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## Leadership styles and safety performance in high-risk industries: a systematic review

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### ABSTRACT

The importance of leadership on safety has been well acknowledged and studied for many years in various high-risk industries. This paper aims at (1) synthesising the existing safety leadership research by performing a systematic literature review to gain an overview of the relationship between various leadership styles and safety performance in high-risk industries with a main focus on health and workplace safety and (2) analysing and comparing the major results from the reviewed studies. The results show that nine leadership styles – transformational leadership, transactional leadership, leader–member exchange, authentic leadership, empowering leadership, ethical leadership, paternalistic leadership, charismatic leadership and passive leadership – have been frequently used in the development and validation of safety leadership theories as well as in understanding the leadership influence towards safety climate, safety compliance and safety participation in various contexts. However, blurred boundaries among the constructs of leadership styles alongside inconsistency in the conceptualisation and measurement of safety performance hinder the advancement of understanding safety leadership's influence on safety performance. It is therefore of importance that further research develops consistent measurement instruments and conceptualisation and that systems thinking is applied to the study of leadership styles' influence on safety performance.

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**KEYWORDS** Safety leadership; leadership style; safety performance; systematic literature review; high-risk industries

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## 1. Introduction

Safety leadership refers to ‘the process of interaction between leaders and followers, through which leaders can exert their influence on followers to achieve organisational safety goals under the circumstances of organisational and individual factors’ (Wu, 2005, p. 28). Effective safety leadership has been found not only to reduce human failures associated with incompletion, fatigue and inadequate communication, but also to be a prerequisite for improving safety-related performance, for example, by motivating members to work more efficiently, to take ownership and to be responsible for safety (Clarke, 2013; Lu & Yang, 2010; O’Dea & Flin, 2001), as well as reducing accident and injury rates (Mullen & Kevin Kelloway, 2009; Zohar, 2002).

Safety leadership has an impact on different aspects of safety performance, which refers to an organisational metric of safety outcomes, measured by workplace accidents, injuries and fatalities, and it also refers to the ‘actions or behaviours that individuals exhibit in almost all jobs to promote the health and safety of workers, clients, the public, and the environment’ (Burke et al., 2002, p. 432). The safety performance model developed by Griffin and Neal (2000), based on theories of job performance (Borman & Motowidlo, 1993), includes safety compliance and safety participation. While safety compliance refers to the employee’s performance of activities that directly influence workplace safety, such as ‘adhering to safety procedures and carrying out work in a safe manner’, safety participation refers to the employees’ behaviours in creating an atmosphere that supports safety, such as by ‘helping co-workers, promoting the safety program within the workplace, demonstrating initiative, and putting effort into improving safety in the workplace’ (Neal et al., 2000, p. 101; Griffin & Neal, 2000). It is worth noting that there has not been a consensus about the constituents of safety performance. The lack of an adequate measure for this concept is one of the barriers when evaluating the effectiveness of safety programmes (Glendon & Litherland, 2001). In this paper, safety performance indicates not only a metric for individuals’ safety-related behaviours but also an organisational metric for safety outcome.

Examining the influence of leadership on safety in high-risk industrial contexts have provided insights into how leadership could be developed and measured for better safety performance (Borgersen et al., 2014; Chen, 2017; Conchie & Donald, 2009; Dahl & Olsen, 2013; Hoffmeister et al., 2014; Li et al., 2015; McFadden et al., 2009). High-risk industries refer to ‘the industries whose work process imply considerable risk for people and the environment, regarding large potential for either major accidents as in aviation, nuclear power generation, or chemical production or smaller scale incidents and occupational accidents as in medicine or timber harvesting as both people and the environment may be at considerable risk in such

settings' (Grote, 2012, p. 1983). The success or failure of organisations are highly influenced by leadership styles and leader-led interventions (Oladipo et al., 2013). Understanding the relationship between leadership styles and safety performance is therefore of importance.

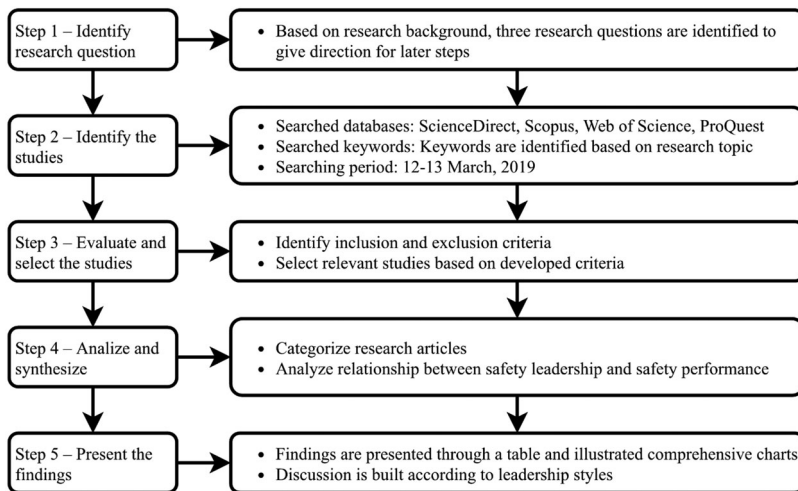
While several studies have been conducted, confirming the positive association between leadership and safety performance (Christian et al., 2009; Clarke, 2013), no concrete conclusion has been drawn regarding which leadership style is the most effective. Blurred boundaries among the constructs of leadership styles alongside inconsistency in the conceptualisation and measurement of safety performance may hinder the advancement of understanding safety leadership's influence on safety performance. Moreover, researchers usually consider the impact of a limited number of leadership styles (i.e. transformational leadership, transactional leadership, leader-member exchange [LMX]) (Christian et al., 2009; Clarke, 2013). Although they have clearly pictured the relationship between leadership styles and safety performance, many studies have failed to specify the context in which this relationship exists (Clarke, 2013). Taking the context into consideration is indispensable, as leadership varies under different circumstances (Denis et al., 2010). However, many prior studies on safety leadership were not situated within the high-risk industrial contexts.

To facilitate a thorough understanding of safety leadership research, this paper aims 1) to synthesise the existing safety leadership research by performing a systematic literature review to gain an overview of the relationship between various leadership styles and safety performance in high-risk industries and 2) to analyse and compare the major results of the reviewed studies.

## 2. Method

A systematic literature review 'locates existing studies, selects and evaluates contributions, analyses and synthesises data, and reports the evidence in such a way that allows reasonably clean conclusions to be reached' (Denyer & Tranfield, 2009, p. 671). The review process performed in this study consisted of five key steps, as presented in [Figure 1](#).

