common goal (Fernández-Muñiz et al., 2014) and is dependent upon the context (Pilbeam et al., 2016). Safety leadership has significant effects on safety performance and achieving organizational safety goals through establishing safety norms (procedures and practices), creating a specific safety culture, and leaders' safety-related behaviors (Cheung et al., 2021). Safety leadership can have positive impacts on employees' safety performance in major hazard installations through safety initiatives (e.g., spiritual rewards driven by leaders) (Zhao et al., 2021). Safety leadership also plays a significant role in creating safety climate within organizations and motivating workers to perform their tasks in a safe manner (Griffin & Neal, 2000)

Two categories of leadership styles were identified from the literature: transactional leadership and transformational leadership (Clarke, 2013; Fernández-Muñiz et al., 2014). Transactional leadership reflects the leader-subordinates exchanges in which the leader uses extrinsic motivation (rewards and punishments) to ensure that the followers pursue organizational goals. Transactional leadership considers compliance with safety obligations by monitoring the consequences and establishing objectives. The leader explains expectations to the followers and they are rewarded for meeting expectations and their efforts (Bass, 1999; Clarke, 2013; Fernández-Muñiz et al., 2014). Active transactional leadership can affect safety outcomes and lead to fewer injuries and have positive effects on workplace safety, compliance with safety procedures, and perceived safety climate and transactional leaders encourage followers to engage in safety-related activities (Clarke, 2013).

On the other hand, transformational leadership supports performance improvement by motivating followers and transforming their attitudes, values, and beliefs (Bass, 1985). Transformational leadership style seeks to develop trust and can lead to stronger interpersonal relationships between leaders and followers by making followers aware of the importance of their innovative and creative behaviors and the results obtained (Clarke, 2013). Transformational leadership can have a positive role in improved safety communication, employee safety-related behaviors, and safety issues. In addition, transformational leadership encourages employees' safety participation and compliance and their perception of the safety climate (Clarke, 2013). In combination, both transactional and transformational leadership are important in a safety context (Clarke, 2013; Fernández-Muñiz et al., 2014). In a study conducted to examine the relationship between transformational and transactional leadership styles and safety citizenship behaviors, Dartey-Baah et al. (2020) mentioned that both transformational and transactional leadership styles have positive effects on SCBs and can promote SCBs because safety leadership is one of the key determinants of safety behaviors. If employees receive appropriate leadership from their managers/supervisors, they are willing to go beyond safety expectations. Thus, managers with transformational and transactional leadership characteristics can get employees engaged in extra-role safety behaviors or SCBs. Nguni et al. (2006) indicated that citizenship behavior was more strongly associated with transformational leadership than transactional leadership

because of affecting the employee attitude, organizational commitment, and in-role performance. Both types of leadership (transactional and transformational) can increase change-oriented OCB by enhancing the quality of leader-member exchange. Also, employees' work-related attitudes (e.g., job satisfaction) are positively associated with change-oriented behavior (Choi, 2007). Empirical evidence showed the relationship between leadership and affiliative OCB. The affiliative OCB helps sustain working relationships and engagements (Khan et al., 2020). Tremblay and Gibson (2016) found that transactional leadership behavior can influence organizational citizenship behavior through the mediating effects of perceived supervisor support.

2.3. Influential factors

Safety knowledge and safety motivation as person (individual)-related factors affect the safety citizenship behaviors of workers (Christian et al., 2009; Curcuruto & Griffin, 2018). These factors also have positive relationships with workers' safety behavior (Guo et al., 2016). Laurent et al. (2020) showed that safety knowledge and safety motivation mediated the relationship between conscientiousness and SCB. Participation in voluntary safety activities can be improved by increasing employees' knowledge about safety. Workers who know how to enhance safety may volunteer to participate in safety activities to benefit their organization and others. Safety knowledge is related to employees' knowledge about safety practices and procedures. Knowledge about safety had a mediating role in the relationship between safety climate and individual safety behavior (Griffin & Neal, 2000). Safety motivation is regarded as the motivation of employees to perform the work in a safe manner, comply with safety rules, and participate in safety activities. Results from Quansah et al. (2021) showed that safety motivation can mediate the link between supervisor behavior and safety citizenship behavior.

