Leading the way to safety: An investigation of S.A.F.E.R. Leadership

by

Timur Ozbilir

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Approved:	Kevin Kelloway, PhD Supervisor
Approved:	Jennifer Robertson, PhD Committee Member
Approved:	Mark Fleming, PhD Committee Member
Approved:	Margaret McKee, PhD Committee Member
Approved:	James Barker, PhD External Examiner
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Abstract

Work related injuries and fatalities can cause significant human suffering as well as considerable social and economic costs. A growing body of research has demonstrated that leaders can play an important role in enhancing safety at work. However, most studies have relied on existing models of leadership, such as transformational leadership, to investigate the impact of leadership on safety outcomes. Furthermore, most studies have used cross-sectional research designs, which is a gap in the literature considering how the relationships between leaders and followers occur over time. This dissertation aimed to address these gaps over the course of three studies. In study 1, a new scale of safety leadership was developed based on the S.A.F.E.R Leadership Model (Wong, Kelloway, & Makhan, 2015). The S.A.F.E.R Leadership Scale demonstrated good convergent and concurrent validity, as well as incremental validity above and beyond two existing measures of safety leadership. Study 2 adopted a cross-lagged research design to investigate the temporal relationships between safety leadership, safety climate, and safety performance (i.e., safety compliance and safety participation) using a sample of transit workers. The findings suggest that S.A.F.E.R leadership predicts safety climate and performance over time, demonstrating predictive validity, and the direction of causality is from S.A.F.E.R leadership to the outcomes, and not vice versa. Study 3 also adopted a temporal design, examining impact of workload on S.A.F.E.R leadership in a training context. An analysis of the post-training growth trajectories of workload and S.A.F.E.R leadership suggested that workload was not a barrier to transfer of training for nurse leaders. Taken together, this dissertation demonstrates that the S.A.F.E.R Leadership Model is a viable model of safety leadership that is different from the existing conceptualizations of safety leadership, and provides a psychometrically sound measure of S.A.F.E.R Leadership that can be used in training to enhance safety behaviours and outcomes in organizations.

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Workplace injuries and fatalities continue to occur at alarming rates, resulting in significant human suffering as well as severe economic and social costs (Barling, Loughlin, & Kelloway, 2002; Neal & Griffin, 2006). In 2019 alone, 5333 fatal occupational injuries were reported in the USA (U.S. Bureau of Labor Statistics, 2020b). In addition, 2.8 million nonfatal injuries and illnesses were reported in 2019 by the private industry employers (U.S. Bureau of Labor Statistics, 2020a). The Association of Workers' Compensation Boards of Canada (AWCBC) reported 264,438 lost-time injuries, 362 injury related fatalities, and 665 occupational disease related fatalities across Canada in 2018 (AWCBC, 2020), although the actual numbers are thought to be much higher due to important data limitations including underreporting, increasing use of workplace accommodation practices, jurisdictional differences in injury and fatality definitions (Barnetson, 2012; Grant, 2017a, 2017b; Sharpe & Hardt, 2006; Thompson, 2007). Moreover, it is estimated that the total cost of workplace injuries in Canada is a staggering $26.8 billion a year (Parachute, 2015).

Traditionally, organizations have attempted to account for occupational safety by focusing on the accident proneness of individuals, ergonomic design of equipment, and external regulatory systems, such as government-imposed standards (Barling et al., 2002). As such, many organizations have taken a control-oriented approach to managing occupational safety, which emphasizes the use of rules and punishment to enforce behaviours and increase compliance (Barling & Hutchinson, 2000; Zacharatos, Barling, & Iverson, 2005). For the past few decades, however, it has been increasingly recognized that occupational safety is better managed by a commitment-based approach, which aims

to increase employees' trust in management and commitment to the organization, for example, through participation in decision-making and training (Barling & Hutchinson, 2000; Hofmann, Burke, & Zohar, 2017; Zacharatos et al., 2005). To foster a commitment-based approach in the prevention of workplace injuries, practitioners and researchers have made considerable efforts to understand the key predictors that enhance safety performance, such as leadership (Barling et al., 2002; Clarke, 2013; Flin & Yule, 2004; Zacharatos et al., 2005; Zohar, 2002b).

Given their influence within an organization, leaders can play a critical role in fostering workplace safety (Flin & Yule, 2004). A growing body of research investigating the relationship between leadership and safety outcomes has demonstrated that safety-specific transformational leadership, authentic leadership, empowering leadership, and ethical leadership is positively associated with employees' perceptions of safety climate as well as employees' safety participation, safety compliance, and number of injuries (e.g., Barling et al., 2002; Chughtai, 2015; Martínez-Córcoles, Gracia, Tomás, Peiró, & Schöbel, 2013; Mullen & Kelloway, 2009; Nielsen, Eid, Mearns, & Larsson, 2013). Conversely, laissez-faire, active management-by-exception, and passive leadership have been negatively associated with perceptions of safety climate and safety behaviours (Kelloway, Mullen, & Francis, 2006; Luria, 2008; Mullen, Kelloway, & Teed, 2011; Wong, Ozbilir, & Mullen, 2017; Zohar, 2002).

In light of these findings, developing safety leaders has become increasingly important in improving safety outcomes in organizations (Kelloway & Barling, 2010; Wong et al., 2017). Although very few studies (e.g., Mullen & Kelloway, 2009; Zohar, 2002a) to date have investigated the impact of leadership interventions in the safety

context, collectively they have echoed the findings in the broader leadership literature regarding the effectiveness of leadership development training as an intervention. For example, researchers have reported improved safety outcomes as a result of leadership training focused on leaders' communication of safety priority (Zohar, 2002a), safety-oriented communication (Zohar & Luria, 2003), safety-oriented verbal exchanges (Kines et al., 2010), and safety-specific transformational leadership (Mullen & Kelloway, 2009).

While this growing body of research suggests that positive safety outcomes can be achieved through a focus on leadership, our understanding of leadership in the safety context is still constrained by several conceptual and methodological limitations (Nielsen et al., 2016). First, traditionally, the majority of studies on leadership and safety have focused on specific aspects of leadership, such as communication, or the influence of different pre-defined leadership styles on safety outcomes (e.g., Christian, Bradley, Wallace, & Burke, 2009; Clarke, 2013; Kelloway et al., 2006). This approach has helped researchers to develop a theoretical model to enhance our understanding of the relationship between leadership and employee safety outcomes, these studies, however, we are limited in our knowledge of leader behaviours that go beyond these specific aspects (e.g., communication) or pre-existing frameworks based on leadership styles (e.g., transformational leadership). Consequently, researchers (e.g., Clarke, 2013; Hoffmeister et al., 2014) have called for leadership development studies that incorporate a broader range of leadership behaviours and models that are not confined to leadership traits and styles.

Second, although previous studies provide empirical evidence demonstrating that leadership is associated with safety outcomes, most of these studies have adopted cross-

sectional research designs (Nielsen et al., 2016). This is a serious flaw in leadership research in general (Shamir, 2011), especially considering how 'the relationships between leaders and followers occur over time….whether or not it is acknowledged by any given study' (Bluedorn & Jaussi, 2008, p. 657). The lack of time-lagged studies has made it difficult to establish a causal relationship between leadership and safety outcomes, even though there are good theoretical reasons to assume that leadership affects safety in the workplace (Barlow & Iverson, 2005). Furthermore, theoretical models of safety generally postulate that leadership predicts safety (Barlow & Iverson, 2005; Christian et al., 2009). However, reverse causality may be an explanation for some of the relationships in cross-sectional designs (Neal & Griffin, 2006; Nielsen et al., 2016). For example, leadership style may be influenced by followers' safety performance, such that a leader may exhibit passive leadership behaviour if they view the safety performance of their employees to be positive and stable (Nielsen et al., 2016).

Finally, research from the broader leadership literature suggests that training efforts will not yield the anticipated effects if the information and skills learned are not implemented successfully in the workplace (Aguinis & Kraiger, 2009; Baldwin & Ford, 1988). Researchers (e.g., Blume et al., 2010) have identified a number of factors that may influence transfer of training that fall under the three broad categories of trainee characteristics, training design, and the work environment (Baldwin & Ford, 1988; Botke, Jansen, Khapova, & Tims, 2018; Burke & Hutchins, 2007; Clarke, 2002). Despite promising findings from several studies regarding the effectiveness of safety specific leadership training (Avolio et al., 2009; Barling, 2014), we still do not know much about the factors that influence transfer of training in the safety context.

This dissertation addresses these gaps in the literature over the course of three studies[1]. Study 1 is a scale development and validation study based on the S.A.F.E.R Leadership Model (Wong, Kelloway, & Makhan, 2015) of safety leadership which comprises five core effective leadership dimensions: (1) speaking of safety, (2) acting safe at work, (3) focusing on maintaining safety standards, (4) engaging others in safety initiatives, and (5) recognizing individuals who adhere to safety. Study 2 investigates the lagged effect of S.A.F.E.R leadership on safety climate and safety performance, namely safety compliance and safety participation while considering the possibility of reverse causality among the study variables. Finally, Study 3 focuses on the impact of workload on the transfer of safety leadership training based on the S.A.F.E.R Leadership Model (Wong, Kelloway, & Makhan, 2015). The next few sections provide a review of the literature and theory on leadership and safety.

Leadership and its scope of influence

The nature and effects of leadership have been one of the most researched topics in organizational behaviour (Barling, Christie, & Hoption, 2010). Central to leadership is the ability of an individual to influence the way employees think and feel about their job, their leader, and themselves, and as well as the way they perform at work (Barling et al., 2010; Wong et al., 2017).

[1] It should be noted that this research was part of a larger consulting project that involved several faculty members and PhD students. The S.A.F.E.R. Leadership Model was conceptualized by Wong, Kelloway, and Makhan (2015). I was the lead student researcher on the scale development study (Study 1). The scale was used to develop a training intervention, which was provided to safety leaders at several nursing homes (not part of this dissertation), at a large municipal transit company (Study 2), and the Nova Scotia Health and Community Services Safety Association (Aware – NS; Study 3). The studies involving nursing homes and Aware-NS followed a similar procedure (training with goal setting and follow up over 3 months but no control group for Aware-NS) while the study involving the transit company had only two time points

Constructive forms of leadership, such as transformational leadership (Bass, 1985), contingent reward (Bass, 1985), high-quality leader-member exchange (Dansereau et al., 1975) , charismatic leadership (Weber, 1947), authentic leadership (see Avolio & Gardner, 2005 for a review), and ethical leadership (Brown et al., 2005; Treviño et al., 2000), have been associated with positive employee perceptions of their jobs (e.g., job satisfaction, Judge & Piccolo, 2004; organizational commitment, Walumbwa et al., 2008), their leaders (e.g., satisfaction with leader, Judge, Piccolo, & Kosalka, 2009; trust in leader, Kelloway, Turner, Barling, & Loughlin, 2012), and themselves (e.g., motivation, Judge & Piccolo, 2004; wellbeing, Kelloway, Weigand, McKee, & Das, 2013). In terms of performance, constructive forms of leadership have been associated with higher levels of task performance (e.g., Ng, 2017; Wong & Laschinger, 2013), citizenship behaviours (e.g., Ilies et al., 2007; Wang et al., 2005), and fewer counterproductive behaviours (e.g., Kessler et al., 2013; Rotundo & Sackett, 2002).

Conversely, destructive leadership, which can be active, such as abusive supervision (Tepper, 2007), petty tyranny (Ashforth, 1994), tyrannical leadership (Skogstad et al., 2007), or passive, such as passive management-by-exception (Bass, 1985) and laissez-faire leadership (Skogstad et al., 2007), has been associated with adverse employee outcomes. Among these are negative employee perceptions of their jobs (e.g., commitment, Colquitt, 2001; organizational ethicality, Ogunfowora, 2013; role ambiguiry and role conflict, Skogstad et al., 2007; job satisfaction, Tepper, 2000), their leaders (e.g., satisfaction with leader, Judge & Piccolo, 2004; low leader ethicality, Ogunfowora, 2013), and themselves (e.g., distress, Kelloway & Barling, 2004; wellbeing, Schyns & Schilling, 2013). Additionally, destructive leadership has been associated with

low performance (Schyns & Schilling, 2013) and counterproductive work behaviours (Kessler et al., 2013).

Leadership and Safety

Interest in safety leadership has surged in recent years as researchers have consistently demonstrated that leaders play an important role in shaping employees safety perceptions, attitudes, and behaviours that drive safety outcomes (Barling et al., 2002; Clarke, 2013). Wu (2008, p. 600) has defined safety leadership as "the process of interaction between leader and followers through which a leader can exert influence on followers to achieve organizational safety goals within the context of organizational and individual factors". Specifically, safety leadership can affect followers' safety performance in direct or indirect ways. While the direct effects involve leaders' modelling of safe and unsafe behaviours and using monitoring and control to reinforce followers' behaviours, indirect effects involve the establishment of norms relating to practices and procedures to influence followers' perceptions and attitudes (Flin & Yule, 2004; Wong et al., 2017). In other words, perceptions and attitudes are thought to predict safety behaviours, which, in turn, affect safety outcomes, such as injuries.

Direct influence of safety leadership on employees' safety performance

Neal, Griffin, and Hart (2000) identify two components of safety performance: safety compliance and safety participation. Safety compliance refers to the core safety activities that employees must perform to maintain workplace safety, such as following safety rules and procedures and using personal protective equipment properly. Safety participation, on the other hand, refers to extra-role (or citizenship) safety behaviours that

do not directly improve workplace safety but help to create an atmosphere that supports safety, such as promoting safety within the organization, demonstrating initiative with regard to safety, and putting effort into improving safety in the workplace (Fernández-Muñiz, Montes-Peón, & Vázquez-Ordás, 2017; Neal et al., 2000).

To understand the impact of leadership in the safety context, researchers have turned to investigating the relationship between various leadership styles and safety performance, with the Full-Range Leadership Model (Bass, 1985), more specifically, transformational (both generalized and safety-specific) and transactional leadership, being the most frequently studied (Inness et al., 2010). Transformational leaders are thought to influence employees' safety performance by demonstrating the priority given to safety through their own behaviour (idealized influence), encouraging employees to reach high levels of safety (inspirational motivation), encouraging employees to suggest new and innovative ways of reaching safety targets (intellectual stimulation), and demonstrating concern for their employees' safety and wellbeing (individualized consideration, Barling et al., 2002; Inness et al., 2010; Kelloway et al., 2006). Transactional leaders, on the other hand, are thought to influence employees' safety performance by clarifying expectations and rewards in exchange for followers meeting safety performance expectations (contingent reward), proactively monitoring employees' safety behaviour and taking action before errors before they occur, (active management-by-exception), and monitoring employees' safety behaviour and taking action once problems have occurred (passive management-by-exception, Kapp, 2012). Finally, laissez-faire leaders exert influence on employees' safety performance through the absence of safety leadership behaviours (Mullen et al., 2011).

In a meta-analysis on the impact of transformational and active-transactional leadership on safety performance, Clarke (2013) found that transformational leadership had a direct influence on safety participation while active-transactional leadership had a stronger direct effect on safety compliance than transformational leadership. In a more recent study (Willis et al., 2017), active management-by-exception was found to have a stronger effect on safety participation when individual-level perceptions of accident likelihood was high. Interestingly, active management-by-exception, which if often perceived negatively and described as 'corrective' or 'punitive' leadership (Barling et al., 2010; Zohar, 2002b), appeared to prove valuable in the safety context, due to its emphasis on monitoring for potential errors in a highly visible way serving as a daily reinforcement of the importance of safety (Clarke, 2013; Zohar, 2010). Examining the individual dimensions of transformational transactional leadership among apprentice and journeymen, Hoffmeister et. al (2014) found that idealized influence predicted safety compliance in both samples; idealized influence, inspirational motivation, and contingent reward predicted safety participation in the apprentice sample; and the global measure of leadership predicted safety participation in the journeymen sample.

In contrast, although it has not been studied to the same extent as transformational or transactional leadership, passive leadership (i.e., passive management-by-exception and laissez-faire) has been demonstrated to have negative effects on safety compliance and participation (e.g., Mullen et al., 2011). Furthermore, investigating the impact of inconsistent leadership style on safety performance, Mullen, Kelloway, and Teed (2011) reported that the positive relationship between transformational leadership and safety performance was attenuated if leaders also engaged in passive leadership.

Although most research on the relationship between leadership and safety performance has focused on the Full-Range Leadership Model (Bass, 1985), researchers have demonstrated that other leadership styles predict safety performance as well. For example, empowering leadership, which aims to increase employees' potential for self-management (Arnold et al., 2000), has been associated with higher levels of safety compliance and participation, and lower levels of risky behaviours (Martínez-Córcoles et al., 2013). Employees who are in high-quality leader-member exchanges are more likely to engage in more safety citizenship behaviours (Hofmann et al., 2003), upward safety communication (Hofmann & Morgeson, 1999; Kath et al., 2010), and safe driving performance (Newnam et al., 2012). Participative management style, involving more communication and feedback, has been associated with better safety performance in the nuclear industry (Kivimaki et al., 1995) as well as process industries (Fernández-Muñiz et al., 2017). Authentic and servant leadership styles have been associated with improved safety performance among workers in the oil industry (Cavazotte et al., 2013) and construction industry (Schack & Schack, 2013), respectively.

Indirect effect of leadership on safety performance through perceptions and attitudes

Leadership can also influence safety performance indirectly through employee perceptions and attitudes. The main way in which leadership can influence safety performance is through safety climate, which refers to employees' perceptions regarding the value or importance of safety in an organization (Zohar, 1980). Safety climate has been operationalized as both an individual-level and a group level construct, where individual-level safety climate represents 'individual perceptions of policies, procedures,

and practices relating to safety' and group-level safety climate refers to 'shared perceptions of the group as a whole' (Neal & Griffin, 2006, pp. 946–947).

Empirical studies have provided support for the link between leadership styles and perceived safety climate in an organization. For example transformational leadership and active transactional leadership have been shown to be related to a more positive safety climate in several studies (e.g., Barling et al., 2002; Christian et al., 2009; Clarke, 2013; Nahrgang et al., 2011; Smith et al., 2016), whereas passive leadership has been linked to poorer safety climate (e.g., Kelloway et al., 2006; Luria, 2008; Nielsen et al., 2016; Smith et al., 2016). Transformational leaders are expected to facilitate a more positive safety climate by, for example, calling attention to the importance of safety (i.e., idealized influence), challenging their employees to work toward a collective safety-related goal (i.e., inspirational motivation), showing interest in employees' physical wellbeing (i.e., individualized consideration), and encouraging employees to think of novel ways to engage in safety (i.e., intellectual stimulation, Barling et al., 2002; Wong et al., 2017). Active transactional leaders may contribute to a positive safety climate by setting expectations in terms of safe behaviour and rewards (i.e., contingent reward), as well as monitoring and anticipating problems (active management-by-exception), which promotes perceptions that leaders value safety (Clarke, 2013; Hoffmeister et al., 2014). Passive leaders, on the other hand, are thought to contribute to a diminished safety climate as these leaders fail to effectively promote safe behaviours and practices by only taking action after a problem has occurred (Kelloway et al., 2006; Mullen & Kelloway, 2009). Aside from the Full Range Leadership Model (Bass, 1985), a few other leadership styles, such as authentic leadership and servant leadership, have also been associated with

improved safety climate (Eid et al., 2012; Nielsen et al., 2013; Perry, 2018; Schack & Schack, 2013).

Safety climate, in turn, has been demonstrated to predict safety performance. For example, in a meta-analysis on the relationship between safety climate and safety performance, Clarke (2006) found that safety climate predicted both safety compliance and safety participation, with safety participation having the stronger effect. Positive safety climate is thought to improve employee safety compliance in several ways. First, safety climate may counteract the natural reinforcement of counterproductive behaviour, for example, the immediate and positive consequences of a task achieved in less time by taking shortcuts (Sulzer-Azaroff, 1980), by removing the perceived barriers to safety, such as skepticism regarding the importance of safety (Seo, 2005), and by increasing employees' safety knowledge and motivation (Neal et al., 2000). On the other hand, safety climate is thought to influence safety participation by enhancing employees' perceptions of management safety values and commitment to safety and promoting participation through employees' reciprocation of these values (Flin et al., 2000).

Several studies have examined the mediational role of safety climate in the relationship between leadership and safety performance. For example, in a meta-analysis, Clarke (2013) found that safety climate partially mediated the relationship between transformational leadership and safety participation. Furthermore, safety climate partially mediated the relationship between active transactional leadership and safety compliance, and fully mediated the relationship between active transactional leadership and safety participation. More recently, Smith, Eldridge, and Dejoy (2016) examined the relationship between safety-specific transformational and passive leadership influence on

firefighter safety climate perceptions and safety performance using structural equation modeling and concluded that their findings pointed to the importance of safety climate mediating the influence of leadership on safety performance.

Going beyond the Full Range Leadership Model (Bass, 1985), several researchers have investigated the mediating role of safety climate between leadership and safety performance. For example, in a sample of employees from nuclear power plants, safety climate has been shown to mediate the relationship between empowering leadership and safety participation (Martínez-Córcoles et al., 2012). Examining the effect of leader influence tactics on employee safety participation, Clarke and Ward (2006) found that perceived safety climate fully mediated the effect of inspirational appeals and partially mediated the effects of both rational persuasion and consultation. Clarke (2010) reported that safety climate partially mediated the relationship between supportive leadership behaviours and both dimensions of safety performance. Finally, using a sample of professional truck drivers, Zohar, Huang, Lee, and Robertson (2014) found that safety climate mediated the effect of higher-quality leader-member exchange between leaders (dispatchers) and drivers on safe driving and hard braking behaviours.

Theoretical framework

As discussed in the previous section, leaders can have a direct influence on employees' safety attitudes and performance as well as an indirect influence on safety performance through changes in employees' attitudes to safety in their organizations. According to Ashour (1982) leaders influence employees through two psychological processes: altering the way employees think, and exposing employees to various work

experiences and environments. Thus, leaders rely on both cognitive and experiential pathways to exert their influence on employees.

Cognitive influence refers to the activation of observational and cognitive sources without providing direct experience (Ashour, 1982). As such, the cognitive pathway to alter employees' perceptions, attitudes, motivation, and learning is formed when employees observe and listen to the leader, which helps them understand what types of behaviours can lead to favourable outcomes in their workplace (Wong et al., 2017). Leaders can influence employees cognitively by clarifying for them the target behaviour required, the conditions under which such behaviour is expected, and the incentives that apply to the required behaviour (Ashour, 1982). For example, leaders can act as a bridge between upper management and employees by communicating and clarifying the intentions of workplace policies and practices to employees (Wong et al., 2017). Rationality, the act of clearly communicating expectations and explaining the reasons behind what leaders ask of employees, has been associated with employees' perceptions of power in leaders (Hinkin & Schriesheim, 1990).

Leaders can also influence employees' cognitive motivational states. For example, leaders can boost employee motivation by enhancing internal states such as empowerment and efficacy (Avolio et al., 2004) and by building confidence in employees (Bass, 1985). There is strong evidence that supervisory goal setting serves as a motivational function for the employee, especially when the leader encourages acceptance of these goals (Ashour, 1982). According to expectancy-valence theory, employees will be motivated to follow safety procedures and engage in safety activities if they believe that these behaviours will lead to favourable outcomes (Neal & Griffin,

2006). Self-determination theory (Ryan & Deci, 2000) posits that individuals are more likely to display behaviours arising from intrinsic motivation than those motivated by external rewards. As leaders are individuals with whom employees want to relate and connect, employees are likely to adopt the values espoused by the leader and internalize them (Charbonneau et al., 2001; Conchie, 2013; Ryan & Deci, 2000). Moreover, leaders can use their idealized influence to facilitate employees' internalization of the leaders' mission and values, so that they appear desirable to the employees and eventually become self-rewarding independent of the leader (Bass, 1985; Jung & Avolio, 2000; Piccolo & Colquitt, 2006).

Leaders can also influence employees cognitively through the facilitation of vicarious processes by directing the employee's awareness to others' behaviour and incentive consequences, thus providing a model of behaviour for the employee can emulate (Ashour, 1982). This is in line with Social Learning Theory (Bandura, 1969), which posits that individuals learn through role modeling or vicariously by observing other individuals (Bandura, 1977). In the safety context, this means that observing the leader reward other employees with incentives for safe behaviours can motivate employees to engage in similar behaviours.

