

Development and Test of a Model Linking Safety-Specific Transformational Leadership and Occupational Safety

Julian Barling
Queen's University

Catherine Loughlin
University of Toronto

E. Kevin Kelloway
Saint Mary's University

The authors developed, tested, and replicated a model in which safety-specific transformational leadership predicted occupational injuries in 2 separate studies. Data from 174 restaurant workers (M age = 26.75 years, range = 15–64) were analyzed using structural equation modeling (LISREL 8; K. G. Jöreskog & D. Sörbom, 1993) and provided strong support for a model whereby safety-specific transformational leadership predicted occupational injuries through the effects of perceived safety climate, safety consciousness, and safety-related events. Study 2 replicated and extended this model with data from 164 young workers from diverse jobs (M age = 19.54 years, range = 14–24). Safety-specific transformational leadership and role overload were related to occupational injuries through the effects of perceived safety climate, safety consciousness, and safety-related events.

The vast majority of workers in developed countries take for granted that going to work on a daily basis is an activity that does not compromise their physical safety. The data, however, may tell a different story. For example, although there has been a decline in the annual number of occupational fatalities in the United States, there are still more than 6,000 fatal work injuries per year, with approximately 3.6 million disabling injuries (Conway & Svenson, 1998). The costs in human suffering alone should be sufficient to engage researchers in this issue, but there are other severe economic and social costs. In terms of productivity, the number of days of work lost because of occupational injuries in Canada between 1993 and 1996 exceeded the number of workdays lost because of labor unrest (Barling & Zacharatos, 2000). Estimates from the European Union suggest that an average of 30 days of

work are lost for each workplace accident (Dupre, 2000). Moreover, it is estimated that the total cost of each workplace injury in Ontario, Canada, is \$6,000 (Canadian), with the cost of each workplace fatality being \$492,000 (Marshall, 1996).

The most frequent attempts to account for occupational safety have traditionally emphasized the so-called “accident prone” individual, ergonomic design of equipment, and/or external regulatory systems (i.e., legislation and collective bargaining; see Sheehy & Chapman, 1987). The modal response by organizational researchers has been one of neglect. Less than 1% of organizational research published in top journals has focused on occupational safety, a situation that has not changed for more than 2 decades (Barling & Zacharatos, 2000; Campbell, Daft, & Hulin, 1982), and the present research forms part of an endeavor to redress this situation.

In this study, we develop, test, and replicate a model linking safety-specific transformational leadership and occupational injuries. Transformational leadership has received considerable empirical scrutiny in the literature (Avolio, 1999; Bass, 1998), more than have all other leadership theories from 1990 to 2000 (Judge & Bono, 2000), and it is composed of idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Transformational leadership affects critical subordinate attitudes and work-related outcomes. These include trust in management (Jung & Avolio, 2000; Pillai, Schriesheim, & Williams, 1999), organizational commitment (Barling, Weber, & Kelloway, 1996), satisfaction with leadership (Hater & Bass, 1988), work performance (Barling et al., 1996; Howell & Hall-Merenda, 1999; Judge & Bono, 2000), consolidated business unit performance (Howell & Avolio, 1993), and the effectiveness of shop stewards (Kelloway & Barling, 1993). Transformational leadership predicts performance even when personality characteristics are controlled statistically (Judge & Bono, 2000).

Julian Barling, School of Business, Queen's University, Kingston, Ontario, Canada; Catherine Loughlin, Faculty of Management, University of Toronto, Toronto, Ontario, Canada; E. Kevin Kelloway, Faculty of Management, Saint Mary's University, Halifax, Nova Scotia, Canada.

A version of this article was presented at the conference of the Society for Industrial and Organizational Psychology, New Orleans, Louisiana, April 2000. We greatly acknowledge financial support from the Social Sciences and Humanities Research Council of Canada to Julian Barling, Catherine Loughlin, and E. Kevin Kelloway; from the School of Business, Queen's University to Julian Barling; and from the Connaught Foundation, University of Toronto to Catherine Loughlin. We also acknowledge the help provided by the Toronto Health and Safety Legal Clinic at various stages of this project. We express our appreciation to Stephanie Brady for her assistance throughout this study and to Nick Turner for constructive comments on versions of this article.

Correspondence concerning this article should be addressed to Julian Barling, School of Business, Queen's University, Kingston, Ontario K7L, Canada. E-mail: jbarling@business.queensu.ca

Despite the extensive array of outcomes associated with transformational leadership (e.g., Avolio, 1999; Bass, 1998), there is no research on its possible effects on occupational safety. We suggest that this is a critical omission for two reasons. First, there are indications that leadership is associated with safety (Butler & Jones, 1979; Dunbar, 1975); organizations in which leaders take an active role in promoting occupational safety enjoy better safety records (Cohen, 1977; Hofmann, Jacobs, & Landy, 1995; Shannon, Mayr, & Haines, 1997; Zohar, 1980), and supportive supervision in general is associated with safety at work (see Dunbar, 1975).

Second, and more specifically, each of the four components of transformational leadership is relevant to enhancing occupational safety. With its emphasis on managers becoming role models by doing what is moral or right rather than what is expedient, idealized influence encourages managers to shift their focus toward occupational safety and away from the short-term focus that results from the productivity pressures they must bear. Leaders who are high in idealized influence convey occupational safety as a core value through their own personal commitment, thereby facilitating higher levels of followers' trust in management and organizational loyalty, both of which are critical for subsequent performance (Barling et al., 1996; Pillai et al., 1999). Leaders manifest inspirational motivation when they challenge subordinates to go beyond their individual needs for the collective good. They do so by convincing their followers that they can achieve safety levels previously believed to be unattainable, using symbols and stories to clarify their mission. Using intellectual stimulation, leaders challenge their followers to confront long-held assumptions and motivate them to think in innovative ways that enhance occupational safety. In doing so, leaders encourage their employees to address occupational safety issues and enhance information sharing about occupational safety and risks. Lastly, leaders demonstrate individualized consideration in the context of the subordinate-supervisor relationship by showing an active interest in their followers' well-being, including their physical safety. In this way, leaders' real concern with their employees' safety is evident, as they are not satisfied with achieving minimal external requirements (e.g., government standards).