The literature searches were undertaken on a combination of four databases: Science Direct, Scopus, Web of Science and ProQuest. Search terms were used to locate suitable research articles that were related to safety leadership or to the influence of leadership styles on safety performance. The list consisted of 'leadership', 'leadership style', 'safety leadership', 'transformational leadership', 'transactional leadership', 'LMX', 'empowering leadership', 'authentic leadership', 'safety performance', 'safety outcome', 'safety behaviour' and 'safety behaviour'. To ensure that all relevant studies



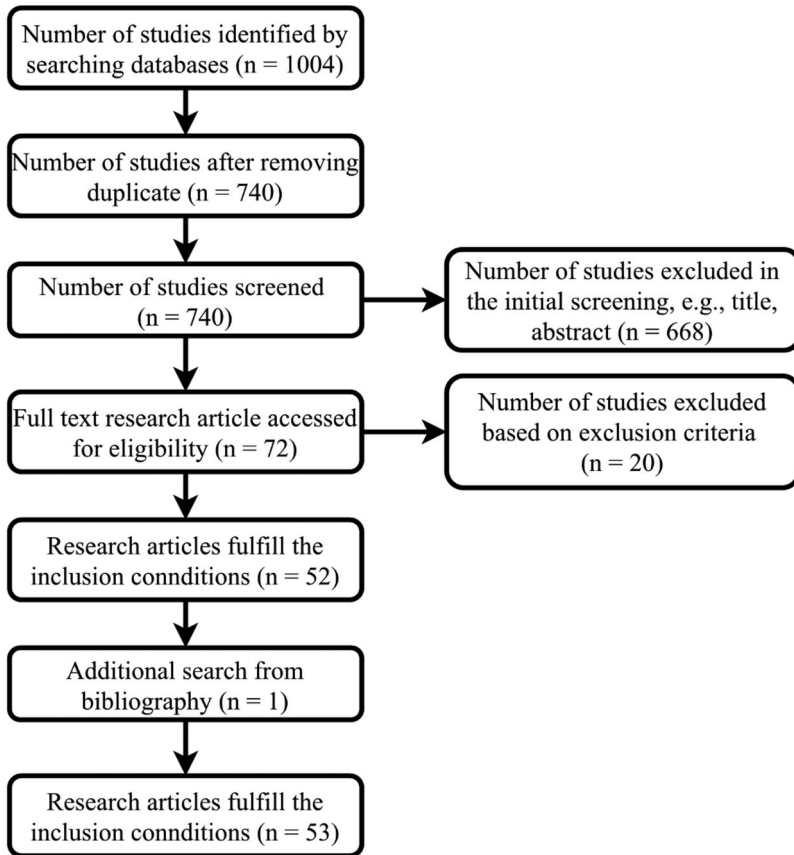
**Figure 1.** A summary of the systematic literature review process.

were included in the review process, the database searches were conducted on the 12<sup>th</sup> and 13<sup>th</sup> of March 2019 by employing several criteria to ensure the selected articles are original and peer-reviewed studies, English language, full text access, search terms are included in the title, abstract, or keywords, and no duplicate studies. The studies need to be conducted in a high-risk industry context and reflect the relationship between safety leadership/leadership style(s) and safety performance.

Studies that did not fulfil these criteria were excluded. Initially, the title, abstract, introduction and conclusion were scanned to ascertain whether the content was relevant. Then, the selected research articles were examined to extract information for the synthesising and analysing step. The extracted information included leadership style(s), authors' information, year of publication, industry, method(s), management level and findings. By using the selected keywords, over 1,000 research articles were identified in the search of the four databases. After the initial selection and screening process, as detailed in [Figure 2](#), 53 research articles remained for further analysis.

### 3. Findings

The systematic review of 53 articles revealed nine leadership styles that had been studied in relation to safety across various high-risk industrial contexts: transformational leadership, transactional leadership, LMX, authentic leadership, empowering leadership, ethical leadership, paternalistic leadership, charismatic leadership and passive leadership. [Table 1](#) provides an overview of



**Figure 2.** Flowchart of the systematic literature review.

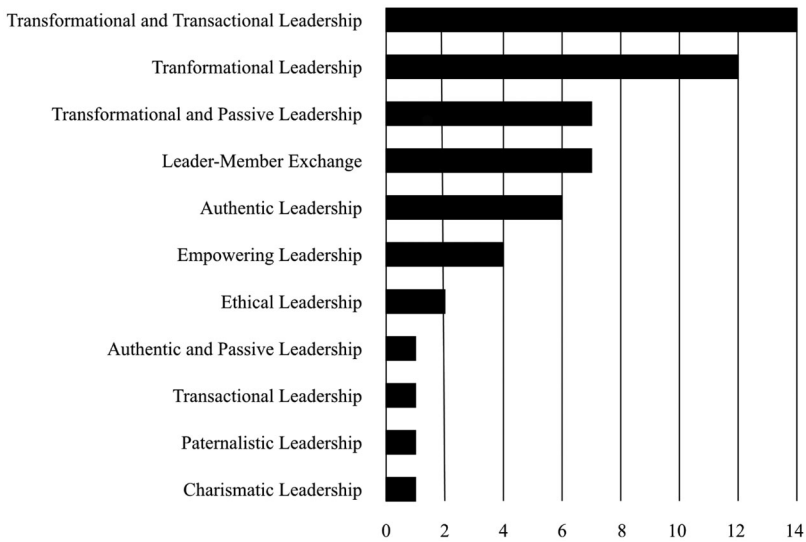
the key attributes underpinning each of the nine leadership styles identified in the review.

The majority of the studies focussed on the influence of transformational and transactional leadership on safety performance, whereas ethical, paternalistic and charismatic leadership styles received relatively less attention. The number of articles studying each leadership style(s) is presented in [Figure 3](#).

In general, all the leadership styles – apart from passive leadership – were shown to have a positive influence on safety performance through reducing the incident and accident rates, creating a positive safety climate, and enhancing employees' safety participation and safety compliance. This relationship can be expressed directly or indirectly through a range of mediators or moderators. The key findings of the reviewed articles are summarised in [Table 2](#).