The cognitive pathway is not the only process through which leaders influence employees. Leaders can also rely on the experiential pathway of influence whereby they expose employees to various work experiences and environments (Ashour, 1982). Leaders' experiential influence behaviours include setting conditions and environmental constraints, designing tasks to be performed, designing the workflow, and manipulating incentives for employee behaviours. In other words, leaders establish appropriate goals,

actively monitor employee performance towards these goals, and provide feedback to employees to sustain and improve performance while employees go through the process of experiencing the reinforcement to strengthen their behaviours (Wong et al., 2017). Leaders manage the timing of reinforcements and the learning environment. The roots of these contingent-reward leadership practices can be traced back to Skinner's (1953) theory of operant conditioning, which posits that a subject will receive a particular consequence, either reinforcing or punishing, following a behavioural response to a stimulus. Experiencing leaders' feedback and goal setting increases employees' self-efficacy, which, in turn, leads to improved performance (Bandura, 1997). Furthermore, research shows that when employees experience positive safety behaviours from their leaders, such as engaging in high-quality leader-member exchanges and role-modeling supportive behaviours, they respond in a similar manner (Hoffman et al., 2012; Neal & Griffin, 2006). This can be explained by the psychological contract theory (Rousseau, 1990), which draws on social exchange theory (Blau, 1964), and the norm of reciprocity (Gouldner, 1960). Psychological contract refers to the perceived exchange relationship between the employee and the employer, formed by implied promises and reciprocal obligations (Rousseau, 1990). Social exchange theory posits that when employees experience positive behaviours they feel obligated to reciprocate by carrying out their tasks at a high standard and engaging in citizenship behaviours (Griffin & Hu, 2013; Mullen, Kelloway, & Teed, 2017; Podsakoff, Mackenzie, Paine, & Bachrach, 2000).

Ashour (1982) argues that combining cognitive and experiential influence is more effective than relying solely on one pathway, suggesting that matching employees' cognitive expectations with actual experience will result in higher leader credibility and

more positive employee behaviours. For example, a leader who sets performance goals for the employee may then provide feedback and incentives along the way to accomplishing those goals. Similarly, a leader may provide practice opportunity for the employee's observationally acquired learning.

The role of safety climate, which has been the most extensively studied measure of the state of organizational safety (Clissold et al., 2012), in the leadership-safety performance relationship can be understood in light of the same theoretical framework. Traditionally, leaders have been thought to create climate (Kozlowski & Doherty, 1989; Lewin et al., 1939), with several studies providing evidence for the relationship (e.g., Barling et al., 2002; Hofmann & Morgeson, 1999; Zohar, 2002b). The leader-perceived climate relationship can be explained by a social learning process which, through repeated observations and exchanges of information with the leader, facilitates employees' interpretation of the organizational environment as to what is valued and supported by the leader and the organization in terms of safety (Ashforth, 1985; Dragoni, 2005; Zohar, 2010). For example, by engaging in behaviours that demonstrate a commitment to safety, such as calling attention to safety or providing safety training (Barling et al., 2002; Zohar, 2010), leaders can signal to employees that their safety and wellbeing is valued within the organization (Mullen et al., 2017), exerting cognitive influence on employees (Ashour, 1982).

Positive employee perceptions regarding the importance of safety and leaders' concern for group members' welfare, have, in turn, been shown to predict employees' safety performance (Clarke, 2006; Hofmann et al., 2003; Neal et al., 2000). A positive safety climate may lead to safety compliance by raising awareness of rules and the

importance of following them (i.e., safety knowledge), removing barriers to safety, such as skepticism regarding importance of safety measures and procedures, and increasing employees' safety motivation (Barling et al., 2002; Clarke, 2006; Neal & Griffin, 2002, 2006; Seo, 2005; Sulzer-Azaroff, 1980). A positive safety climate may also enhance safety participation through safety knowledge and motivation (Christian et al., 2009; Neal et al., 2000), however, as safety participation involves a greater voluntary element than compliance (Clarke, 2006), the safety climate-participation relationship may be explained within social exchange theory (Blau, 1964) and the norm of reciprocity (Gouldner, 1960), where employees feel obligated to respond to positive treatment by the leader and organization by going above and beyond their in-role behaviours.

Study 1: Development of the S.A.F.E.R. Leadership Scale

Establishing and maintaining a high standard for safety at work requires more than individual effort from the employees themselves. Past research has demonstrated that good safety leadership (e.g., Zohar, 2002a), as well as safety-specific transformational leadership (e.g., Barling, Loughlin, & Kelloway, 2002), predicts subordinates' safety behaviours and lower injury rates. However, most of the research on safety and leadership to date has adapted measurements from existing leadership models, such as transformational leadership (Wong, Kelloway, & Makhan, 2015). While this approach highlights the generalizability of basic leadership principles and serves as a good starting point for establishing a theoretical link between leadership and employees' safety related behaviours, the propositions of leadership theory may be too abstract for leaders when used in training. Furthermore, findings from scale development studies show that safety leadership measures developed independently of existing models can yield new

knowledge regarding leader behaviours that influence employee safety outcomes. For example, investigating the impact of specific leader behaviours on employees' safety performance, Griffin and Hu (2013) demonstrated that safety monitoring by itself was not an effective means of increasing extra-role behaviours if the leader was low on safety learning behaviours. Safety learning, which refers to the degree to which a leader encourages and promotes safety-related learning (Griffin & Hu, 2013) is not a component of the Full Range Leadership Model (Bass, 1985), and the monitoring behaviours in Griffin and Hu's study (2013) included responding to and correcting mistakes and errors of team members, and were not limited to controlling behaviours as in the Multifactor Leadership Questionnaire (Avolio et al., 1999; Yukl, 1999). Therefore, the purpose of this study is to develop and validate a practical measurement of safety leadership that moves away from pre-existing leadership styles and provides a foundation and a guide for safety leadership training.

According to Wong, Kelloway, and Makhan (2015), the S.A.F.E.R. Leadership Model is not meant to replace existing models of safety leadership but should be viewed as a manifestation of existing models. Furthermore, it is not bound to any existing model of leadership but is rooted in more general models of effective organizational leadership, which makes it easier to teach leaders the importance of, and the skills involved in, safety leadership (Wong, Kelloway, & Makhan, 2015).

S.A.F.E.R. Leadership

The S.A.F.E.R. Leadership Model (Wong, Kelloway, & Makhan, 2015) of safety leadership offers a platform for both research and practice in workplace safety that is not bound by any existing models of safety leadership. The model comprises five core

dimensions: (1) speaking of safety, (2) acting safe at work, (3) focusing on maintaining safety standards, (4) engaging others in safety initiatives, and (5) recognizing individuals who adhere to safety practices.

Speak: Speaking about safety

Behaviours relating to speaking of safety enable one-way dissemination of information about safety and subordinates' safety performance and may include data reporting, feedback, or simply verbal exchanges regarding safety. As such, communication is a key component of safety leadership as it is the mechanism through which the leader's view and position on safety are shared with their employees. Indeed, communication has been identified as a critical aspect of effective safety leadership by leaders themselves (Fruhen et al., 2013) and has been shown to mediate the relationship between leader-member exchange and safety commitment, which, in turn, predicts lower rates of accidents (Hofmann & Morgeson, 1999). As well, feedback provided at least three times a week was found to effectively maintain improved safety behaviours (Komaki et al., 1980).

Several intervention studies to date have focused on improving safety performance by coaching leaders on how to communicate. For example, Zohar (2002b) implemented an intervention that involved teaching leaders how to communicate safety as a priority, as well as enhancing leaders' interview skills for giving their employees safety-related feedback. Frequency of safety interactions was reported to be significantly higher in the experimental group, and minor injury rate, earplug use, and perceived safety climate were more stable over time. In another intervention study involving Danish construction foremen, coaching leaders on safety communication was found to increase

the amount of verbal exchanges regarding safety, the subordinates' attention to safety, and the safety index of the work site (Kines et al., 2010). In summary, Zohar (2002b) and Kines et al.'s (2010) intervention studies demonstrate that safety communication and feedback are associated with better safety outcomes, and that those two behaviours are skills that can be successfully trained.

Act: Acting safe at work

Although communication is an important aspect of safety leadership, it is critical that leaders reinforce what they communicate through the physical visibility of their efforts (Biggs et al., 2013). In other words, they need to engage in observable behaviours to demonstrate their own adherence to safety at work. Thus, acting safe is primarily related to the concept of behavioral integrity, which refers to the perceived alignment between the leaders' expectations and actions for safety (Leroy et al., 2012). Previous research suggests that leader's behavioral integrity towards safety may contribute to a safer workplace by enhancing subordinate compliance through the establishment of clear expectations of appropriate safety behaviours (Halbesleben et al., 2013; Leroy et al., 2012). Specifically, Leroy et al. (2012) found that priority of safety mediated the relationship between leader's behavioral integrity and reported treatment errors. Furthermore, in a cross-lagged analysis, Halbesleben et al. (2013) showed that psychological safety and safety compliance at Time 2 mediated the relationship between behavioral integrity of leaders at Time 1 and frequency and severity of injuries at Time 3. Together, these two studies demonstrate that the alignment between leaders' expectations of subordinates and their own actions regarding safety can improve both in-role (i.e., compliance) and extra-role (i.e., reporting errors) safety behaviours.

Focus: Focusing on maintaining safety standards

A good safety leader fosters a safety-focused workplace by demonstrating commitment, persistence, motivation; and engaging in monitoring. Research suggests that perceptions of leaders' commitment to safety are related to lower perceived risk and more willingness from subordinates to participate in safety programs (Cree & Kelloway, 1997). The inability to commit or consistently adhere to safety standards can be as detrimental as not complying with them in the first place. For instance, subordinates of inconsistent leaders who displayed both safety-specific transformational and safety-specific passive leadership behaviours reported lower safety participation and compliance (Mullen, Kelloway, & Teed, 2011).

Motivating subordinates is a mechanism by which good safety leaders can enhance subordinates' safety performance. Conchie et al. (2013) found that intrinsic motivation mediated the relationship between safety-specific transformational leadership and safety citizenship behaviours (i.e., whistle blowing and safety voice behaviours), while extrinsic motivation mediated the relationship between safety-specific transformational leadership and safety compliance. Furthermore, the motivation to not partake in risk-taking behaviours is linked to lower injury rates at work (Westaby & Lowe, 2005).

Focusing on safety involves using active monitoring. Leaders who are able to recognize problems in the workplace are the ones who are constantly keeping track of their subordinates' safety performance. Indeed, Griffin and Hu (2013) found that safety-specific monitoring was positively associated with safety compliance. An intervention study conducted by Zohar and Luria (2003) revealed that training leaders to monitor

subordinates led to higher observer-rated frequency of safety behaviours and self-reported ratings of safety climate. According to Griffin and Hu (2013), consistent monitoring increases subordinates' safety behaviours because the act of monitoring enforces a clear standard for which safety behaviours are appropriate, and which are not.

Engage: Involving others in safety initiatives

Effective safety leaders recognize that safety is a group effort and strive towards engaging their employees in important decisions and initiatives. They achieve this by opening up a two-way communication channel that enables subordinates to suggest ways to improve safety in their organization and voice their safety related concerns.

In a study involving offshore drill workers, engaging subordinates and encouraging their questions were considered to be important assets of a good leader by 97% of the respondents (Crichton, 2005). Furthermore, leaders' receptiveness to safety information is related to subordinates' willingness to raise safety issues (Mullen, 2005). Upward safety communication is a specific type of communication that happens when subordinates reach an adequate level of comfort to discuss safety issues with their leaders without the fear of being reprimanded (Hofmann & Stetzer, 1998). In a sample of mixed industry blue-collar workers, upward safety communication mediated the relationship between the high quality of leader-member exchange and lower perceived injury risk (Muldoon et al., 2012). Ease of incident reporting may suggest that there is trust and high psychological safety in the leader-subordinates relationship (Clark & Payne, 1997; Conchie et al., 2013; Reason, 1997). Trust is not only an important indicator of a good safety culture, but also how a good safety leader exerts their influence on subordinates' safety performance. Safety-specific trust mediates the relationship between safety-

specific transformational leadership and safety voice behaviours (Conchie et al., 2013). As well, transformational leadership is associated with more safety citizenship behaviours only under high or moderate levels of cognitive trust (Conchie & Donald, 2009).

Overall, engagement behaviours from leaders can create a psychologically safe environment for subordinates to bring up safety issues are important for increasing extra-role safety behaviours and reducing counterproductive safety behaviours.

Recognize: Recognizing individuals who adhere to safety practices

Aside from having a consistent feedback and monitoring system for correcting safety violations, a safety leader values and acknowledges subordinates who are safe in their everyday work. A well-designed safety-incentive program uses social praise, recognition, tangible reinforcements, and non-monetary privileges to reinforce the reporting of hazards (Komaki et al., 1978). However, a good safety leader does not necessarily need to reward safety accomplishments by monetary means. In an intervention study by (Austin et al., 1996), daily feedback and weekly monetary reinforcements were associated with 64% labor cost reductions in roofers compared to the workers who were paid by an hourly wage. The researchers conducted a follow-up and found that monetary rewards were not necessary, rewarding employees with break times improved safety compliance. Since recognition is a comparably cost-efficient form of reward that does not draw from company resources, good safety leaders should use it to reinforce desirable safety behaviours.

Present Study

The survey development process recommended by Hinkin (1998) was followed to develop and validate a measurement that captures the five core behaviours of S.A.F.E.R. leadership. The results are presented in two phases. Phase 1 details the initial item generation and item reduction processes. Phase 2 details the psychometric properties of the S.A.F.E.R. Leadership Scale, including reliability estimates, and factor structure, and provides validity evidence.

Phase 1: Item Generation and Reduction

Item generation. A process recommended by Hinkin and Schriesheim (1989) was followed for scale development. An extensive review of the literature on leadership and safety was conducted for item generation. Five subject matter experts (PhD students in industrial/organizational psychology, including the author) independently developed items in the five content domains of the S.A.F.E.R. Leadership Model (Wong, Kelloway, & Makhan, 2015): speaking of safety, acting safe, focusing on safety, engaging others in safety, and recognizing safe behaviours. Speaking of safety is one-way information dissemination from the leader to subordinates regarding safety at work. This includes providing feedback on negative safety violations. Acting safe comprises of observable behaviours performed by the leader to enforce his/her own adherence to safety at work (i.e., their own safety behaviours). Focusing on safety manifests as tangible behaviours of the leader that fosters a safety-focused work environment. This includes commitment, persistence, motivation, and monitoring (e.g., corrective actions). Engaging others in safety is when the leader encourages two-way/open involvement in safety decisions. This can also be with their subordinates or even other stakeholders of the organization (e.g.,

upper management, external liaisons). Recognizing safe behaviours is the act of providing individualized praise, appreciation, and recognition of safety accomplishments to the leader's subordinates.

A total of 56 items were generated. Following Hinkin's (1998) recommendation, items that were difficult to understand, double-barreled, nonrepresentative, or redundant were eliminated. This process resulted in a total of 29 items: 8 items for the speaking of safety domain, 5 for the acting safe domain, 6 for the focusing on safety domain, 5 for the engaging others in safety domain, and 5 for the recognizing safe behaviours domain (see Table 1).

Item reduction. Next, the 29 items were assessed for content validity through an item sort task (Mackenzie et al., 2011). Item-sort tasks are recommended in the early stages of scale development, as they provide a way to remove items that are not conceptually consistent with the construct definition (Hinkin, 1998). This ensures high content validity, which is necessary for construct validity (Anderson & Gerbing, 1991).

Participants and procedure. An item-sort task was performed by 9 doctoral students in industrial-organizational psychology, who served as subject matter experts. Seven participants were women, and 2 were men. Doctoral students are an appropriate sample for this type of task as they have the intellectual ability to assess the agreement between items and conceptual definitions (Schriesheim et al., 1993).

Participants were presented with the definitions of the 5 content domains of S.A.F.E.R. leadership and the 29 items in randomized order and asked to sort the items in the content domain they thought the items represented. Agreement was determined by the percentage of subject matter experts who sorted the item under the same content domain. Items with agreement lower than 50% and/or sorted into a content domain other than the

hypothesized one were flagged for further scrutiny. Based on these criteria, 4 items had lower than 50% agreement, one of which was also sorted into a content domain that was not the hypothesized one (See Table 1).

Results. Two items, "*My supervisor keeps everyone informed of any potential hazards in the workplace*", and "*My supervisor initiates conversations about safety*", which were hypothesized to fall under the content domain of Speaking of Safety, both had 44% agreement, with Acting Safe as their secondary domain. The item, "*My supervisor fosters an environment in which employees can openly discuss safety*", which was hypothesized as a Focusing on Safety item, was sorted into Engaging Others in Safety and had 33% agreement. The item, "*My supervisor brings employees' safety-related concerns to upper management when appropriate*", which was hypothesized as an Engaging Others in Safety item, was sorted into Acting Safe. This item was kept in Engage as it was considered to best represent that domain. Finally, subject matter experts recommended that the item "*My supervisor discussed how we can prevent*

Table 1

Preliminary items for the S.A.F.E.R. Leadership Scale

Original item (My supervisor…)	Hypothesized content domain	Dominant/Secondary content domain	Agreement (%)	Q-sort decision
communicates a positive vision of workplace safety	Speak	Speak	100%	Speak
discusses how we can prevent accidents	Speak	Speak	89%	Speak; reword to "talks about how to prevent accidents"
keeps employees informed about new safety-related protocols	Speak	Speak	100%	Speak
provides employees with safety-related feedback	Speak	Speak	89%	Speak
shares safety-related information with employees	Speak	Speak	100%	Speak
talks about safety-related problems at work	Speak	Speak	100%	Speak
keeps everyone informed of any potential hazards in the workplace	Speak	Speak/Act	44%	Remove
initiates conversations about safety	Speak	Speak/Act	44%	Remove
complies with the safety protocols he/she describes	Act	Act	100%	Act
practices what he/she preaches when it comes to safety	Act	Act	100%	Act
pays attention to safety rules and regulations	Act	Act	100%	Act
acts on employees' safety suggestions	Act	Act	78%	Act
intervenes when employees are being unsafe	Act	Act	89%	Act
demonstrates a commitment to a safe workplace	Focus	Focus	89%	Focus
puts safety ahead of other business concerns	Focus	Focus	78%	Focus

monitors for any unsafe actions	Focus	Focus	78%	Focus
Monitors for safety hazards	Focus	Focus	67%	Focus
motivates employees to be safe	Focus	Focus	88%	Focus
fosters an environment in which employees can openly discuss safety	Focus	Engage/Focus	33%	Remove
brings employees' safety-related concerns to upper management when appropriate	Engage	Act/Engage	44%	Keep in Engage
encourages employees to suggest new ways to improve safety	Engage	Engage	100%	Engage
asks employees to share their perspectives on safety	Engage	Engage	100%	Engage
encourages employees to report any challenges related to safety	Engage	Engage	100%	Engage
consults employees when making safety-related decisions	Engage	Engage	88%	Engage
praises employees when they are being safe	Recognize	Recognize	100%	Recognize
recognizes employees who participate in workplace safety committees	Recognize	Recognize	100%	Recognize
praises employees who prioritize safety	Recognize	Recognize	100%	Recognize
recognizes employees who perform their jobs safely	Recognize	Recognize	100%	Recognize
recognizes employees who promote safety	Recognize	Recognize	100%	Recognize

accidents" be reworded to "*My supervisor talks about how to prevent accidents*" as they thought this is more in line with the Speaking of Safety domain, which involves one-way information dissemination from the leader to subordinates regarding safety at work. At the end of the item-sort procedure, there were 6 items in the Speaking of Safety domain, and 5 items in each of the other four domains.

Phase 2: Psychometric Properties of the S.A.F.E.R. Leadership Scale

The psychometric properties of the S.A.F.E.R. Leadership Scale were assessed by examining the scale's reliability, factor structure, and validity. Following Hinkin's (1998) recommendations, an exploratory factor analysis was conducted to determine the factor structure of the scale, followed by testing the internal consistency of the scale to ensure it exceeded the recommended cutoff of .70 (Hinkin, 1998).

With regards to convergent validity, Campbell and Fiske (1959) assert that the focal construct should be empirically related to theoretically similar constructs such that it retains its uniqueness while reflecting the similarities with related constructs. As S.A.F.E.R. leadership is theoretically related to other conceptualizations of safety leadership, it is expected that it will significantly correlate with the Safety-specific Transformational Leadership Scale (Barling et al., 2002) and the Safety Leadership Scale (Griffin & Hu, 2013).

To provide evidence for concurrent validity, it is important to demonstrate that S.A.F.E.R. leadership is associated with outcomes that other conceptualizations of safety leadership are associated with. As good safety leadership has been associated with safety citizenship behaviours (e.g., Hoffman et al., 2003), safety communication with leaders (e.g., Hoffman & Morgeson, 1999), safety-specific trust (e.g., Conchie et al., 2013), and safety

performance (i.e., safety compliance and participation, e.g., Clarke, 2013), it is expected that S.A.F.E.R. leadership will also be associated with those outcomes.

Finally, it is important that a new measure provides information that exceeds the information provided by other similar measures (Sechrest, 1963). Evidence for incremental validity is presented to demonstrate that S.A.F.E.R. leadership has the ability to explain outcomes beyond other predictors, namely safety-specific transformational leadership (Barling et al., 2002) and safety leadership (Griffin & Hu, 2013).

H1. The S.A.F.E.R. Leadership Scale will demonstrate factorial validity, such that the proposed dimensions will cluster into five distinct, reliable factors.

H2: S.A.F.E.R. Leadership will demonstrate convergent validity, such that it will be positively associated with other similar measures, specifically the Safety-specific Transformational Leadership Scale (Barling et al., 2002) and Safety Leadership Scale (Griffin & Hu, 2013), and negatively associated with the Passive Leadership Scale (Kelloway, Mullen, & Francis, 2006).

H3: S.A.F.E.R. Leadership will demonstrate concurrent validity, such that it will be positively associated with subordinates' safety outcomes, specifically safety citizenship behaviours, safety climate, safety communication with leaders, safety compliance and participation, and safety-specific trust.

H4. S.A.F.E.R. Leadership will demonstrate incremental validity, such that it will explain incremental variance in safety citizenship behaviours, safety climate, safety communication with leaders, safety compliance and participation, and safety-specific trust, above and beyond safety-specific transformational leadership and safety leadership.

Method

Participants and procedure

Data from a sample of 300 blue collar workers in the United States was used for this phase of the validation process. Blue-collar workers were recruited as they were more likely to have safety-relevant jobs compared to white-collar workers. This validation sample was recruited and purchased through Qualtrics. Inclusion criteria for participation requires participants to be 18 years of age or older, employed as full-time or part-time, and working under a direct supervisor. Respondents were compensated $4.00US for completing the survey online. After giving informed consent, participants were asked to complete a survey that included basic demographic questions, such as gender, age, occupation, and job tenure, followed by the items generated for scale development, and other measures, such as safety-specific transformational leadership, safety behaviours, and safety-specific trust to test the hypotheses of the study. Three questions asking participants to select a particular response on a Likert scale were added to the survey as attentional checks. Thirty-six participants who did not pass these attentional checks were excluded from the analysis. The final sample included 264 individuals, 134 women (50.2%) and 130 men (49.8%), representing diverse occupations (e.g., plumber, construction worker, bus driver, electrician, welder, carpenter, cleaner) from various industries, including construction (15.5%), food services (5.7%), automotive (4.2%), healthcare (4.2%), manufacturing (3%). See Table 2 for participant demographics.

Table 2

Demographic characteristics of participants

Characteristic	n	%
Gender		
Men	134	50.2
Women	130	49.8
Ethnicity		
Caucasian	222	76.5
African American	20	7.6
Asian and Pacific Islander	20	7.6
South/South East Asian	1	.4
Hispanic	16	6.1
First Nations	3	1.1
Other	2	.8
Age	43.2 (12.5)	
Tenure (mo)	60.0 (78.2)	
Time with supervisor (mo)	41.9 (55.8)	
Education		
Grade 12 or less	102	38.6
College	101	38.3
Bachelor's degree	45	17
Master or professional degree	16	6.1

Note. Due to the large number of occupations and industries represented, a breakdown is not provided for these variables.

Measures

The questionnaire administered to the Qualtrics sample consisted of demographic questions, the 26-item S.A.F.E.R. Leadership Scale, along with scales used for convergent, concurrent, and incremental validity analyses. Participants were asked to recall their safety-related workplace experiences in the past three months.