Study 1

In one of the few empirical studies focusing on leadership behaviors and safety, Hofmann and Morgeson (1999) showed that the relationship in 49 dyads between leader-member exchanges

and occupational accidents was mediated by safety communication and safety commitment. This is consistent with empirical data that show that the effects of transformational leadership on performance are mediated by different aspects of employee morale, such as commitment, trust, and fairness (Barling et al., 1996; Jung & Avolio, 2000; Pillai et al., 1999). Similarly, members' own union commitment mediated the effects of shop stewards' transformational leadership on rank-and-file members' union participation (Kelloway & Barling, 1993). As a result, we predict that a transformational leadership style that emphasizes occupational safety will be associated in the first instance with safety consciousness and perceived safety climate.

Safety climate reflects employees' perceptions of the organization's policies, procedures, and practices concerning occupational safety and helps employees to make sense of the priority accorded to occupational safety within the organization. Although previous research has shown that perceptions of safety climate predict safety knowledge and motivation (Griffin & Neal, 2000) and safety behaviors (Hofmann & Stetzer, 1996; Neal, Griffin, & Hart, in press), much less research has addressed safety climate's predictors. The first step in our model links safety-specific transformational leadership and perceived safety climate, thereby extending previous research on the nature and consequences of perceived safety climate.

We argue that management actions directly affect perceived safety climate. For example, when managers call attention to the importance of safety, thereby displaying idealized influence, employees' perceptions of safety climate are enhanced. Similarly, when management is perceived to provide safety training because of a commitment to occupational safety rather than an obligation to comply with external regulations, perceived safety climate is improved. There is now a growing body of literature showing that perceived safety climate is a significant predictor of safety performance (Hofmann & Stetzer, 1996; Neal et al., in press; Zohar, 2000), and we predict that perceived safety climate will be a function of safety-specific transformational leadership (see Figure 1).

Whereas perceived safety climate addresses employees' perceptions of management and organizational approaches to safety, safety consciousness focuses on individuals' own awareness of safety issues. Individual safety consciousness exists at both the cognitive and the behavioral levels. At the cognitive level, safety consciousness consists of a general awareness of safety issues as well as a more specific knowledge of the behaviors required to

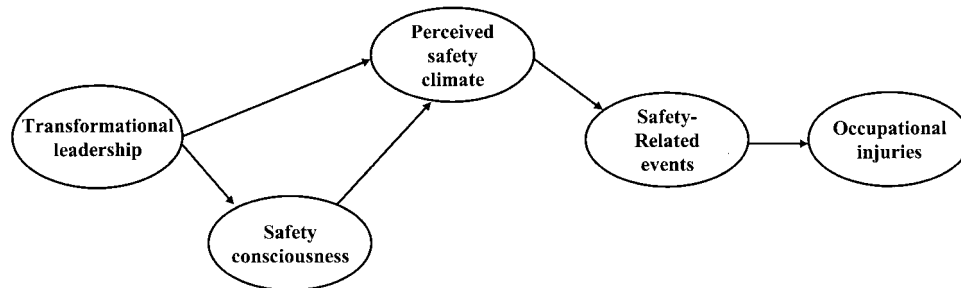


Figure 1. Proposed model linking transformational leadership and occupational injuries.

ensure safety. However, the concept of safety consciousness goes one step further than mere knowledge of the required behaviors to their enactment, and the proposed model predicts that a transformational leadership style will be associated with individual safety consciousness. When transformational leaders manifest idealized influence by focusing on the importance of safety and intellectual stimulation by encouraging employees to think about safety, employee safety consciousness is raised. We also propose that individual safety consciousness is associated with perceived safety climate: Clearly, a minimum threshold level of safety consciousness is necessary for employees to be concerned with perceptions of safety climate.

Previous research on the link between organizational conditions and occupational injuries has yielded modest relationships (e.g., Shannon et al., 1997). One plausible reason for this is that this is an indirect rather than a direct relationship. Beyond the proposed indirect effects of safety-specific transformational leadership, our model suggests that the most proximal predictors of occupational injuries are not perceived safety climate and safety consciousness but rather safety-related events: When individual safety consciousness is raised and management actions result in favorable perceptions of the safety climate, safety-related events are minimized. In turn, these safety-related events directly predict occupational injuries such as lacerations, strains, sprains, or burns. This notion is supported by the estimate that for every injury, there are significantly more safety-related events (i.e., more close calls or near misses).

Lastly, two methodological points are in order. First, this study is conducted within one specific industry (i.e., the restaurant industry) and focuses on two specific jobs (i.e., people working in restaurants and in fast food outlets). We constructed the study this way because many occupational injuries are job- or industry-specific (see Castillo, 1999; Personick, 1991). When engaging in the initial stages of model development and testing, it is appropriate to maximize internal validity and delay issues of generalizability. Second, accepting a model does not necessarily imply that no other models fit the data equally well or even better. Accordingly, we contrast the proposed model with two alternative models, namely, a partially mediated and a nonmediated model.

