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Safety in the C-Suite: How Chief Executive Officers Influence Organizational Safety Climate and Employee Injuries

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According to social learning theory, powerful and high status individuals can significantly influence the behaviors of others. In this paper, we propose that chief executive officers (CEOs) indirectly impact frontline injuries through the *collective* social learning experiences and effort of different groups of organizational actors—including members of the top management team (TMT), organizational supervisors, and frontline employees. We found support for our collective social learning model using data from 2,714 frontline employees, 1,398 supervisors, and 229 members of TMTs in 54 organizations. TMT members' experiences within a CEO-driven TMT safety climate was positively related to organizational supervisors' reports of the broader organizational safety climate and their subsequent collective support for safety (reported by frontline employees). In turn, supervisory support for safety was associated with fewer employee injuries at the individual level. We discuss the theoretical and practical implications of these findings for workplace safety research and practice.

Keywords: CEO, safety climate, top management team, injuries

Sadly, each year 2.3 million workers worldwide die from a work-related incident or disease (International Labor Organization, 2015). In a growing number of incidents, the organizational leader is singled out by the media for blame (e.g., Blinder, 2015) as was British Petroleum's (BP) former CEO, Tony Hayward, after the Deep Water Horizon explosion took the lives of 11 workers. Months before the explosion, Hayward told an audience "If you lead an organization you have a duty of care to everyone in it. It's a fact. And the bigger the organization, the more people you're taking care of" (Hayward, 2009). However, investigations into the explosion (e.g., National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011) suggest either a striking gap between Hayward's words and actions or that he was unable, as CEO, to improve BP's safety culture (Frontline, 2010).

In contrast, other CEOs are recipients of public accolades for taking tangible actions in support of employee safety. For example, since 2009, the United States National Safety Council (NSC) has annually recognized CEOs of small- to large-sized organizations who "share a dedication to employee safety as a primary goal and are cultivating safety leadership at all levels of their organizations" (NSC, 2009). While the NSC awards, investigative media reports, and other factors (e.g., lobbying for tougher criminal sanctions for CEOs; United Steel Workers [USW], 2015) create an impression that CEOs play a key role in shaping positive or negative safety outcomes, empirical evidence related to the influence of the top organizational leaders on safety is nonexistent.

On the one hand, inaccurate, romanticized beliefs about the role of top leaders in achieving organizational outcomes (Meindl, Ehrlich & Dukerich, 1985) may explain why many believe CEOs ultimately drive safety performance, when in fact they may actually have little influence in this domain. This reasoning aligns with the romance of leadership perspective (Bligh, Kohles, & Pillai, 2011; Meindl et al., 1985). Others have similarly argued that the complexity of modern organizations requires the collective ability and motivation of several organizational leaders (Colbert, Barrick, & Bradley, 2014). On the other hand, consistent with the so-called "CEO effect" (Hambrick & Quigley, 2014; Mackey, 2008; Quigley & Hambrick, 2015) and related trickle-down models of lead-

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ership effects (e.g., Mayer, Kuenzi, Greenbaum, Bardes, & Salvador, 2009; Simons, Friedman, Liu, & McLean Parks, 2007), CEO behavior may be a powerful predictor of safety on the frontlines. In this study, we attempt to bring clarity to these competing theoretical views.

We contribute to theoretical work on CEO leadership and workplace safety in two ways. First, we argue that although CEOs are important, an accurate portrayal of their influence on workplace safety must carefully weigh the contributions of their followers (Meindl, 1995). To this end, we adapt social learning theory (Bandura, 1977)—a framework often used to explain trickle-down effects (e.g., Mayer et al., 2009)—to explain how safety priorities set by CEOs cascade to the frontlines. In our adaptation of this theory, we stress that CEOs do not directly affect workplace safety; rather, they rely on the *collective* experiences of key groups of organizational actors. We build on the perspective that leadership in today's organizations involves shared responsibilities, *as well as* shared vicarious learning and teaching experiences (Waldman & Yammarino, 1999). That is, CEOs lead executive teams, and members of these teams, in turn, collectively influence the work and experiences of groups of managers, and so on. As such, an individual-level social learning framework may not adequately account for the collective experiences of these different groups of leaders and followers. To address this shortcoming, we develop the concept of *collective social learning* to explain how CEOs indirectly influence frontline safety through the collective social learning and subsequent behavioral modeling experiences of three focal groups—members of the top management team (TMT), organizational managers/supervisors, and frontline employees.

Second, this paper emphasizes the important role of safety climate in understanding the collective social learning of safety priorities from CEOs. Although previous studies note that top management fosters organizational safety climate (Zohar, 2010; Barling, Loughlin, & Kelloway, 2002), research has yet to examine the specific role that CEOs play. According to Peterson, Smith, Martorana, and Owens (2003) and Zaccaro (2001), this distinction is important in order to fully understand how top management achieves organizational goals. There are differences in positional power that clearly differentiate CEO actions from those of the TMT (Carpenter, Geletkanycz, & Sanders, 2004; Stoker, Grutterink, & Kolk, 2012). As such, Peterson et al. (2003) argued that a complete examination of the impact of CEOs must consider how they lead others, beginning with their executive teams. Thus, our paper further contributes to the literature by theoretically differentiating between the safety climate that a CEO creates in the executive suite from the broader organizational safety climate.

Specifically, we introduce the concept of *TMT safety climate,* which refers to an organizational-level construct informed by a CEO's safety-related actions and the priority a CEO puts on safety relative to other organizational goals (e.g., operational efficiency, profits) in her/his interactions with members of the TMT. In contrast, *organizational safety climate* captures shared perceptions among lower-level employees of the relative priority top managers put on safety, compared with other competing priorities (Zohar & Luria, 2005). Lastly, we explore the role of *supervisory support for safety*, which captures frontline employees' (individual and aggregate) perceptions that supervisors value safety, as reflected in communication, encouragement, and other supervisory behaviors that support safety (Christian, Bradley, Wallace, & Burke, 2009). We propose that these distinct safety constructs are the vehicles through which safety priorities cascade from the CEO to the frontlines through a process of collective social learning. This perspective challenges and extends current conceptualizations of safety climate as a singular construct at the organizational level.

A Multilevel Perspective on Social Learning

Bandura's (1973, 1977) social learning theory explains how people acquire information about appropriate behaviors by observing salient models perform behaviors that are expected and reinforced. For behaviors to be adopted, the observer must be aware of and pay attention to the role model in order to activate the social learning process. The observer must also remember the modeled behavior and be able to recollect it later (Bandura, 1977). Lastly, Bandura argues that reinforcements are essential to direct the observer's attention to the desired role behavior. This increases the probability that the observer will engage in the behavior and continue to do so in the future. Indeed, research indicates that people tend to model their behavior after higher-status individuals (e.g., Lian, Ferris, & Brown, 2012; Mayer et al., 2009). Although Bandura (1977) developed these ideas to capture how an individual learns from a role model, there has been little work on how social learning occurs at the collective organizational level of analysis. This is important because employees at different levels of the organizational hierarchy are likely to have shared vicarious learning experiences from either a common, single leader (e.g., a CEO) or several high-status executives (e.g., TMT members). We propose a collective social learning perspective to describe how these processes unfold in the context of workplace safety.

