A safer workplace: A longitudinal examination of S.A.F.E.R leadership on employee outcomes

by

Diana Serban

A Thesis Submitted to

Saint Mary's University, Halifax, Nova Scotia

In Partial Fulfillment of the Requirements for

The Degree Master of Science in Applied Psychology

August 2022, Halifax, Nova Scotia

Approved: _____

E. Kevin Kelloway, PhD

Supervisor

Approved: _____

Mark Fleming, PhD

Committee Member

Approved: _____

Debra Gilin, PhD

Committee Member

Approved: _____

John Fiset, PhD

External Examiner

Date: August 26th 2022

Abstract

A safer workplace: A longitudinal examination of S.A.F.E.R leadership on employee outcomes

By Diana Serban

Abstract: A longitudinal study with three waves of data collection (N = 304) was conducted to examine the relationship between S.A.F.E.R leadership (Wong et al. 2015) and employee health and safety outcomes. Safety climate was tested as a mediator for the relationship between S.A.F.E.R leadership and the following outcomes: occupational injuries, occupational incidents, anxiety around safety, safety participation, and safety compliance. A series of cross-lagged structural equation models revealed that S.A.F.E.R leadership predicted safety climate, anxiety around safety, and safety compliance. Safety climate was also predicted by anxiety around safety, occupational injuries, occupational incidents, and safety participation. Finally, safety climate was found to mediate the relationship between S.A.F.E.R leadership and safety participation.

[August 26th 2022]

Table of Contents

Acknowledgements

First and foremost, I would like to thank my wonderful supervisor, Dr. Kevin Kelloway, for teaching me the ins and outs of research. Your guidance, expertise, and patience throughout the entirety of my thesis is something I can't thank you enough for.

To my committee members, Dr. Debra Gilin, for challenging me and making me think harder about my work, and to Dr. Mark Fleming for your expertise and advice on safety. You have both influenced me to view my thesis through a different lens and have helped me produce stronger work.

To my family and friends who have supported me throughout the entirety of my Master's degree, and have (perhaps unwillingly) listened to my rants about structural equation modelling – I thank you. I especially want to thank my mom who has provide more support and encouragement than ever imaginable.

A special thanks to Cameron Pound – for your kindness and encouragement throughout this crazy process, I am grateful to have you in my life.

And of course, to my academic partner in crime – Haya Bakour. Thank you for being by my side through thick and thin (and Paris).

A safer workplace: A longitudinal examination of S.A.F.E.R leadership on employee outcomes

According to the Association of Workers' Compensation Boards of Canada (AWCBC, 2020), Canada reported 925 workplace fatalities in 2019. Among these deaths, 29 of them were under the age of 25. Additionally, in the past 6 years, Canada has experienced a 10% increase in the number of accepted time lost claims (AWCBC, 2020). Unfortunately, evidence suggests that these statistics are a severe underestimate of the reality of the matter due to a number of reasons, including underreporting (Barnetson, 2012). In fact, results from a 2017 poll identified that 21.5% of respondents reported at least one work-related injury in the past year, of which 41.8% were disabling injuries (Barnetson et al., 2018). Only 31% of the workers with disabling injuries filed a worker's compensation claim, showcasing the severity of the matter (Barnetson et al., 2018). Reasons for the underreporting dilemma include ambiguity in the definition of lost-time across provinces, fear of reprisal, belief that the pain experienced is a normal result of work or aging, lack of management responsiveness after prior reports, compensation not covering highly paid workers, and workers using alternative sources that provide higher compensation (e.g., long-term disability plans) (Pranksy et al., 1999; Tucker & Keefe, 2022).

Not only do injuries, as well close calls (i.e., 'incidents') have direct social and economic impacts, there are also a number of indirect costs associated with occupational injuries, including losses in wage, household productivity, and a decreased quality of life (Waehrer et al., 2007). It is no surprise that organizations are now focusing on the relevant factors which contribute to workplace safety (Clark, 2013; Jiang & Probust, 2016, Mullen et al., 2017). Given their status within organizations, supervisors have been characterized as key factors that can promote and boost workplace safety procedures and practices within their organization (Mullen et al., 2017).

Previous research has identified dimensions of good safety leaders, yet little is known about the extent to which safety leadership impacts employee outcomes and the mechanism through which this occurs (Ozbilir 2021).

Leadership and safety

Safety leaders engage in and maintain behaviours that help organizations achieve a desired state of safety (Cooper, 2010). When organizations have leaders who actively promote occupational safety, the organization has better safety records (Ongori & Agolla, 2008). Effective safety leadership has been linked to a number of outcomes that result in the improvement of safety performance and gain in financial benefits in organizations (Veltri et al., 2007). Specifically, safety leadership positively affects employees' safety behaviours and attitudes, helps reduce injury rates and insurance premiums, and contributes to increased productivity (Veltri et al., 2007). On the contrary, ineffective safety leaders hinder the ability of many companies to achieve success (Cooper & Finley, 2013). For instance, Westerlund et al. (2004) found that poor decision-making skills in leaders predicted employee sick leave. Oftentimes, what constitutes an effective safety leader is investigated in terms of leadership style (e.g., Barling et al., 2002; Martinez-Corcoles et al., 2017) because leadership style has been noted to be an antecedent of safety perceptions and behaviour (Clarke, 2013). More recently, a general model of safety leadership has emerged that integrates the principles of different safety leadership styles, along with basic principles of effective leadership (Wong et al., 2015).

The following section describes the leadership styles (e.g., transformation leadership, safety-specific transformational leadership, and active transaction leadership) and leadership behaviours that have been noted to play a role in health and safety. Then, I describe how

previous styles and models were incorporated to develop the S.A.F.E.R model of leadership (Wong et al., 2015).

Transformational leadership. The four components of transformational leadership can enhance occupational safety (Barling et al., 2002). Leaders who engage in idealized influence are able to convey the core values of the organization, including safety (Barling et al., 1996). Inspirational motivation in a safety context is achieved when leaders convince their followers that they can meet safety goals. Leaders who demonstrate individualized consideration care about their followers on multiple levels, including their physical safety (Barling et al., 2002). Zohar (2002) found that transformational leadership is negatively related to occupational injuries. The basic principles of transformational leadership have been used to develop a model of safety-specific transformational leadership (Barling et al., 2002).

Safety-specific transformational leadership. Safety-specific transformational leadership is a distinct construct from general transformational leadership, which accounts for more variance in safety outcomes (Mullen & Kelloway, 2006). Safety-specific transformational leaders are those who promote safety-related practices (Mullen & Kelloway, 2006). It has been found that safety-specific transformational leaders contribute to the prediction of safety outcomes more so than transformational leaders who do not promote safety practices (Mullen & Kelloway, 2006). This is because leaders can be transformational in one aspect of the job, such as productivity, but lack in other aspects, such as promoting safety standards. Although transformational leadership forms only part of Bass' (1985) full-range leadership model, there has been a considerably greater focus on transformational compared with transactional leadership, both generally in leadership research and more specifically in relation to safety leadership (Clarke, 2013).

Active transactional leadership. According to the augmentation hypothesis, transformational leadership builds upon a foundation of successful transactional leadership (Bass et al., 2003). In Bass' (1985) leadership model, transactional leaders are those who rely on a reward-system to achieve organizational goals. Transactional leadership can be further divided into four subcategories of styles. (1) Contingent reward, where the leader motivates employees by using rewards and positive reinforcement to meet identified goals; (2) management by-exception active, where the leader monitors employee behaviours and provides corrective action prior to the occurrence of serious problems; (3) management-by exception passive, where the leader monitors employee behaviours and takes corrective action once problems have occurred, and; (4) laissez-faire, which is the absence of leadership behaviours (Bass, 1985).

In relation to safety, active transactional leadership has a positive association with some aspects of occupational safety (Clarke, 2013). Specifically, active transactional leadership positively impacts employee safety participation and safety compliance (Clarke, 2013). These leaders impact how employees perceive the importance of safety in the organization (Clarke, 2013). Perception of safety may be enhanced in the organization with active transactional leaders because these leaders create clear boundaries, are supportive of employees, and take visible action to prevent incidents from occurring (Clarke, 2013; Dunbar, 1975).

Although aspects of both transformational and active transactional leadership have produced notable outcomes in safety, it has been suggested that a combination of behaviours that occur in various leadership styles could produce more influential safety outcomes (Lyubykh et al., 2022).

Leadership behaviours. It has recently been noted that the behaviours leaders engage in are not exclusive to a specific leadership style, but rather, leaders tend to engage in behaviours

that span several leadership categories (Katz-Navon et al., 2020; Willis et al., 2017). Leadership behaviours fall into five categories: (1) change-oriented (i.e., innovation and improvement focused behaviours), (2) relational-oriented (i.e., employee-leader relationship improvement behaviours), (3) task-oriented (i.e., outcome focused behaviours), (4) passive leadership behaviours (i.e., inert behaviours), and (5) destructive (i.e., harming or hostile behaviours) (DeRue et al., 2011; Lyubykh et al., 2022; Wellman, 2017). These behaviours are typically combined in order to achieve optimal outcomes, including workplace safety outcomes (Willis et al., 2021).

Researchers have proposed that when leadership behaviours are contextual to safety outcomes, the association between leadership behaviours and workplace safety is stronger (Barling et al., 2002; Lyubkh et al., 2022). For instance, in the context of safety, leaders need to gain the trust of their employees in order to engage them in safety initiatives (i.e., relational-oriented leadership), communicate safety protocol (i.e., task-oriented leadership) and ensure the long-term safety of employees (change-oriented leadership) (Lyubykh et al., 2022).

In a meta-analysis by Lyubkh et al., 2022, it was found that change, relationship, and task leadership behaviours are positively associated with workplace safety. Partial support was also found for the negative impact of destructive and passive leadership behaviours on workplace safety (Lyubkh et al., 2022). Interestingly, when leaders engaged in task-oriented behaviours they had the strongest influence on employee safety outcomes, whereas change-oriented behaviours, which are prominent in transformational leadership, were not the most influential on any employee safety outcome (Lyubkh et al., 2022).

S.A.F.E.R Leadership

Developed by Wong et al. (2015), the S.A.F.E.R Leadership model is an integration of leadership behaviours found in existing models of safety leadership with its core tracing back to general principles of effective organizational leadership, oftentimes recognized as transformational leadership. Aspects of safety-specific transformation leadership and active transactional leadership are present in this model through the recognition to build a trusting relationship between leader and employee and the role of rewards in promoting safety(Barling et al., 2002; Bass, 1985). Additionally, leadership behaviours that were noted to increase safety in organizations are present in the S.A.F.E.R. leadership model as it emphasizes the need to communicate about safety with employees and showcase commitment to safety (Lyubkh et al., 2022).

The model is a guideline for the combination of leadership behaviours that are needed to produce optimal outcomes in a safety context. The S.A.F.E.R Leadership model is comprised of five leadership dimensions: (1) speak about safety, (2) act safely at work, (3) focus on the maintenance of safety standards, (4) engage others in safety initiatives, and (5) recognize individuals who adhere to safety (Wong et al., 2015).

Speak about safety. Leaders can communicate about safety by engaging in a number of behaviours, for instance providing employees safety-related feedback and having conversations with employees about safety at work (Ozibilir, 2021). Safety communication is an important component in a safety model because it provides a transfer of information from leader to employees (Ozibilir, 2021). In fact, communication has been identified as a critical part of effective safety leadership by leaders themselves (Fruhen et al., 2013). Leaders are responsible for transferring the organization's safety vision and for accurately reporting the safety concerns of employees (Flin & Yule, 2004). By doing so, a true lens of the organization's safety

performance is evident and management will have the ability to make appropriate safety-related decisions (Flin & Yule, 2004). Previous research has found that leaders who provide feedback three or more times a week are able to improve safety behaviours in their employees (Komaki et al., 1980). How leaders can effectively communicate safety initiatives with employees is coachable and has been found to improve communication (Kines et al., 2010). Specifically, safety communication coaching increased the number of verbal exchanges regarding safety, the employees' attention to safety, and the safety index of the work site (Kines et al., 2010). Therefore, speaking of safety is a critical component of safety leadership that is both trainable and producing promising results.

Act safely at work. What is communicated about safety in the workplace is further consolidated when employees see their leader actively engaging in safe behaviours at work (Biggs et al., 2013). Peterson (2004) notes that leaders have a duty to engage in actions that demonstrate the importance of safety if they want to see an improvement of the safety system. When leaders role model positive safety behaviours, employees may experience increased self-efficacy to accomplish the goals and objectives modelled (Bandura, 1997). When leaders model safety behaviours they can influence employees to mimic these behaviours, thereby improving safety. In fact, safety role modelling, i.e., when leaders role model safe behaviours at work, has been linked to an increase in safety-related whistleblowing and employee safety behaviours in the workplace (Ogunfowora et al., 2021). Another study found that alignment between leaders' expectation of employees and their own actions regarding safety can improve safety behaviours (Leroy et al., 2012). By engaging in observable safety behaviours, leaders are both demonstrating their adherence to safety at work and encouraging employees to do the same.