Safety citizenship behaviours. Subordinates' safety citizenship behaviours were measured with the 27-item ($\alpha = .98$) Safety Citizenship Behaviours Scale (Hofmann et al., 2003). Participants answered the frequency that they demonstrate extra-role safety behaviours at work on a 5-point Likert-type scale, with *"Never = 1"* or *"Always = 5"*. A sample item is *"I assist others to make sure they perform their work safely"*. A higher summed score on the Safety

Citizenship Behaviours Scale indicated higher frequency of subordinates' safety citizenship behaviours at work.

Safety climate. Safety climate was measured with the 10-item (α = .87) Safety Climate Scale (Zohar, 2000). Participants answered the extent to which they agree with statements about how their leaders contributed to the overall safety climate of the organization on a 5-point Likert-type scale, with *"Strongly disagree = 1"* or *"Strongly agree = 5"*. A sample item is *"My supervisor says a good word whenever he sees a job done according to the safety rules"*. A higher summed score on the Safety Climate Scale indicated that the subordinates perceived higher quality safety climate at the workplace.

Safety communication. Safety communication with leaders was measured with the 7-item (α = .86) Safety Communication Scale (Hoffman & Stetzer, 1998). Participants answered the extent to which they agree with statements about their safety communication with their leaders at work on a 5-point Likert-type scale, with *"Strongly disagree = 1"* or *"Strongly agree = 5"*. A sample item is *"I feel comfortable discussing safety issues with my supervisor"*. A higher summed score on the Safety Communication Scale indicated more frequent safety communication with their leaders at work.

Safety performance. Safety performance measured with Neal, Griffin, and Hart's (2000) 8-item scale, comprising of a Safety Compliance (α = .94) and a Safety Participation Scale (α = .88). Participants answered the extent to which they agree with statements about their safety performance at work on a 5-point Likert-type scale, with *"Strongly disagree = 1"* or *"Strongly agree = 5"*. A sample item for safety compliance is *"I used the correct safety procedures for carrying out my job"*. A sample item for safety participation is *"I promoted the safety program*

within the workplace". A higher summed score on the Safety Compliance and Participation Scale indicated more in-role and extra-role safety behaviours at work, respectively.

Safety leadership behaviours. Safety leadership behaviours were measured with the 8-item (α = .96) Safety Leadership Scale (Griffin & Hu, 2013). Participants answered the extent they agree to statements regarding their leaders and safety at work on a 5-point Likert-type scale, with *"Strongly disagree = 1"* or *"Strongly agree = 5"*. A sample item is *"[My leader] places a high personal value on the team's safety"*. A higher summed score on the Safety Leadership Scale indicated more good safety leadership behaviours at work.

Safety-specific transformational leadership behaviours. Safety-specific transformational leadership behaviours were measured with the 10-item (α = .97) Safety-specific Transformational Leadership Scale (Barling et al., 2002). Participants answered the frequency that their leaders exhibited safety-specific transformational behaviours on a 5-point Likert-type scale, with *"Not at all = 1"* or *"Frequently or always = 5"*. A sample item is *"Expresses satisfaction when I perform my job safely"*. A higher summed score on the Safety-specific Transformational Leadership Scale indicated more transformational safety leadership behaviours at work.

Safety-specific trust. Safety-specific trust was measured with the 3-item (α = .96) Safety-specific Trust Scale (Conchie & Donald, 2009). Participants answered the extent they agree to statements regarding their safety-related trust in their leaders on a 5-point Likert-type scale, with *"Strongly disagree = 1"* or *"Strongly agree = 5"*. A sample item is *"I trust my supervisor's judgment when it comes to safety"*. A higher summed score on the Safety-specific Trust Scale indicated more safety-related trust in leaders at work.

Safety-specific passive leadership. Safety-specific passive leadership behaviours were measured with the 3-item ($\alpha = .83$) Safety-specific Passive Leadership Scale (Kelloway, Mullen, & Francis, 2006). Participants answered the frequency that their leaders exhibited safety-specific passive behaviours on a 5-point Likert-type scale, with *"Not at all = 1"* or *"Frequently or always = 5"*. A sample item is *"Avoid making decisions that affect safety on the job"*. A higher summed score on the Safety-specific Passive Leadership Scale indicated more passive safety leadership behaviours at work.

Results

Exploratory factor analysis. To test Hypothesis 1, principal axis factoring with direct oblimin rotation was conducted in SPSS for the 26 items. Factor analysis was preferred over principal components analysis because the former distinguishes between common and unique variance while the latter makes the assumption that there is no unique variance (i.e., the total variance is equal to common variance), which may result in inflated loadings if the factors are not correlated (Gorsuch, 1997; Widaman, 1993). The Herze-Zinkler test suggested a violation of normality ($hz = 3.74$, $p < .001$); therefore, principal axis factoring was chosen over maximum likelihood (Fabrigar et al., 1999). To account for potential correlations among factors, direct oblimin, an oblique rotation, was chosen (Costello & Osborne, 2005; Yong & Pearce, 2013). Initially, the factorability of the 26 items was examined using several indicators. The Kaiser-Meyer-Olin measure of sampling adequacy was .98, above the commonly recommended value of .5 (Tabachnick, 2007). Bartlett's test of sphericity was also significant $\chi^2(325) = 10221.68$, $p < .001$. The communalities were all above .30. Given these overall indicators, factor analysis was regarded to be suitable for the set of items. The Kaiser-Guttman retention criterion of eigenvalues greater than 1.0 suggested a 2-factor solution that explained 80.64% of the variance

(76.67%, and 3.96%, respectively). However, none of the factor loadings were greater than .40 (Hinkin et al., 1997) for the second factor[2]. Three-, four-, and five-factor solutions were forced as well; however, none of them yielded a solution that was acceptable (See Appendix C for EFA results). Therefore, a one-factor solution was retained (See Tables 3 and 4 for eigenvalues, communalities, and factor loadings). Hypothesis 1 (i.e., S.A.F.E.R. Leadership will demonstrate factorial validity by clustering into 5 distinct factors) was not supported.

Finally, Hinkin (1998) and Cook (1981) recommend short measures to minimize biases caused by boredom or fatigue and argue that adequate internal consistency can be obtained with as few as 3 items. As a 26-item scale is too long for practical use in a survey instrument, 3 items were selected to represent each of the five content domains based on item-total correlations (See Table 5 for the final set of items).

[2] A parallel analysis using the GPArotation package (Bernaards, & Jennrich, 2005) in R suggested a 2-factor solution; however, the parallel analysis scree plot suggested that a 1-factor solution is also possible. (See Appendix C).

Figure 1

Scree plot for the principal axis factoring of S.A.F.E.R. items

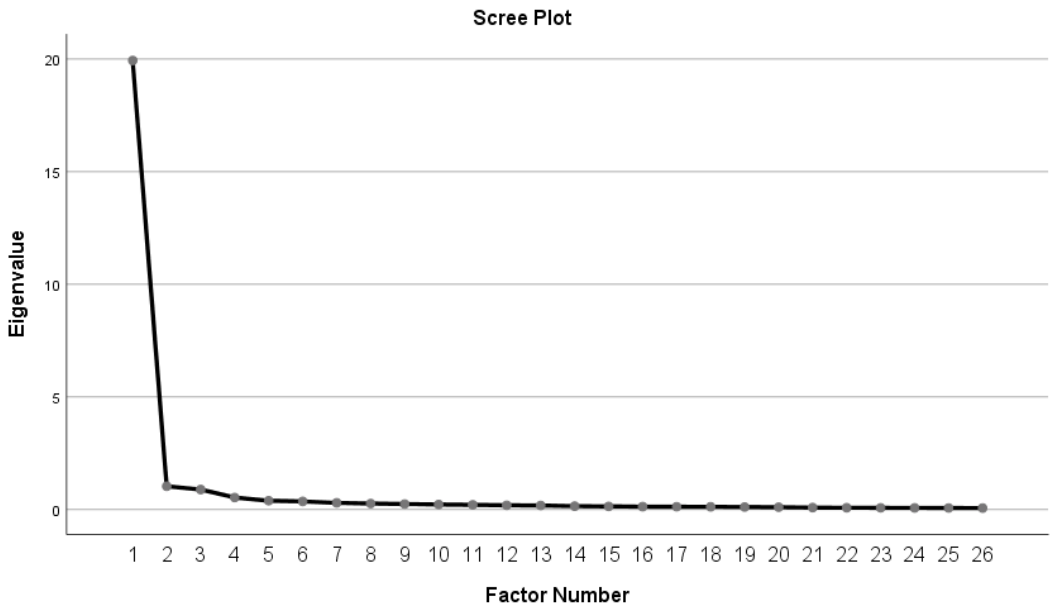


Table 3

Total variance explained for the one-factor solution with 15 items

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.1	80.9	80.9	11.9	79.6	79.6
2	0.8	5.3	86.2			
3	0.3	2.3	88.5			
4	0.3	1.8	90.3			
5	0.3	1.7	92.0			
6	0.2	1.2	93.3			
7	0.2	1.2	94.5			
8	0.2	1.0	95.5			
9	0.1	0.9	96.3			
10	0.1	0.8	97.1			
11	0.1	0.7	97.8			
12	0.1	0.6	98.4			
13	0.1	0.6	99.0			
14	0.1	0.5	99.5			
15	0.1	0.5	100.0			

Table 4

Final communalities and factor loadings for the 15-item S.A.F.E.R. Leadership Scale

	M	*SD*	h^2	Factor
talks about safety-related problems at work_S	4.90	1.76	0.85	0.92
communicates a positive vision of workplace safety_S	5.06	1.73	0.85	0.92
talks about how to prevent accidents_S	4.95	1.77	0.82	0.91
complies with the safety protocols he/she describes_A	5.21	1.75	0.81	0.9
practices what he/she preaches when it comes to safety_A	5.12	1.76	0.73	0.86
pays attention to safety rules and regulations_A	5.27	1.67	0.72	0.85
demonstrates a commitment to a safe workplace _F	5.21	1.6	0.68	0.83
monitors for any unsafe actions_F	5.02	1.72	0.84	0.92
motivates employees to be safe_F	5.03	1.81	0.86	0.93
encourages employees to suggest new ways to improve safety_E	4.74	1.87	0.77	0.88
encourages employees to report any challenges related to safety_E	4.98	1.76	0.87	0.93
asks employees to share their perspectives on safety_E	4.65	1.82	0.8	0.89
praises employees who prioritize safety_R	4.69	1.81	0.77	0.88
praises employees when they are being safe_R	4.66	1.87	0.79	0.89
recognizes employees who perform their jobs safely_R	4.68	1.85	0.78	0.88

Note. S = Speak, A = Act, F= Focus, E = Engage, R = Recognize.

Table 5

Inter-item correlations for the S.A.F.E.R. Leadership Scale (N = 264)

Items	Item-total correlation	Cronbach's Alpha if item is deleted
Speak		
talks about safety-related problems at work	**0.917**	**0.947**
communicates a positive vision of workplace safety	**0.891**	**0.949**
talks about how to prevent accidents	**0.886**	**0.950**
shares safety-related information with employees	0.849	0.954
provides employees with safety-related feedback	0.848	0.954
keeps employees informed about new safety-related protocols	0.837	0.955
Act		
complies with the safety protocols he/she describes	**0.897**	**0.93**
practices what he/she preaches when it comes to safety	**0.884**	**0.93**
pays attention to safety rules and regulations	**0.877**	**0.93**
acts on employees' safety suggestions	0.845	0.94
intervenes when employees are being unsafe	0.797	0.95
Focus		
monitors for any unsafe actions	**0.893**	**0.92**
motivates employees to be safe	**0.877**	**0.92**
demonstrates a commitment to a safe workplace	**0.853**	**0.93**
Monitors for safety hazards	0.842	0.93
puts safety ahead of other business concerns	0.757	0.94
Engage		
asks employees to share their perspectives on safety	**0.897**	**0.91**
encourages employees to suggest new ways to improve safety	**0.893**	**0.91**
encourages employees to report any challenges related to safety	**0.878**	**0.91**
brings employees' safety-related concerns to upper management when appropriate	0.832	0.92
consults employees when making safety-related decisions	0.663	0.95
Recognize		
praises employees who prioritize safety	**0.92**	**0.95**
praises employees when they are being safe	**0.92**	**0.95**
recognizes employees who perform their jobs safely	**0.92**	**0.95**
recognizes employees who participate in workplace safety committees	0.90	0.95
recognizes employees who promote safety	0.82	0.97

*Note***.** Bolded items were retained for the final scale.

Convergent validity. To assess convergent validity, a measure should be related to theoretically similar constructs (Campbell & Fiske, 1959). As expected, S.A.F.E.R. leadership was positively associated with safety-specific transformational leadership ($r = .85$, $p < .001$) and safety leadership ($r = .85$, $p < .001$), and negatively associated with safety-specific passive leadership ($r = -.42$, $p < .001$). Hypothesis 2 (i.e., S.A.F.E.R. will demonstrate convergent validity) was supported. Table 6 summarizes the means, standard deviations, and correlations among the variables in the study.

Concurrent validity. To assess concurrent validity, it is important to demonstrate that a measure is associated with outcomes that similar measures are associated with. As expected, S.A.F.E.R. leadership was significantly and positively correlated with the six outcome variables, safety-specific trust ($r = .79$, $p < .01$), safety citizenship behaviours ($r = .58$, $p < .01$), safety climate ($r = .77$, $p < .01$), safety communication with leaders ($r = .70$, $p < .01$), safety participation ($r = .53$, $p < .01$), and safety compliance ($r = .39$, $p < .01$), supporting Hypothesis 3 (i.e., S.A.F.E.R. will demonstrate concurrent validity). Table 6 summarizes the means, standard deviations, and correlations among the variables in the study.

Table 6

Intercorrelations among the study variables (N = 259)

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Age	43.39	12.49	-													
2.Gender	1.52	.50	-.17**	-												
3.Etnicity	1.71	1.57	-.22**	.06	-											
4.Tenure (mo)	60.16	78.49	.33**	-.13*	-.02	-										
5.S.A.F.E.R.	4.94	1.59	-.11	.10	.02	-.05	**.98**									
6.SSTL	3.41	1.02	-.16**	.05	.09	-.09	.85**	**.97**								
7.SafeLead	3.67	.96	-.11	.03	.02	-.02	.85**	.87**	**.96**							
8.PassiveLead	2.45	1.12	-.08	-.08	.07	-.08	-.42**	-.32**	-.39**	**.83**						
9.SafeTrust	3.87	1.03	-.07	.01	.01	-.05	.79**	.77**	.85**	-.48**	**.96**					
10.Citizen	3.36	.91	-.10	.03	.05	-.03	.58**	.68**	.57**	-.07	.42**	**.98**				
11.SafeComm	3.72	.89	.03	.10	-.02	.01	.70**	.67**	.69**	-.60**	.75**	.41**	**.86**			
12.SafeClimate	3.47	.86	-.04	.09	.02	.01	.77**	.70**	.76**	-.66**	.79**	.39**	.80**	**.87**		
13.SafeComp	4.24	.74	.06	.08	-.04	.10	.39**	.38**	.46**	-.28**	.44**	.37**	.44**	.43**	**.94**	
14.SafePart	3.81	.81	-.08	.13*	.06	-.01	.53**	.52**	.54**	-.11	.44**	.66**	.41**	.39**	.61**	**.88**

Note: SafeLead = Safety Leadership; SSTL = Safety-specific Transformational Leadership; PassiveLead = Safety-specific Passive Leadership; SafeTrust = Safety-specific Trust; Citizen = Safety Citizenship; SafeComm = Safety Communication; SafeClim = Safety Climate; SafePart = Safety Participation; SafeComp = Safety Compliance. For gender, 1 = Male, 2 = Female ** $p < .01$. * $p < .05$. Alphas are on the diagonal in bold.

Incremental validity. To demonstrate incremental validity, a measure should predict outcomes beyond other similar measures (Sechrest, 1963). Using a procedure outlined by Aiken and West (1991), a series of hierarchical regression analyses were conducted. Safety-specific transformational leadership and safety leadership were entered in the first step, and S.A.F.E.R. Leadership in the second step.

As shown in Table 7, when entered in the first step, higher safety-specific transformational leadership was related to higher safety-specific trust (β = .17, p < .05), safety citizenship behaviours (β = .78, p < .001), safety climate (β = .17, p < .05), and safety communication with leaders (β = .26, p < .01), while safety leadership was related to higher safety-specific trust (β = .70, p < .001), safety climate (β = .62, p < .001), safety communication with leaders (β = .47, p < .001), safety participation (β = .38, p < .001), and safety compliance (β = .58, p < .001). Entered in the second step, S.A.F.E.R. leadership accounted for a significant increase in variance in safety-specific trust (R^2_{change} = .01, p <.001), safety climate (R^2_{change} = .05, p <.001), and safety communication with leaders (R^2_{change} = .03, p <.001). Hypothesis 4 (i.e., S.A.F.E.R. will demonstrate incremental validity) was partially supported[3].

[3] When safety-specific transformational leadership was entered in the first step, S.A.F.E.R. leadership accounted for incremental variance in safety-specific trust, safety climate, safety communication, safety participation, and safety compliance. When safety leadership was entered in the first step, S.A.F.E.R. leadership accounted for incremental variance in safety-specific trust, safety citizenship, safety climate, safety communication, and safety participation. See Appendix D for regression tables.

Table 7

Regressions of safety outcomes on S.A.F.E.R. Leadership (N = 262)

	Safety-specific Trust		Safety Citizenship		Safety Climate		Safety Comm		Safety Participation		Safety Compliance	
Step and Variable	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$
Step 1		.72[c]		.47[c]		.59[c]		.50[c]		.31[c]		.22[c]
SSTL	.17[a]		.78[c]		.17[a]		.26[b]		.19		-.13	
SL	.70[c]		-.11		.62[c]		.47[c]		.38[c]		.58[c]	
Step 2		.01[c]		.00		.05[c]		.03[c]		.01		.00
SSTL	.06		.76[c]		-.05		.10		.10		-.15	
SL	.59[c]		-.12		.40[c]		.31[b]		.27[a]		.56[c]	
S.A.F.E.R.	.23[c]		.04		.48[c]		.36[c]		.21		.04	

Note. [a]$p < .05$, [b]$p < .01$, [c]$p < .001$; Safety Comm = Safety Communication, SSTL = Safety-specific Transformational Leadership, SL = Safety Leadership

Discussion

A growing body of research (e.g., Barling et al., 2002; Mullen & Kelloway, 2009) has demonstrated that leaders play a pivotal role in promoting safety outcomes among employees. However, most of this research has predominantly focused on the influence of pre-defined leadership styles, such as transformational leadership (Bass, 1985), on safety outcomes (Clarke, 2013; Kelloway et al., 2006), while safety leadership has been measured with versions of pre-existing scales adapted to the safety context, such as the Safety-specific Transformational Leadership Scale (Barling et al., 2002). The goal of this study was to develop a measure of safety leadership that incorporates a broader range of leadership behaviours than those confined to a specific leadership style, based on the S.A.F.E.R. Leadership Model (Wong, Kelloway, and Makhan (2015). The model consists of five components: (1) speaking of safety, (2) acting safe at work, (3) focusing on maintaining safety standards, (4) engaging others in safety initiatives, and (5) recognizing individuals who adhere to safety. In developing a psychometrically sound

measure of S.A.F.E.R. leadership, the study followed an established scale development process proposed by Hinkin (1998), examining the scale's factor structure, and validity.

The factor analysis of the S.A.F.E.R. Leadership instrument revealed that the measurement is unidimensional rather than having five separate dimensions. This finding suggests that the core behaviours of S.A.F.E.R. leadership are not perceived to be distinct from each other; rather, subordinates view these behaviours as one general category of behaviours indicative of good safety leaders. This is consistent with other leadership assessment tools in organizational psychology in which subordinates also perceive good leadership as one general set of behaviours, most notably the Transformational Leadership Scale within Bass' (1985) Full Range Leadership Model. The four dimensions of transformational leadership (i.e., idealized influence, inspirational motivation, intellectual stimulation, individualized consideration) on the Multifactor Leadership Questionnaire are reported to be highly correlated and do not consistently factor into their four theoretical dimensions (Bycio et al., 1995; Judge & Piccolo, 2004). In fact, some researchers treat the four dimensions as indicators of an overall higher order transformational leadership factor (e.g., Judge & Piccolo, 2004), while others found it to factor into contingent rewards (Bycio et al., 1995; Heinitz et al., 2005) as well as support for a second order and higher order factor structure (Avolio et al., 1999; Tejeda et al., 2001). Yet, the Multifactor Leadership Questionnaire serves as a measurement of transformational leadership-like quality that predicts leaders' effectiveness and subordinates' performance (Judge & Piccolo, 2004). Despite the lack of a differentiable factor structure, transformational leadership theory has been used to develop successful leadership training in general transformational leadership (Barling et al., 1996) as well as safety-specific transformational leadership (i.e., Mullen & Kelloway, 2009). Therefore, although S.A.F.E.R. Leadership is psychometrically a one factor

measure, in practice the five-dimension conceptualization may aid managers in understanding and remembering the specific behaviours of a good safety leader.

The study also provided evidence for the validity of the newly developed measure. Demonstrating convergent validity, the S.A.F.E.R. Leadership Scale was positively related to two existing safety leadership measurements, the Safety-specific Transformational Leadership Scale (Barling et al., 2002) and the Safety Leadership Scale (Griffin &Hu, 2013). As well, S.A.F.E.R. leadership was negatively related to safety-specific passive leadership (Kelloway et al., 2006). As expected, S.A.F.E.R. leadership was associated with ideal safety-related subordinate outcomes, such as ease of safety communication with leaders, higher safety compliance and participation, more safety citizenship behaviours, improved safety climate, and enhanced safety-specific trust in leaders, demonstrating concurrent validity.

Additionally, S.A.F.E.R. leadership was positively associated with ease of safety communication, safety climate, and safety-specific trust above and beyond safety-specific transformational leadership and safety leadership, demonstrating incremental validity. In other words, S.A.F.E.R. leadership is not only associated with behavioural safety performance, but it also predicts intangible safety attitudes and perceptions beyond the two existing safety leadership measures. This finding is particularly important given the notion that safety-related cognition precedes action (Fugas et al., 2012). For example, past studies have demonstrated that safety-specific trust, safety climate, and ease of safety communication mediate the relationship between good safety leadership and both in-role and extra-role safety behaviours (Clarke, 2013; Conchie et al., 2012) as well as distal safety outcomes, such as injuries and accidents (Barling et al., 2002; Hofmann & Morgenson, 1999; Zohar 2002a).

Safety attitudes and perceptions can also mediate each other or moderate the relationship between leadership and subordinates' safety performance. For example, trust has an indirect effect on safety voice citizenship behaviours through the willingness to communicate and disclose sensitive information about safety (Conchie et al., 2012), while the relationship between safety trust and injury rates is mediated by safety climate (Luria, 2010). Transformational leadership was found to be associated with more safety citizenship behaviours under high or moderate levels of cognitive trust (Conchie & Donald, 2009). In another study, transformational and contingent reward leadership were linked with higher safety compliance only when group safety climate was positive (Kapp, 2012).

The association of S.A.F.E.R. leadership with safety attitudes and perceptions has strong implications for practical training. Managers who exhibit the behaviours outlined by S.A.F.E.R. leadership are more likely to generate the appropriate safety attitudes and perceptions necessary for their leadership to influence subordinates to perform safely. By doing so, leaders can play an important role in reducing the number of work-related injuries and deaths which result in significant social and economic costs (Barling et al., 2002; Neal & Griffin, 2006).

Limitations and Future Directions

There are several suggestions to improve the S.A.F.E.R. Leadership Scale as a psychometric measurement tool. The current study utilized a cross-sectional sample, which does not allow for predictive validity testing. Thus, this study can be followed up with a longitudinal validation study, such as a time-lagged analysis, to examine how S.A.F.E.R. leadership relates to safety outcomes over time. A longitudinal design would also allow for testing indirect effects of S.A.F.E.R. leadership on behavioral safety performance through safety attitudes and perceptions, since safety behaviours may take time to develop, even after the changes in safety cognitions.

For instance, subordinates' perceptions of safety climate may mediate the relationship between S.A.F.E.R. leadership behaviours and subordinates' safety performance at a later time point. Additionally, it should be noted that using online surveys for data collection meant that we were not able to recruit individuals who did not have Internet access.