Collective Social Learning of Safety Priorities, Procedures, and Practices

Collective social learning broadly explains shared observations and vicarious learning that occurs between groups of organizational actors. We propose that when a group of organizational actors is exposed to a prescribed set of core safety values and role behaviors, this shared experience encourages group members to engage in similar safety-oriented actions. For example, members of the TMT can collectively vicariously learn safety priorities from the CEO, and, in turn, collectively model these priorities to other groups—most directly, to organizational managers and supervisors. The supervisory group further collectively models behavior consistent with espoused safety priorities to their staff (Clarke, 2013). Waldman and Yammarino (1999) have similarly discussed the salience of role modeling and the subsequent collective effort it activates among TMT (and lower management groups) in transmitting the CEO's priorities. Note that TMT members and supervisors experience both sides of the collective social learning process—as observers of safety priorities and subsequent role models of the priorities to others—thereby explaining how safety priorities are transmitted and sustained across the firm.

According to Zohar (2010), a safety climate prescribes the priority given to procedures, policies, and practices that govern desired safety role behaviors. For collective social learning to occur, group members must possess shared cognitions regarding safety priorities and expectations (Zohar, 2010). These shared cognitions and interpretations of the climate explain why members of a group engage in similar safety-oriented behaviors that are subsequently emulated by others. Thus, collective social learning clarifies how CEOs indirectly influence frontline safety by shaping the collective experiences and subsequent modeling efforts of different groups of organizational actors, through the safety climate in which they are nested.

TMT Safety Climate and Organizational Safety Climate

Research indicates that CEOs can have a powerful role modeling effect on TMT members (e.g., Jordan, Brown, Treviño, & Finkelstein, 2013). In this paper, we propose that a safety-oriented CEO initiates the process of collective social learning by shaping TMT members' orientation to safety in the executive suite. First, safety-oriented CEOs prioritize safety in their interactions with their executives. While TMT members must often contend with the relative priority placed on safety compared to other competing priorities, such as production speed and efficiency (Zohar, 2010), they collectively learn from the CEO that a higher priority must be placed on safety. Indeed, Fruhen, Mearns, Flin, and Kirwan's (2014) study of top managers' perceptions of the ideal safety behaviors of a CEO found that balancing safety appropriately with costs and talking with everyone in the organization about safety are key. Second, the collective social learning experience of TMT members should be further augmented when the CEO engages in behaviors consistent with his or her espoused priority on safety (e.g., actively promoting workplace safety initiatives), establishes high safety standards, and uses reinforcements to promote these standards (Zohar, 2010; Zohar & Luria, 2005). These safety-oriented actions of the CEO—prioritizing safety, engaging in safety-consistent behaviors, and reinforcing safety in others—align with Zohar's (2010) discussion of interrelated pattern level characteristics that contribute to the development of a safety climate. As such, we propose that the CEO's safety orientation creates a unique safety climate in the executive suite, which we refer to as TMT safety climate.

In turn, we propose that the priority given to safety policies, procedures, and performance in the TMT safety climate is transmitted to the broader organization through the collective actions of TMT members. Colbert and colleagues (2014) have noted the importance of members of the TMT in accomplishing broad organizational objectives through "creating structures and systems to ensure the effective functioning of the organization" (p. 11). This suggests that the shared safety experiences of TMT members should motivate collective action toward translating the CEO's priority on safety to others. Specifically, we hypothesize that TMT members are likely to collectively learn to emulate the CEO's safety priorities embedded in the TMT safety climate. In turn, they should collectively role model safety priorities to others outside the executive suite (Waldman & Yammarino, 1999). This is because, in their pivotal role as purveyors of the CEO's safety priorities, TMT members are inclined to collectively emphasize the safety priorities prescribed in the TMT safety climate. This collective action is motivated by the CEO's persistence in regular conversations with TMT members about the relative importance of safety and recognizing TMT members when they appropriately prioritize safety (Fruhen et al., 2014). In sum, we propose that executives nested in the TMT safety climate are more likely to emphasize the CEO's relative priority of safety to others, fostering an organizational safety climate that is collectively perceived by organizational managers/supervisors who they interact with most directly.

> *Hypothesis 1:* TMT safety climate is positively related to organizational safety climate.

Organizational Safety Climate, Supervisory Support for Safety, and Employee Injuries

Zohar (2010) argues that a complete understanding of the impact of organizational safety climate must consider how safety policies and procedures prioritized by the TMT are transmitted to the frontlines and ultimately shape safety performance. On this point, supervisors play a key role in executing safety policies and procedures by "turning them into predictable, situation-specific action directives" (Zohar & Luria, 2005, p. 617) that ultimately prevent injuries. Like the TMT, the supervisory group plays a role in collectively observing, learning, and subsequently role modeling safety priorities in their daily interactions with frontline employees. We, therefore, propose that organizational-level supervisor support for safety is informed by the organizational safety climate (i.e., the actual priority members of the TMT place on safety) and manifests in organizational-wide supervisor safety behavior. Moreover, although supervisors have some discretion in how they implement safety policies and procedures in their workgroups, Zohar and Luria (2005) have shown that organization-level and group-level (i.e., supervisory) safety climates are positively related. This suggests that a strong organizational safety climate should positively influence organizational supervisors, as a collective, to engage in safety supportive behaviors.[1]

> *Hypothesis 2:* Organizational safety climate is positively related to organizational-level supervisory support for safety.

The last part of our theoretical model highlights the unique safety-related interactions frontline employees have with their direct supervisors, and how these exchanges, in turn, prevent work-related physical injuries at the individual level. Zohar (2010) notes that organizational supervisors are ultimately responsible for implementing the TMT's espoused safety policies into practice. Probst (2015) takes this argument further in stressing that "the influence of one's supervisor can be seen as more 'proximal' than the higher level organizational safety climate" (p. 1901). Similarly, we propose that an employee's personal experiences of his or her supervisor's safety practices should be the most direct predictor of injuries. Further, we suggest that the collective role modeling of safety priorities by organizational supervisors (i.e., organizational-level supervisor support for safety) informs the priority individual supervisors place on safety in their daily interactions with individ-

[1] Perceptions of supervisor support for safety can be partitioned into at least three levels—between-organization, between-groups, and individual. Our focus in this paper is at the organizational level, given our bird's-eye view interest in understanding how collective social learning processes drive organizational supervisors to collectively support safety (by implementing safety practices), and subsequent effects on injuries. In contrast, researchers have extensively explored the antecedents and consequences of group-level supervisory safety practices (Christian et al., 2009).

ual employees, and this, in turn, leads to fewer individual injuries. This reasoning is supported by meta-analytic research that shows a negative link between individual perceptions of supervisor support for safety and injuries (Christian et al., 2009).

Taken together, we propose that, beginning with the CEO's actions in the executive suite, the collective social learning of safety priorities unfolds through a series of organizational-level constructs, with increasingly local referents to the frontline. Specifically, we argue that organizational safety climate and supervisory support for safety sequentially mediate the distal effects of a CEO-driven TMT safety climate on frontline injuries.

Hypothesis 3: Individual experiences of supervisor support for safety are negatively associated with individual injury reports.

Hypothesis 4: CEO safety priorities embedded in the TMT safety climate are indirectly related to employee injuries through organizational safety climate and supervisory support for safety, respectively.

Method

Study Context

Participating organizations were primarily signatories to a "CEO safety charter" in Canada. Such programs motivate CEOs to make a public pledge to continuously improve safety in the workplace and community. Charter organizations have varied safety records according to the provincial workers' compensation board (WCB) associated with this program. Overall, the time-lost injury rate among charter organizations is higher than nonsignatory organizations.