Method

Participants. Participants in Study 1 worked in the food and beverage industry. In an attempt to ensure heterogeneity of respondents across different work sites, we used different recruitment strategies. First, we sent E-mails to all students enrolled in an undergraduate business degree at one university, asking for volunteers who worked in restaurants or the fast food industry. Second, we placed posters in one street of a Canadian city (population 125,000), in which there was a large number of restaurants, asking for volunteers who worked in a restaurant either busing or waiting on tables. Third, we approached all food and beverage staff in a large hotel establishment. Fourth, we requested participation from food and beverage workers who were attending a union training session that was not related to health and safety. Lastly, we approached people working in fast food establishments individually to ask for their cooperation in completing and returning the questionnaire package. As a result, it is not possible to calculate either an overall response rate or a response rate for the first 4 groups. However, of the 200 questionnaires distributed through this last method, 84 were returned, for a 42% response rate.

The average age of the 174 participants (64% men) was 26.75 years ($SD = 11.53$, range = 15–64). Their average experience at the restaurant, hotel, or fast food outlet was 3.13 years ($SD = 4.42$, range = 1–21), and they worked an average of 27 hr per week ($SD = 11.87$, range = 1–60). Differences on these demographic characteristics as well as all the study variables across the five different recruitment techniques are presented in Table 1.

Instruments. Descriptive statistics, intercorrelations, and internal consistency data are presented in Table 2.

We used 10 items from the Multifactor Leadership Questionnaire (MLQ; Bass & Avolio, 1990) to assess participants' perceptions of their direct supervisors' *safety-specific transformational leadership behaviors*. As have others (Jung & Avolio, 2000), we used selected items from the MLQ. Two items were used to assess each of the four components of transformational leadership and contingent reward. We included contingent reward because factor analyses suggest that it consistently loads together with the four transformational leadership components (e.g., Bycio, Hackett, & Allen, 1995; Carless, 1998) and correlates very highly with the dimensions of transformational leadership in two large samples (correlation range = .68–.77, $N = 1,394$ and $1,498$; Avolio, Bass, & Jung, 1999). The decision to use a unidimensional index was vindicated by an exploratory factor analysis with varimax rotation that yielded a single factor accounting for 55.5% of the variance. All the items we used were modified to ensure that they were appropriate for the occupational safety context (e.g., "My supervisor talks about his/her most important values and beliefs" was

Table 1
Descriptive Statistics for All Study Variables Across the Five Recruitment Methods

Variable	E-mail to students ($n = 19$)		Community posters ($n = 26$)		Hotel employees ($n = 30$)		Union members ($n = 18$)		Fast food outlets ($n = 77$)		$F(4, 169)$
	M	SD	M	SD	M	SD	M	SD	M	SD	
Age	21.72	4.68	22.34	3.98	35.22	12.21	41.25	9.22	23.87	10.99	17.66**
Months at restaurant	28.58	34.16	14.25	17.67	67.57	84.25	133.70	71.52	26.31	28.48	17.69**
Hours worked per week	24.25	13.62	27.44	11.40	34.10	7.50	33.25	8.62	24.65	12.15	4.31**
Transformational leadership	2.29	0.67	2.48	1.01	3.27	0.88	2.22	0.68	3.39	0.88	14.14**
Perceived safety climate	2.56	0.64	2.87	0.83	3.65	0.75	3.21	0.70	3.06	0.61	8.48**
Safety behaviors	3.17	0.77	3.54	0.64	4.16	0.49	4.05	0.44	3.31	0.48	19.16**
Safety-related events	2.04	0.55	2.19	0.68	1.65	0.54	2.11	0.76	1.95	0.59	3.20*
Occupational injuries	1.94	0.52	2.10	0.72	1.83	0.63	2.14	0.71	2.05	0.57	1.15

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

Table 2
Descriptive Statistics and Intercorrelations for All Variables in Study 1 ($N = 174$)

Variable	1	2	3	4	5	6	7
1. Age (years)	—						
2. Tenure (months)	.62	—					
3. Injuries	-.09	.00	.70				
4. Events	-.16	-.01	.64	.81			
5. Safety climate	.12	.03	-.20	-.24	.70		
6. Safety consciousness	.24	.15	-.13	-.26	.47	.74	
7. Transformational leadership	-.18	-.13	-.18	-.22	.44	.36	.91
<i>M</i>	25.67	35.33	2.02	1.95	3.08	3.70	2.99
<i>SD</i>	10.63	49.92	0.62	0.61	0.74	0.60	0.99

Note. Alphas are on the diagonal.

changed to “My supervisor talks about his/her values and beliefs about the importance of safety”). Each item was rated on a 5-point scale (1 = *not at all*, 5 = *frequently or always*).

Perceived safety climate was assessed using a 10-item short form of Zohar’s (1980) scale (e.g., “Upper management assigns a high priority to safety issues,” “Workers who violate safety regulations upset their fellow workers even when no harm is done,” reverse coded). Shortened versions of this scale have been used in other studies (Hofmann & Stetzer, 1996).

There were no appropriate scales available to assess safety consciousness, safety-related events, or occupational injuries, and, as a result, we generated scales in each instance; all items appear in the Appendix. To measure safety consciousness, we generated seven items. Respondents indicated their agreement with each item on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). Safety-related events were assessed with 11 events relevant to the restaurant industry. Lastly, to ensure that the occupational injuries we assessed were specific to the restaurant industry, we based these eight items on Castillo’s (1999) description of the injuries experienced most frequently in this industry. For both the safety events scale and the occupational injuries scale, respondents indicated the frequency with which each event had occurred over the past year on a 5-point scale (1 = *never*, 5 = *frequently*).