Focus on the maintenance of safety standards. A leader who is involved in establishing and maintaining safe work systems and safety standards are actively demonstrating their own commitment to safety and concern for their employees (Cooper, 1998). A focus on the maintenance of safety standards is therefore an essential component of safety leadership. Past literature suggests that when leaders display inconsistent safety behaviours, regardless of leadership type, employee safety participation (involvement in safety development) and safety compliance (following safety policies) is decreased (Mullen et al., 2011). The sheer presence of safety standards in an organization is not enough to influence safety behaviours in employees—an active effort to maintain these standards is needed. This can be achieved through safety monitoring—the degree to which a leader monitors and responds to employee safety mistakes (Griffin & Hu, 2013). Griffin & Hu (2013) found that safety monitoring increases both safety compliance and safety participation in employees. Similarly, Zohar and Luria (2003) found that when leaders offer weekly feedback concerning the frequency of safety-oriented interactions, safety climate is improved and employees engage in more safety behaviours. By actively maintaining safe work systems, leaders are further showcasing the importance of safety in the workplace.

Engage others in safety initiatives. In order to achieve safety initiatives, all levels of the organization must be involved. A good leader will take it upon themselves to ensure all employees have a say in safety decisions and initiatives. In general, effective leaders engage employees by encouraging their questions and feedback (Crichton, 2005). O'Dea & Flin (2001) note that when leaders form a 'joining' relationship with their employees **(i.e., the leader consults employees in decision-making)**, more time is spent in communicating safety issues. This can in turn lead to a better understanding of the safety issue and actions that can be taken to

prevent incidents from reoccurring. A study by Flin & Yule (2004) found that encouraging employee involvement in safety initiatives and being supportive of employee input leads to an increase in employee safety-related behaviours. By engaging employees in safety initiatives, employees gain an increased sense of ownership and willingness to promote the initiatives and share information regarding critical issues (Leveson, 2016). A leader who involves their employees builds trust and cooperation, which in turn motivates safety participation (Griffin & Hu, 2013). As such, leaders should ensure that safety-related initiatives are developed as a team effort.

Recognize individuals who adhere to safety. A good safety leader is able to identify instances where employees adhere to safety rules and provide recognition and positive feedback (Ozbilir, 2021). Recognition from a leader is oftentimes viewed by the employee as a reward and source of psychosocial support (Baranik et al., 2010). In turn, psychological support instils feelings of respect and trust towards the leader, motivating the employee to continue displaying the behaviours that resulted in recognition (Baranik et al., 2010). With respect to safety, the literature suggests that introducing short-term rewards (e.g., recognition) when safety behaviour is observed results in a perceived increase in the value and frequency of safety behaviour (Zohar & Luria, 2003). Similarly, McAfee & Winn (1989) found that when incentives are provided to employees after safe behaviours, there is an increase in safety and a decrease in workplace incidents. Therefore, providing recognition to employees who display positive safety behaviours promotes the continuation of safety behaviours.

Recently, a measure of S.A.F.E.R leadership has been developed that can be used to test the relationship between the S.A.F.E.R model and employee outcomes (Ozbilir, 2021). Evidence from a factor analysis of S.A.F.E.R Leadership scale indicate that the behaviours present in

S.A.F.E.R are not perceived to be distinct from one another, indicating that the scale is unidimensional (Ozbilir, 2021).

Safety Climate

The relationship between safety leadership and safety climate is well documented in the literature (e.g., Clarke, 2006; Ozbilir, 2016; Smith et al., 2016). Safety climate refers to the shared perceptions of employees about the importance of safety within their organization (Barling et al., 2002). Safety climate can be discussed on an organizational level (i.e., forming from instituted policies and procedures) or group-level safety climate (i.e., forming from supervisory practices) (Zohar et al., 2005). Previous research has found that safety climate can predict both safety knowledge and motivation (Griffin & Neal, 2000) and safety behaviours (Hofmann & Stetzer, 1996). Specifically, a positive safety climate impacts safety compliance and participation by increasing employee knowledge on the rules and regulations of safety in the workplace and decreasing skepticism towards safety (Barling et al., 2002; Clarke 2006). Safety climate is affected by management actions (Barling et al., 2002). For example, when a manager talks about the extent to which safety is valued in the organization, the employees perceptions of safety climate are enhanced (Barling et al., 2002). Barling et al. (2002) found support for a model linking safety-specific transformational leadership and occupational injuries indirectly through perceived safety climate (Barling et al., 2002). The aspects of safety climate that influence the relationship between leadership and occupational injuries include the leader's ability to undertake preventative action, the leader's reaction towards safety issues, and how important safety is to the leader (Zohar, 2002). Leaders who react calmly and effectively in response to occupational injuries and incidents may influence how employees will react as well.

I hypothesized:

H1a: *Employee perception of S.A.F.E.R leadership would predict safety climate.*

Furthermore, in a study on construction workers, it was found that safety climate not only impacts safety performance, but also indirectly impacts psychological well-being (Chen et al., 2017). Similarly, research suggests that safety climate has a direct impact on employee well-being and burnout (Silla & Gamero, 2018). Specifically, this relationship exists because safety climate diminishes demands that may result in increased stress or poor well-being (Silla & Gamero, 2018).

Theoretical Foundation

The mediational role of safety climate on health and safety outcomes can be explained with consideration to two theories: the *social exchange theory* and the *social learning theory*. The social exchange theory (Blau, 1960) states that an employee's relationship with a managerial figure is motivated by the transactions between the two parties involved. This forms what is called a *reciprocity norm*, where favorable treatment from one party motivates favorable treatment in return (Gouldner, 1960; Cropanzano & Mitchell, 2005). Stated otherwise, employees act accordingly to how they perceive they are treated by their organization or manager (Gouldner, 1960).

Support for the application of social exchange theory and reciprocity norm in organizations has been documented in the literature (e.g., Eisenberger et al., 1990). Deloy et al. (2010) found that when leaders are committed to workplace safety and engage in a social exchange dynamic with employees, the employees react more positively when they perceive greater levels of organizational support for workplace safety. In other words, the employees reciprocate the positive environment created by their leaders.

In light of the current study, employees who work in organizations with a positive safety climate are more likely to perceive their leaders' efforts towards organizational safety as beneficial to their personal well-being. In turn, they are more likely to reciprocate by engaging in safer work behaviours, thereby reducing the occurrence of incidents, injuries, and anxiety.

The mediational role of safety climate can also be explained in part by the *social learning theory,* which suggests that social behaviour can be learned through observation and imitation of the behaviours of others (Bandura, 1977). In the context of the workplace, employees who view other employees receive a reward or benefit for their actions will be motivated to engage in the same action. Leaders can therefore cognitively influence employees to act safely by highlighting the safe behaviours of other employees and the incentives they have received (Ashour, 1982). In the context of safety, leaders who reward employees for safe work behaviours, will in turn create a positive safety climate and encourage employees to engage in safe behaviours at work.

The principles of the social exchange theory and the social learning theory suggest that the S.A.F.E.R leadership model can impact employee behaviour that may in turn lead to a variety of outcomes. Four possible outcomes include frequency of occupational injuries, frequency of occupational incidents, employee anxiety towards safety, and safety behaviours.

Employee outcomes

Workplace incidents & injuries. Past literature suggests that a leaders who actively promote occupational safety is positively related to employee safety records (e.g. Hofmann & Morgeson, 1999; Ongori & Agolla, 2008; Zohar, 2002). For instance, good safety leadership and safety-specific transformational leadership have been noted to increase employee safety behaviours and decrease injury rates (Barling et al., 2002; Zohar, 2002). Another study

investigating the rate of workplace injuries in nurses found that effective leadership is linked to lower rates of injury (Lee et al., 2011). Similarly, safety-specific passive leadership predicts safety-related variables, including injuries (Kelloway et al., 2006).

These findings suggest that leadership, and particularly leadership that is oriented toward safety, is an important antecedent of safety outcomes. As such, I hypothesized:

> ***H2a:*** *Employee perception of S.A.F.E.R. leadership would predict occupational injuries.*
>
> ***H2b:*** *Safety climate mediates the relationship between S.A.F.E.R leadership and occupational injuries.*
>
> ***H3a:*** *Employee perception of S.A.F.E.R. leadership would predict occupational incidents.*
>
> ***H3b:*** *Safety climate mediates the relationship between S.A.F.E.R leadership and occupational incidents.*

The outcomes of safety leadership arguably go beyond occupational injuries and incidents to include outcomes related to the mental well-being of employees, such as anxiety around safety.

Employee anxiety around safety. Occupational health and safety research typically explores the physical outcomes of safety, yet there is an increased recognition of the need for 'mentally safe' work environments (Dollard & Bakker, 2010). **A mentally safe work environment, for example, can encompass the level of anxiety employees feel in relation to their safety at work** (Dollard & Bakker, 2010)**.** Additionally, both absenteeism and early retirement have been found outcomes of mental health problems, including anxiety (McDaid et al., 2005). Yet, despite the known consequences of poor mental health, there has been a

negligence towards the recognition of mental health in some aspects of organizations, including health and safety (Mcdaid et al., 2005). N**o studies to date have explored the concept of anxiety around safety in the workplace. For the purpose of this study, anxiety around safety is defined as feelings of nervousness, stress, and uneasiness towards one's own safety in the workplace.**

Anxiety is the result of environmental demands exceeding an individual's coping resources that are needed to deal with the demands (Topper, 2007). A number of risk factor predictors of anxiety and depression have been noted, including lack of safety, heavy lifting, unsupportive workplace relationships, and job demands (Battams et al., 2014; Christos & Pienaar, 2006).

The link between leadership and mental well-being has also been well established in the literature (e.g., Arnold et al., 2007; Kelloway & Barling, 2010; McKee et al., 2011). Positive leadership behaviours predict context-specific and context-free well-being (Kelloway et al., 2013). Similarly, ethical leadership leads to increased work engagement and decreased emotional exhaustion (Chughtai et al., 2015). Poor leadership has been linked to increased levels of anxiety, depression, and psychosomatic symptoms (Hoel et al., 1999). In the context of safety, managers who promote safety practises positively affect employee wellbeing and productivity (Ishola, 2017). Similarly, occupational safety significantly predicts the well-being of social workers (Adewole, 2020).

Furthermore, how a leader behaves in moments of extreme stress impacts how employees behave and the emotions they experience (Harms et al., 2017). Leaders shape employee emotions and influence how employees evaluate stressful events in the workplace (Lyons & Schneider, 2009). Research has found that positive leadership behaviours including, inclusive decision-making, increased autonomy and input into the workplace may help protect workers from

depression and anxiety (Battams et al., 2014). As S.A.F.E.R leadership emphasizes the development of a positive relationship between leaders and employees, I hypothesized:

H4a: *Employee perception of S.A.F.E.R. leadership would predict employee anxiety around safety.*

H4b: *Safety climate mediates the relationship between S.A.F.E.R leadership and anxiety around safety.*

Safety behaviours. Safety behaviours (otherwise known as safety performance) include: (1) safety compliance, referring to the in-role behaviours that must be performed to maintain safety, such as safety rules and regulations and (2) safety participation, referring to the extra-role behaviours that indirectly contribute to the development of a safe work environment, such as helping co-workers and engaging in safety training (Neal et al., 2000). Empirical evidence has suggested that employee perceptions of their leaders' concern for their safety is an antecedent to employee safety behaviours (Clarke, 2013; Hofmann et al., 2003). Specifically, leadership has been found to be closely related to both compliance and engagement (where engagement included safety participation) (Nahrgang et al., 2011). Additionally, empowering leadership, a style that aims to increase employees' perception of self-management (Arnold et al., 2000), has been associated with higher levels of safety compliance and participation (Martínez-Córcoles et al., 2013). Therefore, I hypothesized:

H5a: *Employee perception of S.A.F.E.R. leadership would predict safety participation.*

H5b: *Safety climate mediates the relationship between S.A.F.E.R leadership safety participation.*

H6a: *Employee perception of S.A.F.E.R. leadership would predict safety compliance.*

H6b: *Safety climate mediates the relationship between S.A.F.E.R leadership and safety compliance.*

Study Objectives

With the new development of a S.A.F.E.R leadership scale (Ozbilir, 2021), more research is needed to better understand the relationship between S.A.F.E.R leadership and health and safety outcomes. The goal of this study was to test how S.A.F.E.R leadership impacts employee outcomes, including occupational injuries, occupational incidents, safety behaviours, and anxiety towards safety. Additionally, I investigated the mediational role of safety climate on the aforementioned constructs to gain a better understanding of the underlying mechanism by which S.A.F.E.R leadership influences employee outcome. A three wave longitudinal design with data collection spaced eight weeks apart was implemented and cross-lagged structural equation models were used to evaluate my hypotheses.

Methodology

Participants

Participants were recruited via the online survey panel, Prolific. To be included in the study, participants must have been working 30 hours a week, have a direct supervisor, and have a job that requires them to go into the workplace (i.e., not work remotely). Participants received compensation through the online survey platform for their involvement in the study.

Design

A longitudinal study with three waves of data collection was conducted. Data were collected in 8 week intervals, for a total of 16 weeks. The relationship between S.A.F.E.R

leadership and the following variables was tested: number of occupational injuries, number of occupational incidents, safety behaviours (i.e., safety participation and safety compliance), and employee anxiety towards safety. Safety climate was tested as a mediator of the relationship between S.A.F.E.R leadership and the aforementioned variables.

Procedure

Respondents were recruited via online survey panel and responses were matched by the panel operator across points of data collection using a unique ID.