Procedure

Data collection spanned July 2012 to April 2014. In 2012 and 2013, charter and a few noncharter organizations were sent letters of invitation. In return for participation, organizational leaders received a free organizational safety climate benchmarking report. In total, 54 organizations provided data. While the majority of organizational leaders were CEOs and presidents by title, a minority were owners or regional vice presidents. Members of senior management teams, supervisors, and frontline employees were invited to participate in the research and all participants provided consent as per our university research ethics approval.

The employee survey was distributed online or by hard copy. Participating organizations were encouraged to survey as many frontline employees as possible. However, some selected a targeted group of employees (e.g., from a specific division or location). Typically, the human resources department distributed a URL link to the survey and up to two reminder email messages to encourage participation. Senior managers and CEOs received an email invitation directly from the researchers to complete the survey and two email reminder messages.

Participants

We administered surveys to the three groups of employees initially in 62 organizations. In line with past research (e.g., Mayer et al., 2009), responses from supervisors and frontline employees were retained when there were three or more respondents per group. However, given the difficulty associated with collecting data from executives (Cycyota & Harrison, 2006), we retained organizations with one top management team participant. Nonetheless, we had 82% of organizations with three or more completed TMT surveys and an overall average number of completed TMT surveys across all organizations (M = 4.77, SD = 3.18) comparable to previous research (e.g., Colbert et al., 2014 (M = 4.50); Simons & Peterson, 2000 (M = 5.00)).

Our final sample consisted of 2,714 employees, 1,398 supervisors, and 229 members of TMTs from 54 organizations.[2] Participating organizations represented a variety of sectors, including: public sector (e.g., health care) (43%), manufacturing (20%), service sector (13%), commodity and wholesale (11%), building construction (7%), and others (e.g., road construction). Firm size ranged from 15 to 3,085 employees (M = 376.98, SD = 603.89, Mdn = 185). The average number of participants per organization, broken down by respondent group, is: frontline employees, 50.26 (SD = 90.67, range 3 to 568); supervisors, 27.96 (SD = 60.35, range 3 to 369); TMT members, 4.77 (SD = 3.18, range 1 to 16). The overall average response rate to the employee and supervisor surveys was approximately 31%.

Measures

Unless stated otherwise, all items (shown in Appendix A) were measured using a rating scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

Top managers. The preamble to the TMT measure asked: "Please respond to the following statements about the head of your organization (e.g., CEO, owner)." We adapted 10 items from Zohar and Luria's (2005) 16-item organizational safety climate scale to measure *TMT safety climate*.[3] In consultation with an injury prevention expert, we selected content that would most likely to be carried out by a CEO (e.g., "Requires each manager to help improve safety in his-her department"). The internal consistency reliability of this scale was .92.

Supervisors. Supervisors and managers rated organizational safety climate using Zohar and Luria's (2005) 16-item scale. These statements were prefaced with "Top management in this organization . . ." A sample item is "considers safety when setting production speed and schedules." The internal consistency reliability of this scale was .96.

[2] Note that the actual sample sizes varied depending on the analyses conducted. At the organizational level of analysis, employee, supervisor, and TMT ratings ranged in size from 45 to 54.

[3] In order to further test that the 10-item version of this scale corresponds with the full 16-item scale, we correlated scores on the two versions of the scale in two samples that completed the full scale. First, using the sample of managers/supervisors who completed the TMT-driven organizational safety climate, we found a strong correlation between the 10-item and 16-item versions of the scale, r = .989, $p < .01$. In a separate sample of 258 employees recruited through Amazon Mturk (see Footnote 4), we found a similarly strong positive correlation between these two versions of the scale, r = .988, $p < .01$. Moreover, 51 respondents in the Mturk sample identified as middle- or senior-management. In this subsample, the correlation between the two versions was highly similar, r = .988, $p < .01$. These results suggest that the 10-item version of the scale is equivalent to the full version.

Frontline employees. Frontline employees completed two measures. Perceptions of their direct *supervisor's support for safety* were measured using a 10-item scale developed by an injury prevention expert for internal use by the WCB.[4] A sample item is: My direct supervisor "makes sure we have the proper tools and equipment needed to do the job safely." This scale demonstrated a high level of internal consistency reliability ($\alpha = .93$). *Work-related injuries* were measured using a five-item index (e.g., strain or sprain) similar to Barling et al. (2002). They were asked: "Rate the frequency you have experienced the following work-related injuries in the previous THREE months. The response choices ranged from 1 (*never*) to 5 (*more than five times*)." We used this short time period to ensure accurate recall of injuries.

Analytic Strategy

We tested our hypotheses using multilevel structural equation modeling (MSEM; Muthén & Asparouhov, 2008) in Mplus (Muthén & Muthén, 1998-2015). We chose MSEM because of the limitations of traditional techniques (e.g., hierarchical linear modeling) for testing multilevel mediation, which can lead to underestimation or overestimation of true indirect effects (Preacher, Zyphur, & Zhang, 2010). The MSEM approach relies on Muthén and Asparouhov's (2008) general model, which specifies a measurement model, and two structural models—a within-cluster ("individual-level") and a between-cluster ("organizational-level") structural model (Preacher et al., 2010). In fitting the overall likelihood of the model, greater weight is allocated to the component (i.e., within- vs. between-cluster component) with more variance and/or more observations (Ryu, 2014). Mplus provides several traditional indicators of fit, including chi-squared tests, comparative fit index (CFI), Tucker-Lewis index (TLI), and root-mean-square error of approximation (RMSEA). Mplus also provides level-specific information for the standardized root-mean-square residual (SRMR) index. Appendix B shows the Mplus syntax for our MSEM analysis.

We tested our measurement model using multilevel cofirmatory factor analysis (CFA). In these analyses, it was crucial to create parcels to manage the number of parameters to be estimated (Little, Cunningham, Shahar, & Widaman, 2002). Little et al. note that parceling yields more stable latent estimates because it reduces random errors associated with each item and decreases the sample-size-to-parameter ratio. We created 3–4 indicators for each latent construct using random distribution of items (Landis, Beal, & Tesluk, 2000). We used observed (average) scores for employee injuries because this scale is a formative measure (i.e., items do not underlie a latent construct).

Results

Data Aggregation and Measurement Model

We examined and found support for aggregating perceptions of TMT safety climate, organizational safety climate, and supervisor support for safety to the organizational level. Specifically, we found acceptable within-organization agreement (James, Demaree, & Wolf, 1993) for each construct: median r_{wg} values were .93, .80, and .77, respectively. In addition, we found significant between-organization variances in TMT safety climate, ICC1 = .42, $p <$ .01, ICC2 = .77, organizational safety climate, ICC1 = .25, $p <$ .01, ICC2 = .90, and supervisor support for safety, ICC1 = .18, $p < .01$, ICC2 = .94.