Future studies can also overcome possible common method bias by collecting data on S.A.F.E.R. leadership and safety performance from various sources. S.A.F.E.R. leadership can be assessed as a group rating by collecting data from several subordinates of the same leader, or even assessed by the leaders themselves. As well, safety performance can be observer-rated, or can be objective data such as injury and accident rates, or even information gathered from work equipment such as hard braking behaviours in the study of driving safety (Zohar et al., 2014).

Perhaps the most promising utilization of S.A.F.E.R. leadership is its practical application as a behaviorally based safety leadership training program. Instead of a training program based on a model of leadership that may be too abstract for managers, S.A.F.E.R. leadership offers a more practical alternative that is not tied to any existing leadership style. By focusing on leader behaviours, rather than styles, as a starting point, a more comprehensive workplace safety program can be developed to provide leaders with behavioural guidance on fostering safer workplaces (Haccoun & Saks, 1998; Zohar, 2002a). More specifically, this method could assist decision-makers in enhancing their safety performance assessments, goal setting, and feedback procedures (Komaki, Heinzmann, & Lawson, 1980; Zohar, 2002). Finally, this approach to safety training may make it easier to teach leaders the importance of, and skills involved in, safety-specific leadership.

Conclusion

As the existing propositions of safety leadership theory may be too abstract for leaders in a training context, the current study aimed to develop a behaviourally based measure of safety leadership based on the S.A.F.E.R. Leadership Model (Wong et al., 2015) which consists of five dimensions: speaking of safety, acting safe, focusing on safety, engaging others in safety, and recognizing safe performance. S.A.F.E.R. leadership was positively associated with safety attitudes, perceptions, and safety performance (i.e., safety compliance and participation). Furthermore, the S.A.F.E.R. Leadership Scale was associated with unique variance in safety attitudes and perceptions above and beyond the two commonly used measures of safety leadership, namely the Safety-specific Transformational Leadership Scale (Barling et al., 2002) and the Safety Leadership Scale (Griffin & Hu, 2013). The S.A.F.E.R. Leadership Model offers a platform for both research and practice in workplace safety by offering a behaviorally based safety leadership paradigm conceived outside existing ideas of leadership models.

Study 2: Lagged Relationships between Safety Leadership and Safety Outcomes

Due to its strong influence on organizationally relevant outcomes, such as goal achievement and efficiency, leadership remains one of the most researched topics in organizational behaviour (Barling et al., 2010). In the last few decades, leadership has emerged as an important predictor with regard to workplace safety (Barling et al., 2002; Christian et al., 2009; Zohar, 2002a). A growing body of research on leadership within the safety context has demonstrated that leaders can directly influence employees' safety performance (e.g., Barling et al., 2002; Hofmann et al., 2003), indirectly influence employees' safety performance through enhanced safety perceptions and attitudes (e.g., Clarke, 2013; Zohar, 2002b), and employees'

safety performance, in turn, has been linked to better safety outcomes, such as fewer accidents and injuries (e.g., Hoffmeister et al., 2014; Zohar, 2002a).

Although this body of research has considerably improved our understanding of the role of the leader in workplace safety, our knowledge about the leadership-safety performance is constrained by several limitations (Nielsen et al., 2016). First, most studies (e.g., Barling et al., 2002) have focused on leader behaviours associated with various leadership styles, such as transformational leadership, instead of a wide range of leader behaviours that may influence safety performance. Second, most research has been cross-sectional in design, which has made it difficult to establish causality (Clissold et al., 2012; Eby et al., 2015; Nielsen et al., 2016). Third, studies have generally assumed that leadership is a predictor of safety, ignoring the potential of reverse causality (Barlow & Iverson, 2005; Christian et al., 2009). This study addresses these gaps in the literature by exploring the impact of S.A.F.E.R leadership on employees' perceptions of safety climate and safety performance and the potential bidirectionality of these relationships in a cross-lagged study design.

Leader behaviours instead of styles

Traditionally, most studies (e.g., Barling et al., 2002; Clarke, 2013; Kelloway et al., 2006) on the relationship between leadership and employee safety have focused on the effect of different leadership styles on employees' safety related outcomes. Although these studies have helped researchers develop a theoretical model to improve our understanding of the leadership-safety performance relationship, measures from these studies have not always been appropriate for use in applied settings for several reasons. First, these measures do not always focus on the specific, observable, and trainable leader behaviours that drive employees' safety performance or safety outcomes (Clissold et al., 2012; Pilbeam, Doherty, Davidson, & Denyer, 2016; Wong et

al., 2017). Second, they tend to focus solely on the transformational aspect of leadership as opposed to capturing the entire range of leadership behaviours necessary for facilitating change in safety performance and outcomes (Clarke, 2013; Pilbeam et al., 2016). Third, according to some authors (e.g., Inness et al., 2010; van Knippenberg & Sitkin, 2013), some of these measures (e.g., safety-specific transformational leadership) confound safety and transformational leadership suggesting that the variance in employee safety performance may be explained by safety climate rather than transformational leadership. Yukl (1999) has critiqued the transformational-transactional leadership framework for being ambiguous, omissions of relevant behaviours, and being biased towards heroic conceptions of leadership.

Based on these observations, this study moves away from the pre-defined leadership styles and uses the S.A.F.E.R. Leadership Model (Wong, Kelloway, & Makhan, 2015), which, rather than being a theory about effective leadership, focuses on five core leadership dimensions: Speak (i.e., behaviours relating to one-way dissemination of information), Act (i.e., observable behaviours that demonstrate leaders' own adherence to safety at work), Focus (i.e., behaviours that demonstrate commitment and motivation), Engage (i.e., behaviours that encourage employee involvement in safety decisions), and Recognize (i.e., behaviours that demonstrate appreciation of safety accomplishments).

Time-lags and reverse causality

Research has demonstrated that leadership does have an impact on employees' safety climate perceptions and safety performance; however, most studies investigating these relationships have been cross-sectional where the variables were measured at a single time point. This is not surprising as the limited number of longitudinal studies has been a gap in leadership research in general (Martinko et al., 2013; Shamir, 2011). Although cross-sectional studies have

been helpful in terms of establishing associations among these variables, they do not provide evidence for any causal effect of leadership on workplace safety (Barlow & Iverson, 2005; Clarke, 2013; Neal & Griffin, 2006; Nielsen et al., 2016). Thus, even if there are theoretical reasons for assuming that leadership influences workplace safety, only a few studies so far provide empirical evidence for this. For example, Parker, Axtell, and Turner (Parker et al., 2001) reported that supportive supervision had a positive lagged effect on safe working among manufacturing workers 18 months later. In a longitudinal study of health care workers, Mullen and Kelloway (2009) reported significant effects of safety-specific transformational leadership training on safety climate, safety compliance, safety participation, and injuries. In a time-lagged study of nurses, Halbesleben et al. (2013) found that safety compliance mediated the effect of leaders' behavioural integrity for high safety values on injuries. Examining the time-lagged relationship between different leadership styles and safety climate in the offshore petroleum industry, Nielsen et al. (2016) found that constructive and laissez-faire leadership were associated with subsequent changes in safety climate.

Although these studies suggest that leadership is a predictor of safety, reverse causality may be a possible explanation for some of these relationships. Nielsen et al (2016) suggest that both behavioural and perceptual mechanisms explain the reverse effect of safety on leadership. Workplace safety may influence leadership through a behavioural mechanism, where the leader's evaluation of workplace safety at their organization may affect the actual behaviour of the leader. For example, leaders who perceive that their subordinates are hindering their personal or organizational goal achievement (e.g., through non-compliance) may adopt a more authoritarian or tyrannical leadership style. Conversely, leaders who have a positive perception of safety may exhibit less safety specific leadership, giving the impression that the leader is passive with regard

to safety. Additionally, workplace safety may influence leadership through a perceptual process, where employees' evaluations of workplace safety at their organization may alter their perceptions of the leader. For example, employees who have a negative evaluation of safety in their organization may view their leaders in an increasingly more negative light over time, whereas employees who have a positive evaluation of safety in their organization may perceive their leaders in a more positive light over time. It is also feasible that employees' safety performance may lead to enhanced perceptions of leadership and climate, as ongoing positive safety performance is likely to result in organizational rewards (Clarke, 2006; Neal & Griffin, 2006). Finally, accident involvement may bias an employee's perceptions of safety in their organization (Neal & Griffin, 2006).

Despite the plausibility of bidirectional relationships among safety leadership, safety climate, and safety performance, only a few studies have explored reciprocal associations due to the use of cross-sectional data in most studies. For example, in a longitudinal study, Neal and Griffin (2006) reported a significant lagged effect between safety participation and safety motivation such that engaging in safety activities resulted in increased safety motivation, which has been associated with more positive perceptions of safety climate and leadership (Clarke, 2006). More recently in a time-lagged study, Nielsen et al. (2016) found that employees' perceptions of safety climate were negatively related to subsequent ratings of tyrannical leadership. The current study addresses these limitations by investigating the bidirectional, time-lagged relationships among safety leadership, safety climate, and safety performance.

Hypotheses

To address the limitations of past research this study will investigate forward and reversed time-lagged relationships between S.A.F.E.R leadership and workplace safety.

Individual level perceptions of safety climate and employees' safety performance (i.e., safety compliance and participation) will be used as indicators of workplace safety. More specifically, it is hypothesized that:

Hypothesis 1. S.A.F.E.R leadership will exert a lagged effect on a) safety climate, b) safety compliance, and c) safety participation.

Hypothesis 2. Safety climate will exert a lagged effect on a) safety compliance, and b) safety participation.

Hypothesis 3. There is a reciprocal relationship between a) S.A.F.E.R leadership and safety climate, b) S.A.F.E.R leadership and safety compliance, c) S.A.F.E.R leadership and safety participation.

Hypothesis 4. There is a reciprocal relationship between safety climate and a) safety compliance, and b) safety participation.

Method

Participants and Procedure

Data for this study were collected in two waves as part of a larger consulting project that aimed to provide safety leadership training to leaders in a large municipal transit company (See footnote 1 on pg 5). Participants were recruited internally by the company. All leaders in the operations divisions were invited to participate in the training and the employees (i.e., bus and train drivers for the company) who reported to them were invited to the survey. Participation in the training was required as part of their job for the leaders but participation in this study was voluntary for the employees. There were not any incentives offered.

Participants were asked to complete online surveys at two time points separated by three months, which is considered long enough to reduce bias due to contextual cues and to allow previously recalled information to leave short-term memory (Podsakoff et al., 2003). One reminder was sent for each wave of data collection. Of the 838 participants who were recruited by the transit company, 668 participants completed the survey at Time 1 (79.7% response rate), and 245 at Time 2 (63.3% attrition rate).

The 245 participants (212 males, 32 females) who completed the survey at both time points were an average age of 48.27, *SD* = 9.79. The average number of years employed was 11.16, *SD* = 9.64, 52.2% had less than grade 12 education, 22% grade 12, 6.5% had a college degree, and 18% had a bachelor's (1.2% did not respond). See Table 8 for the demographic characteristics of the participants. The 245 participants, nested within 61 leaders, were asked to create a unique participant ID at Time 1, which was used to link their data from the two time points. Attrition analyses revealed no systematic differences between sample and dropouts with regard to the main study variables.

Table 8
Demographic characteristics of participants

Characteristic	n	%
Gender		
Men	212	86.5
Women	32	13.1
Age	48.3 (9.8)	
Tenure (yrs)	11.2 (9.6)	
Education		
Grade 12 or less	182	75.2
College	16	6.6
Bachelor's degree	44	18.2

Measures

S.A.F.E.R. Leadership Behaviours. S.A.F.E.R. leadership behaviours were assessed using the scale developed in Study 1. Participants were asked to rate the frequency with which their leaders exhibited the 15 S.A.F.E.R. leadership behaviours in the last 3 months using a 7-point frequency scale ranging from "*Never = 1*" to "*Always = 7*". Internal consistency was .97 at both time points. Sample items include "*Talks about how to prevent accidents*" and "*Recognizes employees who perform their jobs safely*".

Safety climate. Safety climate was measured using Kelloway and Calnan's (2014) 18-item scale comprising of the supervisor, coworker, and system factors. Participants answered the extent to which they agreed with statements about their perceived safety climate at work on a 7-point Likert-type scale, with *"Strongly disagree = 1"* or *"Strongly agree = 7"*. Sample items include '*My coworkers believe in working safely*', '*My supervisor is a good safety role model*', and '*Safety issues are dealt with effectively in my workplace*'. Higher scores indicate more positive perceptions of safety climate. Internal consistency was .95 at Time 1 and .96 at Time 2.

Safety performance. Safety performance were measured with Neal, Griffin, and Hart's (2000) 8-item Safety Behaviours Scale, comprising of Safety Compliance (4 items, $\alpha = .89$ at Time 1, $\alpha = .93$ at Time 2) and Participation Scale (4 items, $\alpha = .85$ at Time 1, $\alpha = .88$ at Time 2). Participants answered the extent to which they agree with statements about their safety performance at work on a 7-point Likert-type scale, with *"Strongly disagree = 1"* or *"Strongly agree = 7"*. A sample item for safety compliance is *"I use the correct safety procedures for carrying out my job"*. A sample item for safety participation is *"I promote the safety program within the workplace"*. A higher summed score on the Safety Compliance and Participation Scale indicates more in-role and extra-role safety behaviours at work, respectively.

Results

Analysis of Dropout Effects

In analyzing sample attrition, those who continued were compared to those who dropped out of the study between Time 1 and Time 2 in terms of the study variables. Independent sample t-tests revealed that there were no group differences in terms of S.A.F.E.R. leadership, $t(666) = .1.99$, *ns*; safety climate, $t(659) = .43$, *ns*; safety compliance, $t(584) = -.13$, *ns*; and safety participation, $t(585) = .53$, *ns*. Additionally, there were no significant differences between the two groups in terms of age, $t(662) = -.139$, *ns*; or tenure, $t(660) = -.46$, *ns*.

Correlations

Eleven leaders who only had responses from a single direct report were excluded from the analysis. Means, standard deviations, and correlations of the study variables at each time point are presented in Table 9.

A positive cross-sectional association was found between S.A.F.E.R. leadership and safety climate ($r = .69$, $p < .01$ at Time 1, $r = .77$, $p < .01$ at Time 2), safety compliance ($r = .35$, $p < .01$ at Time 1, $r = .55$, $p < .01$ at Time 2), and safety participation ($r = .51$, $p < .01$ at Time 1, $r = .56$, $p < .01$ at Time 2). Additionally, S.A.F.E.R. leadership at time 1 was positively correlated with safety climate at time 2 ($r = .37$), safety compliance at time 2 ($r = .32$), and safety participation at time 2 ($r = .35$). Safety climate at time 1 was positively correlated with safety compliance and participation at time 2 ($r = -.38$, $r = -.39$, respectively). Also, safety compliance and participation at time 1 were positively correlated with S.A.F.E.R leadership ($r = .22$, $r = .28$, respectively), and safety climate at time 2 ($r = .34$, $r = .34$, respectively), providing preliminary evidence for the cross-lagged model.

Table 9

Descriptive Statistics and Intercorrelations of Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. S.A.F.E.R. Leadership, Time 1	5.40	1.42	-							
2. S.A.F.E.R. Leadership, Time 2	5.81	1.15	.44**	-						
3. Safety Participation, Time 1	5.74	0.96	.51**	.28**	-					
4. Safety Participation, Time 2	5.96	0.90	.35**	.56**	.40**	-				
5. Safety Compliance, Time 1	6.30	0.71	.35**	.22**	.48**	.34**	-			
6. Safety Compliance, Time 2	6.36	0.73	.32**	.55**	.25**	.71**	.46**	-		
7. Safety Climate, Time 1	5.75	0.95	.69**	.41**	.62**	.39**	.51**	.38**	-	
8. Safety Climate, Time 2	5.86	0.94	.37**	.77**	.34**	.68**	.34**	.66**	.48**	-

Note. ** $p < .01$. * $p < .05$.

Cross-lagged Analyses

Structural equation modeling (SEM) was used to analyze the cross-lagged relationships between leadership and safety. Cross-lagged panel analysis using SEM allows researchers to make causal inferences from temporal precedence, which is not possible in cross-sectional designs (Lang, Bliese, Lang, & Adler, 2011; Neal & Griffin, 2006). In addition, cross-lagged designs eliminate the need to control for demographics as they control for previous levels of a variable (Zapf et al., 1996).

Prior to hypothesis testing, response interdependencies were assessed due to the nested nature of the data (i.e., direct reports nested within leaders). To do this, intraclass correlations (ICC) were calculated for each dependent variable in the model. ICCs provide an indication of the extent to which direct report scores that report to the same leader are consistent, and therefore could be in part a reflection of a higher-level unit analysis. Multilevel modeling can then statistically account for the extent that clustering (as indicated by group consistency) contributes to individual responses. Although there are no hard-and-fast rules about ICC values (ρ), the rule of thumb states that random effects are most effective when $\rho > .05$ (Hedges & Hedberg, 2007; Theobald, 2018). The dependent variables in this study generated low ρ values, indicating little agreement among direct reports who report to the same leader (S.A.F.E.R. Time 2 = .03, Safety Climate Time 2 = .04, Safety Compliance Time 2 = .04, Safety Participation Time 2 = .07). Research indicates multilevel modeling is advantageous when analyzing nested data, even when ICCs are low (Hayes, 2006; Nezlek, 2014). To provide the most conservative test of the hypotheses, the CLUSTER option in MPlus was used to account for these low levels of interdependence.

Consistent with previous research (e.g., Eby et al., 2015; Kinnunen et al., 2016; Mathieu & Farr, 1991), item parceling was used when testing models. By reducing the number of model parameters to be estimated, item parceling results in a more optimal variable-to-sample size ratio and more robust parameter estimates, particularly with smaller samples (Bagozzi & Edwards, 1998; Bandalos, 2002; Little, Rhemtulla, et al., 2013). Parcels were formed using a partial disaggregation model (Bagozzi & Heatherton, 1994; Kelloway, 2015) where each parcel comprised of three items combined (i.e., averaged) based on the conceptual dimensions of S.A.F.E.R. leadership (i.e., Speak, Act, Focus, Engage, Recognize). These five indicators were then used to define the latent construct of S.A.F.E.R. leadership. Likewise, three parcels were created for safety climate based on the three dimensions of safety climate (i.e., Supervisor, Coworker, and System). Parceling was not necessary for safety compliance or participation as these were measured with only four items each.

The latent variable approach was chosen as it allows for measurement errors to be taken into account. As not all variables followed a normal distribution, robust maximum likelihood (MLR) was used as the method of estimation. Four fit indices were used for model comparison: Akaike's information criterion (AIC), comparative fit index (CFI), Tucker-Lewis index (TLI), and standardized root mean square residual (SRMR). For AIC, lower scores indicate better fit to the data. For CFI and TLI, a value of at least .90 is recommended, and for SRMR values lower than .08 are recommended. In addition to these, the Satorra-Bentler scaled $\chi 2$ difference test was used for model comparison.

Measurement Invariance

Two types of measurement invariance were examined: configural and metric. Configural invariance indicates that items can be assigned to factors as theoretically suggested, while metric

invariance refers to the relation between the latent variable and the items remaining constant over time (Finkel, 1995). Models specifying the same factor structure across time (configural invariance) demonstrated good fit to the data for safety compliance and safety participation. Furthermore, setting the factor loadings equal across time (metric invariance) did not significantly change the model fit, as demonstrated by the nonsignificant change in $\chi 2$. The configural model for safety climate did not demonstrate acceptable fit; therefore, the items were freed across time after inspecting modification indices, following recommendations in the literature (Finkel, 1995; Kelloway, 2015; Little et al., 2007) . Metric invariance was demonstrated based on a nonsignificant change in $\chi 2$, $\Delta \chi 2(2) = 1.53$, *ns.* Similarly, the configural model for S.A.F.E.R. leadership did not demonstrate acceptable fit; therefore, the Act and Focus items were allowed to correlate at both time points, and the error terms for one item (Recognize) were allowed to correlate across time. Metric invariance was demonstrated based on a nonsignificant change in $\chi 2$, $\Delta \chi 2(4) = 4.18$, *ns*. In all analyses, these invariance constraints were included. Results of tests for configural and metric invariance are provided in Table 10.

Table 10

Measurement Invariance Results

Construct/model	χ^2	df	AIC	CFI	TLI	SRMR	Comparison	Δdf	$\Delta\chi2$
S.A.F.E.R. Leadership									
Model 1: Configural Invariance	217.32	34	6181.10	0.88	0.84	0.05			
Model 2: Adjusted Configural Invariance	60.75	31	5992.85	0.98	0.97	0.04			
Model 3: Metric Invariance	63.75	35	5987.59	0.98	0.98	0.05	3 vs 2	4	4.18
Safety Climate									
Model 1: Configural Invariance	53.61	8	3589.72	0.86	0.74	0.05			
Model 2: Adjusted Configural Invariance	6.159	5	3531.69	0.99	0.99	0.04			
Model 3: Metric Invariance	7.67	7	3530.87	0.99	0.99	0.08	3 vs. 2	2	1.53
Safety Compliance									
Model 1: Configural Invariance	42.15	19	3045.52	0.95	0.93	0.03			
Model 2: Metric Invariance	45.83	22	3044.95	0.95	0.94	0.09		3	3.68
Safety Participation									
Model 1: Configural Invariance	38.49	19	4670.62	0.96	0.94	0.05			
Model 2: Metric Invariance	39.15	22	4665.83	0.96	0.95	0.05		3	0.66

Note. *p < .05, ** p <.01, ***p <.001. Changes in $\chi2$ are based on the Satorra-Bentler Scaled Chi-square Test.

Cross-Lagged Models and Tests of the Hypotheses

Analyses of time-lagged relationships between leadership and safety were conducted in MPlus (Muthén & Muthén, 2012) in four steps:

1. Stability model. This model estimates stabilities of the study variables over time and does not include cross-lagged relations.
2. Forward causation model. This model is used to test cross-lagged relationships from leadership to safety and safety climate to safety performance (i.e., compliance and participation)
3. Reverse causation model. This model is used to test cross-lagged relationships from safety to leadership and safety performance to safety climate.
4. Reciprocal model. This model includes both the forward and reverse causation models.

Results are organized into two sections. First, the lagged effects in forward causation models are presented, followed by an investigation of reverse causation among the study variables.

Lagged Effects in Forward Causation Models (Hypotheses 1 and 2)

As shown in Table 11, the forward causation model where S.A.F.E.R. leadership at Time 1 is related to safety climate at Time 2 demonstrated better fit to the data compared to the stability model, $\Delta\chi^2 = 6.31(1)$, $\rho < .05$. In this model, S.A.F.E.R. leadership at Time 1 was positively associated with safety climate at Time 2 ($\beta = .35$; $p < .001$). Hypothesis 1a was supported.

The forward causation model where S.A.F.E.R. leadership at Time 1 is related to safety compliance at Time 2 ($\beta = .20$; $p < .01$) exhibited excellent fit to the data and gave a significant improvement compared to the stability model, $\Delta\chi^2$ (1) = 4.76, *ns*. Hypothesis 1b was supported.

Similarly, the forward causation model where S.A.F.E.R. leadership at Time 1 is related to safety participation at Time 2 (β = .22; p < .01) demonstrated excellent fit to the data with significant improvement compared to the stability model, $\Delta\chi^2$ (1) = 3.99, ρ < .05), supporting Hypothesis 1c.

The forward causation model where safety climate at Time 1 is related to safety compliance at Time 2 exhibited good fit to the data (β = .27; p < .01) and gave a significant improvement compared to the stability model, $\Delta\chi^2$ (1) = 5.97, ρ < .05. Hypothesis 2a was supported.

The forward causation model where safety climate at Time 1 is related to safety participation at Time 2 (β = .29; p < .01) exhibited good fit to the data, $\Delta\chi^2$ (1) = 4.59, ρ < .01. Hypothesis 2b was supported.