During each wave of data collection, participants were asked to reflect back on the last two months of work and complete a 20 minute survey. The survey measured safety climate, occupational injuries, occupational incidents, safety behaviours, and employee anxiety towards safety. The survey also asked participants to rate their leader's safety leadership based on the S.A.F.E.R Leadership scale. Please refer to Appendix A for a full list of materials used in the study.

Measures

Safety leadership (15 items, T1, *a* = .96; T2, *a* = .97; T3, *a* =.97). Safety leadership was measured using the unidimensional measure of S.A.F.E.R Leadership instrument developed by Ozbilir (2021). Sample items included '*how frequently does your supervisor talk about safety related problems at work?'* and '*how frequently does your supervisor demonstrate a commitment to a safe workplace?'.* Responses were recorded on a 1 (never) to 7 (always) Likert-type scale.

Safety climate (6 items, T1, *a* = .89; T2, *a* =.89; T3, *a* =.92). Safety climate was assessed using Kelloway & Calnan's (2014) measure of safety climate. The scale includes three dimensions: supervisor, coworkers, and system factors. Responses were recorded on a 1 (never) to 7 (always) Likert-type scale. As the supervisor dimension of safety climate overlaps

extensively with safety leadership, which will be used to predict safety climate in the current study, the supervisor dimension is excluded. Additionally, the coworkers dimension is excluded from the study because it is more likely to be dependent on characteristics and past experiences of coworkers and is less relevant to the study. As such, for the purpose of this study, only the system factors dimension of safety climate was included. Sample items included '*incidents are always reported'* and *'all reported incidents are formally documented'.*

Safety participation (4 items, T1, *a* = .83; T2, *a* = .85; T3, *a* =.87). Safety participation was assessed using Neal et al., (2000) Safety Behaviours Scale on a 7-point Likert-type scale with *"Strongly disagree = 1"* or *"Strongly agree = 7"*. Sample items include '*I promote the safety program within the organizations*' and '*I put extra effort to improve the safety of the workplace'.*

Safety compliance (4 items, T1, *a* = .88; T2, *a* = .90; T3, *a* =.88). Safety compliance was assessed using Neal et al., (2000) Safety Behaviours Scale on a 7-point Likert-type scale with *"Strongly disagree = 1"* or *"Strongly agree = 7"*. Sample items include *'I use all the necessary safety equipment to do my job'* and '*I use the correct safety procedures for carrying out my job'.*

Anxiety around safety (7 items, T1, *a* = .90; T2, *a* = .89; T3, *a* =.92)**.** A measure of anxiety around safety was developed for the purpose of this study based on General Anxiety Disorder-7 questionnaire (Spitzer, 1999). The items of the GAD-7 were reworded to reflect anxiety that is elicited due to the safety of the organization. For instance, the item "*feeling nervous, anxious, or on edg*e" was changed to "*feeling nervous, anxious, or on edge that I will experience an injury or incident at work".* Similarly, the item *"not being able to stop or control worrying" was changed to "not being able to stop or control worrying about the possibility of an incident or injury occurring at work".* Participants were asked the frequency at which they

experienced each item on a 7-point Likert-type scale with *"Strongly disagree = 1"* or *"Strongly agree = 7".*

Occupational injuries (8 items). Injuries were assessed based on a Workers' Compensation Board Database that outlines the injuries suffered by health care workers. Participants were asked to state the frequency with which they experienced each type of injury and the sum total was used for analysis. Because occupational injuries were not measured on a Likert-type scale, a value for Cronbach's alpha could not be generated. Examples of items included are pricks, bruises, sprains, and cuts.

Occupational incidents (16 items). Occupational safety incidents were assessed based on Mullen & Kelloway's (2009) measure of occupational incidents. Participants were asked to state the frequency with which they experienced each type of incident and the sum total was used for analysis. Similar to occupational injuries, occupational incidents was not measured on a Likert-type scale and a value for Cronbach's alpha could not be generated. Sample items include '*was exposed to chemicals or cleaning solutions without proper ventilation'* and '*was in contact with broken glass'.*

Attention checks Three attention checks were placed within the measures. An example of an attention check was "Please select '3' for your answer for this question."

Analytical Procedure

Structural equation modelling (SEM) with observed variables was used to analyze the lagged relationships between employee perception of S.A.F.E.R leadership, safety climate, and a number of health and safety outcomes. Specifically, cross-lagged panel analysis was conducted to analyze associations and statistical mediations among S.A.F.E.R leadership, safety climate and anxiety around safety (model 1), injuries (model 2), incidents (model 3), safety participation

(model 4), and safety compliance (model 5) across three time-points. Outcome variables were analyzed in separate models in order to reflect the purpose of the study, which was to test the mediational effect of safety climate on the relationship between leadership and health and safety outcomes. This was deemed the more appropriate option in comparison to a one model analysis that contained all the outcomes variables as this would place the focus on the relationships among outcome variables as opposed to the mediational effect.

It is recommended to establish mediational effects using longitudinal data with at least three waves of data collection for two reasons (Cole & Maxwell, 2003; Maxwell & Cole, 2007). First, the effects that are found in mediation analyses are causal effects that need time to occur and as such, the effect of the independent variable (*X)* should precede the mediator (*M*) which should precede the dependent variable (*Y*) (Maxwell, 2003). Second, longitudinal data allows for more accurate parameter estimates as researchers are able to control for prior levels of the mediator and independent variables (Maxwell, 2003). This is contrasted with cross-sectional data that results in weaker inferences on the directional causation of an effect and has parameter biases (Selig & Preacher, 2009; 2017). To test mediation with longitudinal panel data, cross-lagged panel models (CLPMs) using structural equation modelling (SEM) is widely used (Wu et al., 2018).

When conducting SEM, it is recommended to quantify model fit through multiple methods (Hoyle,1995). As a measure of absolute goodness-of-fit test, the chi-squared (X^2) was used which compares the implied covariance matrix to the observed data. Relative fit indices (e.g., the Tucker-Lewis Index (TLI)), were analyzed to compare the specified model to a baseline model. Non-centrality-based indices, including the Comparative-Fit-Index (CFI), the Normed-

Fit-Index (NFI) and the Root Mean Square Error of Approximation (RMSEA), were used. Values greater than .95 indicate adequate fit for the TLI, CFI, and NFI (Hu & Bentler, 1995). For the RMSEA, values below .08 indicate a reasonable fit and values below .05 an excellent fit (Byrne, 2002; Hu & Bentler, 1999). A parsimonious fit index (i.e., the Parsimonious Normed-Fit-Index (PNFI)) was also calculated which uses adjusted fit indices from other categories to favor more parsimonious models over more complex models (Mulaik et al., 1989).

Results

Exploratory Factor Analysis for Anxiety Around Safety

Prior to further analyses and due to the novelty of the use of GAD-7 in a safety context, an exploratory factor analysis was conducted. A principal-components extraction was performed on the 7 items using SPSS 28.0. Bartlett's test of sphericity, which tests the overall significance of all the correlations within the correlation matrix, was significant (χ^2 (21) = 1400.67, $p < 0.01$), indicating that it was appropriate to use the factor analytic model on this set of data. The Kaiser-Meyer-Olkin measure of sampling adequacy indicated that the strength of the relationships among variables was high (KMO = .91), thus it was acceptable to proceed with the analysis. Initial analysis of a scree plot supported a 1-factor solution (Figure 1). One eigenvalue exceeded 1, further indicating a 1-factor solution. Table 1 indicates the communalities and factor loadings for the unrotated solution.

Analysis of the unrotated solution suggests that the 1-factor solution containing all 7 items cumulatively explained 61.7% of item variance. The factor had an eigenvalue of 8.82 and was defined by feelings of uneasiness and tension at work due to the safety of the environment. These results are consistent with previous studies exploring the psychometric properties of the GAD-7 (e.g., Johnson et al., 2019).

Figure 1.

Scree Plot for the Anxiety Around Safety Measure

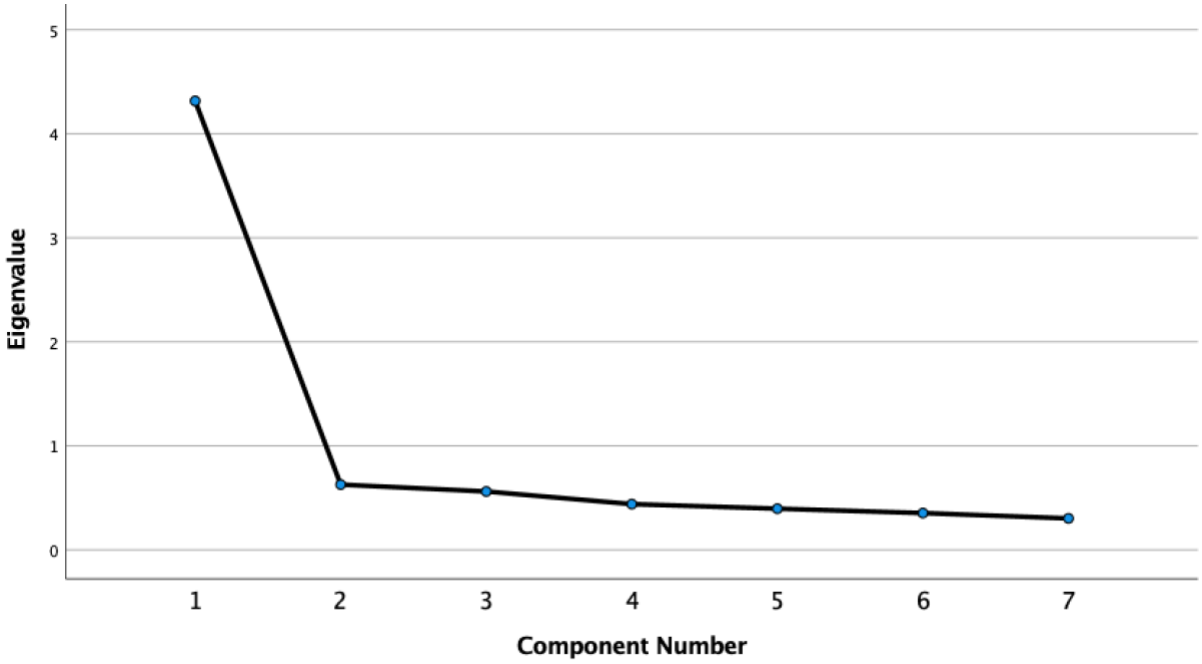


Table 1.
Exploratory Factor Analysis (Principal Components) Exploring Anxiety Around Safety

Item	*M*	*SD*	**Factor Loadings** Anxiety Around Safety	Communalities
1. Feeling nervous, anxious, or on edge that I will experience an injury or incident at work	1.37	.67	.80	.64
2. Not being able to stop or control worrying about the possibility of an incident or injury occurring at work	1.29	.64	.78	.61
3. When thinking about my safety at work, I often worry	1.43	.71	.77	.59
4. Trouble relaxing at work whenever thinking about safety	1.29	.61	.81	.66
5. Being so restless that it is hard to sit still when I have a task that requires me to be safe	1.28	.66	.80	.63
6. Found myself becoming easily annoyed or irritable when thinking about workplace safety	1.40	.65	.74	.54
7. Feeling afraid, as if someone or myself will experience an incident or injury in the workplace	1.36	.67	.80	.65
Percentage of Variance Explained	61.66			
Eigenvalue	4.32			

Note. $N = 303$; means, standard deviations, factor loadings, communalities, and proportions of variance for principal-components extraction for the unrotated solution for the Anxiety Around Safety Questionnaire

Attrition Analysis

Of the 494 participants who completed the survey at time 1, 403 completed the survey at time two, and 304 completed the survey at all three time points. An attrition analysis was performed to identify if there are any group differences between participants at Time 1 and participants at Time 3. Independent sample t-tests revealed that there are no group differences in terms of S.A.F.E.R leadership , $t(411) = .1.97$, *ns*; safety climate, $t(411) = .2.03$, *ns*; safety compliance, $t(411) = 0.74$, *ns*; safety participation, $t(411) = 1.45$, *ns*.; and anxiety around safety, $t(411) = 0.81$, *ns*. However, results suggest that there are group differences between incidents, $t(411) = 3.33$, $p<.05$ and injuries, $t(411) = 3.36$, $p < .05$. Specifically, participants at time 1 experienced a higher number of occupational incidents ($M = 4.82$, $SD = 10.83$) and injuries ($M = 3.20$, $SD = 6.29$) than participants at time 3 (incidents, $M = 2.84$, $SD = 4.50$; injuries, $M = 2.03$, $SD = 2.99$). This indicates that participants who experienced more incidents and injuries were more likely to drop out of the study for unknown reasons. A potential explanation could be that reflecting on past injuries and incidents can elicit feelings of discomfort, which in turn, may discourage future participation.

Attention checks were implemented at all three time points in the study. Participants who failed two or more of three attention checks were removed from the study. Three participants were removed at time 1, one participant was removed at time 2, and zero participants were removed at time 3.