Additionally, Jiang and Probst (2016) considered the relationships among leadership styles, safety knowledge and safety motivation, and safety participation. Their findings indicate that a high level of transformational leadership can lead to high safety motivation and increased safety participation. Recently, Basahel (2021) showed that safety leadership was positively influenced by safety knowledge. It was found that safety knowledge and safety motivation were predicted by safety leadership and a high level of safety performance was correlated with a high level of safety motivation. Also, the links between safety leadership and safety knowledge and safety leadership and safety motivation were positive (Basahel, 2021).

A psychological contract of safety represents the exchange relationships and reciprocal obligations between an employee and the employer (Walker, 2010). Based on psychological contract theory, implied promises and reciprocal obligations are important components in forming the psychological contract. The psychological contract of safety considers the reciprocal safety obligations (such as upholding safety standards and keeping work equipment functioning properly) of individuals with their organizations/employers/supervisors. Previous studies have shown the mediating role of PCS on the relationships between supervisor and co-worker safety behaviors and worker safety behavior (Newaz et al., 2019; Newaz et al., 2021).

As discussed by Newaz et al. (2019), PCS can be defined as perceived mutual obligations between employees and supervisors. Safety-related behaviors will be positively influenced if PCS between employees and supervisors (managers / the organization) are fulfilled (Newaz et al., 2019). Findings in the field of organizational behavior and organizational psychology suggested the link between psychological contract and some dimensions of organizational citizenship behavior such as civic virtue. Also, perceived employer obligation was positively related to helping (Coyle-Shapiro, 2002). However, there is little empirical evidence to support

the links between safety leadership and PCS and PCS and SCB. Ahmad et al. (2019) reported a positive effect of leadership on employees' extra-role behaviors and creative performance and showed the mediating role of the psychological contract in the relationship between leadership and employees' extra-role behaviors.

3. Objectives and hypothesis

The hypothesized model (Figure 1) represents the paths between safety leadership styles and SCBs by the mediational role of safety knowledge, safety motivation, and PCS. Based on reviewing the empirical evidence, the following hypotheses can be suggested:

H1a. Active transactional leadership is positively related to affiliative-oriented citizenship through the mediating role of safety knowledge.

H1b. Active transactional leadership is positively related to affiliative-oriented citizenship through the mediating role of safety motivation.

H1c. Active transactional leadership is positively related to affiliative-oriented citizenship through the mediating role of PCS.

H2a. Active transactional leadership is positively related to change-oriented citizenship through the mediating role of safety knowledge.

H2b. Active transactional leadership is positively related to change-oriented citizenship through the mediating role of safety motivation.

H2c. Active transactional leadership is positively related to change-oriented citizenship through the mediating role of PCS.

H3a. Transformational leadership is positively related to affiliative-oriented citizenship through the mediating role of safety knowledge.

H3b. Transformational leadership is positively related to affiliative-oriented citizenship through the mediating role of safety motivation.

H3c. Transformational leadership is positively related to affiliative-oriented citizenship through the mediating role of PCS.

H4a. Transformational leadership is positively related to change-oriented citizenship through the mediating role of safety knowledge.

H4b. Transformational leadership is positively related to change-oriented citizenship through the mediating role of safety motivation.

H4c. Transformational leadership is positively related to change-oriented citizenship through the mediating role of PCS.