**Table 1.** Attributes of the included leadership styles.

Transformational leadership	(1) Idealised influence: a leader is seen as an example for their employees to imitate. (2) Inspirational motivation: employees are encouraged to achieve something beyond their individual goals. (3) Intellectual stimulation: employees are inspired to think creatively and innovatively. (4) Individualised consideration: respect and personal concern is shown to employees as individual (Bass & Avolio, 1997).
Transactional leadership	(1) Contingent reward: an adequate reward and recognition for positive behaviours are clearly communicated to employees. (2) Management by Exception Active: a leader is proactive and emphasise prevention (Bass & Avolio, 1997).
Authentic leadership	Self-awareness: a leader seeks feedback to improve interaction with others and accurately describes how others view their capabilities. Relational transparency: a leader presents one's authentic self to others by saying exactly what he or she means and is willing to admit mistakes when they are made. Balanced processing: a leader objectively analyses all relevant points of view before coming to a decision. Such leader also solicits views that challenge their deeply held positions. Internalized moral perspective: a leader demonstrates the consistency between beliefs and actions and makes decision based on their core beliefs (Gardner et al., 2005).
Ethical leadership	Communication: a leader is willing to respond to employees' concerns Caring: a leader cares a lot for employees Role modelling: a leader conducts his/her personal life in an ethical way Treating employees fairly: a leader makes correct and fair decisions Honesty: a leader can be trusted Listening to employees: a leader listens to what employees want to say patiently (Brown et al., 2005)
Charismatic leadership	Charismatic leadership is characterised by Intensive and Care, Visionary appeal, Charisma and Moral example (Li et al., 2015). Charismatic leaders usually show their ability to formulate and articulate an inspiration vision. Their behaviours and actions foster an impression that they and their mission are extraordinary (Conger et al., 2000).
Leader-Member Exchange	Respect: mutual respect for the capabilities of the other. Trust: the anticipation of deepening reciprocal trust with the other. Obligation: the expectation that interacting obligation will grow over time as career-oriented social exchanges blossom into a partnership (Graen & Uhl-Bien, 1995).
Empowering leadership	(1) Leading by example: leader's commitment to work. (2) Participative decision-making: employee's inputs are used to make decision, display behaviours by leaders. (3) Coaching: employees are encouraged to solve problem by themselves to share and increase knowledge. (4) Informing: information is shared by leaders. (5) Showing concern/ interacting with employees: a leader shows concern for employee's welfare and discuss with them (Arnold, Arad, Rhoades, & Drasgow, 2000).
Paternalistic leadership	(1) Morality: the degree to which the leader acts with self-discipline and unselfish. (2) Benevolent: 'Creating a virtuous cycle of encouraging and initiating positive change in organisations through: a) ethical decision making, b) creating a sense of meaning, c) inspiring hope and fostering courage for positive action, and d) leaving a positive impact for the larger community' (Karakas & Sarigollu, 2011, p. 537). (3) Authoritarianism: a leader shows strong authority and control over employees and demand employees' unquestioned conformality (Farh & Cheng, 2000).
Passive leadership	Passive leader generally only intervenes when a safety-related problem has happened or the safety-related situation has become serious that action is required or when they have no choice but take action (Kelloway et al., 2006)



**Figure 3.** Number of research articles with their corresponding studied leadership style(s).

### ***3.1. Influence of transformational and transactional leadership on safety performance***

As shown in [Table 2](#), transformational and transactional leadership-based interventions are of critical importance in establishing different safety performance. The most noticeable influence is the safety climate, which refers to employees' perceptions regarding safety in their organisation (Zohar, 1980). The importance of transformational and transactional leadership in formulating and developing a safety climate is well documented in various industrial contexts, for example, in the construction (Hoffmeister et al., 2014; Toderi et al., 2016), military (Zohar & Tenne-Gazit, 2008), coalmine (Du & Sun, 2012) and petrochemical industries (Wu et al., 2011). The safety climate contributes towards lowering injury rates (Zohar, 2002), enhancing safety participation and safety compliance (Clarke & Ward, 2006; Martinez-Corcoles & Stephanou, 2017; Smith et al., 2016) as well as influencing other safety behaviours, including risky behaviours, safety inspections, accident investigations, safety training and safety motivation (Martinez-Corcoles & Stephanou, 2017; Wu et al., 2011). Besides its mediating role, safety climate can also be a moderator in the leadership–safety compliance relationship. In other words, under positive group-safety climate conditions, employee's safety compliance increases, corresponding to higher levels of supervisory leadership; under weak group-safety climate conditions, no improvement in safety compliance has been shown (Kapp, 2012). Transformational

Table 2. Synthesis of the systematic literature review findings on safety leadership.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
Authentic leadership	Borgersen et al. (2014)	Shipping	Front-line	A multiple regression analysis	Authentic leadership positively and significantly predicts the perception of the safety climate.
	Cavazotte et al. (2013)	Oil industry	Front-line	Structural equation modelling (SEM)	Authentic leadership influences safety performance, that is, safety compliance and safety participation of workers through the perception of justice. It also influences the perception of justice through the supervisor's feedback.
Authentic, Laissez-faire	Eid et al. (2012)	Offshore Oil&Gas	Not specific	Theory-driven literature review	Authentic leadership affects safety outcomes through positive safety climate perceptions. Also, psychological capital is proposed to mediate the impact of the safety climate on safety outcomes.
	Hystad et al. (2014)	Offshore Oil&Gas	Front-line	SEM	Authentic leadership has an indirect effect via psychological capital and a positive direct effect on safety climate, which is negatively related to subjective risk perceptions.
	Nielsen et al. (2013)	Offshore Oil&Gas	Front-line	Mediation analysis	Safety climate mediates the relationship between authentic leadership and risk perception.
	Wong and Giallonardo (2013)	Healthcare	Front-line	SEM	Authentic leadership is significantly related to decreased adverse patient outcomes via trust in the manager and in areas of work life.
	Sandhaland et al. (2017)	Shipping	Front-line	Path analysis	Authentic leadership is positively associated with situation awareness.
Charismatic Leadership	Li et al. (2015)	Coalmines	Not specific	SEM	Laissez-faire leadership is negatively associated with situation awareness and positively associated with psychological job demands. Psychological job demands are negatively associated with situation awareness and positively related to the willingness to take risks. Adequate situation awareness is negatively related to the willingness to take risks. Charismatic leadership has a significantly negative correlation with unsafe behaviours of miners through attitudes towards safety.

*(continued)*

Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
Empowering leadership	Hechanova-Alampay and Beehr (2001)	Chemical industry	Not specific	Regression analysis	The span of control (positively) and empowerment (negatively) are associated with unsafe behaviours and safety accidents. Unsafe behaviours are positively related to safety accidents.
	Martinez-Corcoles et al. (2011)	Nuclear power	Front-line	CFA (confirmatory factor analysis), SEM	Safety climate is a mediator in the relationship between leadership and safety behaviours. Safety culture is a mediator in the relationship between leadership and safety climate and also directly affects safety climate and safety behaviours.
	Martinez-Córcoles et al. (2012)	Nuclear power	Front-line	CFA, SEM	The promotion of dialogue and open communication partially mediates the relationship between empowering leadership and collaborative team learning, which is a mediator in the relationship between empowering leadership and safety participation.
	Martinez-Córcoles et al. (2013)	Nuclear power	Front-line	CFA, multilevel analysis	Empowering leadership enhances safety compliance and safety participation and reduces team members' risky behaviours.
Ethical leadership	Lotfi et al. (2018)	Nursing	Front-line	SEM	The ethical leadership of nursing managers is significantly positively related to the perception of a patient safety culture and organisational commitment.
	Lu et al. (2013)	Container shipping	Front-line	EFA (exploratory factor analysis), SEM	Organisational commitment predicts the patient safety culture. Ethical leadership has a positive influence on the ethical climate.