Next, we carried out multilevel CFA to capture the extent to which the measures loaded on their respective constructs as shown in our theoretical model (Model 1). We also tested an alternate four-factor model (Model 2) where TMT safety climate and organizational safety climate loaded on one factor, given their similar reference to top management leaders, while aggregate supervisor support for safety loaded on the second factor. Lastly, Model 3 allowed all variables to load onto a single factor at both levels. The hypothesized factor structure (Model 1) demonstrated excellent fit with the data, $\chi^2(34) = 28.93$, $p > .05$, CFI = 1.00, TLI = 1.00, RMSEA = .001, $SRMR_{within} = .005$, and $SRMR_{between} = .032$. In comparison, Model 2 showed significantly worse fit to the data, particularly at the between level (as illustrated by the SRMR index): $\Delta\chi^2(2) = 57.39$, $p < .01$ [$\chi^2(36) = 145.76$, $p < .05$, CFI = .98, TLI = .98, RMSEA = .034, $SRMR_{within} = .005$, and $SRMR_{between} = .134$]. Lastly, Model 3 also demonstrated significantly worse fit compared to Model 1, $\Delta\chi^2(3) = 189.14$, $p < .01$ [$\chi^2(37) = 199.52$, $p < .01$, CFI = .97, TLI = .96, RMSEA = .04, $SRMR_{within} = .02$, and $SRMR_{between} = .145$].

Hypotheses Testing

The descriptive statistics and correlations among the study variables at the individual and aggregate levels are presented in Table 1. We controlled for the impact of employee gender on injuries because males experience a higher rate of injuries than females (AWCBC, 2016). We also controlled for the impact of firm size on organizational safety climate because it may be more difficult to instill strong perceptions of safety priorities in larger organizations.

The MSEM test of our proposed model showed excellent fit to the data, $\chi^2(47) = 53.15$, $p > .05$, CFI = .99, TLI = .99, RMSEA = .01, $SRMR_{within} = .03$, and $SRMR_{between} = .06$. As shown in Table 1 and Figure 1, the path from TMT safety climate to organizational safety climate was significant ($B = .66$, $p < .01$), providing support for H_1. H_2 was also supported by the direct positive path from organizational safety climate to aggregate supervisor support for safety, $B = .62$, $p < .01$. At the within level, individual perceptions of supervisor support for safety was negatively related with employee injuries, $B = -.17$, $p < .01$, providing support for H_3.

We tested an alternate, partially mediated model linking TMT safety climate directly to aggregate supervisor support for safety. This alternate model demonstrated excellent fit to the data, but was not significantly different from the fully mediated model, $\Delta\chi^2(1) = .34$, $p > .05$, [χ^2 (46) = 53.51, $p > .05$, CFI = .99, TLI = .99, RMSEA = .01, $SRMR_{within} = .03$, and $SRMR_{between} = .07$]. The direct path from TMT safety climate to aggregate supervisor support for safety was not significant, $B = .06$, $SE = .16$, $p > .05$. Thus, we chose the fully mediated model in line with

[4] We carried out initial construct validation of this scale using a sample of 258 employees recruited from Amazon Mechanical Turk (MTurk). We found that this scale converges with two established scales that assess supervisor support for safety: Zohar's (2000) scale and Hayes, Perander, Smecko, and Trask (1998) scale (*r*s = .82 and .88, respectively).

Table 1
Means, Standard Deviations, Internal Consistency Reliabilities, and Correlations Among the Study Variables

Variables	*M*	*SD*	Individual-level correlations 1	2		
1. Gender						
2. Supervisor support for safety	3.66	.76	.04			
3. Employee injuries	1.45	.63	.05*	−.12**		
	M	*SD*	Organizational−level correlations 1	2	3	4
1. TMT safety climate	3.98	.44				
2. Organizational safety climate	3.72	.49	.57**			
3. Aggregate supervisor support for safety	3.84	.37	.31**	.69**		
4. Aggregate employee injuries	1.51	.35	−.11	−.12	−.07	
5. Full-time equivalence	376.98	603.89	−.17	−.36**	−.44**	.06

Note. TMT = top management team; SPE = safety-integration of performance evaluations. At the organizational level, employee, supervisor, and TMT ratings ranged in sample size from n = 45–54. At the individual level, n ranged from 2,253 to 2,714.
* $p < .05$. ** $p < .01$.

the rule of thumb that parsimonious models with fewer estimated parameters are better than more complex models—particularly if the parsimonious model is most closely aligned with the proposed theoretical model and if the alternate model offers minimal gains in model fit indicators (Bentler & Mooijaart, 1989; Kumar & Sharma, 1999). We tested our proposed mediation (H_4) using Bayesian estimation procedures in Mplus. Specifically, the indirect effect was iteratively estimated (iterations = 10000) using a process similar to traditional bootstrapping (Zyphur & Oswald, 2015). We found support for the indirect effect of TMT safety climate on aggregate supervisor support for safety through organizational safety climate, $B = .34$, posterior $SD = .12$, $p < .01$, 95% CI [.13, .59], providing support for H_4.

Lastly, in a separate MSEM analysis, we tested a model that linked TMT safety climate directly and indirectly to aggregate (firm-level) employee injuries through organizational safety climate and aggregate supervisor support for safety. The results showed no support for any direct or indirect effects.[5] We also tested the accuracy of the hypothesized causal ordering of the constructs in our theoretical model using two alternate models. This is pertinent given the cross-sectional nature of the data. First, we tested the possibility that organizational safety climate was an antecedent of perceptions of TMT safety climate and found no support for this mediation order ($B = .03$, posterior $SD = .08$, $p > .05$, 95% CI [−.11, .18]). Second, we tested the possibility that aggregate supervisor support for safety preceded TMT safety climate in influencing organizational safety climate and also found no empirical support ($B = .03$, posterior $SD = .18$, $p > .05$, 95% CI [−.41, .23]). Taken together, our results strongly suggest that the best model is one that links CEO-driven TMT safety climate to employee injuries through organizational safety climate and supervisor support for safety, respectively (Table 2).

Discussion

While some believe that CEOs play an important role in setting workplace safety priorities and are responsible for preventing injuries to frontline employees (e.g., Frontline, 2008; NSC, 2015; USW, 2015), others have questioned the ability of top organizational leaders to impact organizational outcomes (e.g., Bligh et al., 2011). In this study, we assess *if* and *how* CEOs influence employee injuries. Drawing on social learning theory (Bandura, 1977), we find that CEOs affect workplace safety, although their influence is largely indirect and relies on the collective efforts of distinct groups of organizational actors. We found that executives' experiences of a CEO-driven TMT safety climate were positively related to organizational supervisors' perceptions of organizational safety climate, which, in turn, influenced frontline employees' reports of supervisors' collective support for safety. At the individual level, the stronger an employee's experience of her/his supervisor's support for safety, the lower the employee's injuries. Importantly, our findings are robust and not affected by firm size and employee gender. Moreover, we tested a series of alternative causal ordering of constructs, starting with organizational safety climate and/or supervisor support for safety, as opposed to the

[5] There are important conceptual differences between self-reported injuries at the individual level and aggregate scores of these reports at the organizational-level, which can explain these null findings. According to Klein and Kozlowski (2000), "just because the relation holds at the lower level does not mean it will also hold at higher levels. Relationships that hold at one level of analysis may be stronger or weaker at a different level of analysis, or may even reverse direction" (p. 213). Similarly, we believe that self-reported workplace injuries, though appropriate for capturing individual-level differences, do not necessarily capture the same concept when aggregated to the organizational level. Such aggregate scores may not accurately capture the true level of injuries in the organization because of significant underreporting of injuries in safety-sensitive industries (see, e.g., Probst, 2015; Probst, Brubaker, & Barsotti, 2008). This issue is further exacerbated when only a small percentage of the total workforce is sampled. Thus, unlike organizational safety climate, for instance, where one can reliably sample from a select number of employees to inform the researcher about the global construct, taking a similar approach with self-reported injuries, an index, is likely to lead to measurement deficiency. Therefore, we chose not to aggregate employee injuries to the organizational level in the main analysis.