Figure 1. Research model: safety knowledge, safety motivation, and psychological contract of safety as mediators of the relationship between safety leadership and SCBs

4. Method

4.1. Sample and procedure

This cross-sectional study was conducted at a steel-manufacturing company in Iran. To assess the study variables, a questionnaire consisting of six parts including demographic information, employees' perceptions regarding safety leadership styles, safety knowledge, safety motivation, PCS, and SCBs was distributed among 250 employees of the company and 205 questionnaires were gathered (response rate = 82%). For implementing the survey and gathering the self-reported answers, health and safety representatives of each unit of the study company distributed the questionnaires among employees. Questionnaires contained a short presentation letter describing the research objectives. All the data were gathered in a two-month period. The sample included employees in different occupations such as maintenance operators, computer numerical control (CNC) operators, electricians, machine operators, mechanics, packing workers, and crane operators. All members of the sample were male.

4.2. Measures

All responses to items were rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Scores for each measure were averaged across all respondents.

Employees' perceptions regarding safety leadership styles were assessed by 10 items adopted from the multifactor leadership questionnaire (Avolio et al., 1999) and Fernández-Muñiz et al. (2014). Example items are "The workers who comply with safety rules and procedures are actively valued and rewarded" and "The managers/supervisors arouse awareness about important safety issues". The Cronbach alpha for the scale was 0.86.

Safety knowledge was measured by five items adapted from Vinodkumar and Bhasi (2010). An example item is "I have expertise and know how to perform my job in a safe manner" and safety motivation was assessed by three items adapted from Neal and Griffin (2006). An example item is "I feel that it is worthwhile to put in effort to maintain or improve my personal safety and to maintain and improve others safety". The Cronbach alpha for the safety knowledge scale was 0.77 and the Cronbach alpha for the safety motivation scale was 0.78.

PCS was measured by 12 items adapted from Newaz et al. (2019). Example items are "My employer/manager/supervisor meets their obligation to set a good example for safety behavior"

and "My employer/manager/supervisor meets their obligation to inform employees about the outcome of safety meetings". The Cronbach alpha for the scale was 0.90.

Safety citizenship behavior was assessed by twenty-seven items adopted from Hofmann et al. (2003). Two distinct forms of SCBs including affiliative and change-oriented SCBs were considered in the current study. Affiliative-oriented SCBs include prosocial behaviors and change-oriented SCBs are proactive behaviors. Example items are "I am speaking up and encouraging others to get involved in safety issues", "I am helping other crew members learn about safe work practices", and "I am telling other crew members to follow safe working procedures". The Cronbach alpha for the scale was 0.91.

4.3. Data analysis

Gathered data were analyzed by statistical package for social science (SPSS 20) and analysis of moment structure software (AMOS 24). To test the hypothesized model, structural equation modelling (SEM) was employed to conduct the path analysis. To test the model fit, fit indices such as χ^2 ratio (< 3), CFI (comparative fit index) (> 0.95), and RMSEA (root mean square error of approximation) (< 0.08) were considered (Curcuruto & Griffin, 2018). In addition, the Spearman correlation coefficient was utilized to measure the correlations among study variables.

5. Results

5.1. Descriptive statistics

Information about the demographic attributes of employees is reported in Table 1.

Variable	Frequency	(%)
<i>Age</i>		
21-30	2	0.90
31-40	49	23.90
41-50	135	65.90
51-60	19	9.30
Older than 60	0	0.00
<i>Work experience</i>		
1-5 years	1	0.50
6-10 years	7	3.40
11-15 years	25	12.20
16-20 years	114	55.60
More than 20 years	58	28.30
<i>Education level</i>		
High school diploma and associate degree	101	49.30
Bachelor of Science	91	44.40
Master of Science and higher	13	6.30

Correlations among all study variables are shown in Table 2. Psychological contract of safety was more strongly related to transformational leadership ($r = 0.731$, $p < 0.01$) than active transactional leadership ($r = 0.515$, $p < 0.01$). This may reflect the importance of transformational style as a cognitive process in evoking changes in followers' values to align them with organizational goals and safety procedures in perceived safety obligation between worker and supervisor/employer.