Descriptive statistics and correlations for all study variables are presented in Table 2. Of the participants who completed all three surveys, 144 (47.4%) were male, 158 (52.0%) were female, and 2 identified as other (.7%). The average age of participants was 31.6 years (SD = 8.67 years), and the average amount of time spent working for their supervisor is 2.70 years (SD

= 4.27). Anxiety around safety (r = -.16, p < .05) and injuries (r = -.14, p < .05) had a weak negative relationship with age. The sample is highly educated with most participants having a Bachelor's degree (n = 131 (43.1%); Grade 12, n = 32 (12.8%), College, n = 43 (14.1%), Doctoral, n = 1, (.3%)). However, after a series of independent sample t-tests, no group differences emerged for education levels in terms of S.A.F.E.R leadership , t(166) = .15, *ns*; safety climate, t(166) = .00, *ns*; safety compliance, t(166) = .40, *ns*; safety participation, t(166) = 1.19, *ns*.; anxiety around safety, t(166) = 2.73, *ns*; injuries, t(166) = .42, *ns;* and incidents, t(166) = .27, *ns.* Most participants worked in finance and insurance (n = 30, 9.9%), health care and social assistance (n = 29, 9.5%), retail trade (n = 29, 9.5%), manufacturing (n = 28, 9.2%), educational services (n = 26, 8.6%), professional, scientific, and technical services (n = 26, 8.6%), and construction (n = 17, 5.6%).

Structural equation modelling (SEM) with observed variables was conducted using AMOS for SPSS. Prior to analysis, the assumptions of noncollinearity and homoscedasticity were verified.

Table 2.

Descriptive Statistics and Intercorrelations of Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Time 1																							
1. S.A.F.E.R Leadership	4.27	1.49	**(.97)**																				
2. Safety Climate	5.01	1.28	.65**	**(.89)**																			
3. Anxiety around safety	1.34	.51	-.02	-.12*	**(.90)**																		
4. Safety Participation	4.74	1.26	.57**	.50**	.09	**(.83)**																	
5. Safety Compliance	5.83	.95	.38**	.49**	-.16**	.50**	**(.88)**																
6. Injuries	2.71	3.83	-.06	-.13*	.35**	.06	-.12*	-															
7. Incidents	4.08	7.27	-.05	-.10	.38**	.04	-.15*	.54**	-														
Time 2																							
8. S.A.F.E.R Leadership	4.26	1.46	.76**	.54**	-.04	.45**	.34**	-.01	-.03	**(.93)**													
9. Safety Climate	4.99	1.27	.51**	.73**	-.21**	.32**	.40**	-.16**	-.14*	.62**	**(.89)**												
10. Anxiety around safety	1.34	.49	.02	-.10	.58**	.15*	-.14*	.29**	.25**	.01	-.18**	**(.89)**											
11. Safety Participation	4.57	1.33	.43**	.35**	-.01	.67**	.36**	.08	.04	.53**	.39**	.09	**(.85)**										
12. Safety Compliance	5.71	.99	.26**	.34**	-.25	.29**	.57**	-.14*	-.12*	.37**	.45**	-.24**	.44**	**(.90)**									
13. Injuries	2.48	3.51	-.01	-.11	.16**	.03	-.11	.58**	.40**	-.03	-.19**	.25**	.04	-.19**	-								
14.Incidents	3.33	.5.04	-.02	-.10	.25**	.07	-.12*	.47**	.55**	-.05	-.20**	.23**	.06	-.17**	.65**	-							
Time 3																							
15. S.A.F.E.R Leadership	4.25	1.42	.71**	.54**	.03	.48**	.32**	.04	.00	.73**	.52**	.05	.45**	.22	.00	.00	**(.97)**						
16. Safety Climate	5.01	1.20	.47**	.68**	-.07	.41**	.39**	.02	-.07	.52**	.72**	-.05	.38**	.32**	-.06	-.08	.66**	**(.90)**					
17. Anxiety around safety	1.35	.54	-.08	-.14*	.56**	.04	-.15*	.26**	.24**	-.04	.18**	.63**	.03	-.29**	.16**	.17**	.02	-.09	**(.92)**				

18. Safety Participation	4.72	1.31	.46**	.42**	.08	.68**	.39**	.10	.05	.50**	.41**	.17**	.71**	.31**	.02	.09	.63**	.51**	.13*	**(.87)**			
Variable	***M***	***SD***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
19. Safety Compliance	5.71	.97	.30**	.32**	-.14	.33**	.47**	-.03	-.05	.34**	.36**	-.12*	.46**	.62**	-.07	-.05	.24**	.38**	-.15**	.46**	**(.88)**		
20. Injuries	2.03	2.99	.02	-.06	.31**	.10	-.07	.54**	.43**	.05	-.10	.33**	.12	-.10	.64**	.48**	.02	-.04	.31**	.11	-.05	-	
21. Incidents	2.84	4.50	-.01	-.04	.24**	.13*	-.03	.41**	.50**	.04	-.08	.26**	.15**	-.07	.48**	.53**	-.04	-.09	.21**	.12*	-.03	.68**	-

Note. $N = 304$; ** $p < .01$; * $p < .05$.

Cross-lagged Analyses

AMOS for SPSS was used to conduct cross-lagged analyses. Time-lagged relationships between study variables were analyzed in two steps. First, a stability model estimating the stability of study variables over time was conducted. Please see Figure 2 for a visual of the stability model where the coefficient *s* represents the autoregressive effects that capture the stability of the constructs over time in terms of the rank orders of the scores, *x* denotes the independent variable (S.A.F.E.R Leadership), *m* denotes the mediator (safety climate), and *y* denotes the corresponding health and safety outcome. The autoregressive effects account for the stability in variables across time. For instance, S.A.F.E.R leadership at T3 was predicted by S.A.F.E.R leadership at T2 and S.A.F.E.R leadership at T1. Additionally, S.A.F.E.R at T2 was predicted at S.A.F.E.R at T1. The stability model does not include any cross-lagged relationships between study variables across time.

I then estimated a series of cross lagged panel models; one for each safety outcome. Please see Figure 3 for an outline of the model used in the analyses where the *a, b,* and *c'* coefficients represent the cross-lagged effects that are the focus of a mediational analysis. Specifically, the *a* coefficient represents the direct effect of S.A.F.E.R leadership on safety climate, *b* represents the direct effect of safety climate on employee outcomes, and *c'* is the direct effect of S.A.F.E.R leadership on employee outcomes. The gray errors pointing to each endogenous variable represent the error term associated with the variable. The cross-lagged panel model improves over the stability model by allowing researchers to examine the indirect effect of the independent variable at time 1 on the dependent variable at time 3 through the mediator at time 2 (a_1b_2) and the leftover direct effect of the independent variable at time 1 on

the dependent variable at time 3 (*c'*) (Wu et al., 2017). The model includes an estimation of autoregressive effects from the stability model in order to control for the stability of study variables across time. By controlling for the stability in variables across time, I get a more accurate representation of parameter estimates because I have a better understanding of the true effects of the variables on one another while controlling for variations across time. More specifically, by controlling for the effect of time across study variables, I am mitigating the effects of external factors that could be leading to a higher or lower estimation of parameter estimates (Wu et al., 2017). It is especially important to control for prior levels of study variables when testing indirect and direct effects as they are confounding variables in mediation analysis (Cole & Maxwell, 2003).

Each model included SAFER leadership, safety climate and the outcome assessed at all three time periods. Within each wave I allowed residual correlations following Kelloway et al. (2000).

Figure 2.

Stability Model

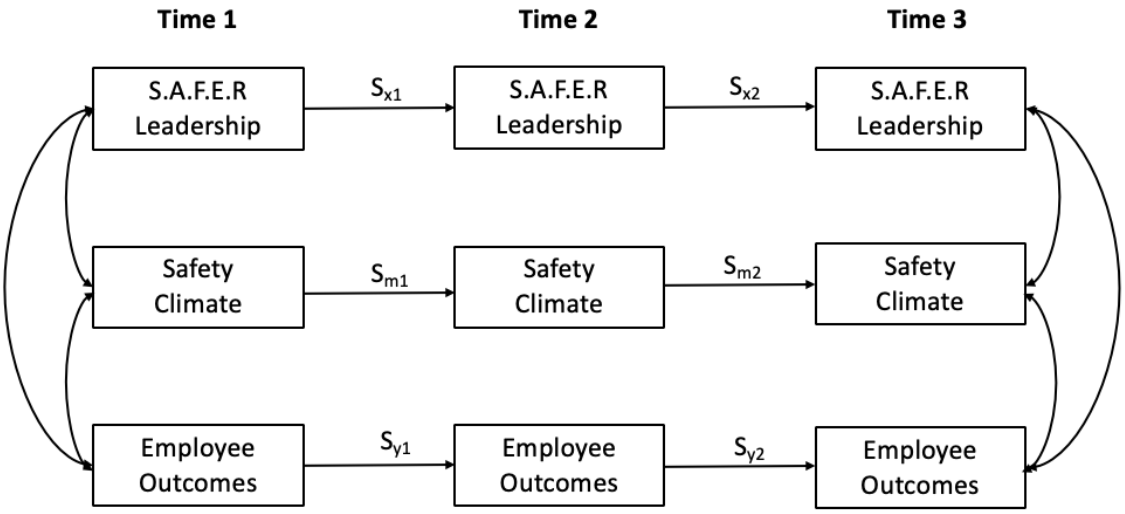
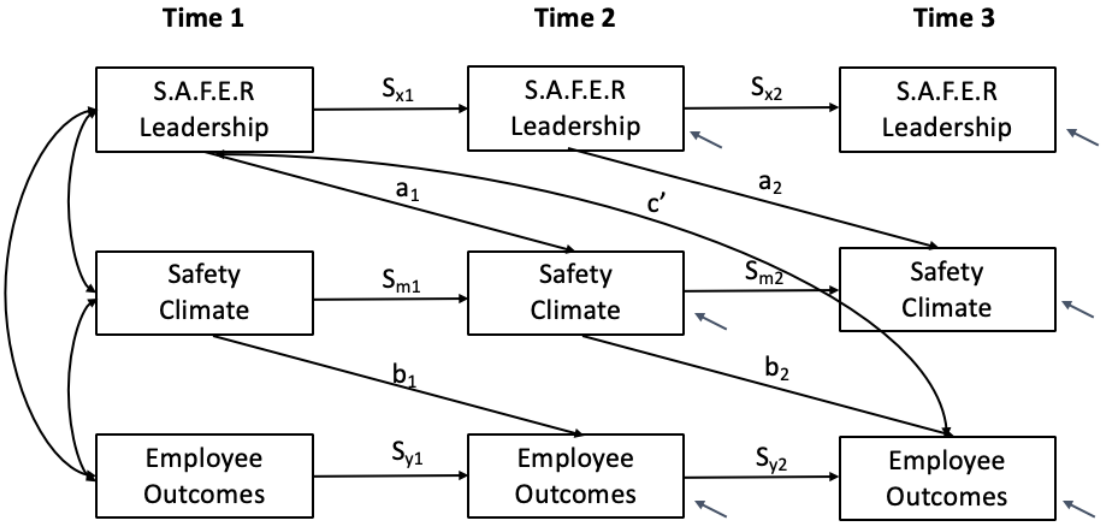


Figure 3.

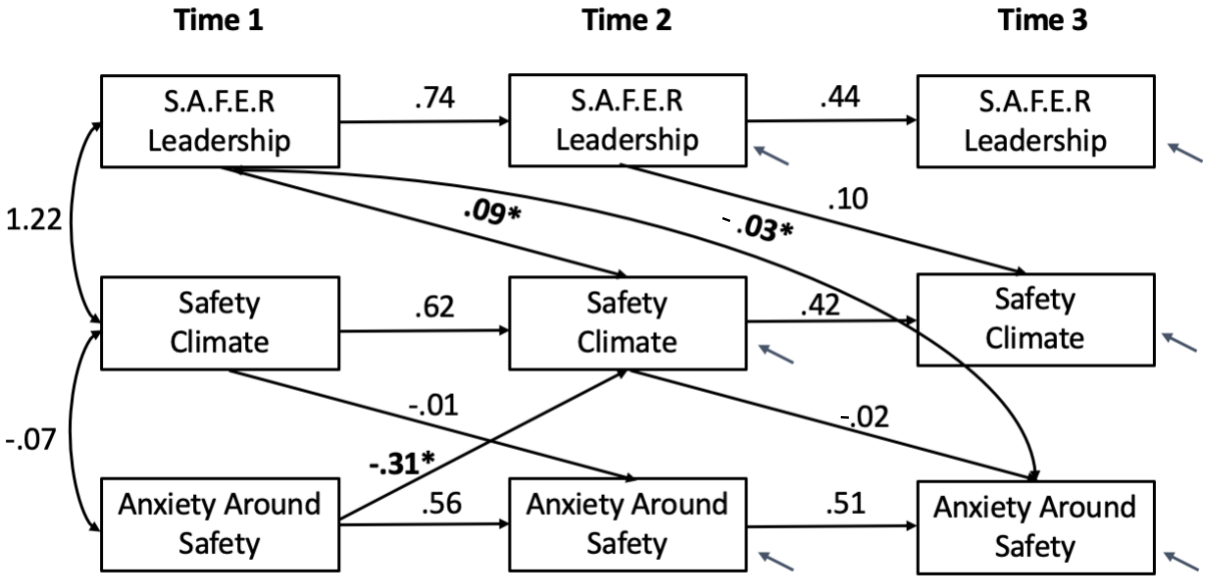
Cross-Lagged Panel Model for Longitudinal Mediation



The fit indices for the structural models are presented in Table 3. Model 1 tested the relationship between S.A.F.E.R leadership, safety climate, and anxiety around safety (Figure 4). The model provided an acceptable fit to the data (X^2 (14, N = 304) = 17.72, *ns*, CFI = 1.00, RMSEA = .04, *ns*) and a better fit than the stability model ($\Delta\chi^2$ (7) = 131.05 ρ < .05). S.A.F.E.R leadership at time 1 had a direct effect on anxiety around safety at time 3 (β = -.03; p<.05). S.A.F.E.R leadership and anxiety around safety at time 1 had significant direct effects on safety climate at time 2 (β = .09; p < .05; β = -.31; p < .01). Safety climate at time 2 did not have a direct effect on anxiety around safety at time 3 (β = -.02; *ns*). Using a bootstrapping method with 200 samples, the indirect effect was determined to be non-significant (b = .00, 95% BCa CI[.00, .00], *ns*). Hypothesis 1 and 4a are supported. Hypothesis 4b is not supported.