*(continued)*

Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
LMX					
	Credo et al. (2010)	Drilling	Front-line	CFA, SEM	Perceptions of the management's safety concerns is positively related to perceived organisational ethics, perceived organisational support (POS) and LMX. Perceived organisational ethics is positively related to POS. LMX positively influences POS, which in turn positively impacts employee safety involvement. POS is significantly associated with safety communication. LMX is significantly associated with safety communication, safety commitment and accidents. Safety communication and safety commitment mediate the relationship between POS, LMX and accidents.
	Hofmann and Morgeson (1999)	Manufacturing	Front-line	SEM	LMX has a positive influence on incident reporting intentions, which is mediated by reporting-specific trust. The positive relationship between organisational identification and incident reporting intention is moderated by patient safety codification. Additionally, the relationship between LMX and reporting-specific trust is moderated by management support.
	Jungbauer et al. (2018)	Healthcare	Front-line	Multilevel SEM	The LMX and safety climate dimensions of perceived management attitudes towards safety as well as job demands interfering with safety are predictors of upward safety communication.
	Kath et al. (2010)	Railways	Front-line	Dominance analysis	LMX has a positive effect on safety climate, which in turn has a positive influence on employees' safety organisational citizenship behaviours (SOCBs).
	Lu et al. (2017)	Container terminal operation	Front-line	CFA, SEM	LMX has a positive and significant effect on safety-related events, while safety communication has a negative and non-significant effect. Safety
	Michael et al. (2006)	Manufacturing industry	Front-line	Hierarchical regression analyses	

*(continued)*



Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
Paternalistic leadership	Chen (2017)	Airlines	Front-line	ANOVA, regression analysis	communication is insufficient to ensure a low incident rate. The paternalistic leadership dimensions of morality related to cabin crews' upward safety leadership and benevolent leadership are positively related to cabin crews' upward safety communication, whereas the authoritarian leadership dimension is negatively related to cabin crews' upward safety communication. The paternalistic leadership dimensions of morality leadership and benevolent leadership have more positive effects, whereas authoritarian leadership has more negative effects on cabin crews' prosocial voice behaviour than acquiescent and defensive voice behaviours do.
Transformational leadership	Adjekum (2017)	Aviation	Front-line	CFA, SEM-PATH	Transformational leadership has a direct effect on safety participation and an indirect effect on safety compliance through safety motivation. Safety motivation is directly and positively related to safety compliance and safety participation.
	Conchie et al. (2012)	Oil&Gas	Front-line	CFA	Safety-specific transformational leadership (SSTFL) influences safety voice-citizenship behaviour sequentially through affect-based trust and disclosure trust intentions. The effects of disclosure trust intentions to mediate the effect of affect-based trust on safety voice behaviours are only significant when the reliance trust intentions are moderate to high.
	Conchie and Donald (2009)	Construction	Front-line	Hierarchical regression	Safety-specific trust moderates rather than mediates the effects of SSTFL on subordinates' safety citizenship behaviours. For high and moderate safety-specific trust levels, leaders have a significant effect on subordinates' behaviours.

(continued)

Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
	Conchie (2013)	Construction	Front-line	CFA	Employee motivation mediates the effect of SSTFL on employees' safety behaviours; that is, SSTFL is related to challenge citizenship behaviours via intrinsic motivation and is related to safety compliance via identified regulations. Trust moderates the indirect effects of SSTFL on employees' challenge citizenship behaviours via intrinsic motivation.
	Hillen et al. (2017)	Healthcare	Top management	Bivariate analysis, regression analysis	Transformational leadership has a significant effect on the reporting frequency of safety events, as perceived by medical directors.
	Lu and Lin (2014)	Container shipping industry	Front-line	Factor analysis, ANOVA, hierarchical regression analysis	The national cultural dimensions of power distance and masculinity between local employees and foreign managing directors have a negative effect on job performance (task performance and contextual performance), whereas uncertainty avoidance and collectivism have a positive influence on job performance. Transformational leadership is positively associated with job performance and moderates the relationship between national culture and job performance.
	McCadden et al. (2009)	Healthcare	Top management	SEM	Transformational leadership is positively and directly related to a patient safety culture, which in turn is related to the increased implementation of patient safety initiatives and to positive patient safety outcomes. Transformational leadership has an indirect relationship with patient safety outcomes, which is mediated through culture and initiatives.

*(continued)*



Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
	Mullen and Kevin Kelloway (2009)	Healthcare	Front-line	CFA	SSTFL training results in higher leader safety attitudes, intentions to promote safety, and perceptions of self-efficacy than both the general transformational training and the control group with no training.
	Sleepers and Mbohwa (2015)	Construction	Top management	CFA	Factors of safety leadership (safety vision, culture, communication) have a key influence on CEOs' and managers' safety commitment and safety culture, which in turn has a positive effect on safety performance. Transformational leadership and safety motivation are positive drivers for the correct safety behaviour in the construction sector.
	Zohar and Tenne-Gazit (2008)	Military	Front-line	CFA, linear regression model	The density of the communication network partially mediates the relationship between transformational leadership and safety climate. Centralisation of the communication network is negatively associated with climate strength. The density and the centralisation of a unit's friendship network is positively related to its safety climate strength.
	Fernandez-Muniz et al. (2017)	Process industries	Front-line	SEM	Safety leadership has a direct negative effect on work pressure and a direct positive effect on environmental conditions and occupational hazards as well as on safety incentives. Safety leadership does not have a significant direct effect on either safety compliance or safety participation, but it does have an indirect effect via working conditions (work pressure, safety incentives, environmental conditions, occupational hazards and co-worker support). Safety leadership has an indirect effect on co-worker support via environmental conditions and occupational hazards.

(continued)

Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
Transformational and Passive leadership	Merrill (2015)	Nursing	Front-line	Bivariate and regression analyses	Transformational leadership has a positive influence on the safety climate, whereas laissez-faire leadership is negatively related to the safety climate.
	Mullen et al. (2011)	Healthcare and other occupations	Front-line	Moderated regression analysis	SSTFL has a positive effect on safety compliance and safety participation, whereas passive leadership has a negative effect on safety compliance but not on safety participation. If the leader has a high level of engagement in terms of both passive leadership and SSTFL, the predictive effect of SSTFL on safety compliance and safety participation is diminished.
	Smith et al. (2016)	Fire service	Front-line	SEM	SSTFL is positively related, and passive leadership is negatively related to the safety climate, which has a positive and significant effect on safety compliance and safety participation. In addition, SSTFL has a positive, significant and direct effect on safety compliance and safety participation, whereas passive leadership is not significantly related to these two variables.
	Toderi et al. (2016)	Construction	Not specific	EFA, SEM	SSTFL has a significant and positive effect on the safety climate, whereas passive leadership has a significant and negative effect on the safety climate.
	Vignoli et al. (2018)	Chemical industry	Front-line	Linear regression analyses, moderation analysis	Both the self-efficacy of trainees in the non-technical skill transfer process and transformational leadership have influence on the intention to transfer safety training, while passive leadership does not. Also, the combination of higher levels of self-efficacy and higher levels of transformational leadership leads to higher levels of the intention to transfer.