Safety knowledge was more closely related to transformational leadership ($r = 0.165$, $p < 0.05$) than active transactional leadership ($r = 0.160$, $p < 0.05$), revealing the importance of transformational leadership in enhancing employee's knowledge of safety practices (Table 2). Additionally, the relationship between safety knowledge and psychological contract of safety was significant ($r = 0.175$, $p < 0.05$) (Table 2). This may suggest the importance of mutual safety obligations between employees and supervisors/employers in enhancing employees' willingness to utilize safety knowledge in proactively improving the safety of workplaces (Jiang & Probst, 2016).

According to Table 2, psychological contract of safety was significantly associated with change SCB ($r = 0.205$, $p < 0.01$). Safety knowledge and motivation were significantly related to both affiliative and change-oriented SCBs. Safety knowledge ($r = 0.409$, $p < 0.01$) and safety motivation ($r = 0.324$, $p < 0.01$) were strongly related to change SCB than affiliative SCB. Although positive relations were observed between the two forms of leadership (active transactional leadership, and transformational leadership) and the two forms of SCBs (affiliative-oriented SCB, and change-oriented SCB), these associations were small and not significant.

Table 2. Correlations among study variables (N = 205)

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Age	-										
2. Work experience	0.477**	-									
3. Education level	0.083	0.216**	-								
4. Safety outcomes	-0.106	-0.131	-0.026	-							
5. Active transactional leadership	0.104	0.218**	0.021	-0.168*	-						
6. Transformational leadership	0.032	0.062	0.226**	-0.041	0.510**	-					
7. Psychological contract of safety	0.015	0.126	0.157*	-0.130	0.515**	0.731**	-				
8. Safety knowledge	0.032	0.113	0.037	-0.102	0.160*	0.165*	0.175*	-			
9. Safety motivation	-0.031	0.055	0.038	-0.012	0.120	0.010	0.011	0.300**	-		
10. Affiliative SCB	0.081	0.144**	0.046	-0.170**	0.088	0.057	0.134	0.289**	0.240**	-	
11. Change SCB	0.018	0.129	0.025	-0.179**	0.091	0.083	0.205**	0.409**	0.324**	0.742**	-

Note: ** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level; and SCB is safety citizenship behavior.

5.2. Model assessment

The values of standardized regression coefficients for examining the effects of leadership styles on two classes of safety citizenship behavior considering the mediating roles of safety knowledge, safety motivation, and PCS are depicted in Figure 2. The results considering the direct effects suggested that although positive in value, both types of leadership had no significant direct effects on two classes of SCBs (the direct effect of active transactional leadership on affiliative-oriented SCB was 0.09 ($p > 0.05$) and also on change-oriented SCB was 0.08 ($p > 0.05$). The direct effect of transformational leadership on affiliative-oriented SCB was 0.06 ($p > 0.05$) and also on change-oriented SCB was 0.08 ($p > 0.05$)).

The results of path analysis showed that the effects of active transactional leadership on safety knowledge ($\beta = 0.13$, $p < 0.001$) and safety knowledge on affiliative-oriented SCB ($\beta = 0.15$, $p < 0.001$) were significant. Also, the effects of active transactional leadership on safety motivation ($\beta = 0.15$, $p < 0.001$) and safety motivation on affiliative-oriented SCB ($\beta = 0.14$, $p < 0.001$) were significant. In addition, the effects of active transactional leadership on PCS ($\beta = 0.17$, $p < 0.001$) and PCS on affiliative-oriented SCB ($\beta = 0.16$, $p < 0.001$) were significant. Moreover, the mediating roles of safety knowledge, safety motivation, and PCS between active

transactional leadership and change-oriented SCB were significant and all the hypotheses were confirmed.

The effects of transformational leadership on safety knowledge ($\beta = 0.21$, $p < 0.001$) and safety knowledge on change-oriented SCB ($\beta = 0.24$, $p < 0.001$) were significant. Also, the effects of transformational leadership on safety motivation ($\beta = 0.16$, $p < 0.001$) and safety motivation on change-oriented SCB ($\beta = 0.20$, $p < 0.001$) were significant. In addition, the effects of transformational leadership on PCS ($\beta = 0.61$, $p < 0.001$) and PCS on change-oriented SCB ($\beta = 0.23$, $p < 0.001$) were significant. Moreover, the mediating roles of safety knowledge, safety motivation, and PCS between transformational leadership and affiliative-oriented SCB were significant and all the hypotheses were confirmed.