Figure 4.

Cross-lagged Model of S.A.F.E.R. and Safety Climate on Anxiety Around Safety



Note. Significant effects are bolded.

Table 3.
Model Comparisons

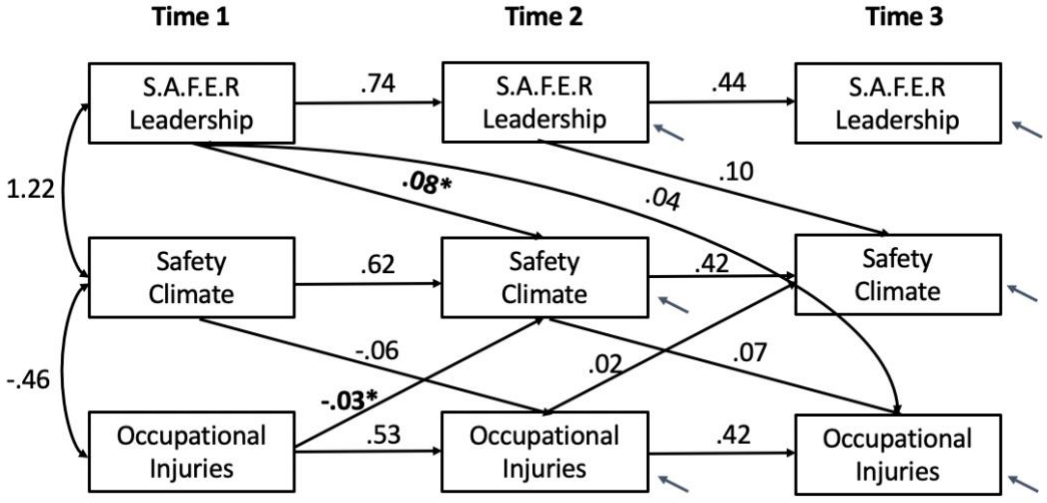
Model	X^2	df	CFI	TLI	NFI	PNFI	RMSEA	Δdf	Δχ2
Leadership & Anxiety Around Safety									
Stability Model	148.77	21	.92	.87	.91	.53	.14		
S.A.F.E.R Leadership ->Safety Climate -> Anxiety around Safety	17.72	14	1.00	.99	.99	.41	.04	7	131.05**
Leadership & Injuries									
Stability Model	142.76	21	.93	.87	.92	.53	.14		
S.A.F.E.R Leadership ->Safety Climate -> Injuries	28.96	14	.99	.99	.98	.41	.05	7	113.80**
Leadership & Incidents									
Stability Model	132.49	21	.93	.88	.92	.54	.13		
S.A.F.E.R Leadership ->Safety Climate -> Incidents	21.94	14	1.00	.99	.99	.41	.04	7	110.55**
Leadership & Safety Participation									
Stability Model	159.10	21	.93	.88	.92	.54	.15		
S.A.F.E.R Leadership ->Safety Climate -> Participation	22.00	11	.99	.98	.99	.33	.06	10	137.10**
Leadership & Safety Compliance									
Stability Model	109.87	21	.95	.91	.94	.55	.12		
S.A.F.E.R Leadership ->Safety Climate -> Compliance	16.41	11	.99	.98	.99	.34	.05	10	22.41**

Note. N = 304; . *p < .05, ** p <.01, ***p <.001; CFI = Comparative-Fit-Index; TLI = Tucker-Lewis Index; NFI = Normed-Fit-Index; PNFI = Parsimonious Normed-Fit-Index; RMSEA = Root Mean Square Error of Approximation

Model 2 tested the relationship between S.A.F.E.R leadership, safety climate, and injuries (Figure 5). The model provided an acceptable fit to the data (X^2 (14, N = 304) = 28.96, ns, CFI = .99; RMSEA = .05, ns) and a better fit than the stability model ($\Delta\chi^2$ (7) = 113.80, ρ < .05). S.A.F.E.R leadership at time 1 had no direct effect on occupational injuries at time 3 (β=.04; *ns*). Both S.A.F.E.R leadership and occupational injuries at time 1 had direct effects on safety climate at time 2 (β = .08; p<.05; β = -.03; p<.05). Safety climate at time 2 had no significant direct effect on injuries at time 3 (β = .07; *ns*). Using a bootstrapping method with 200 samples, the indirect effect was determined to be non-significant (b = .01 95% BCa CI[.00, .03], *ns*). Hypotheses 2a and 2b are not supported.

Figure 5.

Cross-lagged Model of S.A.F.E.R. and Safety Climate on Injuries

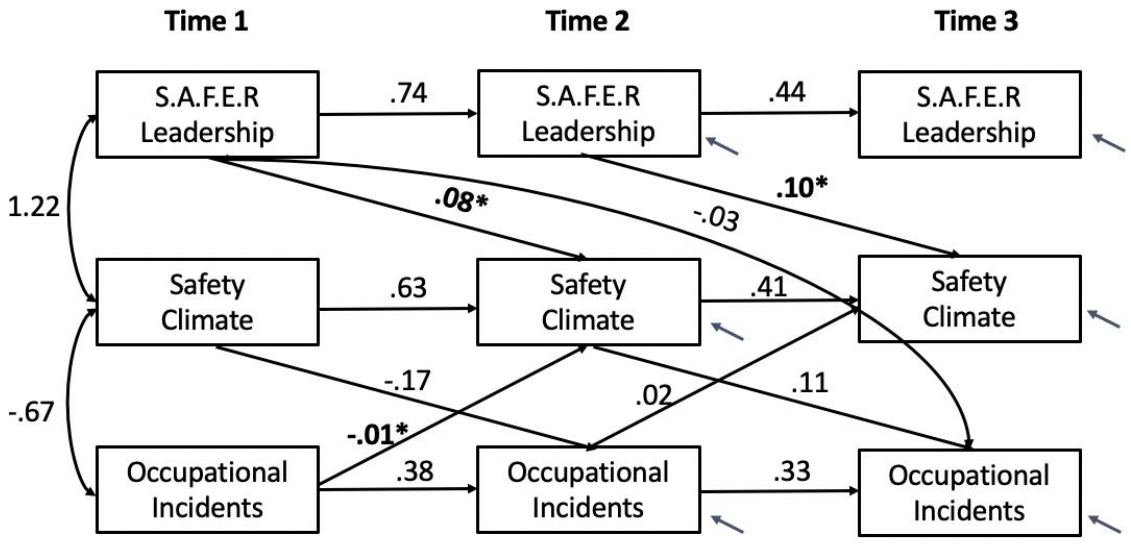


Note. Significant effects are bolded.

Model 3 tested the role of S.A.F.E.R leadership and safety climate in the prediction of occupational incidents (Figure 6). The model provided an acceptable fit to the data (X^2 (14, N = 304) = 21.94, *ns*, CFI = 1.00; RMSEA = .04, ns) and a better fit than the stability model ($\Delta\chi^2(7)$ = 110.55, $p < .05$). S.A.F.E.R leadership at time 1 had a direct effect on safety climate at time 2 (β =.08; $p < .05$), but had no direct effect on occupational incidents at time 3 (β = -.03; *ns*). Additionally, S.A.F.E.R leadership at time 2 had a direct effect on safety climate at time 3 (β = .10; $p < .01$). Occupational incidents at time 1 had a direct effect on safety climate at time 2 (β = -.01; $p < .05$). Safety climate at time 1 had no direct effect on incidents at time 2 (β = -.17; *ns*) and safety climate at time 2 had no direct effect on incidents at time 3 (β = .11; *ns*). Using a bootstrapping method with 200 samples, the indirect effect was determined to be non-significant (*b* = .01 95% BCa CI[.00, .04], *ns*). Hypotheses 3a and 3b are not supported.

Figure 6.

Cross-lagged Model of S.A.F.E.R. and Safety Climate on Incidents

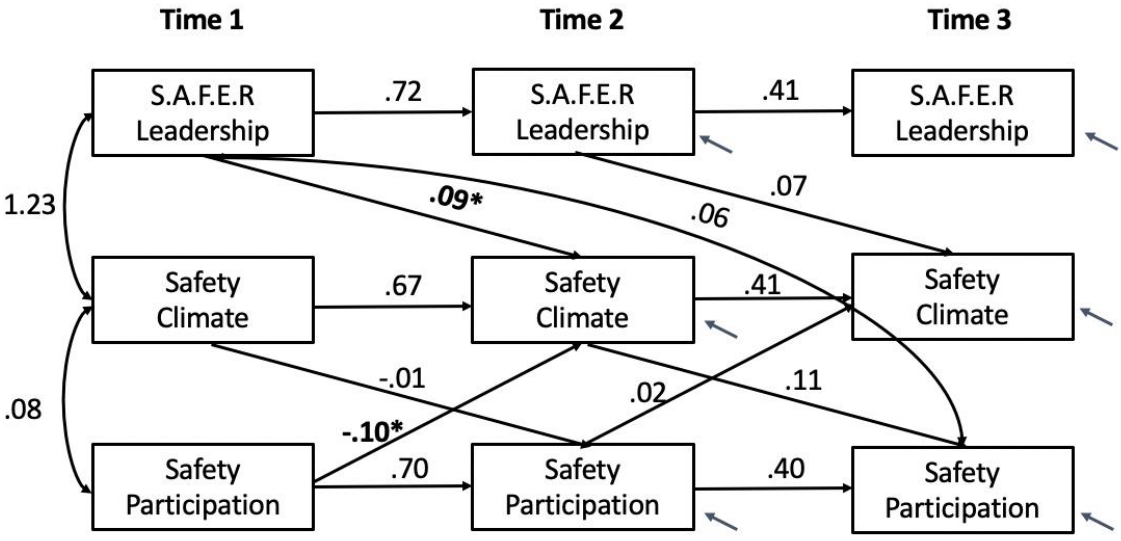


Note. Significant effects are bolded.

Model 4 tested the role of S.A.F.E.R leadership and safety climate in safety participation (Figure 7). The model provided an acceptable fit to the data (X^2 (11, N = 304) = 22.00, *ns*, CFI = .99; RMSEA = .06, *ns*) and a better fit than the stability model ($\Delta\chi^2$ (10) = 137.10, $\rho < .05$). S.A.F.E.R leadership at time 1 had a direct effect on safety climate at time 2 (β = .09; $p<.05$) but no significant direct effect on safety participation at time 3 (β = .06; *ns*). Safety participation at time 1 had a direct effect on safety climate at time 2 (β = -.10; $p < .05$). Using a bootstrapping method with 200 samples, the indirect effect of safety climate was determined to be significant (b = .01, 95% BCa CI[.00, .03], $p < .05$). Hypothesis 5a was not supported and hypothesis 5b is supported.

Figure 7.

Cross-lagged Model of S.A.F.E.R. and Safety Climate on Safety Participation

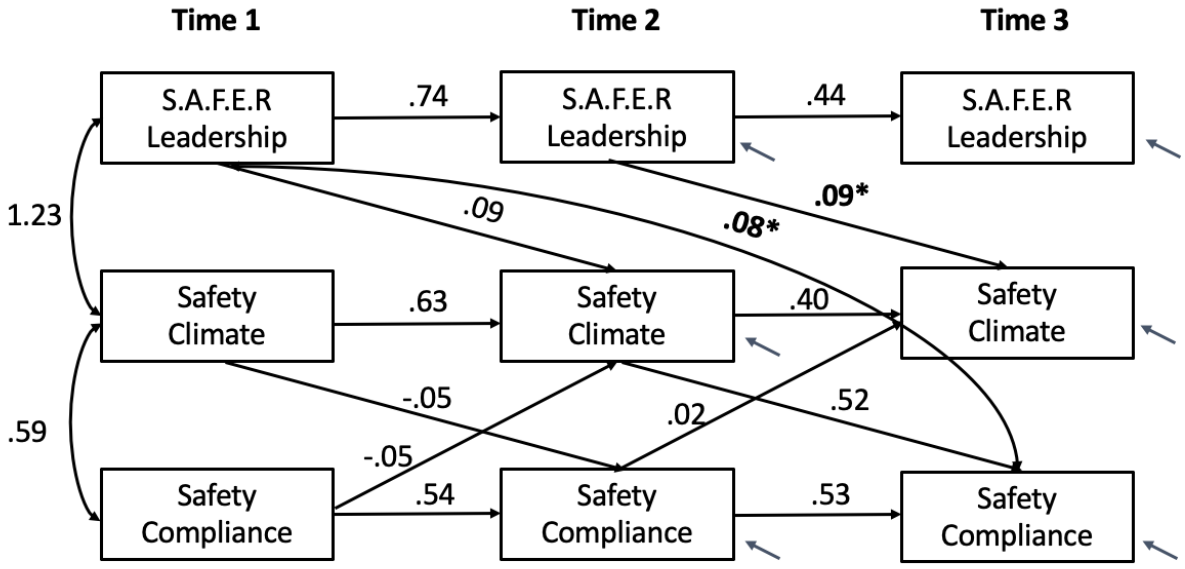


Note. Significant effects are bolded.