Results

The proposed model was operationalized as an observed variable path analysis with parameters estimated with maximum likelihood estimation as implemented in LISREL 8 (Jöreskog & Sörbom, 1993). All analyses were based on the covariance matrix.

As shown in Figure 1, the proposed model hypothesizes that the effect of leadership on safety outcomes is fully mediated by safety consciousness and safety climate. To generate alternative models, we also estimated a partially mediated model (suggesting that safety-specific leadership has direct effects on safety-related events and occupational injuries in addition to the paths shown in Figure 1). Finally, we estimated a nonmediated model suggesting that safety-specific transformational leadership has direct effects but does not affect safety consciousness or safety climate. Both the nonmediated and the fully mediated models are nested within the partially mediated model, allowing their comparison with the chi-square difference test.

Fit indices for the three models are presented in Table 3. The partially mediated model provides a substantially better fit to the data than does the nonmediated model, $\Delta\chi^2(2) = 41.90$, $p < .01$. There was no significant difference between the fully and partially mediated models, $\Delta\chi^2(2) = 3.14$, *ns*. We rejected the partially mediated model on the basis of two related observations. First,

neither the path from leadership to injuries nor the path from leadership to safety events was significant. Second, the fully mediated model provided a more parsimonious fit to the data than did the partially mediated model (parsimony goodness-of-fit index values of .49 vs .30, respectively). Accordingly, the fully mediated model was retained for further analysis.

Standardized parameter estimates for the fully mediated model are shown in Figure 2. Injuries were predicted by events ($\beta = .64$, $p < .01$), and events were predicted by safety climate ($\beta = -.39$, $p < .01$). In turn, safety climate was predicted by individual safety consciousness ($\beta = .36$, $p < .01$). Both safety climate ($\beta = .30$, $p < .01$) and safety consciousness ($\beta = .36$, $p < .01$) were predicted by safety-specific transformational leadership.

Discussion

The results of Study 1 provide strong support for the mediational model linking safety-specific transformational leadership and occupational injuries. The model provided a good fit to the data (Table 3), all the proposed links in the model achieved statistical significance (Figure 2), the amount of variance accounted for was substantial, and the proposed model performed better than did either of the two alternative models. Beyond the extent to which these findings enhance our understanding of the role of organizational variables in occupational injuries, the breadth of situations to which safety-specific transformational leadership can be applied is demonstrated, further enhancing its external validity and utility.

A major feature of the current model is the role of perceived safety climate. Some attention has been given to the role of management in promoting occupational safety, and, as noted pre-

Table 3
Fit Indices for the Three Models in Study 1

Model	χ^2	<i>df</i>	GFI	AGFI	NFI	CFI	RMSEA
Fully mediated	4.34	5	.99	.97	.98	1.00	.00
Nonmediated	46.22**	3	.91	.74	.78	.79	.39
Partially mediated	3.14	3	.99	.96	.99	1.00	.30

Note. Chi-square $Ns = 174$. GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; NFI = normed fit index; CFI = comparative fit index; RMSEA = root-mean-squared error of approximation.

** $p < .01$.

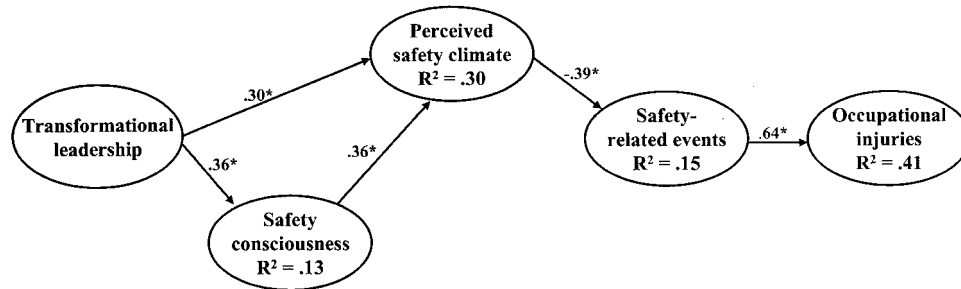


Figure 2. Results of LISREL 8 tests linking transformational leadership and occupational injuries in Study 1.
* $p < .01$.

viously, perceived safety climate exerts a significant effect on safety performance. Our findings replicate and extend this literature in several ways. First, the direct effects of perceived safety climate on safety-related outcomes are replicated. Second, as depicted in our model, perceived safety climate mediates the relationship between safety-specific transformational leadership and occupational safety. Third, our model identifies the role of safety-specific transformational leadership and safety consciousness within this context.

Nonetheless, several questions emerge: First, given the early stages of this research, it is critical to replicate the findings from Study 1. Second, we could assess the comparative role of safety-specific transformational leadership by including other possible predictor variables, and it is to these questions that we turn our attention in Study 2.

Study 2

Although the restaurant industry (the focus of Study 1) is a major employer, with 400,000 establishments and 6,000,000 employees in America (Personick, 1991), focusing on a single industry limits external validity. Thus, the sample for this second study is based on a group of employees with a more restricted age range who held a wider variety of jobs. We chose to focus on young workers (i.e., younger than 25 years of age) because occupational safety is an especially critical issue for this group (Castillo, 1999; Dupre, 2000; Runyan & Zakocs, 2000), with young workers consistently found to be at the highest risk for injuries (Dupre, 2000; Loughlin & Barling, 2001; Loughlin & Frone, in press). In addition, we did not restrict sample selection to any one occupation, which thereby resulted in a heterogeneous group of occupations.