*(continued)*



Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
	Vignoli et al. (2018)	Chemical industry	Not specific	Mediation analysis	Safety training and transformational leadership lead to higher levels of work engagement and subsequently enhance SOCBS, whereas passive leadership leads to lower levels of work engagement and subsequently decreases levels of SOCBS.
	Jiang and Probst (2016)	Public transit agency	Front-line	Hierarchical linear modelling	Transformational leadership has a direct and positive influence on safety participation. Passive leadership is not related to safety participation. Transformational leadership does not strengthen the safety knowledge–participation relationship, and passive leadership does not weaken the safety motivation–participation relationship. Under low transformational leadership levels, employees' safety motivation is not related to safety participation, whereas under high passive leadership, employees' safety knowledge is not related to safety participation.
Transformational and Transactional leadership	Clarke and Ward (2006)	Manufacturing industry	Front-line	SEM	The leader's influence tactics associated with transformational leadership have a significant relationship with safety participation, mediated partially by safety climate (consultation) or fully (inspirational appeals). The leader's influence tactics associated with transactional leadership have a direct influence on safety participation (coalition) and are partially mediated via safety climate (rational persuasion).
	Dahl and Olsen (2013)	Offshore Oil&Gas	Not specific	CFA, EFA, SEM	Three work climate dimensions (workers' competence and involvement, role clarity and the follow-up of contractors) mediate the positive significant relationship between leadership involvement in daily work operations and the level of safety compliance.

(continued)

Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
	Dartey-Baah and Addo (2018)	Power transmission subsector	Front-line	SEM	Leadership involvement also has a moderate direct effect on the level of safety compliance. The idealised influence dimension of transformational leadership has a positive significant effect on safety compliance and participation. The management-by-exception (active) (MBEA) dimension of transactional leadership does not have a significant effect on safety compliance but has a positive effect on safety participation.
	Du and Sun (2012)	Coalmines	Top management	EFA, SEM	Safety leadership is positively associated with the safety climate in coalmines.
	Fernandez-Muniz et al. (2014)	Construction and services	Front-line	SEM	Transformational leadership has a direct positive effect on employees' safety participation, safety compliance and employee satisfaction, while transactional leadership does not. Transactional and transformational leadership have a direct positive effect on proactive risk management, which has a direct positive influence on safety participation and safety compliance. Safety participation has a direct positive effect on safety compliance and employee satisfaction. Safety compliance has a direct positive effect on safety outcomes, which in turn directly positively affects employee satisfaction.
	Hoffmeister et al. (2014)	Construction	Front-line	Relative weights analysis, CFA	All dimensions of transformational and transactional leadership are related to at least one safety outcome, except for MBEA. Different dimensions are related to different outcomes. Idealised attributes are the most important factor for a positive safety climate, whereas idealised behaviours are the most important factor in safety participation. Intellectual stimulation, inspiration motivation and contingent reward do predict safety climate, compliance and participation, but the relative importance of each varies considerably across the outcomes. Individualised consideration hardly contributes a large amount to the overall variance explained in safety outcomes for both

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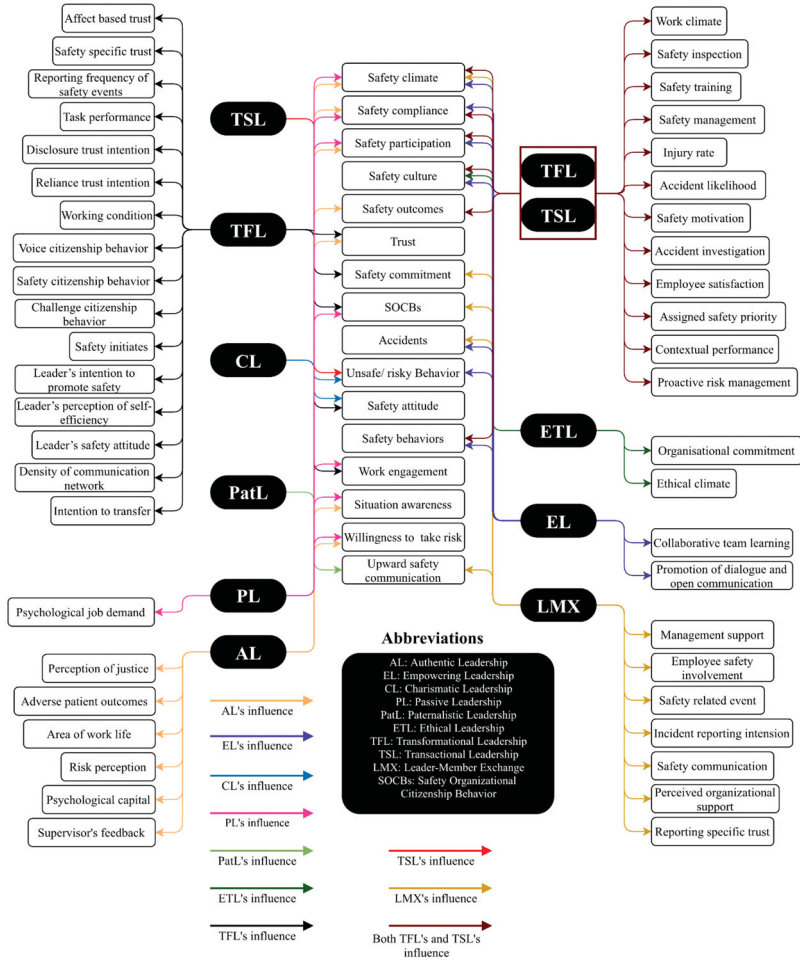
Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
	Kapp (2012)	Manufacturing and construction	Front-line	Moderated multiple regression (MMR)	<p>apprentices and journeymen. Job type can be a moderator.</p> <p>A greater level of transformational leadership and contingent reward are both associated with greater levels of safety compliance and safety participation. However, the group-safety climate moderates the leadership–safety compliance relationship.</p>
	Lu and Yang (2010)	Container terminal operation	Top management	CFA	Transformational leadership (e.g. safety motivation and safety concern) is positively related to safety compliance and safety participation, whereas safety policy being closely linked to transactional leadership has a positive but not a significant influence on safety compliance.
	Lu et al. (2016)	Dry bulk shipping	Front-line	Multiple regression analysis	National cultural dimensions, such as power distance, uncertainty avoidance, collectivism and long-term orientation, have a positive effect on safety behaviour. Long-term orientation has a positive influence, whereas masculinity has a negative influence on safety attitude.
	Willis et al. (2017)	Oil&Gas service and food manufacturing	Front-line	Multilevel analysis	Transformational leadership is positively related to safety attitude and safety behaviour. Transactional leadership is positively related to safety behaviour but does not have a significant influence on the safety attitude of seafarers.
	Wu et al. (2011)	Petrochemical industry	Front-line	SEM	If the accident likelihood is high, MBEA and (1) safety participation and (2) contextual performance are positively related, while the relationship between transformational leadership and contextual performance is negative, and vice versa when the accident likelihood is low. Safety leadership has a direct positive effect on the safety climate and safety performance (safety

(continued)

Table 2. Continued.