Model 5 tested the role of S.A.F.E.R leadership and safety climate in safety compliance (Figure 8). The model provided an acceptable fit to the data (X^2 (12, N = 304) = 22.42, *ns*, CFI = .99; RMSEA = .05, *ns*) and a better fit than the stability model ($\Delta\chi^2$ (9) = 87.46, $\rho < .05$). S.A.F.E.R leadership at time 1 had a direct effect on safety compliance at time 3 (β = .08; $p < .05$) but had no significant direct effect on safety climate at time 2 (β = .06; *ns*). S.A.F.E.R leadership at time 2 had a direct effect on safety climate at time 3 (β = .09; $p < .05$). Safety climate at time 2 had no direct effect on safety compliance at time 3 (β = .52; *ns*). Using a bootstrapping method with 200 samples, the indirect effect of safety climate was determined to be non-significant (b = .01, 95% BCa CI[.00, .02], *ns*). Hypotheses 6a is supported and 6b is not supported.

Figure 8.

Cross-lagged Model of S.A.F.E.R. and Safety Climate on Safety Compliance



Note. Significant effects are bolded.

Discussion

The mechanism through which safety leadership operates has predominately been studied in light of specific leadership styles and with the use of cross-sectional data. Consequently, little is known about the safety leadership to outcome relationship over time. Additionally, limited studies examine the mediational role of safety climate on the relationship between safety leadership and health and safety outcomes longitudinally. The current study addresses these gaps by using a three-wave longitudinal design to test the mechanism of a general model of safety leadership.

The overarching aim of this study was to analyze the relationships between S.A.F.E.R leadership, safety climate, and employee health and safety outcomes including safety behaviours, occupational injuries, occupational incidents, and anxiety around safety. First, I begin by discussing the direct effects present in the study, followed by an explanation of the mediational effects or lack thereof. In line with previous literature (e.g., Barling et al., 2002), the findings provide support for the link between S.A.F.E.R leadership and safety climate. In other words, S.A.F.E.R leadership influences the perceptions of employees about the importance of safety within their organization. In reference to the social exchange theory, employees act accordingly to how they are treated by their organization (Gouldner, 1960). S.A.F.E.R leadership behaviours could have therefore influenced how employees view the safety of their organization.

Furthermore, a novel construct of anxiety around safety (i.e., the occurrence of anxiety symptoms that are rooted from the safety of an organization) was developed for the purpose of this study, based on a general measure of anxiety (GAD-7) (Spitzer, 1999). Initial tests of reliability and factor structure produced promising results that were in line with previous studies on the psychometric properties of the GAD-7 (e.g., Johnson et al., 2009). Future research is

needed to further validate the anxiety around safety measure to ensure that it is capturing the construct as it is intending to.

On average, participants experienced, “mild” anxiety around safety based on cut-off values of the GAD-7 (Spitzer, 2006). Although low in prevalence, anxiety around safety was found to have a direct effect on perception of safety climate. As employee emotions have been found to frame how stressful events are perceived (Lyons & Schneider, 2009), employees who have high anxiety around safety could view safety as being out of their control, decreasing how important they perceive safety to be in their organization. Additionally, S.A.F.E.R leadership predicted anxiety around safety, where leaders who were perceived as being high in S.A.F.E.R leadership predicted lower levels of anxiety in employees. The link between leadership and well-being has been established in the literature (e.g., Arnold et al., 2007; Kelloway & Barling, 2010; McKee et al., 2011). The predictive nature of safety leadership on anxiety around safety may be explained in part explained by the leader’s role in their employees’ stress perception. For instance, how a leader acts in times of extreme stress (e.g., during a safety incident) in turn impacts how employees behave and the emotions they experience (Harms et al., 2017). Thus, when leaders behave safely around employees, it may in turn decrease the employees’ anxiety towards safety. Future studies should seek to understand if anxiety may act as a mediator in the relationship between safety leadership and safety climate. Previous work on the relationship between leadership and anxiety found that poor leadership is linked to increased levels of anxiety, depression, and psychosomatic symptoms (Hoel et al., 1999). In turn, anxiety around safety can decrease employee motivation to engage in safe work behaviours as they are depleted of cognitive resources (Ashour, 1982).

Future studies should also focus on the antecedents of anxiety around safety. For instance, it would be important to note how witnessing or experiencing an occupational injury or incident may impact how anxious someone is about safety. By understanding the predictors of anxiety around safety, we can have a better understanding of the factors needed to decrease its prevalence in organizations.

Additionally, there was a direct effect of both occupational injuries and occupational incidents on safety climate in which high amounts of injuries and incidents negatively impacted safety climate. The prevalence of injuries and incidents in the workplace can influence employee perceptions of the importance to be safe at work. Although much of the literature focuses on the impact of safety climate on incidents and injuries (e.g., Barling et al., 2002), the current study highlights that also the reverse is true. This is in line with a meta-analysis that revealed that injuries were more predictive of safety climate than safety climate was predictive of injuries (Beus et al., 2010). When incidents or injuries occur in an organization, employees may perceive their organization to be unsafe or unconcerned about the well-being of their employees. In turn, perception of safety climate is decreased.

A direct effect of S.A.F.E.R leadership on safety compliance was also found. This is in line with previous literature (e.g., Nahrgang et al., 2011) and suggests that S.A.F.E.R leadership can improve safety compliance in organizations. Specifically, S.A.F.E.R leadership could positively predict an individual's ability and willingness to adhere to safety rules because individuals may see others being rewarded for positive behaviour, which acts as motivation to engage in similar behaviour.

Safety participation was found to negatively predict safety climate. In other words, being involved in safety initiatives at work lowers the perception of the importance safety within the

organization. Results also suggest that safety climate mediates the relationship between S.A.F.E.R leadership and safety participation. An indirect effect was found that indicates that S.A.F.E.R leadership impacts safety participation through safety climate. Individuals who perceive their workplace to prioritize safety may be more inclined or motivated to listen to their leader's safety advice or engage in safe behaviours themselves. As noted by the social exchange theory (Blau, 1964), employees act accordingly to how they perceive they are treated by their organization or manager (Gouldner, 1960). As such, employees who perceive their organizations to care about their safety would be more inclined to act accordingly and engage in safe behaviours themselves.

Contrary to my hypotheses and previous research, the current study found no intermediary effect of safety climate on the relationship between safety leadership and all but one (safety participation) occupational health and safety outcomes. Rather, the pattern of results suggest that time 1 measures of safety leadership and the relevant outcome predict safety climate at time 2 in most cases. The discrepancy between the current study and previous research could be in part be due to the rigorous nature of the study. Previous literature has predominately focused on cross-sectional or two-wave data (e.g., Smith et al., 2016). With the incorporation of a three-wave design, I have a better estimation of the parameters as the stability of the variables are controlled for, which could not be done in a cross-sectional design. These findings are theoretically different from my hypothesized model, suggesting that the outcomes I tested have a stronger impact on safety climate than safety climate has on them. Safety climate could therefore be more sensitive to organizational and personal factors than otherwise known. In a metanalysis by He et al., (2019), researchers state that safety climate antecedents can be grouped in three categories: situational factors (job and organizational characteristics), interpersonal interactions

(leader-member exchange) , and personal factors (locus of control, big five personality traits). The health and safety outcomes in the current study fall into similar categories, where injuries and incidents ae related to organizational characteristics, and safety participation and anxiety around safety are personal factors.

Limitations

There are several limitations associated with the current study. First, as with all self-report measures, there is a threat to the validity of the findings. Specifically, the self-reported outcomes (e.g., incidents and injuries) may be under-reported due to a number of factors, including difficulty to recall, resulting in a conservative estimate of the outcomes (Pransky et al., 1999). Future studies can overcome this limitation by collecting data from various sources. For instance, the current study measures employee perceptions of S.A.F.E.R leadership, whereas future studies may choose to focus on group responses to one particular leader or perceptions from the leaders themselves. Safety behaviours of employees may be observer-rated and occupational.

Second, although online survey data typically provides good data (Buchanan & Hyizdak, 2009), it is possible that the sample of participants may differ systematically from the wider population. For instance, my sample of participants had a higher education level on average than the general public which could in turn impact the results of the study (Census Bureau, 2022). More specifically, highly educated individuals may have a higher attention to detail or have an easier time understanding the consequences of unsafe work behaviours and may not benefit from additional measures to improve safety. As such, having a more highly educated sample could have potentially weakened the results of the study. Online survey platforms use convenience sampling, meaning that individuals who participate are on a first-come, first-serve basis.

Additionally, individuals who choose to participate in the study may have a particular interest in the topic ad may be attracted solely to the reward offered. As such, it may be beneficial for future studies to investigate the relationship between S.A.F.E.R leadership and employee outcomes using organizational case studies.

Third, relationships among study variables change over time and thus, choice of time-lag may produce varying results (Ford et al., 2014). Although the current study did employ a short interval of 8 weeks in order to detect effects, as recommended by the literature (e.g., Barling et al., 2002), it is possible that different intervals may have produced a different pattern of results. A number of studies indicate that the length of time lag can significantly impact the magnitude of the stability coefficients, and in some cases even the direction of cross-lag coefficients, in longitudinal research (Cole & Maxwell, 2003; Taylor, 2020). As such, it is important that replication studies, as well as studies employing several measurement points over an extended period of time, should take place in order to solidify results.

Fourth, there are potential issues with the generalizability of the results of this study. The attrition analysis revealed group differences between participants who dropped out after time 1 versus those who completed all three waves of data collection. Specifically, participants who dropped out after the first study had higher levels of incidents and injuries when compared to individuals who didn't drop out. This is indicative that individuals who experience higher levels of injuries or incidents could have potentially dropped out to due to unknown factors, and created a bias that could have potentially weakened effects found in the study. Specifically, if individuals who experience the most injuries and incidents drop out, it could have been due to feeling uncomfortable to talk about or be reminded of their injuries or incidents. This in turn leaves individuals who experience less injuries and incidents in the workplace, who may be less

reactive to the safety initiatives demonstrated by leaders who are high in S.A.F.E.R leadership. The study then loses representation from individuals who experience high injuries and incidents, decreasing generalizability. The sample of participants also displayed a large variation in incidents throughout all three time points. This could be due to the difference in incidents for high risk jobs (e.g., construction) versus office-type jobs. In turn, this can impact the generalizability of the study as it is more relevant to particular industries

Fifth, further work is needed to develop the anxiety around safety measure used in this study. The study bases anxiety around safety off the premise of the GAD-7 (Spitzer et al., 2006). In order to gain a better understand of what anxiety around safety consists off, qualitative work is needed. Specifically, this work should pinpoint what workers are anxious about at work with regards to their safety.

Theoretical and Practical Implications

With the new development of a measure of S.A.F.E.R leadership (Ozbilir, 2021), the current study is the first to measure the impact of a general model of safety leadership on health and safety outcomes. Specifically, the study adds to the literature by investigating the role of S.A.F.E.R leadership on occupational injuries, incidents, anxiety around safety, and safety behaviours over time. Additionally, the study highlights that health and safety outcomes have a stronger impact on safety climate than safety climate has on them.

Previous seminal studies investigating the relationship between safety leadership, safety climate, and safety outcomes (e.g., Barling et al., 2002) do so in a cross-sectional manner. Additional meta-analyses investigating the same relationships state that the use of cross-sectional studies is a major limitation (e.g., Clarke, 2006; Clarke, 2013). Cross-sectional studies do not provide insight on the order the variables appear in time, for instance, does X precede Y or is the

inverse true? By implementing a more rigorous design, I was able to identify the temporal order of variables and obtain more accurate parameter estimates.

The results of the study have a number of practical implications. Specifically, it was found that individuals who are anxious about safety perceive a lower safety climate in their organization. As safety climate has been previously noted to be negatively associated with occupational injuries and incidents, it is important to understand the antecedents of safety climate (Clarke, 2010). The current study found that when individuals are anxious about safety, they perceive a lower safety climate. This could be because the high level of anxiety can make the organization seem threatening to the individual as they are in a stressed cognitive state. As such, it would be beneficial for organizations to implement programs or have resources available for employees to decrease anxiety. For instance, it is suggested that a broad range of health promotion interventions are effective in reducing symptoms of anxiety and depression in the workplace (Martin et al., 2009). This is especially important as studies have noted that individuals with anxiety do not receive the level of care consistent with best practises in the workplace (Nash-Wright, 2011).