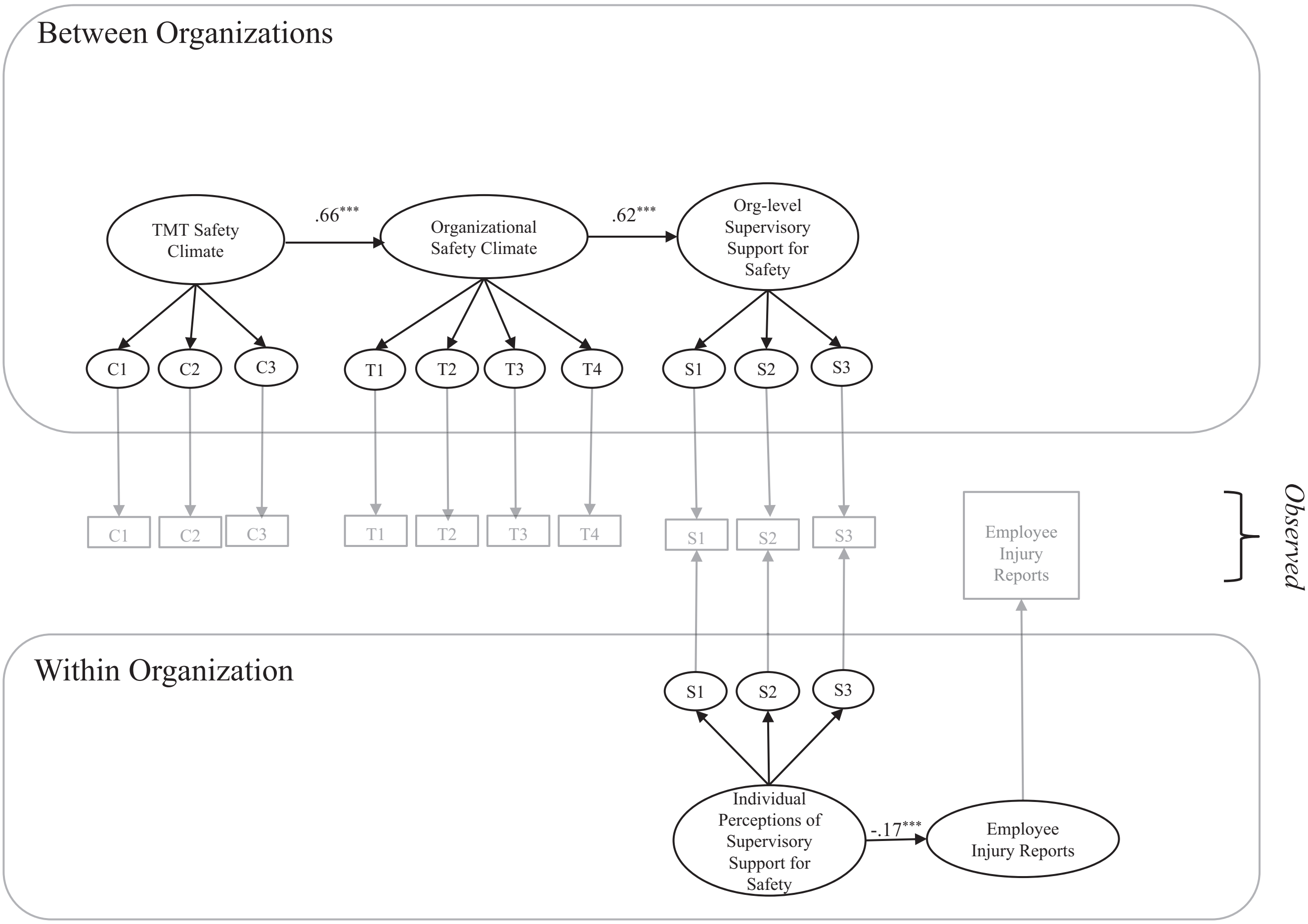

Figure 1. Multilevel SEM test of hypothesized relationships (full mediation). Note: Factor loadings are not displayed. Estimates reported are unstandardized values. We control for organizational size and employee gender (not shown) in this model. *** $p < .001$.

CEO-driven TMT safety climate. Overall, the results provide more support for a "top-down," collective social learning model, than a "bottom-up" social learning process.

Theoretical and Practical Implications

Our study makes a valuable contribution to theory about the influence that CEOs have on workplace safety. Our findings reconcile the prevailing theoretical perspective that CEOs matter (i.e., the CEO effect; Hambrick & Quigley, 2014) with the alternate, romance of leadership perspective (Meindl et al., 1985). That is, rather than supporting one perspective over the other, we find that although the CEOs in our study do not have a *direct* impact on employee safety, they *indirectly* influence frontline safety by fostering a safety climate in the TMT that then trickles down to lower levels of the organization. These findings further support the argument that, in order to understand the influence of leaders, we must consider the contributions of their followers and, specifically their experiences, interpretations, and actions (Colbert et al., 2014; Meindl, 1995). This is an alternative viewpoint to the dominant assumption in leadership research and some public discourse, which tends to be leader-centric and disproportionately weighs role-based leader's behaviors in achieving organizational outcomes (e.g., Mackey, 2008; Quigley & Hambrick, 2015). Indeed, according to Bandura's (1977) social learning framework, "those who have high status, prestige, and power are much more effective in evoking matching behavior in observers than models of low standing" (p. 18). Consistent with this, CEOs who espouse safety priorities would presumably exert greater direct influence on workplace injuries, compared with lower status managers and supervisors. In contrast, we find that the CEO's influence on injuries is indirect, and relies on the collective engagement and actions of different groups of organizational members. While CEOs can create a TMT safety climate that directly shapes the safety orientation of TMT members, to influence frontline injuries, CEOs must rely on the collective experiences and effort of the TMT, and the proximal influences of supervisors on the frontlines.

Our findings reinforce the need to understand the role and collective experiences of different groups of actors and organizational climate in tracing the pathways of CEO influence. Zohar (2010) has noted the importance of internal consistency between espoused safety priorities at the top and local practices by supervisors to ensure workplace safety. Although inconsistencies will

Table 2
Multilevel Structural Equation Modeling Results (Full Mediation Model)

Variables	Employee injuries		Organizational safety climate		Supervisory support for safety (C)	
	B	*SE*	*B*	*SE*	*B*	*SE*
Within level						
Employee gender	.05	.05				
Supervisor support for safety	$-.17^{***}$	.02				
R^2	$.04^{***}$					
Between level						
Organizational size (FTE)			.00	.00		
TMT safety climate (A)			$.66^{***}$	.16		
Organizational safety climate (B)					$.62^{***}$	.14
R^2			$.37^{***}$		$.66^{***}$	

			95% Confidence interval	
	B	Posterior *SD*	Low CI	High CI
Indirect effect (Bayesian estimation)				
A → B → C	.34	.12	.13	.59