Leadership style(s)	Author(s)	Industrial context	Management level	Research method	Key finding(s)
	Wu et al. (2017)	Construction	Front-line	t-test	inspections, accident investigations, safety training, safety motivation) and an indirect influence on safety performance via the safety climate. The direct effect is greater than the indirect effect. Leadership influences safety performance (i.e. safety participation and safety compliance) through two major mediators: safety management and safety culture.
	Zohar (2002)	Metal processing plant	Front-line	Multiple regression	Assigned safety priority moderates the relationship between leadership styles and the injury rate. The safety climate mediates the relationship between leadership style and the injury rate.
Transactional Leadership	Martinez-Corcoles and Stephanou (2017)	Military	Front-line	SEM	Overall active transactional leadership has a positive influence on three performance behaviours - safety compliance and safety participation and a negative influence on risky behaviours via the safety climate. In addition, MBEA has a direct influence on three performance behaviours.



**Figure 4.** A model of nine leadership styles' influence on safety performance.

leadership is known to be positively associated with the safety climate; this relationship can be mediated by the density of the communication network (Zohar & Tenne-Gazit, 2008).

Transformational and transactional leadership are also directly and positively associated with safety participation and safety compliance (Adjekum, 2017; Dahl & Olsen, 2013; Dartey-Baah & Addo, 2018; Fernandez-Muniz et al., 2014; Jiang & Probst, 2016; Lu & Yang, 2010; Smith et al., 2016). In most studies, however, safety participation and safety compliance can be fostered if leaders establish a positive safety climate: a working climate characterised by role clarity, the follow-up of contractors' and workers' competence and involvement (Dahl & Olsen, 2013), good working conditions (Fernandez-Muniz et al., 2017) and proper safety management and culture

(Wu et al., 2017). In the offshore oil and gas industry, transformational leadership appears to be less effective for contextual performance if employees perceive the risk of an accident as high; by contrast, leaders who engage management-by-exception (active) (MBEA) have a positive influence on safety participation and contextual performance (Willis et al., 2017).

This result indicates that the effectiveness of leadership styles could be dependent on employees' perception of safety-critical context. If the fit between leaders' behaviours and employees' situational regulatory focus is satisfied, leadership styles can lead to beneficial outcome (Hamstra et al., 2014). As such, perceiving high threat of an accident is likely to put followers' self-regulatory focus more towards prevention of losses, and therefore make followers more sensitive towards their leaders' MBEA behaviours because transactional leadership is associated with prevention focus while transformational leadership is associated with promotion focus (Van Dijk & Kark, 2007). In other words, in safety-critical condition, leader practices such as correcting errors and active monitoring of safety behaviour (MBEA) are likely to be strongly associated with safety performance. On the other hand, threats of danger can increase the complexity in a work environment, which could then lead to increased cognitive demands (Hannah et al., 2009). Therefore, if the task is highly complex, leaders engage less frequently in transformational leadership because 'there is no space for stimulating, inspiring behaviours, or soliciting followers' ideas but it is more beneficial to give clear directions' (Dóci & Hofmans, 2015, p. 9). Similarly, if employees' perceive the risk for an accident as high, they might have less capacity to respond to transformational leaders' behaviours. (Dóci & Hofmans, 2015).

Contrary to the finding by Martinez-Corcoles and Stephanou (2017) that MBEA – a dimension of transactional leadership – directly and positively influences safety participation and safety compliance, Dartey-Baah and Addo (2018) did not find a significant effect of MBEA on safety compliance. This result is, however, consistent with that of Hoffmeister et al. (2014), who also found a non-significant relationship between MBEA and safety compliance. It is also partly in line with Fernandez-Muniz et al. (2014), who suggested that, overall, transactional leadership did not influence safety compliance, as MBEA involves active monitoring for mistake prevention and correction, which makes employees choose to comply with safety rules and regulations only when their supervisors are around checking on them, or because close monitoring is more about individual tasks and goal achievement than about handling those tasks in a safe manner or in accordance with the safety rules (Dartey-Baah & Addo, 2018). Dartey-Baah and Addo (2018) conclude that MBEA is positively associated with safety participation. This is in line with Martinez-Corcoles and Stephanou (2017), but contrasts

with Hoffmeister et al. (2014) finding of MBEA not having any significant influence on safety participation, and it partly contrasts with Fernandez-Muniz et al. (2014), who found that, overall, transactional leadership did not have a significant influence on safety participation. Additionally, transactional leadership is identified as having positive and direct connections with safety inspections, safety training and accident investigations (Wu et al., 2011), and it reduces risky behaviours (Martinez-Corcoles & Stephanou, 2017).

Regarding transformational leadership, this style can influence safety compliance by improving subordinates' safety motivation (Adjekum, 2017; Conchie, 2013). Under condition of a high level of transformational leadership, employees with a high level of safety motivation show the highest level of safety participation (Jiang & Probst, 2016). Although motivation is also an important factor through which transformational leadership influences employees' behaviours (such as their safety compliance), employees' challenge their citizenship (i.e. behaviours that employees choose to engage in through their willingness or when following calls for internal regulation), the mediating role of motivation only exists when employees' trust in the leader is high (Conchie, 2013). This finding is also in line with the conclusion by Conchie and Donald (2009), who found that trust moderated rather than mediated the relationship between transformational leadership and employees' safety citizenship behaviours. Also, improving employees' affect-based trust in their leaders has an impact on employees' intentions to engage in safety behaviours (Conchie et al., 2012).

In the chemical industry, transformational leadership increases the level of work engagement and subsequently enhances safety organisational citizenship behaviours (SOCBs); that is, behaviours that emphasise the enhancement of the organisation's safety performance (Vignoli, 2018). In the healthcare industry, transformational leadership may establish a safety culture, which in turn increases a level of implementation of patient safety initiatives, leading to positive patient safety outcomes (McFadden et al., 2009). Additionally, transformational leaders can prevent patients from experiencing unintended harm by promoting their willingness to report safety events to staff (Hillen et al., 2017). Transformational leadership could also promote both the employees' safety attitude (Lu et al., 2016) and the leaders' safety attitude (Mullen & Kevin Kelloway, 2009), which increases the individual's intention to perform safety behaviours. Positive and direct connections between transformational leadership and job performance (Lu & Lin, 2014) and the leaders' intention to promote safety and perceptions of self-efficacy (Mullen & Kevin Kelloway, 2009) are also identified among the findings.