Lagged Effects in Reverse Causation and Reciprocal Models (Hypotheses 3 and 4)

The reverse causation model where safety climate at Time 1 is related to S.A.F.E.R. leadership at Time 2 exhibited better fit to the data compared to the stability model, $\Delta\chi^2$ = 11.95(1), ρ < .01. In this model, safety leadership at Time 1 was positively associated with S.A.F.E.R. leadership at Time 2 (β = .39; p < .001). The reciprocal model which included the bidirectional associations between safety leadership and safety climate also had excellent fit to the model but did not perform significantly better than the competing models, $\Delta\chi^2$(1) = .03, *ns* compared to the forward causation model, and $\Delta\chi^2$ (1) = 1.73, *ns* compared to the reverse causation model. Furthermore, the beta coefficients in the reciprocal model were not significant in either direction (β = .14; *ns*, for S.A.F.E.R. leadership Time 1 to Safety Climate Time 2; β =

.30; *ns,* for Safety Climate Time 1 to S.A.F.E.R. leadership Time 2). Hypothesis 3a was not supported.

The reverse causation model where safety compliance at Time 1 is associated with SAFER leadership at Time 2 did not demonstrate an improvement over the stability model, $\Delta\chi^2$ (1) = 2.60, *ns*). Although the reciprocal model which included the bidirectional associations between safety leadership and safety compliance also had excellent fit to the data, it did not perform significantly better than the forward causation model, $\Delta\chi^2$ (1) = 1.90, *ns*. Hypothesis 3b was not supported.

The reverse causation model where safety participation at Time 1 is associated with S.A.F.E.R. leadership at Time 2 did not demonstrate an improvement over the stability model, $\Delta\chi^2$ (1) = 1.24, *ns*. While the reciprocal model which included the bidirectional associations between safety leadership and safety participation also had excellent fit to the data, it did not perform significantly better than the forward causation model, $\Delta\chi^2$ = .85, Δdf = 1, *ns*. Hypothesis 3c was not supported.

The reverse causation model where safety compliance at Time 1 was associated with safety climate at Time 2 (β = .23; $p < .01$) demonstrated better fit to the data compared to the stability model, $\Delta\chi^2$ (1)= 4.04, $\rho < .05$. The reciprocal model which included the bidirectional associations between safety climate and safety compliance also had good fit to the data but did not perform significantly better than the forward causation model, $\Delta\chi^2$ (1) = 2.22, $\rho < .05$, or the reverse causation model $\Delta\chi^2$ (1) = 3.48, *ns*. Therefore, Hypothesis 4a was not supported.

The reverse causation model where safety participation at Time 1 was associated with safety compliance at Time 2 did not perform better than the stability model, $\Delta\chi^2$ (1) = 2.17, *ns.*

Finally, the reciprocal model which included the bidirectional associations between safety climate and safety participation did not perform better than the forward causation model, $\Delta\chi^2$ (1) = .86, *ns.* Hypothesis 4b was not supported.

Table 11

Model Comparisons

		χ^2	df	AIC	CFI	TLI	SRMR	Comparison	Δdf	Δχ2
				Leadership and Safety Climate						
M1	Stability Model	215.623	94	9131.69	0.95	0.94	0.07			
M2	**S.A.F.E.R. Leadership -> Safety Climate**	**202.817**	**93**	**9121.32**	**0.96**	**0.95**	**0.05**	**2 vs 1**	**1**	**6.31***
M3	**Safety Climate -> S.A.F.E.R. Leadership**	**202.606**	**93**	**9117.45**	**0.96**	**0.95**	**0.05**	**3 vs 1**	**1**	**11.95****
M4	Reciprocal Model	201.200	92	9118.28	0.96	0.95	0.05	4 vs 1	2	11.47**
								4 vs 2	1	0.03
								4 vs 3	1	1.73
				Leadership and Safety Performance						
	S.A.F.E.R. Leadership - Safety Compliance									
M1	Stability Model	230.99	128	8951.99	0.96	0.95	0.07			
M2	**S.A.F.E.R. Leadership -> Safety Compliance**	**224.53**	**127**	**8945.06**	**0.96**	**0.95**	**0.05**	**2 vs 1**	**1**	**4.76***
M3	Safety Compliance -> S.A.F.E.R. Leadership	227.93	127	8949.77	0.96	0.95	0.06	3 vs 1	1	2.60
M4	Reciprocal Model	222.56	126	8944.81	0.96	0.95	0.04	4 vs 1	2	6.68*
								4 vs 2	1	1.90
	S.A.F.E.R. Leadership - Safety Participation									
M1	Stability Model	247.98	128	10527.55	0.95	0.94	0.07			
M2	**S.A.F.E.R. Leadership -> Safety Participation**	**242.04**	**127**	**10522.5**	**0.95**	**0.94**	**0.05**	**2 vs 1**	**1**	**3.99***
M3	Safety Participation -> S.A.F.E.R. Leadership	247.23	127	10528.12	0.95	0.94	0.06	3 vs 1	1	1.24
M4	Reciprocal Model	241.93	126	10524.36	0.95	0.94	0.05	4 vs 1	2	4.93
								4 vs 2	1	0.85
				Safety Climate and Safety Performance						
	Safety Climate - Safety Compliance									
M1	Stability Model	123.437	70	6415.49	0.96	0.94	0.08			
M2	**Safety Climate -> Safety Compliance**	**115.750**	**69**	**6405.81**	**0.96**	**0.95**	**0.05**	**2 vs 1**	**1**	**5.97***

M3	**Safety Compliance -> Safety Climate**	**117.438**	**69**	**6409.60**	**0.96**	**0.95**	**0.05**	**3 vs 1**	**1**	**4.04***
M4	Reciprocal Model	112.994	68	6405.06	0.96	0.95	0.04	4 vs 1	2	7.58*
								4 vs 2	1	2.22
								4 vs 3	1	3.48
	Safety Climate - Safety Participation									
M1	Stability Model	121.574	70	7991.68	0.96	0.94	0.06			
M2	**Safety Climate -> Safety Participation**	**114.706**	**69**	**7985.22**	**0.96**	**0.95**	**0.05**	**2 vs 1**	**1**	**4.59***
M3	Safety Participation -> Safety Climate	119.121	69	7990.87	0.96	0.94	0.05	3 vs 1	1	2.17
M4	Reciprocal Model	114.332	68	7987.11	0.96	0.94	0.05	4 vs 1	2	5.68
								4 vs 2	1	0.86

Note. *$p < .05$, ** $p < .01$, ***$p < .001$. The best fitting models are in bold.

Discussion

Research on the relationship between leadership and workplace safety has predominantly focused on the influence of various leadership styles on safety outcomes, with most studies using cross-sectional designs. Consequently, we do not yet know much about the potential impact of leadership behaviours on workplace safety over time, or the bidirectional relationships between leadership and safety. In order to address these gaps in the literature, the current study examined the relationships among S.A.F.E.R. leadership, safety climate, and safety performance (i.e., safety compliance and safety participation) in a longitudinal design. In the next two sections, the lagged effects of safety leadership on workplace safety will be discussed first, followed by a discussion on bidirectional relationships among the study variables.

Lagged effects among study variables

As expected, cross lagged panel analysis revealed that S.A.F.E.R. leadership exerted a lagged effect on safety climate, supporting Hypothesis 1a. The positive temporal relationship between S.A.F.E.R. leadership and safety climate is consistent with theoretical models of workplace safety which underscore leadership effectiveness as a salient predictor of climate perceptions (Barling et al., 2002; Barlow & Iverson, 2005; Clarke, 2013; Zohar, 2010). By engaging in behaviours that demonstrate a commitment to safety, such as talking about how to prevent accidents, effectively communicating safety expectations, modeling safety behaviours, monitoring for unsafe actions, and recognizing employees who prioritize safety, leaders can shape employees' perceptions regarding the important of safety within their organization, promoting a positive safety climate.

S.A.F.E.R. leadership also had a lagged effect on safety compliance and safety participation, supporting Hypothesis 1b and Hypothesis 1c. This finding supports the notion that, based on social exchange theory (Blau, 1964) and norm of reciprocity (Gouldner, 1960), employees feel obligated to respond to signals from their leaders that their safety is valued within the organization by complying with protective measures, following standard operating procedures, and exhibiting safety participation or citizenship-style safety behaviours, which not only protect themselves but their fellow coworkers.

Finally, safety climate had a lagged effect on safety compliance and safety participation, supporting Hypotheses 2a and 2b. This finding is also consistent with previous research examining the impact of safety climate on safety performance or the mediational role of safety climate in the relationship between leadership and safety performance (Clarke, 2006; Smith et al., 2016). A positive safety climate is thought to improve safety compliance by enhancing employees' knowledge (i.e., raising awareness of rules and the importance of following them), removing barriers to safety including skepticism regarding the importance of safety measures and procedures, and increasing safety motivation (Clarke, 2006; Neal & Griffin, 2002; Seo, 2005). A positive safety climate may lead to increased safety participation through the same mechanisms; however, as safety participation involves a greater voluntary element (Clarke, 2006), the climate-participation may also be explained within social exchange theory (Blau, 1964) and norm reciprocity (Gouldner, 1960). That is, safety climate, which is related to employees' perceptions of management safety values and commitment to safety, is likely to promote safety participation through employees' reciprocation of perceived management values (Clarke, 2006; Flin & Yule, 2004; Neal & Griffin, 2006).

Bidirectional relationships among study variables

Cross-lagged panel analysis revealed that the reverse causation model where safety climate at Time 1 had a positive lagged effect on S.A.F.E.R. leadership at Time 2 exhibited a similar fit to the data as the forward causation model where S.A.F.E.R. leadership at Time 1 had a lagged effect on safety climate at Time 2. However, the reciprocal model which included bidirectional associations between S.A.F.E.R. leadership and safety compliance was not a better fit to the data compared to the forward- and reverse-causation models. Hypothesis 3a was not supported.

The reverse causation models where the lagged effects of safety compliance and safety participation on S.A.F.E.R. leadership were tested did not demonstrate better fit to the data compared to the stability model. Additionally, the reciprocal models testing bidirectional relationships did not exhibit better fit to the data compared to the forward causation models. Therefore, the forward causation models were retained for both. Hypotheses 3b and 3c were not supported.

The reverse causation model where safety compliance at Time 1 had a lagged effect on safety climate at Time 2 demonstrated a similar fit to the data as the forward causation model where safety climate at Time 1 had a lagged effect on safety compliance at Time 2. However, the reciprocal model testing bidirectional relationships did not exhibit a better fit over the competing models. Hypothesis 4a was not supported.

Finally, neither the reverse causation model where safety participation at Time 1 had a lagged effect on safety climate at Time 2 not the reciprocal model testing bidirectional relationships between safety climate and safety compliance demonstrated better fit to the data

compared to the forward causation model where safety climate at Time 1 had a lagged effect on safety participation at Time 2. Hypothesis 4b was not supported.

These findings support the rejection of the reverse causation hypothesis as an explanation for the relationship between S.A.F.E.R. leadership and safety compliance, S.A.F.E.R. leadership and safety participation, and safety climate and safety participation. However, the findings regarding the reverse relationships between S.A.F.E.R. leadership and safety climate, and safety climate and safety compliance should be interpreted with caution. In both of these models, there was evidence of a reverse relationship as indicated by changes in chi-square and fit indices comparable to the forward causation models; however, the reciprocal models were not significantly better than the competing models. One possible explanation for this could be the small sample size in the current study (N = 233). In structural equation modeling, small sample sizes may result in a lack of power and an inability to reject the hypothesis that the model fits the data (Barling, Loughlin, & Kelloway, 2002; Kelloway, 2015). Another possible explanation could be that the three-month time interval used in this study was not long enough to detect reciprocal effects. Therefore, replication of these results with larger samples and longer time lags is recommended.

Contributions and Practical Implications

The current study provides evidence that S.A.F.E.R. leadership, a conceptualization of leadership based on leader behaviours rather than leadership styles, is a significant predictor of safety climate, safety compliance, and safety participation; and safety climate is a significant predictor of safety compliance and safety participation. Taken together, these findings extend Social Learning Theory (Bandura, 1969) by supporting the contention that employees learn behaviours through observations and exchanges with the leader. The findings also suggest that

when employees believe that their leader and organization are committed to safety, they are likely to reciprocate by engaging in compliance and participation behaviours, which extends Social Exchange Theory (Blau, 1964).

The current study has several methodological strengths. The study accounted for the nested structure of the dataset (i.e., several employees completing the survey about the same supervisor), which allowed for obtaining the correct error variances. Furthermore, the current study is one of the few studies that examined these relationships longitudinally, in a cross-lagged design. Cross-lagged analysis using SEM allows for causal inferences among variables, which is not possible in cross-sectional designs (Lang et al., 2011), for several reasons. First, cross-lagged models reduce the risk of common method bias through a temporal separation of the independent and dependent variable (Podsakoff et al., 2003). In the current study, the time lag was 3 months, which is generally considered to be long enough to reduce bias as a result of contextual cues and respondents remembering previous responses (Podsakoff et al., 2003). Second, cross-lagged models allow for the correction of correlated errors across time, reducing the potential methodological impact of using the same measure twice (Kelloway, 2015). Third, cross lagged models control for previous levels of a variable by partialling out the baseline level of a variable and eliminate the need to control for demographic (Zapf et al., 1996).

Using a cross-lagged design the current study was also able to test for reverse causality and bidirectional relationships among the study variables. No definitive evidence of reverse causation or bidirectionality was found for the relationships among the study variables in this study, which suggests that the direction of causality is from S.A.F.E.R. leadership to safety climate, S.A.F.E.R. leadership to safety behaviours, and safety climate to safety behaviours.

Consequently, these findings provide evidence that safety climate perceptions and ultimately employee safety behaviours can be enhanced through S.A.F.E.R. leadership behaviours.

Finally, the findings of this study have implications for the design of training programs that aim to improve safety leadership in organizations. Although previous research suggests that training interventions are effective in developing safety leaders, most interventions have focused on leadership styles, such as transformational leadership (Barling, Weber, & Kelloway, 1996; Dvir, Eden, Avolio, & Shamir, 2002; Mullen & Kelloway, 2009). The current study findings suggest that safety leadership interventions would benefit from integrating S.A.F.E.R. leadership behaviours into their repertoire to bolster safety climate perceptions, safety compliance, and safety participation.

Limitations and Future Research

The current study has several limitations. In a meta-analysis it was found that the magnitude of associations between predictors and outcomes were dependent on the time-lag, such that both forward and reverse causation associations were generally small, with their magnitude increasing over time (Ford et al., 2014). This suggests that the relationships among the study variables may change over time. Therefore, longitudinal studies that employ several measurement points over an extended period of time might help us better understand the short and long-term dynamics between S.A.F.E.R. leadership, safety climate, and safety performance. As is common in longitudinal studies, sample attrition occurred between the two time points. Although attrition analyses revealed no evidence of systematic differences between those who participated both times and those who dropped out after Time 1, highly committed employees may still be over-represented in the final sample (Neal & Griffin, 2006). Although no definitive evidence of reverse causation or bidirectionality was found for the relationships among the

variables in this study, theoretical models should continue to consider these effects as they would have important implications for theory and practice. The mediational role of safety climate in the relationship between S.A.F.E.R. leadership and safety behaviours was not assessed in the current study due to insufficient data. Future studies should investigate the mediational role of safety climate and other possible variables, such as safety motivation, safety attitudes, and safety consciousness to gain a better understand the underlying mechanism by which S.A.F.E.R. leadership influences safety behaviours. Future studies should also investigate how S.A.F.E.R. leadership, safety climate, and safety behaviours influence rates of injuries and fatalities. Safety climate in this study was modelled as perceptions of safety at an individual level. However, based on a definition of safety climate as shared perceptions of safety priority within a group or team, some researchers (e.g., Zohar, 2002b) have operationalized it as a group-level variable. Future research could examine both individual- and group-level effects to further explore the impact of safety climate. The current study involved a specific occupational group (i.e., bus and train drivers from a municipal transit company), who are exposed to higher levels of risks and hazards than the average working population. Furthermore, given the nature of their job, bus and train drivers in general may not be able to assess their leaders in the same way as other workers who are in a physical setting with their leaders. Although the characteristics of this population may limit the external validity of the findings of this study, the literature gaps addressed in this study are universal; therefore, the findings should be relevant to most occupational settings and industries. Nevertheless, future studies should replicate this study in other occupational settings and industries. Finally, the current study used self-reports, which may be biased when social desirability is high (Blume et al., 2010; Podsakoff et al., 2003). Future studies should control for

the potential impact of social desirability and/or include multi-source data, such as self, supervisor, peer ratings (Blume et al., 2010).

Conclusion

The current study adds to the growing body of literature examining the impact of safety leadership on safety outcomes. S.A.F.E.R. leadership, a conceptualization of safety leadership that focuses on leader behaviours rather than leadership styles, was found to have a lagged effect on safety climate, safety compliance, and safety participation, which provides evidence of predictive validity for the scale. As well, the study clarifies the direction of the relationships between S.A.F.E.R. leadership and safety outcomes. Overall, the findings indicate that the overall concept of safety leadership should be broadened to include other types of leader behaviours in addition to those associated with pre-existing leadership styles. Furthermore, the results support the argument that when employees believe their leader values their wellbeing, they are more likely to perceive a positive safety climate and respond by engaging in safety behaviours that lead not only to their own safety but also to the overall safety of the workplace. The findings are consistent with studies (e.g., Barling & Hutchinson, 2000) which have emphasized the use of commitment-oriented management practices as a strategy to safety improvement in organizations. The results of this study should be considered in the design of leadership training and development programs aiming to improve safety in organizations.

Study 3: A longitudinal investigation of S.A.F.E.R. leadership in the context of transfer of training

Leadership has been widely accepted as an important driver of safety outcomes in organizations (Barling, Loughlin, & Kelloway, 2002; Clarke, 2013; Mullen, Kelloway, & Teed,

2011; Zohar, 2002b). A growing body of research has demonstrated that leaders can have a direct influence on employees' safety attitudes (e.g., employee perceptions of safety climate) and safety performance (e.g., employees' safety specific citizenship behaviours), or an indirect influence on safety performance through their impact on employees' safety attitudes (Flin & Yule, 2004; Wong, Ozbilir, & Mullen, 2017). Given leaders' pivotal role in creating and maintaining a safe workplace, developing safety leaders has become increasingly important in improving safety outcomes in organizations (Kelloway & Barling, 2010; Wong et al., 2017).

Although the effectiveness of leadership development interventions has been well established in the literature (Avolio et al., 2009; Barling, 2014), considerably fewer studies have investigated the impact of leadership interventions in the safety context. For example, through an eight-week intervention aimed at improving supervisors' safety practices, Zohar (2002a) observed a significant increase in the frequency of reported supervisory safety-oriented interactions, along with an increase in post-intervention ratings of safety climate and a decrease in injuries. Evaluating the effectiveness of a three-month leadership training intervention targeting various levels of management across three separate organizations, Zohar and Luria (2003) reported an increase in safety-oriented interactions and perceptions of safety climate, and a reduction in unsafe behaviours to near-zero. Evaluating a three-month safety-specific transformational leadership training intervention, Mullen and Kelloway (2009) found that safety-specific training improved leaders' safety attitudes, intentions to promote safety, and self-efficacy, as well as their direct reports' perceptions of safety climate. More recently, evaluating the S.A.F.E.R. Leadership Model (Wong, Kelloway, & Makhan, 2015), which focuses on leader behaviours rather than traits and styles, Kelloway and Mullen (2016) found that employees of

trained leaders reported increased safety leadership relative to the control group in a mixed industry sample comprising representatives from hospitality and municipal governments.

Collectively, these studies echo the findings in the broader leadership literature (see Avolio et al., 2009 for a review) regarding the effectiveness of leadership development training as an intervention. However, it is widely accepted that training efforts will not yield the anticipated effects if the information and skills learned are not implemented successfully in the workplace (Aguinis & Kraiger, 2009; Baldwin & Ford, 1988). Consequently, many training programs incorporate components such as post-training goal setting and coaching to improve transfer of training (Barling, Weber, & Kelloway, 1996; Kelloway & Barling, 2000).

Although the preliminary findings regarding the effectiveness of the S.A.F.E.R. leadership training are promising (Kelloway & Mullen, 2016), we do not yet know much about S.A.F.E.R. leadership in the context of training transfer. Therefore, the aim of this study is to monitor the changes in S.A.F.E.R. leadership over three months following S.A.F.E.R. leadership training. Additionally, the study takes into account the role of workload, one of the most important factors that may affect transfer of training (Baldwin & Ford, 1988; Clarke, 2002; Nijman, Nijhof, Wognum, & Veldkamp, 2006; Sinclair et al., 2003). Although research on the influence of workload on training transfer is still limited (Nijman et al., 2006), workload is thought to deplete trainees' capacity for transfer, which is defined as "the extent to which individuals have the time, energy, and mental space in their work lives to make changes required to transfer learning on the job" (Holton et al., 2000, p. 344). As a result, trainees may not be able to maintain the leadership behaviours they learned in training over extended periods of time (Wong et al., 2017).

Factors influencing transfer of training

Transfer of training is defined as the extent that trainees successfully apply the knowledge, skills, and attitudes learned in a training context back to the job (Baldwin & Ford, 1988; Blume, Ford, Baldwin, & Huang, 2010; Burke & Hutchins, 2007). Despite the fact that organizations spend millions of dollars in training each year, many of the skills learned do not translate to the workplace (Grossman & Salas, 2011), resulting in wasted time and resources as well as unrealized business outcomes (Chiaburu et al., 2010; Laker & Powell, 2011; van der Locht et al., 2013; Volet, 2013). In fact, according to a study of training professionals, approximately 40% of trainees fail to transfer immediately after training, 70% fail to transfer one year after training, and overall only about 50% of training investments lead to improvements at the organizational or individual level (Burke & Saks, 2009; Saks, 2002). Furthermore, the transfer process of soft skills is even more problematic than technical skills as it requires more than mirroring the skills from the training in the work environment (Laker & Powell, 2011).

Since Baldwin and Ford's (1988) review article on the "transfer problem" in organizational training, numerous theoretical and empirical papers have focused on improving transfer of training in the workplace (e.g., Alvarez et al., 2004; Burke & Hutchins, 2007; Ford & Weissbein, 1997; Friedman & Ronen, 2015; Zumrah & Boyle, 2015). Despite the outpouring of studies on transfer of training in the last few decades, the taxonomy of major conceptual factors influencing transfer continues to fall within the three broad categories of trainee characteristics, training design, and work environment (Baldwin & Ford, 1988; Botke, Jansen, Khapova, & Tims, 2018; Burke & Hutchins, 2007; Clarke, 2002). These factors will be reviewed in the next sections.

Trainee characteristics. It is now commonly recognized that trainee characteristics play a significant role in the transfer of training (Baldwin & Ford, 1988; Burke & Hutchins, 2007; Grossman & Salas, 2011). In fact, some researchers (e.g., van der Klink et al., 2001) argue that most of the variability in training outcomes is explained by trainee characteristics. Cognitive ability, self-efficacy, motivation, perceived utility of training, and personality characteristics are among the trainee characteristics that have shown the strongest and most consistent relationships with transfer (Grossman & Salas, 2011).

Cognitive ability refers to an individual's overall intelligence (Colquitt et al., 2000), which is essential for learning and applying training content as it reflects their ability to process complex information, adapt to their surroundings, learn from their experiences, and engage in various forms of reasoning (Neisser et al., 1996). In a meta-analysis based on 20 years of training research, Colquit, Pine, and Noe (2000) reported a moderately high correlation coefficient between cognitive ability and training transfer at .43.

Self-efficacy has been defined as an individual's belief in their competency to complete a task successfully (Bandura, 1986, 1997). Trainees with high self-efficacy are likely to achieve better training outcomes because they are more confident in their ability to learn and apply new skills, and they are more likely to persevere when faced with challenges (Blume et al., 2010; Burke & Hutchins, 2007). Not surprisingly, self-efficacy has been consistently related to positive transfer outcomes, such as transfer generalization and transfer maintenance (e.g., Chiaburu & Marinova, 2005; Ford et al., 1998; Gaudine & Saks, 2004; Latham & Frayne, 1989). It should be noted that the effect of self-efficacy on transfer may be direct or indirect through its influence on motivation (Chiaburu & Marinova, 2005; Colquitt et al., 2000).