Similarly, incidents and injuries were found decrease perception of safety climate. By offering coping programs after incidents and injuries occur, employees could be more likely to 'bounce back' after the event. For instance, mindfulness training has been found to increase both situational awareness and positive responses in stressful situations in a group of nurses that experienced a health and safety issue (Zeller & Levin, 2013). Additionally, safety participation was noted to directly affect perception of safety climate. As such, focusing on increasing safety participation in organizations will in turn increase perception of safety climate. This could be done by improving employee involvement in organizations (Williams, 2008). Specifically,

providing adequate employee safety training and development opportunities can cultivate and maintain desirable employee behaviours, including safety behaviours, and attitudes (Williams, 2008).

S.A.F.E.R leadership was found to decrease anxiety around safety, increase safety compliance, and increase safety climate. Past research on the effectiveness of S.A.F.E.R leadership training found that (1) it was effective in improving employee safety behaviours and (2) it was related to employees' perceptions of other forms of safety leader, such as safety-specific transformational leadership (Kellway & Mullen, 2016). Thus, it would be beneficial for organizations who wish to improve safety outcomes to incorporate S.A.F.E.R leadership training interventions.

Conclusion

Overall, occupational health and safety research is needed in order to decrease the prevalence of adverse safety events in the workplace. The current study suggests that S.A.F.E.R leadership decreases the severity of anxiety around safety and increases safety compliance in organizations. Additionally, anxiety around safety was found to negatively impact employee perceptions of safety climate. Safety climate was found to mediate the relationship between S.A.F.E.R leadership and safety participation. S.A.F.E.R leadership training is recommended as a training intervention in organizations who wish to improve upon health and safety outcomes. More research is needed to further investigate the relationship between anxiety around safety and outcomes, along with more research on the underlying mechanism through which S.A.F.E.R leadership operates.

References

Adewole, A. A. (2020). Occupational safety and wellbeing of social workers in the era of COVID-19 pandemic. *African Journal of Social Work*, 10(3), 34-40.

Arnold, K. A., Turner, N., Barling, J., Kelloway, E. K., & McKee, M. C. (2007). Transformational leadership and psychological well-being: the mediating role of meaningful work. *Journal of Occupational Health Psychology*, 12(3), 193.

Ashour, A. S. (1982). A framework of a cognitive—Behavioral theory of leader influence and effectiveness. Organizational Behavior and Human Performance, 30(3), 407-430.

Association of Workers' Compensation Boards of Canada *Canada's Statistical Results.* (2018). Retrieved from https://awcbc.org/en/

Bakker, A. B., & Demerouti, E. (2014). Job demands–resources theory. *Wellbeing: A complete reference guide*, 1-28.

Bandura, A. (1986). Fearful expectations and avoidant actions as coeffects of perceived self-inefficacy.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York : Freeman.

Banks, M. H., Clegg, C. W., Jackson, P. R., Kemp, N. J., Stafford, E. M., & Wall, T. D. (1980). The use of the General Health Questionnaire as an indicator of mental health in occupational studies. *Journal of Occupational Psychology*, 53(3), 187-194.

Baranik, L. E., Roling, E. A., & Eby, L. T. (2010). Why does mentoring work? The role of perceived organizational support. *Journal of Vocational Behavior*, *76*(3), 366-373.

Barling, J., Loughlin, C., & Kelloway, E. K. (2002). Development and test of a model linking safety-specific transformational leadership and occupational safety. *Journal of Applied Psychology*, *87*(3), 488.

Barnetson, B., Foster, J., & Matsunaga-Turnbull, J. (2018). estimating under-claiming of compensable Workplace Injuries in Alberta, Canada. *Canadian Public Policy*, *44*(4), 400-410.

Bass, B. M. (1985). Leadership: Good, better, best. *Organizational Dynamics*, *13*(3), 26-40.

Battams, S., Roche, A. M., Fischer, J. A., Lee, N. K., Cameron, J., & Kostadinov, V. (2014). Workplace risk factors for anxiety and depression in male-dominated industries: a systematic review. *Health Psychology and Behavioral Medicine: an Open Access Journal*, *2*(1), 983-1008.

Beus, J. M., Payne, S. C., Bergman, M. E., & Arthur Jr, W. (2010). Safety climate and injuries: an examination of theoretical and empirical relationships. *Journal of Applied Psychology*, 95(4), 713.

Biggs, S. E., Banks, T. D., Davey, J. D., & Freeman, J. E. (2013). Safety leaders' perceptions of safety culture in a large Australasian construction organisation. *Safety Science*, *52*, 3-12.

Blau, P. M. (1964). Justice in social exchange. Sociological inquiry, 34(2), 193-206.

Brown, M. E., Treviño, L. K., & Harrison, D. A. (2005). Ethical leadership: A social learning perspective for construct development and testing. *Organizational Behavior and Human Decision Processes*, *97*(2), 117-134.

Bryan, J. H., & Test, M. A. (1967). Models and helping: Naturalistic studies in aiding behavior. *Journal of Personality and Social Psychology*, *6*(4p1), 400.

Buchanan, E. A., & Hvizdak, E. E. (2009). Online survey tools: Ethical and methodological concerns of human research ethics committees. *Journal of Empirical Research on Human Research Ethics*, 4(2), 37-48.

Chen, Y., McCabe, B., & Hyatt, D. (2017). Impact of individual resilience and safety climate on safety performance and psychological stress of construction workers: A case study of the Ontario construction industry. *Journal of Safety Research, 61*, 167-176.

Chiok Foong Loke, J. (2001). Leadership behaviours: effects on job satisfaction, productivity and organizational commitment. *Journal of Nursing Management, 9*(4), 191-204.

Christo, C. O., & Pienaar, L. (2006). Work Motivation. *Job Satisfaction, and Organisational Commitment of Library Personnel in Academic and Research Libraries*.

Chughtai, A., Byrne, M., & Flood, B. (2015). Linking ethical leadership to employee well-being: The role of trust in supervisor. *Journal of Business Ethics*, 128(3), 653-663.

Clarke, S. (2013). Safety leadership: A meta-analytic review of transformational and transactional leadership styles as antecedents of safety behaviours. *Journal of Occupational and Organizational Psychology, 86*(1), 22-49.

Cohen, J. and Single, L. E. (2001), An Examination of the Perceived Impact of Flexible Work Arrangement on Professional Opportunities in Public Accounting, *Journal of Business Ethics,* 32(4): 317-9.

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology*, 112(4), 558.

Cooper, D. (1998). *Improving safety culture: A practical guide*. Wiley.

Cooper, M. D., & Finley, L. J. (2013). Strategic safety culture road map. *Franklin, IN: BSMS*.

Crichton, M. (2005). Attitudes to teamwork, leadership, and stress in oil industry drilling teams. *Safety Science, 43*(9), 679-696.

de Koster, R. B., Stam, D., & Balk, B. M. (2011). Accidents happen: The influence of safety-specific transformational leadership, safety consciousness, and hazard reducing systems on warehouse accidents. *Journal of Operations Management*, *29*(7-8), 753-765.

Derue, D. S., Nahrgang, J. D., Wellman, N. E., & Humphrey, S. E. (2011). Trait and behavioral theories of leadership: An integration and meta-analytic test of their relative validity. *Personnel Psychology*, 64(1), 7-52.

Flin, R., & Yule, S. (2004). Leadership for safety: industrial experience. *BMJ Quality & Safety*, *13*(suppl 2), ii45-ii51.

Ford, M. T., Matthews, R. A., Wooldridge, J. D., Mishra, V., Kakar, U. M., & Strahan, S. R. (2014). How do occupational stressor-strain effects vary with time? A review and meta-analysis of the relevance of time lags in longitudinal studies. *Work & Stress*, 28(1), 9-30.

Fruhen, L. S., Mearns, K. J., Flin, R. H., & Kirwan, B. (2013). From the surface to the underlying meaning-an analysis of senior managers' safety culture perceptions. *Safety Science*, *57*, 326-334.

Griffin, M. A., & Hu, X. (2013). How leaders differentially motivate safety compliance and safety participation: The role of monitoring, inspiring, and learning. *Safety Science*, *60*, 196-202.

Griffin, M. A., & Neal, A. (2000). Perceptions of safety at work: a framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology*, 5(3), 347.

Harms, P. D., Credé, M., Tynan, M., Leon, M., & Jeung, W. (2017). Leadership and stress: A meta-analytic review. *The Leadership Quarterly*, *28*(1), 178-194.

He, Y., Wang, Y., & Payne, S. C. (2019). How is safety climate formed? A meta-analysis of the antecedents of safety climate. *Organizational Psychology Review*, 9(2-3), 124-156.

He, Y., Wang, Y., & Payne, S. C. (2019). How is safety climate formed? A meta-analysis of the antecedents of safety climate. *Organizational Psychology Review*, 9(2-3), 124-156.

Hemingway, M. A., & Smith, C. S. (1999). Organizational climate and occupational stressors as predictors of withdrawal behaviours and injuries in nurses. *Journal of Occupational Health Psychology*, 72(3), 285-299.

Hoel, H., Rayner, C., & Cooper, C. L. (1999). Workplace bullying. John Wiley & Sons Ltd.

Hofmann, D. A., & Morgeson, F. P. (1999). Safety-related behavior as a social exchange: The role of perceived organizational support and leader–member exchange. *Journal of Applied Psychology*, *84*(2), 286.

Hofmann, D. A., & Morgeson, F. P. (2004). The role of leadership in safety.

Hofmann, D. A., & Stetzer, A. (1996). A cross-level investigation of factors influencing unsafe behaviors and accidents. *Personnel Psychology*, 49(2), 307-339.

Hoskins, A. B. (2005). Occupational injuries, illnesses, and fatalities among women. Monthly Lab. Rev., 128, 31.

Hoyle, R. H. (1995). Structural equation modeling: Concepts, issues, and applications. Sage.

Hu, L. T., & Bentler, P. M. (1995). Evaluating model fit.

Hughes, L. W., Avey, J. B., & Nixon, D. R. (2010). Relationships between leadership and followers' quitting intentions and job search behaviors. *Journal of Leadership & Organizational Studies*, 17(4), 351-362.

Ishola, A. A. (2017). Workplace safety management as correlates of wellbeing among factory workers in Oluyole industrial estate, Ibadan, Oyo State Nigeria. *African Journal of Social Work*, *7*(2), 45-51.

Jiang, L., & Probst, T. M. (2016). Transformational and passive leadership as cross-level moderators of the relationships between safety knowledge, safety motivation, and safety participation. *Journal of Safety Research*, *57*, 27-32.

Johnson, S. U., Ulvenes, P. G., Øktedalen, T., & Hoffart, A. (2019). Psychometric properties of the general anxiety disorder 7-item (GAD-7) scale in a heterogeneous psychiatric sample. *Frontiers in Psychology*, 10, 1713.

Judge, T. A., & Watanabe, S. (1993). Another look at the job satisfaction-life satisfaction relationship. *Journal of Applied Psychology*, 78(6), 939.

Katz–Navon, T., Kark, R., & Delegach, M. (2020). Trapped in the middle: Challenging the linear approach to the relationship between leadership and safety. *Academy of Management Discoveries*, 6(1), 81-106.

Kelloway, E. K., & Barling, J. (2010). Leadership development as an intervention in occupational health psychology. *Work & Stress*, *24*(3), 260-279.

Kelloway, E.K., & Calnan, K. (2014) Safety climate: Scale development report. Unpublished manuscript

Kelloway, K., & Mullen, J. (2016). WorkSafeNB SAFER Training & Evaluation.

Kelloway, E. K., Mullen, J., & Francis, L. (2006). Divergent effects of transformational and passive leadership on employee safety. *Journal of Occupational Health Psychology*, *11*(1), 76.

Kelloway, E. K., Weigand, H., McKee, M. C., & Das, H. (2013). Positive leadership and employee well-being. *Journal of Leadership & Organizational Studies*, *20*(1), 107-117.

Kelloway, K. Mullen, J. E. Francis, L. Injuring your leadership: How passive leadership affects employee safety *Journal of Occupational Health Psychology* 11 1 76 – 86 2006.

Kines, P., Andersen, L. P., Spangenberg, S., Mikkelsen, K. L., Dyreborg, J., & Zohar, D. (2010). Improving construction site safety through leader-based verbal safety communication. *Journal of Safety Research*, *41*(5), 399-406.

Komaki, J., Heinzmann, A. T., & Lawson, L. (1980). Effect of training and feedback: component analysis of a behavioral safety program. *Journal of Applied Psychology*, *65*(3), 261.

Lee, D., Coustasse, A., & Sikula Sr, A. (2011). Transformational leadership and workplace injury and absenteeism: Analysis of a national nursing assistant survey. *Health Care Management Review*, *36*(4), 380-387.

Leroy, H., Dierynck, B., Anseel, F., Simons, T., Halbesleben, J. R., McCaughey, D., ... & Sels, L. (2012). Behavioral integrity for safety, priority of safety, psychological safety, and patient safety: A team-level study. *Journal of Applied Psychology*, *97*(6), 1273.

Leveson, N. G. (2016). *Engineering a safer world: Systems thinking applied to safety* (p. 560). The MIT Press.

Lyons, J. B., & Schneider, T. R. (2009). The effects of leadership style on stress outcomes. *The Leadership Quarterly*, 20(5), 737-748.

Lyubykh, Z., Turner, N., Hershcovis, M. S., & Deng, C. (2022). A meta-analysis of leadership and workplace safety: Examining relative importance, contextual contingencies, and methodological moderators. *Journal of Applied Psychology*.