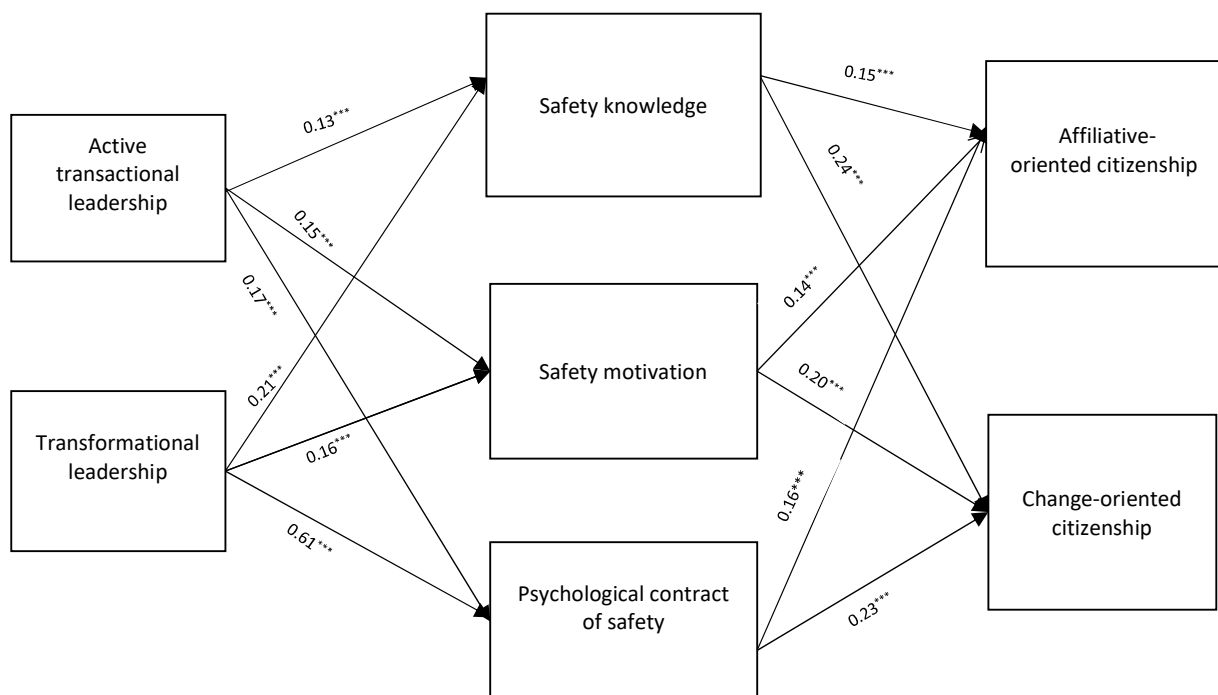


Figure 2. Path diagram depicting the link among leadership styles, safety knowledge, safety motivation, psychological contract of safety, and safety citizenship behaviors

Note: ***Correlation is significant at the 0.001 level

Table 3 shows the indirect effects of active transactional leadership and transformational leadership on affiliative-oriented SCB and change-oriented SCB through safety knowledge, safety motivation, and psychological contract of safety.

The indirect effects of active transactional leadership on affiliative-oriented SCB ($B = 0.49$, $p < 0.001$) and change-oriented SCB ($B = 0.74$, $p < 0.001$) through PCS were significant. In addition, the indirect effects of active transactional leadership on affiliative-oriented SCB and change-oriented SCB through safety knowledge and safety motivation were significant (Table 3).