Motivation refers to the processes that account for an individual's intensity, direction, and persistence of effort toward attaining a goal (Robbins & Judge, 2009). In relation to transfer of training, motivation has been studied in several ways. Pre-training motivation – the trainee's level of intensity and desire as measured before the training intervention (Burke & Hutchins, 2007) – and motivation to transfer – the trainee's intended efforts to apply the skills and knowledge learned in training to the job (Noe, 1986) – have both been positively related to training transfer (Baldwin & Ford, 1988; Blume et al., 2010; Burke & Hutchins, 2007; Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005). Finally, intrinsic and extrinsic motivation have also been associated with positive training outcomes (Taylor et al., 2005; Tracey et al., 1995), although there appears to be a stronger relationship between intrinsic motivation and transfer compared to extrinsic motivation (Facteau et al., 1995).

The perceived utility or value associated with engaging in training may also have an effect on transfer (Burke & Hutchins, 2007). Research has demonstrated that trainees are more likely to apply skills learned in training if they believe in the utility of training or value the outcomes training will provide (Chiaburu & Lindsay, 2008; Ruona et al., 2002; Velada et al., 2007). According to Burke and Hutchins (2007), perceived value or utility of training can be influenced by the extent to which trainees (1) believe in the credibility of the new skills for improving performance, (2) recognize the need to improve their job performance, (3) believe that applying new learning will improve performance, and (4) perceive the new skills to be practical for ease of transfer. Put simply, trainees who do not perceive the training as valuable will not be motivated to learn and apply targeted skills (Grossman & Salas, 2011).

Although empirical research on the role of personality in transfer of training is still scarce, some personality characteristics appear to be relevant (Nijman, 2004). For example,

anxiety was found to be negatively associated with training outcomes, including motivation to learn and transfer (Colquitt et al., 2000). Negative affectivity was a significant predictor of post-training transfer implementation intentions (Machin & Fogarty, 2004) while positive affectivity was related to higher motivations to improve work performance through learning (Naquin & Holton, 2002). Openness to experience and extroversion have both been associated with higher training proficiency (Barrick & Mount, 1991; Naquin & Holton, 2002), while conscientiousness has been shown to positively predict both training proficiency (Barrick & Mount, 1991) and transfer (Colquitt et al., 2000). Finally, internal locus of control has been related to higher motivation to learn and transfer (Colquitt et al., 2000; Quiñones et al., 1995).

Training Design. Many authors have written about the importance of training design and delivery (e.g., Baldwin & Ford, 1988; Clarke, 2002; Tannenbaum & Yukl, 1992; van der Klink et al., 2001). A number of training characteristics are thought to influence transfer directly or indirectly. The next few sections will focus on the effects of several training characteristics on transfer of training, including needs analysis, content relevance, instructional strategies and methods, goal setting, and relapse prevention.

Needs analysis can be useful to determine the relevance of training, and therefore, training transfer (Burke & Hutchins, 2007). Although conceptually needs assessment is thought to be necessary for determining training needs as well as obstacles to transfer (Gaudine & Saks, 2004), there is a shortage of empirical evidence to support the link between needs analysis and training outcomes (Goldstein & Ford, 2002; Lacerenza et al., 2017). Limited research on the topic (e.g., Lacerenza et al., 2017) has found that training programs developed from a needs analysis result in greater transfer and learning. In a meta-analysis by Arthur, Bennett, Edens, and Bell (2003), only 6% of organizations reported using a needs analysis as a precursor to training.

More research is needed to corroborate the limited evidence supporting the link between needs analysis and training transfer (Arthur et al., 2003; Burke & Hutchins, 2007; Lacerenza et al., 2017).

In addition to needs analysis, it is important that training objectives and materials are content valid, i.e., applicable to the transfer task (Baldwin & Ford, 1988; Burke & Hutchins, 2007). This is based on identical elements theory (Thorndike & Woodworth, 1901), which posits that the similarities between training and performance settings maximizes transfer of training. Empirically, content relevance has been associated with transfer outcomes, including transfer, in several studies (Axtell et al., 1997; Rodríguez & Gregory, 2005; Yamnill & McLean, 2005).

Researchers have identified several instructional strategies and methods that facilitate transfer. Several studies (e.g., Holladay & Quiñones, 2003; Lee & Kahnweiler, 2000) have found that using behavioural practice and feedback during training are positively related to transfer. Varied (i.e., using a variety of examples) and spaced practice (i.e., inserting periods of rest) are thought to have a positive impact on learning and transfer (Donovan & Radosevich, 1999; Russ-Eft, 2002) although research findings on these factors have not always been consistent (e.g., Lacerenza et al., 2017). Overlearning – the process of repeated practice beyond the point of initial mastery (Russ-Eft, 2002) –has been shown to moderately improve retention after training, especially for cognitive tasks (Driskell et al., 1992). Using multiple delivery methods, such as information-, demonstration-, and practice-based methods, that facilitate active and passive learning, has been linked to increased learning and transfer (Burke et al., 2006; Lacerenza et al., 2017). Behavioural modeling, a strategy that provides opportunities for trainees to observe and practice targeted behaviours (Grossman & Salas, 2011), appears to enhance trainees' ability to learn and retain new information, and facilitate transfer (Taylor et al., 2005). The use of error-

based examples, which allows training to anticipate potential problems, may improve the utility of training by illustrating the negative consequences that can arise if skills are not acquired (Burke & Hutchins, 2007; Grossman & Salas, 2011). In their meta-analysis, Keith and Frese (2005) found that error-based training resulted in better transfer outcomes compared to error-avoidant training methods.

Goal-setting can be viewed as a behavioural modification strategy that increases the likelihood of a particular behaviour through enhanced motivation (Latham & Locke, 1991). In the training context, goal setting is a specific task that entails teaching the trainee how to set targets for putting new skills into practice when they return to work. Goal-setting can be conducted during training or after training as a post-intervention strategy to enhance transfer (Baldwin & Ford, 1988; Machin & Fogarty, 2003). The difference in timing is related to the two classes of goals to be achieved: mastery (or learning) goals and performance goals (Cannon-Bowers et al., 1998). Mastery goals enhance understanding of the task and task strategies by focusing attention on the learning process itself, whereas performance goals are outcome-oriented and focus on demonstrating competence in achieving performance targets (Cannon-Bowers et al., 1998; Harackiewicz & Elliot, 1993), such as intended transfer outcomes (Nijman, 2004). The use of goals – both assigned and participative – to increase training transfer has found much support in the literature (Burke & Hutchins, 2007). For example, goal-setting has been shown to enhance behaviours necessary for transfer, such as directing attention and action, mobilizing effort, and prolonging effort over time (Brown, 2005; Locke & Latham, 1984, 2002).

Finally, relapse prevention training refers to teaching trainees how to recognize post-training situations that may hinder skill maintenance so they do not backslide into old habits (Burke & Hutchins, 2007; Machin & Fogarty, 2003). Relapse prevention training aims to

enhance self-efficacy for detecting problematic situations and controlling one's behaviour through the use of effective coping strategies (Machin & Fogarty, 2003). Empirical support for the effectiveness of relapse prevention as a training strategy to enhance transfer has been inconsistent (Burke & Baldwin, 1999; Gaudine & Saks, 2004; Wexley & Baldwin, 1986); however, given its grounding in social cognitive learning theory, more research on it is warranted (Burke & Hutchins, 2007).

Work environment. The characteristics of the work environment can have a significant influence on transfer of training (Baldwin & Ford, 1988; Grossman & Salas, 2011; van der Klink et al., 2001). Research on the impact of the work environment on training transfer, which has grown considerably in the last few decades (Burke & Hutchins, 2007), has identified several key factors that influence skill maintenance, including transfer climate, supervisor support, opportunity to perform, and workload. This section includes a review of these factors. Workload is discussed separately as it is the main focus of the study.

Transfer climate refers to employees perceptions regarding the extent to which their work environment facilitates or hinders the use of trained skills (Burke & Baldwin, 1999; Rouiller & Goldstein, 1993). Characteristics of a positive transfer climate can be classified into two categories: 1) situational cues, which include cues to encourage skill use, support from managers through incentives and feedback, availability of equipment and resources, and opportunity to practice trained skills, and 2) consequences, which include corrective action and positive and negative feedback for the correct and incorrect use or non-use of trained skills (Burke & Hutchins, 2007; Grossman & Salas, 2011, Rouiller & Goldstein, 1993). Together, these characteristics can have a significant impact on the extent to which trained skills are applied on the job (Grossman & Salas, 2011). In their meta-analysis of 20 years of research, Colquitt et al.

(2000) reported a moderately strong correlation between climate and transfer at .37. In another meta-analysis published more recently, Blume et al. (2010) found similar results where transfer climate has the strongest association with transfer among all work environment factors. Transfer climate has also been shown to moderate the relationship between post-training transfer interventions and transfer (Burke & Baldwin, 1999; Richman-Hirsch, 2001).

The support trainees receive from their supervisors and peers to use their new skills and knowledge has been one of the most salient predictors of training transfer (Baldwin & Ford, 1988; Nijman et al., 2006; van der Klink et al., 2001). The influence of supervisory and peer support may influence transfer both directly or indirectly through their impact on climate (Burke & Hutchins, 2007). Researchers have identified several supportive supervisory behaviours that have a positive influence on transfer. For example, goal setting prior to or following training, coupled with feedback, can have a significant impact on transfer (Burke & Hutchins, 2007; Grossman & Salas, 2011; Robbins & Judge, 2009; Taylor et al., 2005) by directing attention toward goal-relevant activities, stimulating action, and enhancing persistence (Locke & Latham, 2002). Additionally, supervisors can support trainees by providing recognition, rewards, behaviour modeling, and participating in discussions of new training (Blume et al., 2010; Cromwell & Kolb, 2004; Gilpin-Jackson & Bushe, 2007; Nijman, 2004; Saks & Belcourt, 2006; Salas & Stagl, 2009). Support from peers has also been consistently associated with transfer. For example, in a study by Chiaburu and Marinova (2005) peer support was not only directly related to transfer, but also indirectly through motivation. Hawley and Bernard (2005) reported that networking with peers and having conversations about course content facilitates transfer. Gilpin-Jackson and Bushe (2007) transfer was enhanced when trainees observed others using trained

skills and coached one another. Finally, Blume et al (2010) reported a positive relationship between peer support and transfer in their meta-analytic review of the transfer literature.

Research has consistently demonstrated that transfer may be hindered in situations where trainees are not given opportunities to use their newly acquired skills in their work setting (Burke & Hutchins, 2007; Clarke, 2002; Tannenbaum & Yukl, 1992). Lack of opportunity to apply trained skills on the job was identified as the strongest barrier to positive transfer in several studies (e.g., Clarke, 2002; Cromwell & Kolb, 2004; Gilpin-Jackson & Bushe, 2007). In a study by Lim and Johnson (2002), trainees cited opportunity to use new skills as an important form of support. Salas et al (2009) reported that delay between training and opportunity to use skills was a barrier to successful transfer.

The role of workload in training transfer

An important factor that may limit opportunities to use training and consequently hinder transfer is workload (Botke et al., 2018; Clarke, 2002; Nijman, 2004; Russ-Eft, 2001, 2002). Generally, excessive workload refers to a situation in which an employee has too much to do in the time available (Kirmeyer & Dougherty, 1988). In the training context, workload has been defined as "the extent to which individuals have the time, energy, and mental space in their work lives to make changes required to transfer learning on the job" (Holton et al., 2000, p. 344).

Although there is limited research on the impact of workload on training (Gaudine & Saks, 2004; Grossman & Salas, 2011; Nijman, 2004; Russ-Eft, 2001), several studies have reported that heavy workloads posed significant barriers to transfer, causing the skills learned in training to extinguish due to lack of practice (Clarke, 2002). Porras and Hargis (1982) reported that role overload, role conflict, and job stress were negatively associated with on-the-job skill

use. Decker and Nathan (1985) found that workload was related to training success. In studies involving social service workers, Rooney (1985) and Gregoire (1994) identified workload pressure as a factor that impedes transfer of training. Similarly, in a qualitative study involving trainees who attended a two-day training program within a UK social services department, Clarke (2002) found that workload was one of the main reasons why trainees did not use the skills they learned in training back on the job. Fitzgerald and Kehrhahn (2003) reported a positive correlation between trainees' personal capacity for transfer and their motivation to transfer. In a study examining how work-environment factors influence transfer of training, Cromwell and Kolb (2004) found that overwhelming workload was one of the reasons why front-line supervisors were not able to apply the skills they learned in training to their jobs. In a study by Meyer et al (Meyer et al., 2007), semi-structured interviews with health care workers who attended critical skills course at two UK hospitals revealed that workload was a severe barrier to the implementation of new skills learned in training. Evaluating an academic leadership program for program coordinators, Ladyshewsky and Flavel (2012) identified workload strain as interfering with the program coordinators' ability to transfer the training into practice. Finally, in a study by Lloyd et al (2014) involving 46 health care workers in New South Wales, workload emerged as an important barrier to workplace learning and transfer.

The Current Study and hypotheses

The effectiveness of leadership development interventions has been well established in the general leadership literature (Avolio et al., 2009; Barling, 2014). Although considerably fewer studies have examined the role of leadership development interventions in the safety context (Wong et al., 2017), they have reported similarly positive results in terms of improved leader and employee behaviours and organizational outcomes. For example, researchers have

reported improved safety outcomes as a result of leadership training focused on leaders' communication of safety priority (Zohar, 2002a), safety-oriented communication (Zohar & Luria, 2003), safety-oriented verbal exchanges (Kines et al., 2010), and safety-specific transformational leadership (Mullen & Kelloway, 2009).

Although the combined results of these studies suggest that positive safety outcomes can be achieved through leader-focused safety interventions (Clarke, 2013; Von Thiele Schwarz, Hasson, & Tafvelin, 2016; Wong et al., 2017), most have focused on specific aspects of leadership, such as communication, or leadership styles, such as transformational leadership. Consequently, researchers (e.g., Clarke, 2013; Hoffmeister et al., 2014) have called for leadership development intervention studies that incorporate a broader range of leadership behaviours and models that are not confined to leadership traits and styles.

To address this gap in the literature, Wong, Kelloway, and Makhan (2015) developed the S.A.F.E.R. Leadership Model, which focuses on five core effective leadership dimensions: (1) speaking of safety, (2) acting safe at work, (3) focusing on maintaining safety standards, (4) engaging others in safety initiatives, and (5) recognizing individuals who adhere to safety. In a study involving managers from the hospitality industry and municipal governments, a leadership training program based on the S.A.F.E.R. Leadership Model has been associated with improved employee ratings of leaders' safety behaviours (Kelloway & Mullen, 2016).

Although these findings are promising, we do not currently know much about S.A.F.E.R. leadership in the context of transfer of training. Research suggests that transfer of training can be influenced by many factors, which fall within the three broad categories of trainee characteristics, training design, and work environment (Baldwin & Ford, 1988; Botke, Jansen, Khapova, & Tims, 2018; Burke & Hutchins, 2007; Clarke, 2002). One work environment-related

factor that may influence transfer is excessive workload, which refers to a situation where an employee has too much to do in the time available (Kirmeyer & Dougherty, 1988).

Several studies (e.g., Clarke, 2002; Decker & Nathan, 1985; Fitzgerald & Kehrhahn, 2003; Gregoire, 1994; Ladyshewsky & Flavell, 2012; Rooney, 1985) have reported that heavy workloads may hinder transfer, causing the skills learned in training to become extinguished due to lack of practice (Clarke, 2002). However, none of these studies have examined the impact of workload on leadership training in the safety context, limiting our understanding of workload in relation to transfer of safety-focused leadership training. Furthermore, almost all of these studies were qualitative in nature, and workload was not their main focus. Therefore, this study attempts to address these gaps in the literature by focusing on the changes in S.A.F.E.R. leadership over a three-month period following training. Additionally, the study investigates how these changes are affected by workload.

H1. S.A.F.E.R. leadership ratings of leaders will demonstrate a linear increase over time following S.A.F.E.R. leadership training

H2: Workload will negatively predict the growth of S.A.F.E.R. leadership over time following S.A.F.E.R. leadership training

H3: a) Workload will moderate the effect of time on the growth of S.A.F.E.R. leadership following S.A.F.E.R. leadership training, b) such that leaders with a low workload will report higher S.A.F.E.R. leadership over time.

Method

Participants and Procedure

Data for this study were collected as part of a larger consulting project (see footnote on page 11) that aimed to provide safety leadership training to nurse leaders in both long-term and acute care. Aware-NS, the Nova Scotia Health and Community Services Safety Association, invited institutions who, in turn, invited staff to participate in the training. No incentives were provided. Following Barling et al.'s (1996) model of transformational leadership training, the S.A.F.E.R. leadership training was delivered in a three-hour session that covered the importance of leadership, the S.A.F.E.R. Leadership Model (Wong, Kelloway, & Makhan, 2015), and goal setting. Through lecture format, discussions, and goal setting, leaders gained an understanding of how to incorporate S.A.F.E.R. leadership behaviours in their daily work. Following the training, each leader met individually with a coach to develop a personalized plan for setting specific, challenging, yet attainable goals with respect to S.A.F.E.R. leadership (usually 3-5 goals). Examples of goals for each of the S.A.F.E.R. leadership components were provided. Participants completed the surveys for the first time within 2 days of the training, and then three more times at one-month intervals. Additionally, participants were offered two booster sessions during which the implementation of these leadership plans over the prior month was considered and modified as appropriate.

Of the 186 participants, 117 participants completed the survey at one time point, 40 participants completed the survey at two time points, 18 participants completed the survey at three time points, and 11 participants completed the survey at all four time points.

The average age of the 186 nurse leaders (159 Females, 27 Males) who completed the survey was 47.82 years, *SD* = 9.11. The average number of years employed was 9.50 years, *SD* = 9.07. See Table 12 for participant characteristics. Participants were asked to create a unique participant ID at Time 1, which was used to link their data from different time points.

Table 12
Demographic characteristics of participants

Characteristic	n	%
Gender		
Men	27	14.1
Women	159	85.5
Age	47.8 (9.1)	
Tenure (yrs)	9.5 (9)	

Measures

S.A.F.E.R. Leadership Behaviours. S.A.F.E.R. leadership behaviours were assessed using the scale developed in Study 1. Participants were asked to rate the frequency with which they exhibited the 15 S.A.F.E.R. leadership behaviours in the last month using a 7-point frequency scale ranging from "*Never = 1*" to "*Always = 7*". Internal consistency was .96 at Time 1, .95 at Time 2, .94 at Time 3, and .97 at Time 4. Sample items include "*Talks about how to prevent accidents*" and "*Recognizes employees who perform their jobs safely*".

Workload. Using a 3-item measure (Kelloway & Barling, 1994), participants answered the extent that they agreed with statements about their workload in the last month, using a 7-point Likert scale with *"Never = 1"* or *"Always = 7"*. Internal consistencies of scale items ranged between .86 and .93 over 4 time points. Sample items include "*There was never enough time to finish all of my work*", and "*I had to work very quickly to finish all of my tasks*".

Results

Means, standard deviations, and correlations among the study variables at each time point are presented in Table 13. Prior to hypothesis testing, intraclass correlations (ICC) were calculated due to the nested nature of the data (i.e., time nested within leaders) by running a null model with only the random effect of Leader ID and S.A.F.E.R. as the dependent variable. As the ICC value generated by this analysis was greater than .05 (Hedges & Hedberg, 2007; Theobald, 2018), Leader ID was added as a cluster variable to account for the nested nature of the data.

Table 13

Descriptive Statistics and Interccorrelations of Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. S.A.F.E.R., Time 1	5.32	1.19	-							
2. S.A.F.E.R., Time 2	5.53	1.15	.45**	-						
3. S.A.F.E.R., Time 3	5.73	.92	.33	.35	-					
4. S.A.F.E.R., Time 4	6.07	.93	.78**	.72*	.89**	-				
5. Workload, Time 1	4.63	1.65	-.10	-.01	-.09	.40	-			
6. Workload, Time 2	4.45	1.63	.23	.28*	.03	.30	.70**	-		
7. Workload, Time 3	4.88	1.35	-.10	.03	.19	.50	.51**	.59**	-	
8. Workload, Time 4	4.70	1.31	.29	.48	.58	.69*	.49	.47	.77**	-

Note. ** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

To test hypotheses 1-3, a mixed model was conducted in Jamovi with workload as the time varying covariate. Robust errors maximum likelihood (REML) was used as it accounts for missing data in longitudinal models (Little, Jorgensen, et al., 2013; McNeish, 2018). Results suggest that S.A.F.E.R. increases modestly over time (β = .13, p < .05), supporting Hypothesis 1 (i.e., S.A.F.E.R. leadership ratings of leaders will demonstrate a linear increase over time following S.A.F.E.R. leadership training). Workload has a main effect on S.A.F.E.R. (β = -.20, p

= .01), supporting Hypothesis 2 (i.e., Workload will negatively predict the growth of S.A.F.E.R. leadership over time following S.A.F.E.R. leadership training). Finally, there was a significant interaction between time and workload in predicting S.A.F.E.R. (β = .18, p < .01), supporting Hypothesis 3a (i.e., Workload will moderate the effect of time on the growth of S.A.F.E.R. leadership following S.A.F.E.R. leadership training). See Table 14 for fixed effects parameter estimates.

Table 14
Fixed effects parameter estimates

			95% Confidence Interval				
Names	**Estimate**	**SE**	**Lower**	**Upper**	**df**	**t**	**p**
(Intercept)	5.379	0.0739	5.2340	5.5236	194	72.80	< .001
Time	0.129	0.0489	0.0328	0.2245	123	2.63	0.010
Workload	-0.199	0.0633	-0.3235	-0.0754	288	-3.15	0.002
Time ✻ Workload	0.175	0.0539	0.0693	0.2805	128	3.25	0.001

A simple slopes analysis revealed that when workload was low (1SD below the mean), the relationship between time and S.A.F.E.R. was not significant, b = -.05, p = .54. When workload was average or high (1SD above the mean), there was a significant positive relationship between time and S.A.F.E.R., b = .13, p < .05, and b = .30, p < .001, respectively, partially supporting Hypothesis 3b (i.e, Leaders with a low workload will report higher S.A.F.E.R. leadership over time). See Table 15 for simple effects and Figure 2 for a plot of the interaction).

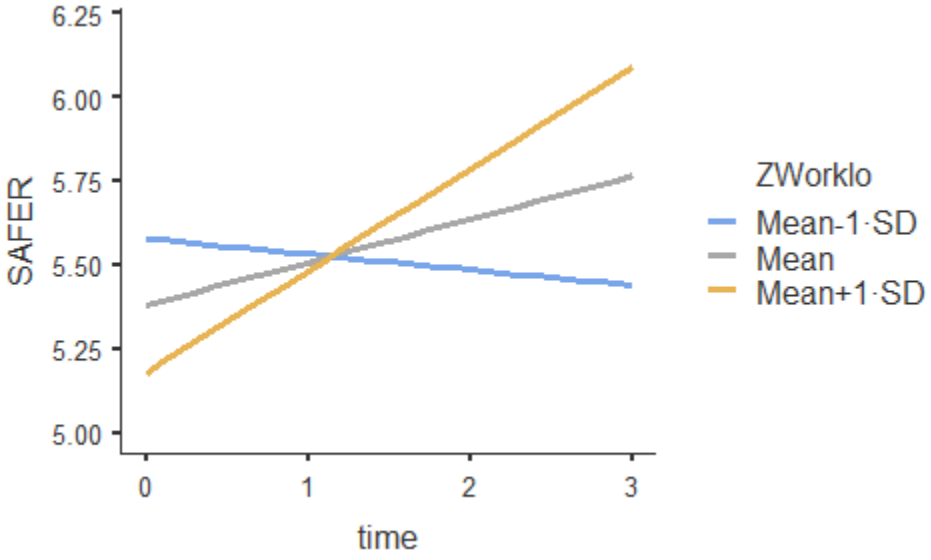
Table 15

Simple effects of time: Parameter estimates

Moderator levels			95% Confidence Interval				
Workload	Estimate	SE	Lower	Upper	df	t	p
Mean-1·SD	-0.0462	0.0745	-0.1936	0.101	135	-0.621	0.536
Mean	0.1286	0.0491	0.0316	0.226	133	2.622	0.010
Mean+1·SD	0.3035	0.0715	0.1622	0.445	135	4.247	< .001

Figure 2

Plot of interaction



Discussion

The current study aimed to explore changes in S.A.F.E.R. leadership post-training, and the impact of workload on the transfer of leadership behaviours learned in the S.A.F.E.R. leadership training program over a 3-month period. As expected, leaders' safety leadership increased, albeit modestly, over time, supporting Hypothesis 1. Although this finding cannot be

attributed solely to the effectiveness of the training due to the lack of a control group, it is consistent with previous studies (e.g., Kelloway & Mullen, 2016) that provide evidence for the effectiveness of S.A.F.E.R. as a leadership training program. As expected, workload negatively predicted the growth of S.A.F.E.R. over time following the training, supporting Hypothesis 2. Furthermore, workload moderated the relationship between time and S.A.F.E.R, supporting Hypothesis 3a; however, S.A.F.E.R. increased over time only for those with an average or high workload, and not for those with a low workload as hypothesized. Therefore, Hypothesis 3b was not supported.