### ***3.2. Influence of leader–member exchange on safety performance***

Six of the reviewed studies reflect the relationship between LMX and a range of safety performance. A good level of LMX can increase employees' SOCBs through a safety climate (Lu et al., 2017). It is also argued that the safety climate predicts upward safety communication (Kath et al., 2010). If employees and their leaders have high-quality relationships, safety communication will increase, which leads to better safety commitment – a predictor of accidents (Hofmann & Morgeson, 1999).

Nevertheless, safety communication alone is not sufficient to ensure a low incident rate if the management's actual commitment to safety is low (Michael et al., 2006). Safety communication should be considered as part of a larger picture, in which it interacts with other variables such as the safety climate, culture, and safety commitment to affect accident rates (Michael et al., 2006). In healthcare, LMX is empirically supported as an important antecedent of incident reporting intention (Jungbauer et al., 2018), which is in line with the transformational leadership effect identified by Hillen et al. (2017). The results also show a positive association between LMX and a lower number of safety-related events (Michael et al., 2006).

### ***3.3. Influence of authentic leadership on safety performance***

Eid et al. (2012) suggested a research model that reflects the association among authentic leadership, psychological capital, safety climate and safety outcomes. This model, however, was not tested empirically. Later, Hystad et al. (2014) conducted an empirical study in the offshore oil and gas industry that confirmed the positive link between authentic leadership and the safety climate, which in turn has an impact on safety outcomes (i.e. subjective risk perceptions). This result is also consistent with the findings by Nielsen et al. (2013).

Psychological capital is positively associated with an authentic leadership style and is a mediator between authentic leadership and the safety climate (Hystad et al., 2014). Other empirical studies have shown that authentic leadership influences safety performance through supervisor feedback and increased perceptions of justice (Cavazotte et al., 2013), and significantly relates to decreased adverse patient outcomes through trust in the manager and in areas of work life in healthcare settings (Wong & Giallonardo, 2013). Authentic leadership also improves situation awareness – 'being aware of what is happening around you and understanding what that information means to you now and in the future' (Endsley & Jones, 2011, p. 13), which is, in turn, negatively associated with a willingness to take risks in the maritime industry (Sandhaland et al., 2017).

### ***3.4. Influence of empowering leadership on safety performance***

Four studies identified the influence of empowering leadership on safety performance. Empowering leadership contributes to enhancing safety compliance and safety participation, while reducing team members' risky behaviours (Martínez-Córcoles et al., 2013). Moreover, Hechanova-Alampay and Beehr (2001) pointed out the direct and negative relationship between empowerment and unsafe behaviours. However, in other studies, empowering leadership only influences safety behaviours through mediators; that is, through collaborative team learning (Martínez-Córcoles et al., 2012) and the safety climate (Martínez-Córcoles et al., 2011). In addition, dialogue promotion and open communication play an important role in mediating the relationship between empowering leadership and collaborative team learning (Martínez-Córcoles et al., 2013). Moreover, if empowering leaders emphasise a safety culture in the organisation, this culture will create a strong safety climate, which subsequently leads to employees' safety behaviours.

### ***3.5. Influence of ethical, charismatic and paternalistic leadership on safety performance***

The relationship between ethical leadership and its influence on safety performance has been studied in healthcare and maritime settings. Ethical leadership is defined as the 'demonstration of normatively appropriate conduct through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making' (Brown et al., 2005, p. 120). Lu et al. (2013) found that ethical leadership was positively relevant to an ethical climate – 'shared perceptions of what ethically correct behaviour is and how ethical issues should be handled' (Victor & Cullen, 1988, pp. 51–52), perceptions of a patient safety culture and organisational commitment (Lotfi et al., 2018). A study of charismatic leadership in coalmines concluded that charismatic leadership had a significantly negative correlation with unsafe behaviours through changing the safety attitudes of the workers (Li et al., 2015). Only one study relating to paternalistic leadership was found in aviation. It identified three dimensions of paternalistic leadership that have different effects on upward safety communication, as well as three types of cabin crew voice behaviour. The study found that morality and benevolent dimensions were positively related to cabin crews' upward safety communication and voice behaviour, whereas the authoritarian dimension exerted the opposite effect (Chen, 2017). This result is in line with the LMX-related study by Kath et al. (2010) regarding the predictive role of relationship-based leadership on upward safety communication.

### 3.6. Influence of passive leadership on safety performance

Passive leaders generally only intervene when a safety-related problem has occurred, or a safety-related situation has become serious enough that action is required, or again, when they have no choice but to take action (Kelloway et al., 2006). Eight studies were identified where passive leadership had an influence on safety performance. This leadership style was not studied in isolation but was usually combined with transformational leadership (seven studies) or authentic leadership (one study).

Passive leadership has a negative effect on safety performance, such as on the safety climate (Merrill, 2015; Smith et al., 2016; Toderi et al., 2016), situational awareness (Sandhaland et al., 2017), has no effect on employees' intention to transfer non-technical skills (Vignoli et al., 2018) and leads to lower levels of SOCBs through work engagement (Vignoli, 2018). In addition, passive leadership is positively related to overload in psychological job demands; that is, 'the extent to which the work pace is high and the availability of sufficient time to execute the required work' (Demerouti et al., 2001, p. 281). An overload in a psychological job demand leads to negative consequences, such as emotional exhaustion, which is the cause of near-misses and injuries (Li et al., 2013). When leaders exhibit a high level of passive leadership, employees' knowledge of a specific type of safety performance is less likely to foster employees' proactive involvement in safety behaviours (Jiang & Probst, 2016).

Although passive leadership does not have a significant and direct effect on safety participation and safety compliance, this leadership style can still affect these two safety performance through a negative safety climate (Smith et al., 2016). Partly in contrast with this finding, Mullen et al. (2011) found a negative correlation between passive leadership and safety compliance. No direct and significant relationship between passive leadership and safety participation was found by Mullen et al. (2011), which is in line with the finding by (Jiang & Probst, 2016).

Moreover, if the leader has a high level of engagement in both transformational and passive leadership styles, the predictive effect of transformational leadership on safety compliance and safety participation is diminished (Mullen et al., 2011). The reason why transformational and passive leadership can exert their influence together is because these two leadership styles are negatively associated with each other but are not mutually exclusive. The interaction between a passive leadership style and transformational leadership is referred to as inconsistent leadership (Mullen et al., 2011). However, one study by Jiang and Probst (2016) concluded that leaders can only be rated as either being high in transformational leadership or being high in passive leadership. This contrast suggests that further research is required to confirm the distinguishment of two constructs.