Note. Estimates are unstandardized coefficients. FTE = Full time equivalent. In lieu of standard errors (*SE*), Bayesian estimation procedures in Mplus provide "posterior standard deviation (*SD*)" estimates. In the Bayesian analysis estimating the indirect effect, we controlled for organizational size (FTE). The results are highly similar without the control variable.
*** $p < .001$.

inevitably occur due to supervisory discretionary actions in day-to-day operations (Zohar & Luria, 2005), Zohar (2010) argues that workplace safety is best achieved when there is alignment among key organizational actors. This reasoning corresponds to our model where CEOs, members of the TMT, and organizational supervisors are all collectively aligned with a set of espoused safety priorities and collectively contribute to enacting these priorities in their given roles. This supports our emphasis on the importance of collective social learning processes in explaining how different groups across the organizational hierarchy jointly contribute toward ensuring that the CEO's safety priorities (or lack thereof) are realized on the frontlines. While researchers have postulated that top management plays a key role in shaping the organization's safety climate (e.g., Barling et al., 2002; Zohar, 2010; Zohar & Luria, 2005), the CEO typically has disproportionately more influence in the executive team (Hambrick, 2007). Upper echelons researchers (Carpenter et al., 2004; Hambrick, 2007) also distinguish the role of the CEO from those of TMT members. As such, there is an opportunity for a nuanced examination of the contributions of CEOs and TMTs to workplace safety. To bridge this gap, we proposed and found that CEOs can create a facet-specific TMT safety climate, which is different from, and more importantly, an antecedent to the broader organizational safety climate. Our results show that the CEO-driven TMT safety climate primarily influences the safety orientation of executives and motivates their collective effort to translate the CEO's safety priorities to those outside the c-suite, thereby fostering the broader organizational safety climate. These distinctions are theoretically important because they answer calls (Peterson et al., 2003; Zaccaro, 2001) to clarify the specific roles that CEOs and TMT members play—in the present context, their differential roles in shaping the organizational safety climate. In doing so, we situate organizational safety climate as a linchpin in a chain of collective-level constructs related to key organizational actors (i.e., CEO-TMT-supervisory) that ultimately impacts employee injuries.

From a practical perspective, the present findings highlight the need for organizations to select and cultivate executive leaders who emphasize safety. This is especially salient from an internal injury prevention perspective and external criminal liability perspective (Blinder, 2015). While occupational health and safety laws hold all organizational members responsible for safety, they demand more from those with the highest degree of control over organizational resources and important organizational decisions (Bittle & Snider, 2006). Further, while supervisor safety-related leadership interventions have been associated with improved safety outcomes (Mullen & Kelloway, 2009), it is critical that the organizational leader's behaviors are in alignment with, and sustain the effects of, supervisory safety training.

Limitations and Future Research

Several limitations of our research warrant discussion. First, the study design was cross-sectional, thus we cannot completely rule out the possibility of alternate ordering of the variables. However, supplementary analysis supported the hypothesized pattern of indirect effects. Second, we relied on employees to report on their own injuries, as well as their supervisor's support for safety. We note that our result is consistent (in strength and magnitude) with meta-analytic estimates of the relationship between supervisor support for safety and composite measures of accidents and injuries (Christian et al., 2009). Nonetheless, future studies should attempt to obtain organizational-level injury reports, although such records may be unreliable due to injury underreporting (Probst, 2015) and interfirm differences in measuring injuries (e.g., lost-time vs. minor injuries). In some of our participating organizations ($n = 10$), fewer than three members of the TMT responded to questions about the CEO. Given the challenges associated with surveying top managers (Cycyota & Harrison, 2006), we decided to retain these data to maximize the power of the analysis. On a related note, our overall sample size for participating organizations was relatively small ($n = 54$). Future research using larger organizational samples is warranted to address potential issues with power and replication.

Finally, it was not feasible to obtain personnel information about employee grouping by supervisor due to the time burden this would place on representatives of participating firms who assisted with survey administration. Thus, we were unable to account and control for the effects of workgroup safety climate and determine how local group-level safety climates mediated the relationship between organizational-level constructs and employee injuries. Zohar and Luria's (2005) results demonstrate that while organizational and group-level climates tend to be aligned, there can be significant variability among workgroups within organizations. Future studies on the effects on CEO behaviors on safety should consider three-level models that account for workgroup safety climate level and strength effects.

In conclusion, our study provides strong preliminary support for the role of the CEO as a driving force in initiating and driving safety priorities throughout the organization, although their influence occurs primarily through the work of other groups of organizational members. As such, it is appropriate to attribute successes in preventing injuries to CEOs when there is also evidence of the contributions of other key organizational actors to this effort. Future empirical and theoretical work that does not account for collective social learning may miss important psychological processes at the organizational level of analysis (beyond organizational safety climate) that contribute to workplace safety. Further, research on CEOs and safety is important given the unacceptably high number of work-related injuries and fatalities and the growing emphasis on injury prevention by all organizational actors, especially top leaders.

References

Association of Workers Compensation Boards of Canada (AWCBC). (2016). *Injury statistics*. Retrieved from http://awcbc.org/?page_id=14

Bandura, A. (1973). *Aggression: A social learning analysis*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.

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,* 488–496. http://dx.doi.org/10.1037/0021-9010.87.3.488

Bentler, P. M., & Mooijaart, A. B. (1989). Choice of structural model via parsimony: A rationale based on precision. *Psychological Bulletin, 106,* 315.

Bittle, S., & Snider, L. (2006). From manslaughter to preventable accident: Shaping corporate criminal liability. *Law & Policy, 28,* 470–496. http://dx.doi.org/10.1111/j.1467-9930.2006.00235.x

Bligh, M. C., Kohles, J. C., & Pillai, R. (2011). Romancing leadership: Past, present, and future. *The Leadership Quarterly, 22,* 1058–1077. http://dx.doi.org/10.1016/j.leaqua.2011.09.003

Blinder, A. (2015, December 3). Mixed verdict for Donald Blankenship, Ex-Chief of Massey Energy, after coal mine blast. *The New York Times*. Retrieved from http://www.nytimes.com/2015/12/04/us/donald-blankenship-massey-energy-upper-big-branch-mine.html?_r=0

Carpenter, M. A., Geletkanycz, M. A., & Sanders, W. G. (2004). Upper echelons research revisited: Antecedents, elements, and consequences of top management team composition. *Journal of Management, 30,* 749–778. http://dx.doi.org/10.1016/j.jm.2004.06.001

Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. (2009). Workplace safety: A meta-analysis of the roles of person and situation factors. *Journal of Applied Psychology, 94,* 1103–1127. http://dx.doi.org/10.1037/a0016172

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,* 22–49. http://dx.doi.org/10.1111/j.2044-8325.2012.02064.x

Colbert, A. E., Barrick, M. R., & Bradley, B. H. (2014). Personality and leadership composition in top management teams: Implications for organizational effectiveness. *Personnel Psychology, 67,* 351–387. http://dx.doi.org/10.1111/peps.12036

Cycyota, C. S., & Harrison, D. A. (2006). What (not) to expect when surveying executives: A meta-analysis of top manager response rates and techniques over time. *Organizational Research Methods, 9,* 133–160. http://dx.doi.org/10.1177/1094428105280770

Frontline. (2008). *A dangerous business: Revisited*. Retrieved from http://www.pbs.org/wgbh/pages/frontline/mcwane/

Frontline. (2010). *The spill*. Retrieved from http://www.pbs.org/wgbh/pages/frontline/the-spill/

Fruhen, L. S., Mearns, K. J., Flin, R., & Kirwan, B. (2014). Safety intelligence: An exploration of senior managers' characteristics. *Applied Ergonomics, 45,* 967–975. http://dx.doi.org/10.1016/j.apergo.2013.11.012

Hambrick, D. C. (2007). Upper echelons theory: An update. *The Academy of Management Review, 32,* 334–343. http://dx.doi.org/10.5465/AMR.2007.24345254

Hambrick, D. C., & Quigley, T. J. (2014). Toward more accurate contextualization of the CEO effect on firm performance. *Strategic Management Journal, 35,* 473–491. http://dx.doi.org/10.1002/smj.2108

Hayes, B. E., Perander, J., Smecko, T., & Trask, J. (1998). Measuring perceptions of workplace safety: Development and validation of the work safety scale. *Journal of Safety Research, 29,* 145–161.