Another aim of this second study was to place the effects of safety-specific transformational leadership into a wider perspective by focusing on an additional predictor, and we included the subjective experience of role overload for several reasons. First, this is consistent with an emphasis placed by management on productivity, possibly at the expense of safety, and is inconsistent with a transformational leadership style. Second, research has consistently shown that the subjective experience of role overload is associated with injuries at work with adults (Hofmann & Stetzer, 1996; Zohar, 2000) and, of special interest to the second study, separate samples of young workers (Frone, 1998; Runyan & Zakocs, 2000). Third, Baugher and Roberts (1999) studied workers in the petrochemical industry and showed that overwork contributed to workers' worries about explosions. Similarly, young workers also believed that fast-paced work placed them at increased risk of occupational injuries (Zakocs, Runyan, Schulman, Dunn, & Evenson, 1998). As a result, we focus on role overload together with safety-specific transformational leadership as possible predictors of occupational safety in this second study (see Figure 3).

Method

Eleven young people involved in a youth program agreed to distribute 300 surveys to local high schools, local colleges, and a downtown community center in a large Canadian city (population 2.6 million); 254 surveys were returned, but listwise deletion resulted in a sample of 164 participants. Although participants were employed in a variety of jobs, 88% were employed in the service sector, as is typical for a sample of young workers. The average age of the 164 participants (48.7% of whom were women) was 19.5 years ($SD = 2.47$, range = 14–24). Sixty percent of the sample was still in high school; they worked for an average of 28.7

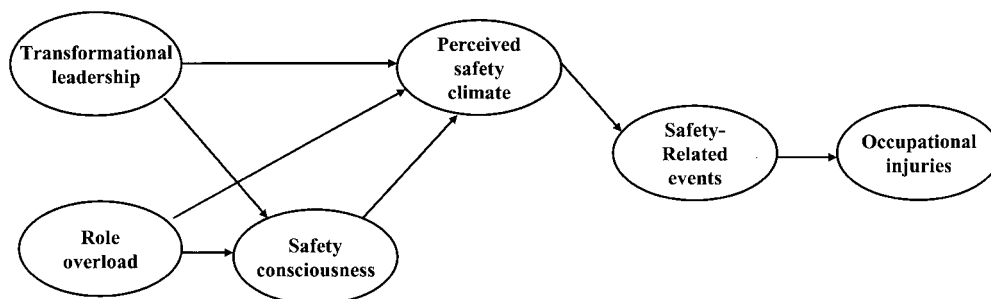


Figure 3. Expanded model linking transformational leadership and occupational injuries in Study 2.

hr per week ($SD = 12.35$, range = 3–60) and had been employed in their current job for an average of 7 months ($SD = 6.32$, range = 1–36).

Two items were adapted from Beehr, Walsh, and Taber (1976) to measure role overload (i.e., “I am so busy on the job that I can’t get to take normal breaks” and “There is too much work to do in my job for it all to be done well”). Both items used a 5-point Likert scale ranging from 1 (*very inaccurate*) to 5 (*very accurate*). Because the overwhelming number of respondents in this study were from the service sector, we used the same safety-specific transformational leadership, safety consciousness, and safety-related injuries questionnaires as those used in Study 1. We added three items to the safety-related events questionnaire to enhance its relevance to the current sample (i.e., “fell off something [e.g., a ladder, shelf],” “had clothes caught in something [e.g., a piece of machinery],” “other injuries not mentioned”; see Appendix).

Results and Discussion

Descriptive statistics and intercorrelations for all study variables are presented in Table 4. The proposed model was operationalized as an observed variable path analysis with parameters estimated with maximum likelihood estimation as implemented in LISREL 8 (Jöreskog & Sörbom, 1993). All analyses were based on the covariance matrix.

The proposed model provided a reasonable but not outstanding fit to the data, $\chi^2(7, N = 164) = 27.48$, $p < .01$, goodness of fit index (GFI) = .95, normed fit index (NFI) = .89, comparative fit index (CFI) = .91, root-mean-squared error of approximation (RMSEA) = .13, $p < .01$, and all of the paths composing the proposed model were significant. Injuries were predicted by safety events ($\beta = .53$, $p < .01$), and safety events were predicted by safety climate ($\beta = -.32$, $p < .01$). Safety climate was predicted by safety consciousness ($\beta = .52$, $p < .01$), safety-specific transformational leadership ($\beta = .13$, $p < .05$), and role overload ($\beta = -.17$, $p < .05$). Safety consciousness was predicted by both safety-specific transformational leadership ($\beta = .55$, $p < .01$) and role overload ($\beta = -.15$, $p < .05$). Inspection of the modification indices suggested that adding a path from safety climate to injuries would substantially improve the fit of the model, $\Delta\chi^2(1, N = 164) = 15.03$, $p < .01$. The resulting model provided a good fit to the data, $\chi^2(7, N = 164) = 12.46$, $p < .01$, GFI = .98, NFI = .95, CFI = .97, RMSEA = .08, *ns*. Standardized parameter estimates for the revised model are presented in Figure 4.

As shown, injuries were predicted by safety events ($\beta = .44$, $p < .01$) and safety climate ($\beta = -.27$, $p < .01$). Safety events

were also predicted by safety climate ($\beta = -.32$, $p < .01$). Safety climate was predicted by safety consciousness ($\beta = .52$, $p < .01$), safety-specific transformational leadership ($\beta = .13$, $p < .05$), and role overload ($\beta = -.17$, $p < .05$). Safety consciousness was predicted by both safety-specific transformational leadership ($\beta = .55$, $p < .01$) and role overload ($\beta = -.15$, $p < .05$).