The indirect effects of transformational leadership on affiliative-oriented SCB ($B = 0.50$, $p < 0.001$) and change-oriented SCB ($B = 0.76$, $p < 0.001$) through PCS were significant. In addition, the indirect effects of transformational leadership on affiliative-oriented SCB and change-oriented SCB through safety knowledge and safety motivation were significant. Chi-square/df,

CFI, and RMSEA as measures of model fit were employed. Results revealed a good fit for the study model (Chi-square/df = 1.02, CFI = 0.98, and RMSEA = 0.01).

Table 3. Mediation effects

	Affiliative-oriented safety citizenship behavior	Change-oriented safety citizenship behavior
Active transactional leadership		
Indirect effect of safety knowledge	0.22***	0.26***
Indirect effect of safety motivation	0.15***	0.16***
Indirect effect of psychological contract of safety	0.49***	0.74***
Transformational leadership		
Indirect effect of safety knowledge	0.21***	0.28***
Indirect effect of safety motivation	0.19***	0.26***
Indirect effect of psychological contract of safety	0.50***	0.76***

Note: ***p < 0.001

6. Discussion

Previous studies highlighted the roles of safety knowledge and safety motivation in employees' safety performance and employees' extra-role behaviors (Laurent et al., 2020; Neal & Griffin, 2006). Moreover, Dartey-Baah et al. (2020) proposed the contribution of both transactional and transformational leadership styles to the safety citizenship behavior of employees. This study also highlights the importance of psychological contract of safety in the relationships between transactional and transformational leadership and affiliative-oriented SCB and change-oriented SCB. Safety leadership and safety citizenship behavior were identified as important safety constructs that can affect worker's safety status and workplace injuries and accidents in high-risk industries (Meng & Chan, 2020). The current work was designed to address the mediating roles of safety knowledge, safety motivation, and psychological contract of safety in the relationships between leadership style and two forms of safety citizenship behavior.

The results indicated that both leadership styles had no direct effects on two classes of SCB, which is inconsistent with the finding of the previous study conducted by Dartey-Baah et al. (2020) in the power distribution sector. They showed both transformational and transactional styles have a significant positive influence on SCBs. A possible explanation for this difference might be that the study variables (safety leadership and SCB) may vary between organizational contexts and may depend upon the perceived organizational climate (Pilbeam et al., 2016). Regarding the contexts, the current study was conducted in the steel manufacturing industry which is known for unsafe working conditions in comparison to some other industrial sectors and has higher rates of occupational accidents and injuries (Berhan, 2020).

Although leadership styles have no direct effect on SCBs, the impact of leadership styles on SCBs were statistically significant by way of safety knowledge and safety motivation, indicating the importance of safety knowledge and safety motivation of employees in promoting a sound relationship between safety leadership and extra-role safety behaviors. This work supported previous findings provided by Laurent et al. (2020) that safety motivation and safety knowledge as person-related factors have significant effects on safety citizenship behaviors.

The findings of this study suggested that transformational leadership has more effects than active transactional leadership on safety knowledge and safety motivation. Furthermore, safety knowledge and safety motivation have more effects on change-oriented SCB than affiliative-oriented SCB. Smith et al. (2020) found that transformational leadership was positively associated with safety motivation and safety motivation was positively related to specific compliance-oriented behaviors such as personal protective equipment use. In addition, as demonstrated by Lu et al. (2019), employees' motivations mediate the link between active transactional leadership and employees' performance. Active transactional leadership also positively influences the components of safety performance including safety participation and safety compliance (Clarke, 2013).

Furthermore, the relationship between leadership styles and SCBs were mediated by the psychological contract of safety indicating that the perceived level of mutual obligations between employees and supervisors/leaders affects employees' safety perception, initiatives, and safety behavior. Workers tend to execute safe behavior when safety obligations between workers and supervisors are fulfilled. Psychological contract of safety can also be considered as a determinant and predictor of employees' safety behavior (Newaz et al., 2019). Leader behavior such as close attention to safety issues and a higher level of organizational support could lead to higher levels of personal initiative, safety voice, and more in-role behavior (Clarke, 2013; Hofmann et al.,

2003). Reciprocal obligations between workers and leaders not only ensure safe behaviors but also have important effects on workers' perceptions considering the importance of safety issues in workplaces. These reciprocal obligations can improve employees' commitment to their leaders, promoting their job performance and citizenship behaviors (Walumbwa et al., 2011).