Hayward, T. (2009, July 27). *Entrepreneurial spirit needed: Tony Hayward, British Petroleum. Stanford School of Business public lecture* [Video file]. Retrieved from http://www.youtube.com/watch?v=FwQM00clxgM

International Labor Organization (ILO). (2015). Safety and health at work. Retrieved from http://www.ilo.org/global/topics/safety-and-health-at-work/lang--en/index.htm

James, L. R., Demaree, R. G., & Wolf, G. (1993). rWG: An assessment of within-group interrater agreement. *Journal of Applied Psychology, 78,* 306–309. http://dx.doi.org/10.1037/0021-9010.78.2.306

Jordan, J., Brown, M. E., Treviño, L. K., & Finkelstein, S. (2013). Someone to look up to: Executive–follower ethical reasoning and perceptions of ethical leadership. *Journal of Management, 39,* 660–683. http://dx.doi.org/10.1177/0149206311398136

Klein, K. J., & Kozlowski, S. W. (2000). *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions*. San Francisco, CA: Jossey-Bass.

Kumar, A., & Sharma, S. (1999). A metric measure for direct comparison of competing models in covariance structure analysis. *Structural Equation Modeling, 6,* 169–197. http://dx.doi.org/10.1080/10705519909540127

Landis, R. S., Beal, D. J., & Tesluk, P. E. (2000). A comparison of approaches to forming composite measures in structural equation models. *Organizational Research Methods, 3,* 186–207. http://dx.doi.org/10.1177/109442810032003

Lian, H., Ferris, D. L., & Brown, D. J. (2012). Does power distance exacerbate or mitigate the effects of abusive supervision? It depends on the outcome. *Journal of Applied Psychology, 97,* 107–123. http://dx.doi.org/10.1037/a0024610

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling, 9,* 151–173. http://dx.doi.org/10.1207/S15328007SEM0902_1

Mackey, A. (2008). The effect of CEOs on firm performance. *Strategic Management Journal, 29,* 1357–1367. http://dx.doi.org/10.1002/smj.708

Mayer, D. M., Kuenzi, M., Greenbaum, R., Bardes, M., & Salvador, R. B. (2009). How low does ethical leadership flow? Test of a trickle-down model. *Organizational Behavior and Human Decision Processes, 108,* 1–13. http://dx.doi.org/10.1016/j.obhdp.2008.04.002

Meindl, J. R. (1995). The romance of leadership as a follower-centric theory: A social constructionist approach. *The Leadership Quarterly, 6,* 329–341. http://dx.doi.org/10.1016/1048-9843(95)90012-8

Meindl, J. R., Ehrlich, S. B., & Dukerich, J. M. (1985). The romance of leadership. *Administrative Science Quarterly, 30,* 78–102. http://dx.doi.org/10.2307/2392813

Mullen, J. E., & Kelloway, E. K. (2009). Safety leadership: A longitudinal study of the effects of transformational leadership on safety outcomes. *Journal of Occupational and Organizational Psychology, 82,* 253–272. http://dx.doi.org/10.1348/096317908X325313

Muthén, B. O., & Asparouhov, T. (2008). Growth mixture modeling: Analysis with non-Gaussian random effects. In G. Fitzmaurice, M. Davidian, G. Verbeke, & G. Molenberghs (Eds.), *Longitudinal data analysis* (pp. 143–165). Boca Raton, FL: Chapman & Hall/CRC.

Muthén, L. K., & Muthén, B. O. (1998–2015). *Mplus user's guide: Statistical analysis with latent variables* (5th ed.). Los Angeles, CA: Author.

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. (2011). *Deep water: The Gulf Oil Disaster and the future of offshore drilling*. Retrieved from http://cybercemetery.unt.edu/archive/oilspill/20121210172821/http://www.oilspillcommission.gov/

National Safety Council (NSC). (2009, February 1). 2009 CEOs who "get it". *Safety+Health*. Retrieved from http://www.safetyandhealthmagazine.com/articles/2009-ceos-who-get-it-23

National Safety Council (NSC). (2015, January 25). 2015 CEOs who "get it". *Safety+Health*. Retrieved from http://www.safetyandhealthmagazine.com/articles/11666-2015-ceos-nschome

Peterson, R. S., Smith, D. B., Martorana, P. V., & Owens, P. D. (2003). The impact of chief executive officer personality on top management team dynamics: One mechanism by which leadership affects organizational performance. *Journal of Applied Psychology, 88,* 795–808. http://dx.doi.org/10.1037/0021-9010.88.5.795

Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15,* 209–233. http://dx.doi.org/10.1037/a0020141

Probst, T. M. (2015). Organizational safety climate and supervisor safety enforcement: Multilevel explorations of the causes of accident underreporting. *Journal of Applied Psychology, 100,* 1899–1907. http://dx.doi.org/10.1037/a0039195

Probst, T. M., Brubaker, T. L., & Barsotti, A. (2008). Organizational injury rate underreporting: The moderating effect of organizational safety climate. *Journal of Applied Psychology, 93,* 1147–1154. http://dx.doi.org/10.1037/0021-9010.93.5.1147

Quigley, T. J., & Hambrick, D. C. (2015). Has the "CEO effect" increased in recent decades? A new explanation for the great rise in America's attention to corporate leaders. *Strategic Management Journal, 36,* 821–830. http://dx.doi.org/10.1002/smj.2258

Ryu, E. (2014). Model fit evaluation in multilevel structural equation models. *Frontiers in Psychology, 5,* 81. http://dx.doi.org/10.3389/fpsyg.2014.00081

Simons, T., Friedman, R., Liu, L. A., & McLean Parks, J. (2007). Racial differences in sensitivity to behavioral integrity: Attitudinal consequences, in-group effects, and "trickle down" among Black and non-Black employees. *Journal of Applied Psychology, 92,* 650–665. http://dx.doi.org/10.1037/0021-9010.92.3.650

Simons, T. L., & Peterson, R. S. (2000). Task conflict and relationship conflict in top management teams: The pivotal role of intragroup trust. *Journal of Applied Psychology, 85,* 102–111. http://dx.doi.org/10.1037/0021-9010.85.1.102

Stoker, J. I., Grutterink, H., & Kolk, N. J. (2012). Do transformational CEOs always make the difference? The role of TMT feedback seeking behavior. *The Leadership Quarterly, 23,* 582–592. http://dx.doi.org/10.1016/j.leaqua.2011.12.009

United Steel Workers (USW). (2015). *Stop the killing*. Retrieved from http://www.stopthekilling.ca

Waldman, D. A., & Yammarino, F. J. (1999). CEO charismatic leadership: Levels-of-management and levels-of-analysis effects. *The Academy of Management Review, 24,* 266–285.