MacDonald, W. (2003). The impact of job demands and workload on stress and fatigue. *Australian Psychologist*, *38*(2), 102-117.

Manshor, A. T., Fontaine, R., & Choy, C. S. (2003). Occupational stress among managers: a Malaysian survey. *Journal of Managerial Psychology*.

Martin, A., Sanderson, K., & Cocker, F. (2009). Meta-analysis of the effects of health promotion intervention in the workplace on depression and anxiety symptoms. *Scandinavian Journal of Work, Environment & Health*, 7-18.

Martínez-Córcoles, M., & Stephanou, K. (2017). Linking active transactional leadership and safety performance in military operations. *Safety Science*, 96, 93-101.

Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods*, 12(1), 23.

McAfee, R. B., & Winn, A. R. (1989). The use of incentives/feedback to enhance work place safety: A critique of the literature. *Journal of Safety Research*, *20*(1), 7-19.

McKee, M. C., Driscoll, C., Kelloway, E. K., & Kelley, E. (2011). Exploring linkages among transformational leadership, workplace spirituality and well-being in health care workers. *Journal of Management, Spirituality & Religion*, 8(3), 233-255.

Morgeson, F. P., DeRue, D. S., & Karam, E. P. (2010). Leadership in teams: A functional approach to understanding leadership structures and processes. *Journal of Management*, 36(1), 5-39.

Mulaik, S. A., James, L. R., Van Alstine, J., Bennett, N., Lind, S., & Stilwell, C. D. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological Bulletin*, 105(3), 430.

Mullen, J., Kelloway, E. K., & Teed, M. (2011). Inconsistent style of leadership as a predictor of safety behaviour. *Work & Stress*, *25*(1), 41-54.

Mullen, J., Kelloway, E. K., & Teed, M. (2017). Employer safety obligations, transformational leadership and their interactive effects on employee safety performance. *Safety Science*, *91*, 405-412.

Nash-Wright, J. (2011). Dealing with anxiety disorders in the workplace: importance of early intervention when anxiety leads to absence from work. *Professional Case Management*, 16(2), 55-59.

Nyberg, A., Westerlund, H., Magnusson Hanson, L. L., & Theorell, T. (2008). Managerial leadership is associated with self-reported sickness absence and sickness presenteeism among Swedish men and women. *Scandinavian Journal of Public Health*, 36(8), 803-811.

O'Dea, A., & Flin, R. (2001). Site managers and safety leadership in the offshore oil and gas industry. *Safety Science*, *37*(1), 39-57.

Offermann, L. R., & Hellmann, P. S. (1996). Leadership behavior and subordinate stress: A 360" view. *Journal of Occupational Health Psychology*, 1(4), 382.

Ogunfowora, B., Maerz, A., & Varty, C. T. (2021). How do leaders foster morally courageous behavior in employees? Leader role modeling, moral ownership, and felt obligation. *Journal of Organizational Behavior*, 42(4), 483-503.

Ongori, H., & Agolla, J. E. (2008). Occupational stress in organizations and its effects on organizational performance. *Journal of Management Research*, *8*(3), 123-135.

Ozbilir, T. (2021). Leading the way to safety: An investigation of SAFER Leadership.

Peacock, E. J., & Wong, P. T. P. (1990). The Stress Appraisal Measure (SAM): A multidimensional approach to cognitive appraisal. *Stress Medicine,* 6, 227-236

Petersen, D. (2000). Safety management 2000: Our strengths & weaknesses. *Professional Safety*, *45*(1), 16.

Peterson, D. (2004). Perceived leader integrity and ethical intentions of subordinates. *Leadership & Organization Development Journal*.

Pransky, G., Snyder, T., Dembe, A., & Himmelstein, J. (1999). Under-reporting of work-related disorders in the workplace: a case study and review of the literature. *Ergonomics,* 42(1), 171-182.

Rajah, R., Song, Z., & Arvey, R. D. (2011). Emotionality and leadership: Taking stock of the past decade of research. *The Leadership Quarterly*, *22*(6), 1107-1119.

Rout, U. R., & Rout, J. K. (2002). Occupational stress. *Stress Management for Primary Health Care Professionals*, 25-39.

Sauter, S. L., & Murphy, L. R. (1995). *Organizational risk factors for job stress* (pp. xii-400). American Psychological Association.

Schein, E. H. (1992). How can organizations learn faster?: the problem of entering the Green Room.

Schmidt, B., Loerbroks, A., Herr, R., Litaker, D., Wilson, M., Kastner, M., & Fischer, J. (2014). Psychosocial resources and the relationship between transformational leadership and employees' psychological strain. *Work*, *49*(2), 315-324.

Silla, I., & Gamero, N. (2018). Psychological safety climate and professional drivers' well-being: the mediating role of time pressure. *Transportation research part F: traffic psychology and behaviour*, *53*, 84-92.

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. Archives of internal medicine, 166(10), 1092-1097.

Topper, E. F. (2007). Stress in the library workplace. *New library world*.

Taylor, R. (2020). What is the Impact of Time Lag in Developmental Research? A Re-Analysis of Meta-Analyses Using Lag as Moderator.

Tse, H. H., Lam, C. K., Lawrence, S. A., & Huang, X. (2013). When my supervisor dislikes you more than me: The effect of dissimilarity in leader–member exchange on coworkers' interpersonal emotion and perceived help. *Journal of Applied Psychology*, 98(6), 974.

Tucker, S., & Keefe, A. (2020). 2020 Report on Work Fatality and Injury Rates in Canada. University of Regina.

Van Vugt, M., Hogan, R., & Kaiser, R. B. (2008). Leadership, followership, and evolution: some lessons from the past. *American Psychologist*, 63(3), 182.

Veltri, A., Pagell, M., Behm, M., & Das, A. (2007). A data-based evaluation of the relationship between occupational safety and operating performance. *Journal of SH&E Research*, *4*(1), 1-22.

Waehrer, G. M., Dong, X. S., Miller, T., Haile, E., & Men, Y. (2007). Costs of occupational injuries in construction in the United States. *Accident Analysis & Prevention*, *39*(6), 1258-1266.

Wager, N., Fieldman, G., & Hussey, T. (2003). The effect on ambulatory blood pressure of working under favourably and unfavourably perceived supervisors. *Occupational and Environmental Medicine, 60,* 468-474.

Wellman, N. (2017). Authority or community? A relational models theory of group-level leadership emergence. *Academy of Management Review*, 42(4), 596-617.

Westerlund, H., Ferrie, J., Hagberg, J., Jeding, K., Oxenstierna, G., & Theorell, T. (2004). Workplace expansion, long-term sickness absence, and hospital admission. *The Lancet, 363*(9416), 1193-1197.

Williams, J. H. (2008). Employee engagement improving participation in safety. *Professional Safety,* 53(12).

Willis, S., Clarke, S., & O'Connor, E. (2017). Contextualizing leadership: Transformational leadership and Management-By-Exception-Active in safety-critical contexts. *Journal of Occupational and Organizational Psychology*, 90(3), 281-305.

Willis, S., Clarke, S., & O'Connor, E. (2021). Identifying the optimal safety leader: a person-centered approach. *Journal of Managerial Psychology*.

Wong, J. H., Kelloway, E. K., & Makhan, D. W. (2015). Safety leadership. *The Wiley Blackwell Handbook of the Psychology of Occupational Safety and Workplace Health*, 83-110.

Wu, W., Carroll, I. A., & Chen, P. Y. (2018). A single-level random-effects cross-lagged panel model for longitudinal mediation analysis. *Behavior Research Methods*, 50(5), 2111-2124.

Yukl, G., & Chavez, C. (2002). Influence tactics and leader effectiveness. *Leadership*, *1*(1), 139-165.

Zeller, J. M., & Levin, P. F. (2013). Mindfulness interventions to reduce stress among nursing personnel: An occupational health perspective. *Workplace Health & Safety*, 61(2), 85-89.

Zohar, D. (2002). The effects of leadership dimensions, safety climate, and assigned priorities on minor injuries in work groups. *Journal of Organizational Behavior*, *23*(1), 75-92.

Zohar, D., & Luria, G. (2003). The use of supervisory practices as leverage to improve safety behavior: A cross-level intervention model. *Journal of Safety Research, 34*(5), 567-577.

Appendix A

First, we want to ask about your immediate supervisor and their safety behaviors.

Please respond using the following scale:

S.A.F.E.R Leadership Scale (Ozbilir, 2021)

In the last 2 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

The next set of questions will ask you about your attitudes toward safety and your involvement in safety initiatives at work. Please answer the following questions to the best of your ability:

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. There is an effective health and safety committee at the workplace
2. Incidents are always reported
3. All reported incidents are formally documented
4. Internal health and safety inspections are done on a routine basis
5. Safety issues are dealt with effectively in my workplace
6. I have access to all of the health and safety resources that I need

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

Please indicate the extent to which you performed safely at work in the last 2 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

The next set of statements will pertain to the reasons you act safely at work. Please state your level of agreeance to each statement.

Safety motivation (Scott et al., 2014)

Why do you work safely?

Strongly Disagree (1) – Strongly Agree (5)

It makes me feel good

It makes me happy

For the enjoyment it brings to the work day

In order to fulfill my personal goals

Striving to work safely is part of who I am

Working safely corresponds to my true nature

I personally value safety

I value a safe working environment

Safety is important to me

I feel a moral obligation to work safely

I would be ashamed if I didn't work safely

I would feel bad if I didn't work safely

In order to get a pay raise

In order to get a promotion

Because I want my coworkers to admire me

Although it doesn't make a difference whether I work safely or not

I work safely even though I think it's pointless

I work safely even though I don't have a good reason to

Now, we would like to ask about your safety behaviors, experiences, and feelings. We remind you that any questions that may elicit feelings of discomfort can be skipped.

Injuries (AWCBC, 2020)

Please indicate the number of times you have experienced each of the following injuries at work in the past 2 months:

1. Bruises
2. Sprains
3. Cuts
4. Pricks
5. Falls
6. Burns
7. Open wounds
8. Other (Please Specify):

Of the injuries you experienced in the past 2 months, how many (if any) have you reported to a manager?

Occupational Incidents (Mullen & Kelloway, 2009)

Please indicate the number of times you have experienced that following incidents at work in the past 2 months:

1. Had something fall on me
2. Overextended myself lifting or moving things
3. Had my hand contact a blade
4. Slipped on a slick surface
5. Had a sharp tool slip
6. Touched a hot surface (e.g., grill or fryer)
7. Had grease or food splatter on me (e.g. from a grill or deep fryer)
8. Was exposed to a smoke filled environment for long periods of time
9. Was exposed to chemicals or cleaning solutions without proper ventilation
10. Was in contact with broken glass
11. Tripped over something on the floor
12. Fell off of something (e.g., a ladder, shelf, etc.)
13. Had clothes caught in something (e.g., a piece of machinery)
14. Had an accident when operating a piece of machinery
15. Nearly had an accident when operating a piece of machinery

Of the incidents you experienced in the past 2 months, how many (if any) have you reported to a manager?

Anxiety around safety (based on GAD-7)

Please reflect back to your feelings and behaviours over the past 2 months. In relation to occupational safety, how often have you experienced the following:

0 – not at all, 1 – several days, 2 – more than half the days, 3 – nearly every day

1. Feeling nervous, anxious, or on edge that I will experience an injury or incident at work
2. Not being able to stop or control worrying about the possibility of an incident or injury occurring at work
3. When thinking about my safety at work, I often worry
4. Trouble relaxing at work whenever thinking about safety
5. Being so restless that it is hard to sit still when I have a task that requires me to be safe
6. Found myself becoming easily annoyed or irritable when thinking about workplace safety
7. Feeling afraid, as if someone or myself will experience an incident or injury in the workplace

Finally, this last set of items is for descriptive purposes only.

Demographics

1. What is your gender?
    - Male
    - Female
    - Other: _____
2. What is your age? Please enter whole numbers (e.g., 45): _____ Years

3. How long have you worked in the job you currently have?_____ years, _____months
4. On average, how many hours do you work per week? _____
5. 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? ?_____ years, _____months

What industry do you work in?

- Agriculture, forestry, fishing and hunting
- Mining, quarrying, and oil and gas extraction
- Utilities
- Construction
- Manufacturing
- Wholesale trade
- Retail trade
- Transportation and warehousing
- Information and cultural industries

- Finance and insurance
- Real estate and rental and leasing
- Professional, scientific and technical services
- Management of companies and enterprises
- Administrative and support, waste management and remediation services
- Educational services
- Health care and social assistance
- Arts, entertainment and recreation
- Accommodation and food services
- Public administration
- Other services (except public administration)
- Other (Please specify):_____

Please select the category that best describes your occupation.

- Management occupations
- Business, finance and administration occupations
- Natural and applied sciences and related occupations
- Health occupations
- Occupations in education, law and social, community and government services
- Occupations in art, culture, recreation and sport
- Sales and service occupations
- Trades, transport and equipment operators and related occupations

- Natural resources, agriculture and related production occupations
- Occupations in manufacturing and utilities

How long have you been working under your current supervisor? ?_____ years, _____months

****Attention check items (will be randomly embedded in the survey)****

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

1. Please select disagree for this answer
2. Please select strongly agree for this answer
3. Please select strongly disagree for this answer