The results of assessing the associations among variables suggested that safety knowledge and safety motivation were positively associated with both affiliative and change-oriented SCBs. Laurent et al. (2020) found that there is a significant relationship between safety motivation and safety knowledge and, subsequently, safety knowledge is positively associated with SCBs. Moreover, current findings demonstrated that the psychological contract of safety was positively related to change-oriented SCBs. Change-oriented behaviors emphasize voluntary action by employees to help organizational improvements and changes and have shown a relationship with the psychological internalization of safety programs (Curcuruto et al., 2019). Increased reciprocal obligations between employees and managers/supervisors and the level of fulfillment of PCS impact workers' safety actions and their safety behavior (Newaz et al., 2021). This mechanism can be explained through PCS. When workers perceived their supervisor act in a certain way that takes care of their safety, the mutual obligations between workers and supervisors are fulfilled. A high level of safety obligations should deliver positive safety perceptions and outcomes (Newaz et al., 2019).

The findings suggested that both active transactional and transformational leadership styles had a significant positive association with a psychological contract of safety, revealing that changes in followers' values concerning safety activities, listening to their concerns, clarifying their role and task requirements, and ensuring their compliance with safety rules and procedures can impact employees' safety behavior, produce desired safety outcomes, and lead to a high level of fulfillment of mutual safety obligation between workers and leaders. Active transactional leadership had a positive relationship with safety motivation. It has been argued that some types of transactional behaviors such as setting expectations for followers and giving effective feedback can influence employees' motivation (Clarke, 2013). Clarke (2013) emphasizes that some aspects of transactional leadership such as contingent reward have positive effects on workplace safety including reduced occupational injury rates and higher safety compliance.

There are some limitations associated with the current study. This work used a cross-sectional design and failed to consider the causal link between the variables (Hu et al., 2020). In addition, although previous findings confirmed that self-reported data on safety-related behaviors can predict safety performance and important safety outcomes, the self-reported data by employees in the current study should be taken into account when interpreting the findings (Hu et al., 2016). Self-reported data are subject to some issues such as inconsistent or incorrect answers and the problem of reliability and validity (Mosher & Miethe, 2015). Future studies can consider other measures such as supervisor ratings or peer ratings on safety-related behaviors. This work examined the mediating roles of safety knowledge, safety motivation, and psychological contract of safety on safety citizenship behavior. All study variables were assessed concerning employees' perceptions at one point in time and might change over time (Hu et al., 2016). Future research could also examine how the levels of affiliative and change-oriented SCBs vary over time and how demographic features, organizational factors, and psychosocial aspects influence both types of SCBs.

Understanding the relationships between safety leadership styles and SCBs and considering the effects of other influential variables will be of interest to managers and safety practitioners to

enhance safety in their organizations by encouraging employees' participation in extra-role safety behaviors and effective safety leadership of supervisors/employers.

7. Conclusion

This study indicated that safety knowledge, safety motivation, and psychological contract of safety could play significant mediating roles in the relationship between safety leadership and safety citizenship behavior. Safety knowledge, safety motivation, and PCS mediated the relationships of transformational and active transactional leadership styles with affiliative and change-oriented SCBs. The results may help identify avenues for enhancing safety in high-hazard industries by highlighting the factors influencing the safety of employees and demonstrating the significance of safety leadership, safety citizenship behavior, and the mediating variables that can affect the safety status of employees.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Omidia, Leila; Karimi, Hossein; Pilbeam, Colin; Mousavi, Saeid; Moradi, Gholamreza

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