Zaccaro, S. (2001). *The nature of executive leadership*. Washington, DC: American Psychological Association.

Zohar, D. (2000). A group-level model of safety climate: Testing the effect of group climate on microaccidents in manufacturing jobs. *Journal of Applied Psychology, 85,* 587–596. http://dx.doi.org/10.1037/0021-9010.85.4.587

Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. *Accident Analysis and Prevention, 42,* 1517–1522. http://dx.doi.org/10.1016/j.aap.2009.12.019

Zohar, D., & Luria, G. (2005). A multilevel model of safety climate: Cross-level relationships between organization and group-level climates. *Journal of Applied Psychology, 90,* 616–628. http://dx.doi.org/10.1037/0021-9010.90.4.616

Zyphur, M. J., & Oswald, F. L. (2015). Bayesian estimation and inference: A user's guide. *Journal of Management, 41,* 390–420.

(*Appendices follow*)

Appendix A

Measures

TMT Safety Climate (Top Management Team-Rated)

The CEO/owner . . .

1. Insists on thorough and regular safety audits and inspections.
2. Tries to continually improve safety levels in each department.
3. Provides all the equipment needed to do the job safely.
4. Considers a person's safety behavior when moving-promoting people.
5. Requires each manager to help improve safety in his/her department.
6. Listens carefully to workers' ideas about improving safety.
7. Considers safety when setting production speed and schedules.
8. Provides workers with a lot of information on safety issues.
9. Regularly supports safety-awareness events (e.g. presentations, ceremonies).
10. Gives safety personnel the power they need to do their job.

Organizational Safety Climate (Supervisor-Rated)

Top management . . .

1. Reacts quickly to solve the problem when told about safety hazards.
2. Insists on thorough and regular safety audits and inspections.
3. Tries to continually improve safety levels in each department.
4. Provides all the equipment needed to do the job safely.
5. Is strict about working safely when work falls behind schedule.
6. Quickly corrects any safety hazards (even if it's costly).
7. Provides detailed safety reports to workers (e.g. injuries, near accidents).
8. Considers a person's safety behavior when moving-promoting people.
9. Requires each manager to help improve safety in his-her department.
10. Invests a lot of time and money in safety training for workers.
11. Uses any available information to improve existing safety rules.
12. Listens carefully to workers' ideas about improving safety.
13. Considers safety when setting production speed and schedules.
14. Provides workers with a lot of information on safety issues.
15. Regularly holds safety awareness events (e.g. presentations, ceremonies).
16. Gives safety personnel the power they need to do their job.

Supervisor Support for Safety (Frontline Employee-Rated)

My immediate supervisor . . .

1. Encourages us to raise safety concerns.
2. Encourages us to report all incidents and accidents.
3. Sets a good safety example by "walking the talk."
4. Actions are consistent with his/her words.
5. Holds regular meetings to communicate safety issues.
6. Considers safety when developing standard work practices and procedures.
7. Enforces health and safety practices and procedures.
8. Refuses to ignore safety rules when work falls behind schedule.
9. Insists we wear our personal protective equipment even if it is uncomfortable.
10. Makes sure we have the proper tools and equipment needed to do the job safely.

Index of Employee Injuries (Frontline Employee-Rated)

1. Strain or sprain
2. Scratch or abrasion (superficial wound)
3. Cut, laceration, or puncture (open wound)
4. Work-related burn or scald
5. Bruise or contusion

(*Appendices continue*)

Appendix B

MSEM and Multilevel Mediation Testing (Bootstrapping) Syntax in Mplus

Title: CEO organizational safety model; !*Insert desired title of analysis here*.

Data: File is CEO Safety Data.dat; !*Specify the name of the file containing the data here. The file should be in the same folder as the Mplus syntax*.

Define:

Center TMTSC_P1 TMTSC_P2 TMTSC_P3 ORGSC_P1 ORGSC_P2 ORGSC_P3 ORGSC_P4 SUPSS_P1 SUPSS_P2 SUPSS_P3 (grandmean); !*Specify centering strategy here*.

Variable: names are

ORGID TMTSC_P1 TMTSC_P2 TMTSC_P3 ORGSC_P1 ORGSC_P2 ORGSC_P3 ORGSC_P4 SUPSS_P1 SUPSS_P2 SUPSS_P3 EINJ EGENDER FTE; !*List all the variables in the dataset here*.

MISSING ARE ALL (−999); !Mplus handles missing data well but all missing data must be properly identified.

UseVariables are ORGID TMTSC_P1 TMTSC_P2 TMTSC_P3 ORGSC_P1 ORGSC_P2 ORGSC_P3 ORGSC_P4 SUPSS_P1 SUPSS_P2 SUPSS_P3 EINJ EGENDER FTE; !*List only the variables to be included in the analysis here.*

Cluster = OrgID;

Within = EGENDER EINJ; !*Identify variables that theoretically reside ONLY at the within level here*.

Between = TMTSC_P1 TMTSC_P2 TMTSC_P3 ORGSC_P1 ORGSC_P2 ORGSC_P3 ORGSC_P4 FTE; !*Identify variables that reside ONLY at the between level here (i.e., those with no within-group variability).*

Analysis:

Type = twolevel;

Estimator = Bayes;

Fbiterations = 10000;

!*Include the two lines above when testing multilevel mediation effects using Bayesian estimation procedures*.

Model:

%within% !*Commands in this section refer to relationships at the within level*.

SUPSS_W by SUPSS_P1 SUPSS_P2 SUPSS_P3; !*This line specifies the measurement model at the within-level*.

EINJ on SUPSS_W; !*Specifies the proposed structural relationship at the within-level*.

EINJ on EGENDER;

%between% !*Commands in this section refer to relationships at the between level*.

TMTSC_B by TMTSC_P1 TMTSC_P2 TMTSC_P3;

ORGSC_B by ORGSC_P1 ORGSC_P2 ORGSC_P3 ORGSC_P4;

SUPSS_B by SUPSS_P1 SUPSS_P2 SUPSS_P3;

!*The four lines above specify the measurement model at the between-level*.

ORGSC_B on TMTSC_B (n);

SUPSS_B on ORGSC_B (p);

ORGSC_B ON FTE;

!*The three lines above specify the proposed SEM relationships among latent variables at the between-level. Each path is labeled (n and p) to identify the specific path, a necessary condition for calculating indirect effects (see below).*

!*Include the five command lines below when running bootstrapping test of multilevel mediation*.

Model Constraint:

New (np);

np = n × p; !*Specifies the indirect effect of TMTSC_B on SUPSS_B through ORGSC_B*.

Output: standardized sampstat modindices Cinterval(HPD); !*Include this command when running Bayesian analyses*.

Note.

TMTSC_P1 - TMTSC_P3—parcels created from TMT safety climate scale.

ORGSC_P1 - ORGSC_P4—parcels created from organizational safety climate scale.

SUPSS_P1 - SUPSS_P3—parcels created from the supervisor support for safety scale.

EINJ—individual score on employee injuries scale.

FTE—organizational size (control variable)

EGENDER—employee gender (control variable)

*variablename*_W—latent variables at the within level.

*variablename*_B—latent variables at the between level.

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