General Discussion

The empirical model validated in this study may have considerable implications for organizational interventions that target improvements in occupational safety. At the most general level, the results of this study suggest that safety-specific transformational leadership provides an opportunity for enhancing occupational safety that goes beyond ergonomic design or regulator approaches. More specifically, the results of the present study suggest that occupational injuries might be reduced in the first instance through a focus on safety-related events, which themselves are a function of perceived safety climate. In turn, the initial role of safety-specific transformational leadership might be addressed. The salience of this argument is enhanced, as a substantial amount of variance was accounted for in occupational injuries in both studies (see Figures 2 and 4, respectively).

Although a persistent concern in survey research is the extent to which sole reliance on self-report measures could pose a threat to the validity of the findings, the self-report of occupational accidents may be underreported (Pransky, Snyder, Dembe, & Himmelstein, 1999), as a result of which findings using self-reported accidents may be biased conservatively. The self-report of injuries may also be appropriate because organizational safety records contain important errors (Eisenberg & McDonald, 1988): In 15% of the cases Eisenberg and McDonald investigated, there was an overreporting of cases, and in 20%, an underreporting of safety cases. Eisenberg and McDonald also showed that there was a systematic error in these situations: Instances of overreporting were more likely to occur for less serious incidents that did not involve lost time, many of which did not have to be reported by the organization. In contrast, underreported incidents were evenly divided between those that involved lost time and those that did not require lost time. Consequently, relying only on organizational records might introduce a systematic bias into the data, and inferences from future research would be enhanced to the extent to

Table 4
Descriptive Statistics and Intercorrelations for All Variables in Study 2 ($N = 164$)

Variable	1	2	3	4	5	6	7	8
1. Age (years)	—							
2. Tenure (months)	.33	—						
3. Injuries	-.12	.08	.77					
4. Events	.04	.04	.53	.92				
5. Safety climate	.05	-.07	-.41	-.32	.72			
6. Safety consciousness	.01	-.16	-.21	-.31	.62	.70		
7. Transformational leadership	-.16	-.11	-.15	-.10	.42	.55	.80	
8. Role overload	.05	-.08	.21	.20	-.26	-.17	-.04	.65
<i>M</i>	19.61	7.29	14.71	26.70	30.86	45.24	32.90	6.27
<i>SD</i>	2.42	6.29	5.06	10.74	5.62	7.58	7.93	2.34

Note. Alphas are on the diagonal.

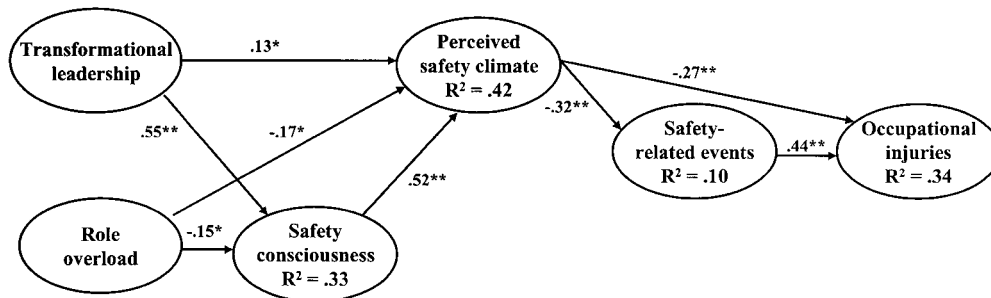


Figure 4. Results of LISREL 8 tests linking transformational leadership and occupational injuries in Study 2.

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

which data on occupational injuries are derived from multiple sources. At the same time, focusing on both near misses (Hemingway & Smith, 1997) and microaccidents (Zohar, 2000) would help to minimize distributional problems associated with studying infrequently occurring events that plague the area of occupational safety. Nonetheless, to the extent that future research makes primary use of self-reported data, imposing some control for socially desirable responding is in order.

Related to the issue of monomethod bias is our decision to use a safety-specific measure of transformational leadership. It might be argued that the relationships found between transformational leadership and the safety-related outcomes in this study are a function of item overlap. We suggest that this is not the case, as previous data have shown that nonsafety-specific transformational leadership also predicts occupational safety (Williams, Turner, & Parker, 2000). Future research might assess whether there are any differential effects associated with general versus safety-specific transformational leadership.

Both our samples are relatively small for structural equation modeling, and both studies obtained modest response rates. In structural equation modeling, small samples lead to a lack of power and an inability to reject the hypothesis that the model fits the data (Kelloway, 1998). Modest response rates raise the possibility of nonresponse bias contaminating the results. However, the empirical evidence for bias is limited at best (Krosnick, 1999; Schalm & Kelloway, 2001). Nonetheless, replication of these results with larger, more representative samples is recommended.

Several issues remain to be addressed in future research. First, our data were derived from cross-sectional designs. Although this is appropriate in the earlier stages of research, the need for longitudinal data on the indirect relationship of safety-specific transformational leadership on occupational safety and injuries is apparent if any inferences about causality or mediation are to be justified.

Second, the nature of role overload needs to be clarified: When the subjective experience of overload is assessed (e.g., Frone, 1998; Hofmann & Stetzer, 1996; Zohar, 2000), as it was in our second study, a negative relationship emerges with occupational safety. In contrast, the greater the number of hours worked (Kaminski, 2001)—a quantitative index of overload—the lower the injury rate. Because it is possible that more reliable employees are offered more overtime work or that more conscientious employees volunteer for more hours, the complex nature of role overload and its effects on occupational safety must be investigated further.