There may be several reasons for this finding. First, participants may have differed in several characteristics that have been shown to influence transfer of training (Baldwin & Ford, 1988; Burke & Hutchins, 2007; Grossman & Salas, 2011). For example, self-efficacy has been associated with enhanced training outcomes as trainees with high levels of self-efficacy tend to have more confidence in their ability to learn and apply competencies, and persist when performing difficult tasks (Baldwin & Ford, 1988; Burke & Hutchins, 2007; Grossman & Salas, 2011). Pre-training motivation, motivation to transfer, as well as intrinsic and extrinsic motivation have been positively related to training transfer (Baldwin & Ford, 1988; Burke & Hutchins, 2007; Chiaburu & Lindsay, 2008; Facteau et al., 1995; Taylor et al., 2005; Tracey et al., 1995). Trainees who believe in the utility or value of training are more likely to apply new skills to their job (Baldwin & Ford, 1988; Burke & Hutchins, 2007; Grossman & Salas, 2011). Some personality characteristics, such as anxiety, negative affect, openness to experience, and extroversion, have also been linked to transfer outcomes (Colquitt et al., 2000; Machin & Fogarty, 2004; Naquin & Holton, 2002).

Second, participants with average to high workloads may have been different from those with low workloads in terms of their perceptions of the priority of safety in their work unit or organization. Safety priority refers to the degree to which employees prioritize safety against work speed, workload, and demands for productivity (Zohar, 2000). According to Katz-Navon, Naveh, and Stern (2005), organizations with a high safety priority place safety above other competing demands, such as work speed and productivity. Furthermore, employees who perceive safety as a high priority within their organization are more likely to take responsibility for safety, while employees who perceive safety as a low priority are more likely to view safety-related policies and practices as lip service and ignore them. (Katz-Navon et al., 2005). Several studies have demonstrated that safety priority has a moderating role in the relationship between leadership and safety performance. For example, Baer and Frese (2003) found that safety priority could encourage or discourage the implementation of new safety procedures, while Smith-Crowe, Burke, and Landis (2003) reported that a climate for the transfer of safety training moderated the relationship between the knowledge and information about safety that employees received during training and their safety performance. More specifically, safety priority was found to encourage or discourage the application of safety knowledge employees received during training.

Third, it is plausible that participants with a higher workload may have set goals that are more clearly behavioural and easily implementable compared to those with a low workload. For example, in some organizational contexts, goals related to Speaking (e.g., Talking to employees about safety), Engaging (e.g., Encouraging employees to share their perspectives on safety), and Recognizing (e.g., Praising employees when they are being safe) dimensions of S.A.F.E.R. may be easier to implement (Kelloway & Mullen, 2016).

Contributions and Practical Implications

This study contributes to the literature in several ways. Safety leadership increased over time following S.A.F.E.R. Leadership Training; a program based on a behavioural model of safety leadership. This approach provides researchers and practitioners with an alternative to safety leadership training programs that rely heavily on leadership styles, such as safety-specific transformational leadership.

The current study is one of the few studies to explore the role of workload in transfer of training, and, to my knowledge, the first to account for workload as a time-varying predictor in a growth curve model as opposed to relying solely on qualitative evidence, especially in the safety context. Workload in this study moderated the impact of time on safety leadership such that those leaders with an average-to-heavy workload reported higher levels of increases in safety leadership over time compared to those with a low workload. For researchers, this finding suggests workload is a variable that should be included in models investigating transfer of safety leadership training. For practitioners, this finding suggests that participants' workload should be taken into consideration when designing and evaluating safety leadership training programs. Finally, contrary to the perception that heavy workload is a barrier to transfer, the findings of this study suggest that even the leaders with a heavy workload can engage in safety leadership behaviours that could potentially improve safety performance in their organizations.

Limitations and Future Research

This study has several limitations. First, the study relies on self-reports from leaders. Future studies should employ evaluations from other sources such as direct reports. Second, this study focused on the impact of workload on transfer of safety leadership training but did not

account for the potential influence of intervening variables such as self-efficacy, safety priority, personality, and motivation, among others. Future studies should control for the potential impact of these variables to gain a better understanding of how workload influences transfer of training. Third, although this study suggests that safety leadership increased over time following S.A.F.E.R. leadership training, the lack of a control group makes it impossible to attribute the changes solely to the training. Future studies should include a control group to evaluate the impact of training programs. Fourth, this study did not set parameters around the goal setting aspect of the training, meaning participants were free to set goals that were more easily implementable, such as goals related to the Speaking, Engaging, or Recognizing dimensions of S.A.F.E.R. Consequently, improvements in safety leadership and the impact of workload may be due to the nature of the goals set by the participants. Future studies should encourage participants to set goals pertinent to all the different dimensions of S.A.F.E.R. Fifth, the current study did not take into account the differential role of the S.A.F.E.R. dimensions in relation to time or workload. Future studies should tease apart the role of specific S.A.F.E.R. dimensions to determine which one(s) interact with workload in predicting outcomes. Sixth, the results of this study should be interpreted with caution due to the small sample size. Finally, the findings of this study provide evidence of the utility of the S.A.F.E.R. Leadership Scale in the context of transfer of training.

Conclusion

The current study adds to a growing body of literature on safety leadership by providing evidence of the utility of the S.A.F.E.R. Leadership Scale in the context of training and training transfer in a longitudinal study design. Furthermore, the findings of the study suggest that workload should be an important consideration in the development of safety leadership training

programs. Although workload is often viewed as a barrier to the implementation of new skills learned in training, the current study suggests that even those with a heavy workload can become better safety leaders by engaging in certain safety-related behaviours. Considering the human and financial costs of accidents and injuries, the potential implications of these findings in terms of accident prevention should not be underestimated.

General Discussion: Summary of Studies 1, 2, and 3

Our understanding of leadership in the safety context has been limited in several ways. First, studies investigating the relationship between leadership and safety have traditionally focused on behaviours associated with leadership traits and styles, using measures adapted from existing leadership models (Wong et al., 2015). Second, most of the research has used cross-sectional designs, limiting our ability to establish a causal relationship, and to explore the possibility of bidirectional relationships, between leadership and safety. Third, despite positive findings from several studies regarding the effectiveness of safety leadership training, there has been a lack of knowledge about the factors that influence transfer of leadership training in the safety context. Over the course of three studies, this dissertation attempted to address these gaps in the literature.

Study 1 involved the development and validation of a measure of safety leadership based on Wong, Kelloway, and Makhan's (2015) S.A.F.E.R. Leadership Model, which comprises five core dimensions: (1) speaking of safety, (2) acting safe at work, (3) focusing on maintaining safety standards, (4) engaging others in safety initiatives, and (5) recognizing individuals who adhere to safety. Although the hypothesized five-factor structure for the final 15-item scale was not supported, S.A.F.E.R. leadership was positively associated with safety-specific transformational leadership (Barling et al., 2002), and safety leadership (Griffin & Hu, 2013),

demonstrating convergent validity. Furthermore, S.A.F.E.R. leadership was positively associated with several safety outcomes, including safety citizenship behaviours, safety climate, safety communication with leaders, safety compliance and participation, and safety-specific trust, demonstrating concurrent validity. Finally, S.A.F.E.R. leadership explained variance in safety citizenship, safety climate, safety communication with leaders, safety compliance and participation, and safety-specific trust, above and beyond safety-specific transformational leadership and safety leadership, demonstrating incremental validity.

Study 2 investigated the lagged effects among S.A.F.E.R. leadership, safety climate, and behavioural safety performance (i.e., safety compliance and safety participation), taking into account the possibility of bidirectionality. As hypothesized, S.A.F.E.R. leadership exerted a lagged effect on safety climate, safety compliance, and safety participation, providing evidence of causality as well as predictive validity. Safety climate also had a lagged effect on safety compliance and safety participation. As for bidirectional relationships, although both the forward and reverse causation models demonstrated similar fit to the data for hypotheses involving S.A.F.E.R. leadership and safety climate, and safety climate and safety compliance, none of the hypothesized reciprocal models demonstrated better fit to the data compared to the forward and/or reverse causation models. Therefore, based on this study, the direction of causality appears to be from S.A.F.E.R. leadership to safety climate, and from safety climate to safety performance, and not vice versa.

Study 3 explored the role of workload on the transfer of S.A.F.E.R. leadership training over a three-month period. As hypothesized, leaders' self-rated safety leadership increased over time, and this relationship was moderated by workload. However, it was those leaders with an average or heavy workload that reported increased safety leadership over time, not those with a

low workload as hypothesized. This finding may be due to the influence of individual differences in self-efficacy, motivation, safety priority, and/or due to the selection of goals that are more clearly behavioural and easily implementable by the high-workload group.

Contributions of current research: Theory and practice

This dissertation contributes to theory in several ways. By developing and validating the S.A.F.E.R Leadership Scale, a new measure of safety leadership that focuses on what leaders do to facilitate safety performance, it answers the call for (e.g., Clarke, 2013; Hoffmeister et al., 2014) leadership studies that incorporate a broader range of leadership behaviours and models than those that are confined to leadership traits and styles. Using both cross-sectional and cross-lagged designs it provides evidence that S.A.F.E.R Leadership is a significant predictor of safety climate, safety compliance, and safety participation; and safety climate is a significant predictor of safety compliance and safety participation. These findings suggest that employees learn behaviours through observations and exchanges with the leader, extending Social Learning Theory (Bandura, 1969). Furthermore, the findings extend Social Exchange Theory (Blau, 1964) by suggesting that when employees believe that their leader and organization are committed to safety, they are likely to reciprocate by engaging compliance and participation behaviours.

Using a cross-lagged design offer several advantages. Through the separation of the independent and the dependent variable cross-lagged designs reduce the risk of common method bias; by allowing for the correction of correlated errors across time they reduce the potential impact of using the same measurement instrument twice; and by partialling out the baseline of a variable they eliminate the need to control for previous levels of a variable or demographic variables. Finally, cross-lagged studies allow for testing bidirectionality between study variables. In this dissertation, cross-lagged analyses offered no definitive evidence of bidirectionality,

suggesting that the direction of causality is from S.A.F.E.R leadership to safety climate, safety compliance, and safety participation; and from safety climate to safety compliance and safety participation. These findings support the notion that both safety climate perceptions and safety performance can be enhanced through a focus on safety leadership.

This dissertation was one of the first to investigate the role of workload in transfer of safety leadership training, and the first to include workload as a time-varying predictor in a growth curve model in the safety context. It was found that leaders with an average-to-heavy workload reported higher levels of post-training increases in S.A.F.E.R leadership compared to those with a low workload. This finding runs counter to previous studies reporting that a heavy workload hinders transfer of training (Botke et al., 2018; Clarke, 2002; Nijman, 2004; Russ-Eft, 2001, 2002), which suggests that workload may operate in a different manner in the safety context.

As for practical implications, the S.A.F.E.R Leadership Scale can serve as the foundation for behaviourally based safety leadership training programs. Although researchers and practitioners have previously designed training programs using safety-specific adaptations of the transformational leadership model (Barling et al., 2002), some managers find these models too abstract and may benefit more from programs that can provide them with practical, behaviourally focused guidelines to improve safety in their organizations (Griffin & Hu, 2013; Wong et al., 2015). Furthermore, this method could assist decision-makers in enhancing their safety performance assessments, goal setting, and feedback procedures (Komaki, Heinzmann, & Lawson, 1980; Zohar, 2002). Finally, although workload is often viewed as a barrier to transfer of training, the findings of this dissertation suggest that even those with a heavy workload can become better safety leaders by engaging in certain safety-related behaviours.

Conclusion

Research on leadership and safety has been hampered by a heavy reliance on existing models of leadership styles as well as a lack of temporal research designs. Therefore, the first goal of this dissertation was to enhance our understanding of the influence of leadership in the safety context by focusing on a model of safety leadership based on leader behaviours that are independent of any existing leadership styles. To this end, a measure of safety leadership was developed and validated based on the S.A.F.E.R Leadership Model (Wong et al., 2015) which consists of five dimensions: Speaking of safety, acting safe, focusing on safety, engaging others in safety, and recognizing safe performance. It was found that S.A.F.E.R leadership was positively associated with safety attitudes, perceptions, and in-role and extra-role safety behaviours, as well as unique variance in safety attitudes and perceptions above and beyond existing safety leadership measures.

The second goal of this dissertation was to examine S.A.F.E.R leadership using temporal research designs. Two studies were conducted for this purpose. The first study adopted a cross-lagged panel design which allowed for the examination of the lagged effects among S.A.F.E.R Leadership, safety climate, and safety performance (i.e., safety compliance, and safety participation). The findings of the study suggest that S.A.F.E.R leadership predicts safety climate, safety compliance, and safety participation over time, and safety climate. Using a cross-lagged design also allowed for testing the potential bidirectional relationships among the study variables. In this dissertation, no evidence of bidirectional relationships was found, suggesting that the direction of causality is from S.A.F.E.R leadership to safety climate, safety compliance, and safety participation, and not vice versa. The second study investigated S.A.F.E.R leadership temporally in the context of training transfer. More specifically, the study examined the impact

of workload on the transfer of S.A.F.E.R leadership training. Contrary to the view that workload is a barrier to transfer of training, it was found that S.A.F.E.R leadership improved over time for those with an average-to-heavy workload.

These findings provide researchers and practitioners with a valid measure of safety that is behaviourally based and not tied to any existing models of leadership styles. The findings also provide further empirical evidence that when employees believe their leader values their wellbeing, they are more likely to perceive that there is a safe working climate and reciprocate by engaging in safety behaviours that contribute not only to their own safety but also that help to make the broader work environment safer. Finally, this dissertation provides one of the first examinations of the role of workload on the transfer of safety leadership training, suggesting that a heavy workload may not necessarily be a barrier to the successful implementation of new skills learned in training. Overall, these findings are consistent with previous studies (e.g., Barling & Hutchinson, 2000), which have advocated the use of commitment-oriented management practices as a strategy to improve safety in organizations.

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Appendix A: Q Sort Instructions for Scale Development

Please sort each of the following items into one of the five content domains you believe it belongs based on the definitions provided below.

SPEAK	One-way information dissemination from the leader to subordinates regarding safety at work. This includes providing feedback on negative safety violations.
ACT	Observable behaviours performed by the leader to enforce his/her own adherence to safety at work.
FOCUS	Behaviours of the leader that foster a safety-focused work environment. This includes commitment, persistence, motivation, monitoring.
ENGAGE	Behaviours of the leader that encourage two-way/open involvement in safety decisions. This can be with their subordinates or even other stakeholders of the organization (upper management, external liasons
RECOGNIZE	Individualized praise, appreciation and recognition of safety accomplishments from the leader to his/her subordinates.

My leader…	SPEAK	ACT	FOCUS	ENGAGE	RECOGNIZE	Comments
pays attention to safety rules and regulations						
Monitors for safety hazards						
keeps employees informed about new safety-related protocols						
asks employees to share their perspectives on safety						
consults employees when making safety-related decisions						
keeps everyone informed of any potential hazards in the workplace						
talks about safety-related problems at work						
monitors for any unsafe actions						
shares safety-related information with employees						
intervenes when employees are being unsafe						

fosters an environment in which employees can openly discuss safety						
complies with the safety protocols he/she describes						
demonstrates a commitment to a safe workplace						
recognizes employees who perform their jobs safely						
acts on employees' safety suggestions						
discusses how we can prevent accidents						
encourages employees to report any challenges related to safety						
initiates conversations about safety						
practices what he/she preaches when it comes to safety						
recognizes employees who participate in workplace safety committees						
puts safety ahead of other business concerns						
provides employees with safety-related feedback						
motivates employees to be safe						
encourages employees to suggest new ways to improve safety						
communicates a positive vision of workplace safety						
praises employees when they are being safe						
recognizes employees who promote safety						
brings employees' safety-related concerns						

to upper management when appropriate						
praises employees who prioritize safety						

Appendix B: Qualtrics Questionnaires

Study 1

Age

Gender: Male Female

Ethnicity:

- Caucasian
- African American
- Hispanic
- Middle Eastern
- First Nation
- Asian and Pacific Islander
- South/Southeast Asian
- Other — Specify

Highest level of education completed:

- Less than grade 12
- Grade 12
- College
- Bachelor
- Master or Professional Degree
- Doctoral

What is your job title? (Open text)

How long have you been working in this position? (In months - numbers only)

What industry do you work in?

How long have you been working under your current supervisor? (In months - numbers only)

S.A.F.E.R Leadership Scale

In the last 3 months, indicate how frequently your supervisor demonstrated the following behavior.

Never – Rarely – Occasionally – Sometimes – Frequently – Usually – Always

My supervisor…

1. pays attention to safety rules and regulations
2. monitors for safety hazards

3. keeps employees informed about new safety-related protocols
4. asks employees to share their perspectives on safety
5. consults employees when making safety-related decisions
6. talks about safety-related problems at work
7. monitors for any unsafe actions
8. shares safety-related information with employees
9. intervenes when employees are being unsafe
10. complies with the safety protocols he/she describes
11. demonstrates a commitment to a safe workplace
12. recognizes employees who perform their jobs safely
13. acts on employees' safety suggestions
14. talks about how we can prevent accidents
15. encourages employees to report any challenges related to safety
16. practices what he/she preaches when it comes to safety
17. recognizes employees who participate in workplace safety committees
18. puts safety ahead of other business concerns
19. provides employees with safety-related feedback
20. motivates employees to be safe
21. encourages employees to suggest new ways to improve safety
22. communicates a positive vision of workplace safety
23. praises employees when they are being safe
24. recognizes employees who promote safety
25. brings employees' safety-related concerns to upper management when appropriate
26. praises employees who prioritize safety

Safety Participation and Compliance (Neal, Griffin & Hart, 2000)

Please indicate the extent to which you performed safely at work in the last 3 months

Strongly Disagree (1) – Strongly Agree (5)

1. I promote the safety program within the organization
2. I put in extra effort to improve the safety of the workplace
3. I help my co-workers when they are working under risky or hazardous conditions

4. I voluntarily carry out tasks or activities that help to improve workplace safety
5. I carry out my work in a safe manner
6. I use all the necessary safety equipment to do my job
7. I use the correct safety procedures for carrying out my job
8. I ensure the highest levels of safety when I carry out my job

Safety climate (Zohar, 2000)

Thinking of the last 3 months, please indicate the extent to which you agree with the following statements about your direct supervisor at work

Strongly Disagree (1) – Strongly Agree (5)

1. My supervisor says a good word whenever he sees a job done according to the safety rules.
2. My supervisor seriously considers any worker's suggestions for improving safety.
3. My supervisor approaches workers during work to discuss safety issues.
4. My supervisor gets annoyed with any worker ignoring safety rules, even minor rules.
5. My supervisor watches more often when a worker has violated some safety rule.
6. As long as there is no accident, my supervisor doesn't care how the work is done (R).
7. Whenever pressure builds up, my supervisor wants us to work faster, rather than by the rules (R).
8. My supervisor pays less attention to safety problems than most other supervisors in this company (R).
9. My supervisor only keeps track of major safety problems and overlooks routine problems (R).
10. As long as work remains on schedule, my supervisor doesn't care how this has been achieved (R)

Safety communication (Hoffman & Stetzer, 1998)

Thinking of the last 3 months, please indicate the extent to which you agree with the following statements

Strongly Disagree (1) – Strongly Agree (5)

1. I feel comfortable discussing safety issues with my supervisor
2. I feel free to discuss safety-related issues with my supervisor
3. I try to avoid talking to my supervisor about safety issues (R)
4. I feel my supervisor openly accepts ideas for improving safety
5. I am reluctant to discuss safety related problems with my supervisor (R)
6. I feel my supervisor encourages open communication about safety
7. I generally try to avoid talking about safety-related issues with my supervisors (R)

Safety Citizenship Behaviours (Hoffman et al., 2003)

Never (1) – Rarely – Sometimes – Often – All of the time (5)

1. I volunteer for safety committees
2. I help teach safety procedures to new crew members
3. I assist others to make sure they perform their work safely
4. I get involved in safety activities to help me crew members work more safely
5. I help other crew members learn about safe work practices
6. I help others with safety related responsibilities
7. I make safety related recommendations about work activities
8. I speak up and encourage others to get involved in safety issues
9. I express opinions on safety matters even if others disagree
10. I raise safety concerns during planning sessions
11. I protect fellow crew members from safety hazards
12. I go out of my way to look for the safety of other crew members
13. I take action to protect other crew members from risky situations
14. I try to prevent other crew members from being injured on the job
15. I take action to stop safety violations in order to protect the well-being of other crew members
16. I explain to other crew members that I will report safety violations
17. I tell other crew members to follow safety working procedures
18. I monitor new crew members to ensure they are performing safety
19. I report crew members who violate safety procedures
20. I tell new crew members that violations of safety procedures will not be tolerated

21. I attend safety meetings
22. I attend non-mandatory safety-oriented meetings
23. I keep informed of changes in safety policies and procedures
24. I try to improve safety procedures
25. I try to change the way the job is done to make it safer
26. I try to change policies and procedures to make them safer
27. I make suggestions to improve the safety of a mission

Safety-specific transformational leadership (Barling, Kelloway & Loughlin, 2002)

Thinking of the last 3 months, please indicate the extent to which your direct supervisor performs these behaviours at work.

Never (1) – Rarely – Sometimes – Often – All of the time (5)

1. Expresses satisfaction when I perform my job safely
2. Makes sure that we receive appropriate rewards for achieving safety targets on the job
3. Provides continuous encouragement to do our jobs safely
4. Shows determination to maintain a safe work environment
5. Suggests new ways of doing our jobs more safely
6. Encourages me to express my ideas and opinion about safety at work
7. Talks about his/her values and beliefs of the importance of safety
8. Behaves in a way that displays a commitment to a safe workplace
9. Spends time showing me the safest way to do things at work
10. Would listen to my concerns about safety on the job

Safety-specific passive leadership (Kelloway, Mullen, & Francis, 2006)

Thinking of the last 3 months, please indicate the extent to which your direct supervisor performs these behaviours at work.

Never (1) – Rarely – Sometimes – Often – All of the time (5)

1. Avoids making decisions that affect safety on the job
2. Fails to intervene until safety problems become serious
3. Waits for things to go wrong before taking action

Safety Leadership Behaviours (Griffin & Hu, 2013)

Thinking of the last 3 months, please indicate the extent that you agree with the statements below.

Strongly Disagree (1) – Strongly Agree (5)

1. Places a high personal value on the team's safety
2. Inspires team members to support safety at work
3. Presents a positive vision of safety for the team'
4. Is alert to safety behaviour in the team
5. Scans the environment for unsafe actions by the team
6. Lets me know if I am working unsafely
7. Encourages new ways of thinking about safety
8. Sees unsafe behaviour as an opportunity for learning

Safety-specific trust (Conchie & Donald, 2006)

Thinking of the last 3 months, please indicate the extent that you agree with the statements below.
Strongly Disagree (1) – Strongly Agree (5)

1. I trust my supervisor to be fair in the way he deals with safety
2. I trust my supervisor's judgment when it comes to safety
3. I trust my supervisor's ability to make sure jobs are carried out safely

Study 2

Age

Gender: Male Female

Highest level of education completed:

- Less than grade 12
- Grade 12
- College
- Bachelor
- Master or Professional Degree
- Doctoral

What is your job title?

How long have you been working in this position? (Years – months)

How long have you been working at your organization? (Years – months)

S.A.F.E.R Leadership Scale

In the last 3 months, indicate how frequently your supervisor demonstrated the following behavior.