To conclude, the influence of leadership on safety has been well explored in research to facilitate a broad understanding of the cause-and-effect relationship between leadership styles and different safety performance. To provide readers with a visual summary of the state-of-the-art literature, a comprehensive illustration of leadership's influence on various aspects of safety performance has been created as shown in [Figure 4](#). This model was developed by consolidating all the findings from the included research articles that studied the relationship between leadership style(s) and safety performance. Each leadership style could be related to different safety performance. A range of common safety performance variables which are associated with two or more than two leadership styles were identified and put in the middle of the figure. Different arrow's colours were used to distinguish the association of each leadership styles and safety performance.

As illustrated in the figure, safety climate has been studied the most, its relationship with various leadership styles e.g. transformational leadership, transactional leadership, passive leadership, authentic leadership, empowering leadership, LMX has been well articulated. Safety compliance and safety participation are also prominent studied variables. Besides, transformational and transactional leadership were often examined in the same study apart from its disparate association. These two leadership styles can be regarded as the bedrock of the safety leadership construct (Wu et al., 2015). Transactional leaders helps organisations achieve their current objectives more efficiently by linking job performance to valued rewards and by ensuring that employees have the resources they need to carry out their work. (Zhu et al., 2005). Transformational leaders generate trust and respect among their followers and motivate them to achieve performance beyond expectations through transforming the follower's attitude, belief, and values (Bass, 1985). Transformational leadership style is seen as highly motivational, where the leader interacts with followers on the leader's values and convictions (Bass, 1985), but is likely to be ineffective in the total absence of transactional relationships between leaders and subordinates (Bass, 1985). Both styles can be combined to achieve the desired aims and can therefore be seen as complementary rather than polar constructs (Bass, 1985). Leaders can also combine them and use both styles to different extents to achieve their organisation's objectives and goals (Bass, 1999). Both styles are, furthermore, related to leader effectiveness, with the best leaders demonstrating both transactional and transformational behaviours (Avolio, 1999; Bass, 1985).

## 4. Discussion

Several research gaps were identified during the systematic literature review. First, despite the significant role of senior managers in promoting safety in organisations (HSE, 2009), much work has still focussed on the front-line management level. This indicates a lack of a holistic approach in conducting safety leadership studies. According to prior studies (Goode et al., 2014; Kim & Gausdal, 2017), the interaction across all management levels has an important impact on achieving overall safety performance. More empirical investigations regarding how senior management levels influence safety performance should therefore be conducted. Due to the distinction between the standardisation of processes or outputs and the standardisation of inputs through training and affiliations to professional bodies, the suggestion is that different safety leadership practices may be required to improve the safety performance of different groups of workers (Pilbeam et al., 2016). Furthermore, applying system-thinking models and methods to study safety leadership is of critical importance because the safety orientation depends on cultural, organisational and contextual factors of attitude and behaviour that, in turn, influence safety (Håvold, 2007). In other words, an appropriate leadership style alone does not ensure safe performance; rather, various factors across the whole work system, such as regulatory and government bodies, will interact with and form the leadership styles (Donovan et al., 2016).

Second, although our paper reveals nine leadership styles that influence safety performance, safety research does not limit itself to these number of leadership styles. Other leadership styles, such as servant leadership, should therefore be studied in the safety context to complement the current safety literature. Also, despite a great deal of research on leadership styles and safety performance, it remains unclear as to what kind of leadership style is the most influential (Donovan et al., 2016). This opens up several questions for further investigation.

Third, according to our study, transformational and transactional leadership are the most common styles that have been studied. Focussing mainly on these two leadership styles also means neglecting the influence of other potential leadership styles (Dinh et al., 2014). This could be a barrier to advancing knowledge on safety research. Hence, more research should delve into the effects of less studied leadership styles to provide a more meaningful and complete picture. In addition, only one or two leadership styles are studied in each individual article. It may be more beneficial to compare and contrast research findings if different active leadership styles with or without passive leadership can be included in the same study.

It is also noteworthy that each leadership style has been defined and typified by its own attributes; there is not a clear boundary among some of

them. For example, charismatic leadership can reflect some dimensions of transformational leadership, and the same is true for LMX and transactional leadership. It is likely that passive leadership and transformational leadership are not mutually exclusive (Mullen et al., 2011). However, study by Jiang and Probst (2016) suggested that these two leadership styles are negatively correlated. Thus, whether these leadership styles are in fact conceptually distinct deserves further examination.

Furthermore, the articles reviewed in this study were selected based on predefined criteria, among which only articles published in the peer-reviewed journals on four databases: Scopus, Science Direct, Web of Science and ProQuest were chosen. Given that empirical studies can greatly vary in their quality, articles included in a systematic review should be assessed for methodological quality using quality assessment checklist (Downs & Black, 1998). Future research that replicates the review process should take this into consideration.

Finally, the emergence of safety climate, safety participation and safety compliance as the most common safety performance measures is worth noting. As such, to what extent do leadership styles influence other safety performance measures? Moreover, the measuring scales and instruments used for the study of safety performance vary across the sample studies, except for the common instruments examining safety participation and compliance (Griffin & Neal, 2000). An overlap exists in the conceptualisation of the safety performance constructs as well. For example, although 'unsafe behaviours', 'risky behaviours' and 'safety behaviours', or 'safety communication' and 'safety upward communication' are presented as separate constructs, these constructs overlap conceptually. This inconsistency hinders a proper comparison among the results to enable a common conclusion to be drawn regarding the relationship between safety leadership and safety performance. Therefore, the current understanding of the actual contribution of leadership styles to safety performance is rather limited. To advance knowledge in the field of safety leadership, the development and application of consistent measuring instruments as well as the conceptualisation of safety performance constructs are clearly important.

## 5. Conclusion

This systematic literature review revealed that nine leadership styles influence safety performance in various high-risk industrial contexts. The boundaries of the nine leadership styles that were identified as influencing safety performance remain unclear, which was a challenge when comparing the research findings. The distribution of the researched leadership styles is uneven, predominantly in favour of transformational and transactional

leadership. Most of the leadership styles were found to have a positive influence on safety performance. However, the most influential leadership style in this regard has yet to be determined. The different measures used for safety performance were safety climate, safety compliance and safety participation. Since the conceptualisation and measurement instruments for the safety performance varied in the reviewed studies, no conclusion can be made regarding which leadership styles are most influential or regarding the consistency of their influence. The findings are therefore considered inconclusive due to the discrepancy in the measurement and conceptualisation of safety performance. Yet, the findings may act as a starting point for generating new research ideas for specific high-risk industries. It is also important to address the need for further research on the development of consistent measurement instruments and conceptualisations for safety performance, for distinguishing constructs and for carrying out a system-thinking analysis of leadership styles' influence in such high-risk organisations.

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