Third, other possible predictors need to be identified and examined in future research. Shannon et al. (1997) identified several workplace practices related to leadership that are associated with a higher injury rate, such as the level and use of discipline for safety infractions. Moreover, Baugher and Roberts (1999) studied workers in the petrochemical industry and showed that low job control and overwork contributed to workers' worries about explosions. This is important because the cognitive distractions caused by such worries may themselves predict safety performance (see Arthur, Barrett, & Doverspike, 1990).

Fourth, future research might focus on other potential mediating variables. Employees' trust in management is affected by managerial practices (Mayer & Davis, 1999) and transformational leadership (Jung & Avolio, 2000) and in turn affects critical organizational outcomes (McAllister, 1995). Likewise, perceptions of fairness are associated with transformational leadership (Pillai et al., 1999) and affect organizational outcomes such as employee theft and turnover (Greenberg, 1990). Thus, the extent to which trust in management and perceived justice mediate the effects of transformational leadership and other workplace conditions on occupational safety should also be addressed. Last, additional validation of the safety-related measures is warranted. More specifically, the relevance of the scales differed somewhat for respondents in different sectors in Study 2. Although this serves to bias the findings conservatively, future research should use occupationally relevant safety measures wherever possible.

In conclusion, the two studies conducted here showed that safety-specific transformational leadership is indirectly associated with occupational safety. In addition, previous research has shown that transformational leadership can be taught (Barling et al., 1996). Future research should assess whether changes in transformational leadership are followed by changes in employees' occupational safety and whether it is possible to teach managers safety-specific transformational leadership.

References

- Arthur, W., Barrett, G. V., & Doverspike, D. (1990). Validation of an information-processing-based test battery for the prediction of handling accidents among petroleum-product transport drivers. *Journal of Applied Psychology, 75*, 621-628.
- Avolio, B. J. (1999). *Full leadership development: Building the vital forces in organizations*. Newbury Park, CA: Sage.
- Avolio, B. J., Bass, B. M., & Jung, D. I. (1999). Re-examining the

- components of transformational and transactional leadership using the Multifactor Leadership Questionnaire. *Journal of Occupational and Organizational Psychology*, 72, 441–462.
- Barling, J., Weber, T., & Kelloway, E. K. (1996). Effects of transformational leadership training on attitudinal and financial outcomes: A field experiment. *Journal of Applied Psychology*, 81, 827–832.
- Barling, J., & Zacharatos, A. (2000). *High performance safety systems: Ten management practices for creating safe organizations*. Manuscript in preparation.
- Bass, B. M. (1998) *Transformational leadership: Industry, military and educational impacts*. Mahwah, NJ: Erlbaum.
- Bass, B. M., & Avolio, B. J. (1990). *Transformational leadership development: Manual for the Multifactor Leadership Questionnaire*. Palo Alto, CA: Consulting Psychologists Press.
- Baughner, J. E., & Roberts, J. T. (1999). Perceptions and worry about hazards at work: Unions, contract maintenance, and job control in the U. S. petrochemical industry. *Industrial Relations*, 38, 522–541.
- Beehr, T. A., Walsh, J. T., & Taber, T. D. (1976). Relationship of stress to individually and organizationally valued states: Higher order needs as a moderator. *Journal of Applied Psychology*, 61, 41–47.
- Butler, M. C., & Jones, A. P. (1979). Perceived leader behavior, individual characteristics, and injury occurrence in hazardous work environments. *Journal of Applied Psychology*, 64, 299–304.
- Bycio, P., Hackett, R. D., & Allen, S. J. (1995). Further assessment of Bass' (1985) conceptualization of transactional and transformational leadership. *Journal of Applied Psychology*, 80, 468–478.
- Campbell, J. P., Daft, R. L., & Hulin, C. L. (1982). *What to study: Generating and developing research questions*. Beverly Hills, CA: Sage.
- Carless, S. A. (1998). Assessing the discriminant validity of transformational leadership behavior as measured by the MLQ. *Journal of Occupational and Organizational Psychology*, 71, 353–358.
- Castillo, D. N. (1999). Occupational safety and health in young people. In J. Barling & E. K. Kelloway (Eds.), *Young workers: Varieties of experience* (pp. 159–200). Washington, DC: American Psychological Association.
- Cohen, A. (1977). Factors in successful occupational safety programs. *Journal of Safety Research*, 9, 168–178.
- Conway, H., & Svenson, J. (1998). Occupational injury and illness rates, 1992–96: Why they fell. *Monthly Labor Review*, 121, 36–58.
- Dunbar, R. L. M. (1975). Manager's influence on subordinates' thinking about safety. *Academy of Management Journal*, 18, 364–369.
- Dupre, D. (2000). Accidents at work in the EU in 1996. *Statistics in Focus: Population and Social Conditions*, 3 (4), 1–4.
- Eisenberg, W. M., & McDonald, H. (1988). Evaluating workplace injury and illness records: Testing a procedure. *Monthly Labor Review*, 111 (4), 58–60.
- Frone, M. R. (1998). Predictors of work injuries among employed adolescents. *Journal of Applied Psychology*, 83, 565–576.
- Greenberg, J. (1990). Employee theft as a reaction to underpayment inequity: The hidden costs of pay cuts. *Journal of Applied Psychology*, 75, 561–568.
- 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, 347–358.
- Hater, J. J., & Bass, B. M. (1988). Superiors' evaluations and subordinates' perceptions of transformational and transactional leadership. *Journal of Applied Psychology*, 73, 695–702.
- Hemingway, M., & Smith, C. S. (1997). Organizational climate and occupational stressors as predictors of withdrawal behaviors and injuries in nurses. *Journal of Occupational and Organizational Psychology*, 72, 285–299.
- Hofmann, D. A., Jacobs, R., & Landy, F. (1995). High reliability process industries: Individual, micro, and macro organizational influences on safety performance. *Journal of Safety Research*, 26, 131–149.
- 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, 286–296.
- Hofmann, D. A., & Stetzer, A. (1996). A cross-level investigation of factors influencing unsafe behaviors and accidents. *Personnel Psychology*, 49, 307–339.
- Howell, J. M., & Avolio, B. J. (1993). Predicting consolidated unit performance: Leadership behavior, locus of control, and support for innovation. *Journal of Applied Psychology*, 78, 891–902.
- Howell, J. M., & Hall-Merenda, K. E. (1999). The ties that bind: The impact of leader-member exchange, transformational and transactional leadership, and distance on predicting follower performance. *Journal of Applied Psychology*, 84, 680–694.
- Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Chicago: Scientific Software.
- Judge, T. A., & Bono, J. E. (2000). Five factor model of personality and transformational leadership. *Journal of Applied Psychology*, 85, 751–765.
- Jung, D. I., & Avolio, B. J. (2000). Opening the black box: An experimental investigation of the mediating effects of trust and value congruence on transformational and transactional leadership. *Journal of Organizational Behaviour*, 21, 949–964.
- Kaminski, M. (2001). Unintended consequences: Organizational practices and their impact on workplace safety and productivity. *Journal of Occupational Health Psychology*, 6, 127–138.
- Kelloway, E. K. (1998). *Using Lisrel for structural equation modeling*. Thousand Oaks, CA: Sage.
- Kelloway, E. K., & Barling, J. (1993). Members' participation in local union activities: Measurement, prediction, and replication. *Journal of Applied Psychology*, 78, 262–279.
- Krosnick, J. A. (1999). Survey research. *Annual Review of Psychology*, 50, 537–567.
- Loughlin, C., & Barling, J. (2001). Young workers' work values, attitudes, and behaviours. *Journal of Occupational and Organizational Psychology*, 74, 543–558.
- Loughlin, C., & Frone, M. (in press). Young workers' occupational safety. In J. Barling & M. Frone, *Psychology of workplace safety*. Washington, DC: American Psychological Association.
- Marshall, K. (1996). A job to die for. *Perspectives on Labour and Income*, 8, 26–31.
- Mayer, R. C., & Davis, J. H. (1999). The effect of the performance appraisal system on trust for management: A field quasi-experiment. *Journal of Applied Psychology*, 84, 123–136.
- McAllister, D. J. (1995). Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal*, 1995, 24–59.
- Neal, A., Griffin, M. A., & Hart, P. M. (in press). The impact of organizational climate on safety climate and individual behavior. *Safety Science*.
- Personick, M. E. (1991). Profiles in safety and health: Eating and drinking places. *Monthly Labor Review*, 114(6), 19–26.
- Pillai, R., Schriesheim, C. A., & Williams, E. S. (1999). Fairness perceptions and trust as mediators for transformational and transactional leadership: A two-sample study. *Journal of Management*, 25, 649–661.
- 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, 171–182.
- Runyan, C. W., & Zakocs, R. C. (2000). Epidemiology and prevention of injuries among adolescent workers in the United States. *Annual Review of Public Health*, 21, 247–269.
- Schalm, R. L., & Kelloway, E. K. (2001). The relationship between