Never – Rarely – Occasionally – Sometimes – Frequently – Usually – Always

My supervisor…

1. Talks about safety related problems at work
2. Talks about how to prevent accidents
3. Communicates a positive vision of workplace safety
4. Complies with the safety protocols he/she describes
5. Pays attention to safety rules and regulations
6. Practices what he/she preaches when it comes to safety
7. Demonstrates a commitment to a safe workplace
8. Monitors for any unsafe actions
9. Motivates employees to be safe
10. Encourages employees to suggest new ways to improve safety
11. Asks employees to share their perspectives on safety
12. Encourages employees to report any challenges related to safety
13. Praises employees when they are being safe
14. Recognizes employees who perform their jobs safely
15. Praises employees who prioritize safety

Safety Climate (Kelloway & Calnan, 2014)

Please indicate your level of agreement or disagreement with the statements below regarding safety at your organization.

Strongly Disagree (1) – Strongly Agree (7)

1. My coworkers value their own safety
2. My coworkers believe safety is a top priority
3. My coworkers believe in working safely

4. My coworkers look out for each other's safety
5. My coworkers always wear their safety equipment
6. My coworkers always work as safely as possible
7. My supervisor emphasizes the importance of safety on a routine basis
8. My supervisor enforces all safety policies and practices
9. My supervisor always acts in a safe manner while on the job
10. My supervisor prioritizes safety above all else
11. My supervisor motivates me to work safely
12. My supervisor is a good safety role model
13. There is an effective health and safety committee at the workplace
14. Incidents are always reported
15. All reported incidents are formally documented
16. Internal health and safety inspections are done on a routine basis
17. Safety issues are dealt with effectively in my workplace
18. I have access to all of the health and safety resources that I need

Safety Participation and Compliance (Neal, Griffin & Hart, 2000)

Thinking of the last 3 months, please indicate the extent that you agree with the statements below.

Strongly Disagree (1) – Strongly Agree (7)

1. I promote the safety program within the organization
2. I put in extra effort to improve the safety of the workplace
3. I help my co-workers when they are working under risky or hazardous conditions
4. I voluntarily carry out tasks or activities that help to improve workplace safety
5. I carry out my work in a safe manner
6. I use all the necessary safety equipment to do my job
7. I use the correct safety procedures for carrying out my job
8. I ensure the highest levels of safety when I carry out my job

Study 3

Age

Gender: Male Female

Have you participated in any health and safety training before? Please describe

Have you participated in any leadership training before?

S.A.F.E.R Leadership Scale

In the last month, indicate how frequently your supervisor demonstrated the following behavior.

Never – Rarely – Occasionally – Sometimes – Frequently – Usually – Always

My supervisor…

1. Talks about safety related problems at work
2. Talks about how to prevent accidents
3. Communicates a positive vision of workplace safety
4. Complies with the safety protocols he/she describes
5. Pays attention to safety rules and regulations
6. Practices what he/she preaches when it comes to safety
7. Demonstrates a commitment to a safe workplace
8. Monitors for any unsafe actions
9. Motivates employees to be safe
10. Encourages employees to suggest new ways to improve safety
11. Asks employees to share their perspectives on safety
12. Encourages employees to report any challenges related to safety
13. Praises employees when they are being safe
14. Recognizes employees who perform their jobs safely
15. Praises employees who prioritize safety

Workload (Kelloway & Barling, 1994)

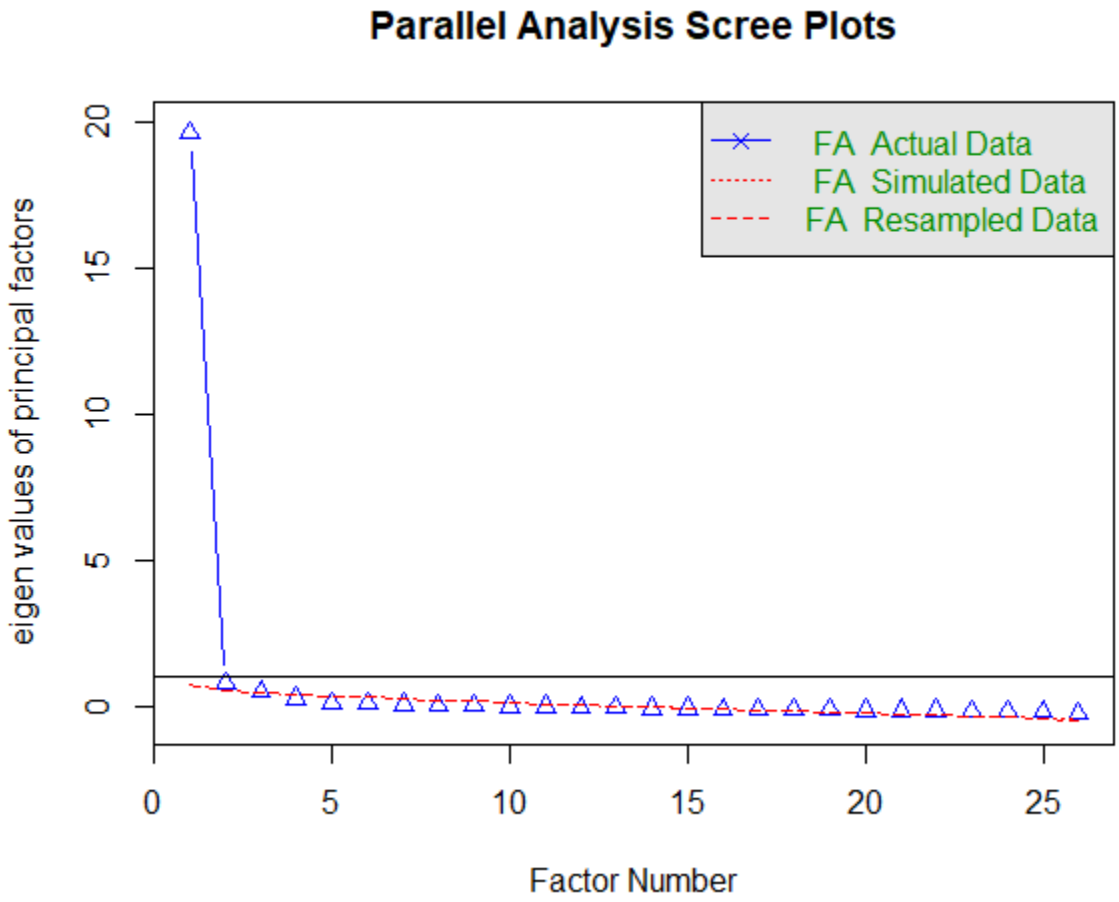
Thinking of the last month, please indicate the extent that you agree with the statements below.

Strongly Disagree (1) – Strongly Agree (7)

1. I had too much work to do
2. There was never enough time to finish all of my work
3. I had to work very quickly to finish all of my tasks

Appendix C: Exploratory Factor Analysis

Parallel Analysis Plot



Five-factor solution

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	19.935	76.673	76.673	19.782	76.084	76.084	18.929
2	1.031	3.964	80.637	0.886	3.408	79.492	17.102
3	0.885	3.404	84.04	0.666	2.563	82.055	9.865
4	0.53	2.038	86.078	0.358	1.377	83.432	6.456
5	0.388	1.494	87.572	0.193	0.742	84.173	1.556
6	0.356	1.37	88.942				
7	0.294	1.129	90.071				
8	0.263	1.013	91.084				
9	0.243	0.934	92.017				
10	0.218	0.84	92.858				
11	0.208	0.799	93.657				
12	0.186	0.715	94.371				
13	0.178	0.683	95.054				
14	0.146	0.563	95.617				
15	0.137	0.527	96.144				
16	0.125	0.48	96.624				
17	0.121	0.465	97.089				
18	0.118	0.453	97.542				
19	0.109	0.42	97.962				
20	0.102	0.392	98.354				
21	0.083	0.318	98.672				
22	0.077	0.297	98.969				
23	0.072	0.276	99.245				
24	0.068	0.263	99.508				
25	0.067	0.257	99.765				
26	0.061	0.235	100				

	Factor				
	1	2	3	4	5
keeps employees informed about new safety-related protocols_S	0.27	-0.22	0.23	0.40	-0.05
shares safety-related information with employees_S	**0.48**	-0.09	0.14	0.40	-0.03
provides employees with safety-related feedback_S	**0.71**	-0.16	0.04	-0.04	0.17
talks about safety-related problems at work_S	**0.57**	-0.21	-0.02	0.26	0.14
communicates a positive vision of workplace safety_S	**0.90**	0.03	-0.04	0.13	0.06
talks about how to prevent accidents_S	**0.78**	-0.14	0.00	-0.01	0.10
complies with the safety protocols he/she describes_A	**0.83**	-0.11	-0.08	0.15	-0.20
practices what he/she preaches when it comes to safety_A	**0.89**	0.05	0.07	0.04	-0.17
pays attention to safety rules and regulations_A	**0.85**	0.02	0.12	-0.01	-0.15
intervenes when employees are being unsafe_A	**0.80**	0.00	0.07	-0.01	-0.01
acts on employees? safety suggestions_A	**0.82**	-0.10	0.07	-0.11	0.14
motivates employees to be safe_F	**0.88**	-0.08	-0.01	-0.02	0.00
monitors for any unsafe actions_F	**0.82**	0.01	0.08	0.12	0.01
demonstrates a commitment to a safe workplace _F	**0.57**	-0.13	0.31	-0.02	-0.17
monitors for any safety hazards_F	**0.91**	-0.06	-0.04	-0.01	-0.04
puts safety ahead of other business concerns _F	0.32	-0.02	**0.68**	-0.06	-0.10
encourages employees to suggest new ways to improve safety_E	0.31	-0.21	0.24	0.27	0.28
encourages employees to report any challenges related to safety_E	**0.75**	-0.11	0.02	0.07	0.16
asks employees to share their perspectives on safety_E	0.32	-0.36	0.14	0.18	0.26
brings employees' safety-related concerns to upper management when appropriate_E	**0.89**	-0.01	0.02	-0.04	0.17
consults employees when making safety-related decisions _E	0.00	-0.16	**0.64**	0.14	0.09
praises employees when they are being safe_R	0.15	**-0.85**	-0.05	-0.04	0.04
praises employees who prioritize safety_R	0.01	**-0.93**	0.01	0.05	-0.06
recognizes employees who perform their jobs safely_R	0.22	**-0.76**	-0.02	-0.06	0.10
recognizes employees who promote safety_R	-0.07	**-0.73**	0.33	-0.05	-0.03
recognizes employees who participate in workplace safety committees_R	0.00	**-0.82**	0.00	0.18	0.05

Note. S = Speak, A = Act, F= Focus, E = Engage, R = Recognize. Factor loadings greater than .40 are in bold.

Four-factor solution

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	19.935	76.673	76.673	19.773	76.051	76.051	18.999
2	1.031	3.964	80.637	0.875	3.366	79.417	6.027
3	0.885	3.404	84.04	0.656	2.524	81.942	14.07
4	0.53	2.038	86.078	0.352	1.352	83.294	8.419
5	0.388	1.494	87.572				
6	0.356	1.37	88.942				
7	0.294	1.129	90.071				
8	0.263	1.013	91.084				
9	0.243	0.934	92.017				
10	0.218	0.84	92.858				
11	0.208	0.799	93.657				
12	0.186	0.715	94.371				
13	0.178	0.683	95.054				
14	0.146	0.563	95.617				
15	0.137	0.527	96.144				
16	0.125	0.48	96.624				
17	0.121	0.465	97.089				
18	0.118	0.453	97.542				
19	0.109	0.42	97.962				
20	0.102	0.392	98.354				
21	0.083	0.318	98.672				
22	0.077	0.297	98.969				
23	0.072	0.276	99.245				
24	0.068	0.263	99.508				
25	0.067	0.257	99.765				
26	0.061	0.235	100				

	Factor			
	1	2	3	4
keeps employees informed about new safety-related protocols_S	0.36	0.10	0.34	**0.40**
shares safety-related information with employees_S	**0.54**	0.13	0.18	0.39
provides employees with safety-related feedback_S	**0.72**	-0.22	0.05	0.03
talks about safety-related problems at work_S	**0.66**	-0.12	-0.01	0.33
communicates a positive vision of workplace safety_S	**0.92**	0.00	-0.09	0.13
talks about how to prevent accidents_S	**0.81**	-0.15	0.01	0.04
complies with the safety protocols he/she describes_A	**0.96**	0.12	-0.03	0.08
practices what he/she preaches when it comes to safety_A	**0.92**	0.16	0.09	-0.04
pays attention to safety rules and regulations_A	**0.86**	0.12	0.16	-0.09
intervenes when employees are being unsafe_A	**0.80**	0.01	0.07	-0.03
acts on employees? safety suggestions_A	**0.80**	-0.20	0.07	-0.06
motivates employees to be safe_F	**0.93**	-0.05	0.00	-0.03
monitors for any unsafe actions_F	**0.83**	0.04	0.07	0.10
demonstrates a commitment to a safe workplace _F	**0.58**	0.08	**0.45**	-0.09
monitors for any safety hazards_F	**0.96**	-0.01	-0.04	-0.02
puts safety ahead of other business concerns _F	0.18	0.10	**0.84**	-0.12
encourages employees to suggest new ways to improve safety_E	0.32	-0.20	0.27	0.37
encourages employees to report any challenges related to safety_E	**0.77**	-0.15	0.01	0.13
asks employees to share their perspectives on safety_E	0.38	-0.30	0.20	0.31
brings employees' safety-related concerns to upper management when appropriate_E	**0.85**	-0.15	-0.02	0.01
consults employees when making safety-related decisions _E	-0.09	-0.04	**0.77**	0.17
praises employees when they are being safe_R	**0.43**	**-0.45**	0.20	0.10
praises employees who prioritize safety_R	0.34	-0.37	0.31	0.15
recognizes employees who perform their jobs safely_R	**0.45**	**-0.46**	0.19	0.07
recognizes employees who promote safety_R	0.09	-0.32	**0.64**	0.03
recognizes employees who participate in workplace safety committees_R	0.29	-0.36	0.24	0.31

Note. S = Speak, A = Act, F= Focus, E = Engage, R = Recognize. Factor loadings greater than .40 are in bold.

3-factor solution

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	19.935	76.673	76.673	19.759	75.995	75.995	19.46
2	1.031	3.964	80.637	0.867	3.334	79.329	2.767
3	0.885	3.404	84.04	0.648	2.492	81.821	14.699
4	0.53	2.038	86.078				
5	0.388	1.494	87.572				
6	0.356	1.37	88.942				
7	0.294	1.129	90.071				
8	0.263	1.013	91.084				
9	0.243	0.934	92.017				
10	0.218	0.84	92.858				
11	0.208	0.799	93.657				
12	0.186	0.715	94.371				
13	0.178	0.683	95.054				
14	0.146	0.563	95.617				
15	0.137	0.527	96.144				
16	0.125	0.48	96.624				
17	0.121	0.465	97.089				
18	0.118	0.453	97.542				
19	0.109	0.42	97.962				
20	0.102	0.392	98.354				
21	0.083	0.318	98.672				
22	0.077	0.297	98.969				
23	0.072	0.276	99.245				
24	0.068	0.263	99.508				
25	0.067	0.257	99.765				
26	0.061	0.235	100				

	Factor		
	1	2	3
talks about safety-related problems at work_S	**0.93**	-0.16	-0.07
communicates a positive vision of workplace safety_S	**1.03**	0.04	-0.12
talks about how to prevent accidents_S	**0.91**	-0.05	-0.01
keeps employees informed about new safety-related protocols_S	**0.58**	-0.04	0.28
shares safety-related information with employees_S	**0.75**	0.00	0.14
provides employees with safety-related feedback_S	**0.83**	-0.12	0.03
complies with the safety protocols he/she describes_A	**0.99**	0.17	-0.04
practices what he/she preaches when it comes to safety_A	**0.85**	0.25	0.11
pays attention to safety rules and regulations_A	**0.77**	0.23	0.19
intervenes when employees are being unsafe_A	**0.80**	0.10	0.07
acts on employees? safety suggestions_A	**0.85**	-0.05	0.06
puts safety ahead of other business concerns _F	0.03	0.17	**0.91**
demonstrates a commitment to a safe workplace _F	**0.48**	0.17	**0.49**
monitors for any unsafe actions_F	**0.90**	0.08	0.06
monitors for any safety hazards_F	**0.98**	0.10	-0.04
motivates employees to be safe_F	**0.95**	0.06	0.00
consults employees when making safety-related decisions _E	0.00	-0.09	**0.77**
encourages employees to suggest new ways to improve safety_E	**0.63**	-0.27	0.20
encourages employees to report any challenges related to safety_E	**0.93**	-0.10	-0.03
asks employees to share their perspectives on safety_E	**0.68**	-0.32	0.13
brings employees' safety-related concerns to upper management when appropriate_E	**0.94**	-0.04	-0.04
recognizes employees who promote safety_R	0.20	-0.24	**0.62**
praises employees who prioritize safety_R	**0.57**	-0.32	0.26
recognizes employees who participate in workplace safety committees_R	**0.62**	-0.38	0.17
praises employees when they are being safe_R	**0.66**	-0.35	0.14
recognizes employees who perform their jobs safely_R	**0.66**	-0.35	0.14

Note. S = Speak, A = Act, F= Focus, E = Engage, R = Recognize. Factor loadings greater than .40 are in bold.

2-factor solution

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	19.935	76.673	76.673	19.738	75.914	75.914	19.73
2	1.031	3.964	80.637	0.85	3.27	79.183	1.05
3	0.885	3.404	84.04				
4	0.53	2.038	86.078				
5	0.388	1.494	87.572				
6	0.356	1.37	88.942				
7	0.294	1.129	90.071				
8	0.263	1.013	91.084				
9	0.243	0.934	92.017				
10	0.218	0.84	92.858				
11	0.208	0.799	93.657				
12	0.186	0.715	94.371				
13	0.178	0.683	95.054				
14	0.146	0.563	95.617				
15	0.137	0.527	96.144				
16	0.125	0.48	96.624				
17	0.121	0.465	97.089				
18	0.118	0.453	97.542				
19	0.109	0.42	97.962				
20	0.102	0.392	98.354				
21	0.083	0.318	98.672				
22	0.077	0.297	98.969				
23	0.072	0.276	99.245				
24	0.068	0.263	99.508				
25	0.067	0.257	99.765				
26	0.061	0.235	100				

	Factor	
	1	2
keeps employees informed about new safety-related protocols_S	**0.83**	0.00
shares safety-related information with employees_S	**0.86**	0.05
provides employees with safety-related feedback_S	**0.88**	-0.07
talks about safety-related problems at work_S	**0.91**	-0.10
communicates a positive vision of workplace safety_S	**0.92**	0.09
talks about how to prevent accidents_S	**0.91**	0.00
complies with the safety protocols he/she describes_A	**0.92**	0.21
practices what he/she preaches when it comes to safety_A	**0.89**	0.29
pays attention to safety rules and regulations_A	**0.88**	0.27
intervenes when employees are being unsafe_A	**0.84**	0.14
acts on employees? safety suggestions_A	**0.91**	-0.01
motivates employees to be safe_F	**0.93**	0.11
monitors for any unsafe actions_F	**0.93**	0.12
demonstrates a commitment to a safe workplace _F	**0.86**	0.18
monitors for any safety hazards_F	**0.91**	0.14
puts safety ahead of other business concerns _F	**0.76**	0.13
encourages employees to suggest new ways to improve safety_E	**0.86**	-0.22
encourages employees to report any challenges related to safety_E	**0.92**	-0.04
asks employees to share their perspectives on safety_E	**0.87**	-0.27
brings employees' safety-related concerns to upper management when appropriate_E	**0.91**	0.01
consults employees when making safety-related decisions _E	**0.68**	-0.07
praises employees when they are being safe_R	**0.86**	-0.30
praises employees who prioritize safety_R	**0.86**	-0.27
recognizes employees who perform their jobs safely_R	**0.86**	-0.30
recognizes employees who promote safety_R	**0.78**	-0.20
recognizes employees who participate in workplace safety committees_R	**0.84**	-0.33

Note. S = Speak, A = Act, F= Focus, E = Engage, R = Recognize. Factor loadings greater than .40 are in bold.

1-factor solution (26 items)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	19.935	76.673	76.673	19.704	75.783	75.783
2	1.031	3.964	80.637			
3	0.885	3.404	84.04			
4	0.53	2.038	86.078			
5	0.388	1.494	87.572			
6	0.356	1.37	88.942			
7	0.294	1.129	90.071			
8	0.263	1.013	91.084			
9	0.243	0.934	92.017			
10	0.218	0.84	92.858			
11	0.208	0.799	93.657			
12	0.186	0.715	94.371			
13	0.178	0.683	95.054			
14	0.146	0.563	95.617			
15	0.137	0.527	96.144			
16	0.125	0.48	96.624			
17	0.121	0.465	97.089			
18	0.118	0.453	97.542			
19	0.109	0.42	97.962			
20	0.102	0.392	98.354			
21	0.083	0.318	98.672			
22	0.077	0.297	98.969			
23	0.072	0.276	99.245			
24	0.068	0.263	99.508			
25	0.067	0.257	99.765			
26	0.061	0.235	100			

Factor loadings and communalities for the one-factor solution (26 items)

	Factor	Communalities
keeps employees informed about new safety-related protocols_S	0.83	0.69
shares safety-related information with employees_S	0.86	0.74
provides employees with safety-related feedback_S	0.89	0.79
talks about safety-related problems at work_S	0.92	0.84
communicates a positive vision of workplace safety_S	0.91	0.83
talks about how to prevent accidents_S	0.91	0.83
complies with the safety protocols he/she describes_A	0.90	0.80
practices what he/she preaches when it comes to safety_A	0.86	0.73
pays attention to safety rules and regulations_A	0.85	0.73
intervenes when employees are being unsafe_A	0.82	0.68
acts on employees? safety suggestions_A	0.91	0.83
motivates employees to be safe_F	0.92	0.85
monitors for any unsafe actions_F	0.92	0.84
demonstrates a commitment to a safe workplace _F	0.84	0.70
monitors for any safety hazards_F	0.90	0.81
puts safety ahead of other business concerns _F	0.74	0.55
encourages employees to suggest new ways to improve safety_E	0.88	0.78
encourages employees to report any challenges related to safety_E	0.93	0.86
asks employees to share their perspectives on safety_E	0.89	0.79
brings employees' safety-related concerns to upper management when appropriate_E	0.91	0.82
consults employees when making safety-related decisions _E	0.68	0.47
praises employees when they are being safe_R	0.89	0.79
praises employees who prioritize safety_R	0.89	0.79
recognizes employees who perform their jobs safely_R	0.89	0.79
recognizes employees who promote safety_R	0.80	0.64
recognizes employees who participate in workplace safety committees_R	0.87	0.76

Appendix D: Incremental Validity of S.A.F.E.R. Leadership

Incremental validity of S.A.F.E.R. Leadership beyond SSTL

	Safety-specific Trust		Safety Citizenship		Safety Climate		Safety Comm		Safety Participation		Safety Compliance	
Step and Variable	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$
Step 1		.60[c]		.47[c]		.49[c]		.44[c]		.27[c]		.14[c]
SSTL	.77[c]		.68[c]		.70[c]		.67[c]		.52[c]		.37[c]	
Step 2		.06[c]		.00		.12[c]		.07[c]		.03[b]		.02[a]
SSTL	.36[c]		.69[c]		.15[a]		.25[b]		.24[a]		.14	
S.A.F.E.R.	.48[c]		-.01		.65[c]		.48[c]		.33[b]		.28[a]	

Note. [a]$p < .05$, [b]$p < .01$, [c]$p < .001$; Safety Comm = Safety Communication, SSTL = Safety-specific Transformational Leadership, SL = Safety Leadership

Incremental validity of S.A.F.E.R. Leadership beyond SL

	Safety-specific Trust		Safety Citizenship		Safety Climate		Safety Comm		Safety Participation		Safety Compliance	
Step and Variable	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$	β	$R^2\Delta$
Step 1		.71[c]		.32[c]		.58[c]		.48[c]		.30[c]		.22[c]
SL	.84[c]		.56[c]		.76[c]		.69[c]		.54[c]		.47[c]	
Step 2		.02[c]		.04[c]		.06[c]		.04[c]		.02[a]		.00
SL	.62[c]		.26[b]		.38[c]		.36[c]		.34[c]		.48[c]	
S.A.F.E.R.	.26[c]		.36[c]		.46[c]		.40[c]		.25[a]		-.02	

Note. [a]$p < .05$, [b]$p < .01$, [c]$p < .001$; Safety Comm = Safety Communication, SSTL = Safety-specific Transformational Leadership, SL = Safety Leadership