- response rate and effect size in occupational health psychology research. *Journal of Occupational Health Psychology*, 6, 160–163.
- Shannon, H. S., Mayr, J., & Haines, T. (1997). Overview of the relationship between organizational and workplace factors and injury rates. *Safety Science*, 26, 201–217.
- Sheehy, N. P., & Chapman, A. J. (1987). Industrial accidents. In C. L. Cooper & I. T. Robinson (Eds.), *International review of industrial and organizational psychology* (pp. 201–227). Chichester, England: Wiley.
- Williams, H. M., Turner, N., & Parker, S. K. (2000, August). *The compensatory role of transformational leadership in promoting safety behaviors*. Paper presented at the annual meeting of the Academy of Management, Toronto, Ontario, Canada.
- Zakocs, R., Runyan, C. W., Schulman, M. D., Dunn, K. A., & Evenson, C. (1998). Improving safety for teens working in the retail trade sector: Opportunities and obstacles. *American Journal of Industrial Medicine*, 34, 342–350.
- Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology*, 65, 96–102.
- 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.

Appendix

Items Generated for Safety-Related Scales

Safety Consciousness

1. I always wear the protective equipment or clothing required by my job
2. I am well aware of the safety risks involved in my job
3. I know where the fire extinguishers are located in my workplace
4. I do not use equipment that I feel is unsafe
5. I inform management of any potential hazards I notice on the job
6. I know what procedures to follow if injured on my shift
7. I would know what to do if an emergency occurred on my shift (e.g., fire)

Safety-Related Events

1. Had something fall on me
2. Overextended myself lifting or moving things
3. Had my hand contact a blade while using or cleaning a meat slicer
4. Slipped on a slick surface and touched grill/fryer
5. Had a knife slip while cutting vegetables
6. Had grease or food splatter on me (e.g., from a grill or deep fryer)
7. Was exposed to a smoke filled environment for long periods of time
8. Had my hand contact a grill while cleaning or cooking
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.)^a
13. Had clothes get caught in something (e.g., a piece of machinery)^a
14. Other injuries not mentioned (specify _____)^a

Injuries

1. Strains or sprains
2. Cuts or lacerations
3. Burns
4. Bruises or contusions
5. Fractured bone
6. Dislocated joint
7. Serious muscle or back pain
8. Blisters

^a Used in Study 2.

Received May 9, 2000
Revision received August 28, 2001
Accepted September 7, 2001 ■