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Safety leadership: A longitudinal study of the effects of transformational leadership on safety outcomes

Jane E. Mullen[1]* and E. Kevin Kelloway[2]

[1]Department of Commerce, Mount Allison University, New Brunswick, Canada
[2]Department of Management, Saint Mary's University, Halifax, Canada

Transformational leadership based interventions were assessed using a pre-test, post-test, and control group design. Leaders ($N = 54$) from 21 long-term health care organizations were randomly assigned to general transformational leadership training, safety-specific transformational leadership training, or a control group. Multivariate analysis of variance (MANOVA) showed that leadership training resulted in significant effects on manager post-training ratings of safety attitudes, intent to promote safety, and self-efficacy. The effects of leadership training on employee ($N = 115$) perceptions of leader safety-specific transformational leadership, safety climate, safety participation, safety compliance, safety-related events and, injuries were also assessed. Multivariate analysis of covariance (MANCOVA), with the pre-test scores as the covariates, showed that leadership training resulted in significant effects on the safety-specific transformational leadership and safety climate outcomes.

Unsafe work practices continue to prevail in many organizations resulting in work related injuries, occupational diseases, and fatalities (International Labour Organization, 2007). Researchers have recently identified safety leadership as a key contributing factor to the prevalence of accidents and injuries in the workplace. Barling, Loughlin, and Kelloway (2002) found that transformational leadership (Bass, 1985) is positively associated with employee perceptions of workplace safety climate when the leadership behaviour focused specifically on safety. Similarly, Kelloway, Mullen, and Francis (2006) examined the effects of a passive form of safety leadership and found that employee perceptions of safety climate were adversely affected when leaders did not actively promote safe work behaviour and practices. Furthermore, perceptions of safety climate mediated the relationship between leadership and safety-related events, which in turn predicted occupational injuries (Barling *et al.*, 2002; Kelloway *et al.*, 2006).

*Correspondence should be addressed to Dr Jane E. Mullen, Department of Commerce, Mount Allison University, Sackville, NB, Canada E4L 4H4 (e-mail: jmullen@mta.ca).

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The growing body of safety literature provides empirical support for the positive impact of transformational leadership on workplace safety attitudes and behaviour (Zohar, 2004) and organizational performance (Geyer & Steyrer, 1998). Although cross-sectional findings suggest the possibility, to date there are no causal data supporting the positive effects of transformational leadership based interventions on safety-related outcomes. Furthermore, recent empirical evidence suggests that safety-specific and general transformational leadership are two, empirically distinct constructs with safety-specific transformational leadership accounting for variance in safety outcomes, beyond the variance accounted for by general transformational leadership (Mullen & Kelloway, 2006). However, the issue of whether safety-specific transformational leadership training leads to improved safety outcomes, beyond those achieved through general transformational leadership training, has not been examined longitudinally. Thus, the purpose of our research is to assess the impact of safety-specific and general transformational leadership training interventions on both leader and employee safety outcomes. In a field experiment, we randomly assigned organizations and their leaders to general transformational leadership training, safety-specific transformational leadership training or a wait-list control group. The effects of training on leaders' self-reported attitudes towards safety, self-efficacy, and intentions to promote safety were assessed. In addition, we assessed the effects of training on employee perceptions of leader safety-specific transformational leadership, safety climate, safety participation, safety compliance, safety-related events, and injuries.

The most frequently used safety training interventions rely on behaviour modification, which include antecedents (e.g. training), behaviour, and consequences (e.g. incentives) (see Connellan, 1979; Luthans & Kreitner, 1985; Zohar, 2002). In light of the recent emphasis on safety initiative approaches for managing safety as opposed to safety compliance approaches (i.e. creating a climate in which employees voluntarily engage in safe work practices because safety is valued rather than compliance) (see Griffin & Neal, 2000; Kelloway *et al.*, 2006), there is a need to examine alternative safety intervention models. An alternative form of safety training draws on transformational leadership because empirical evidence suggests that transformational leadership behaviour can be developed through training (Barling, Weber, & Kelloway, 1996; Frese, Beimel, & Schoenborn, 2003; Kirkpatrick & Locke, 1996). Bass (1990) described two types of transformational leadership interventions. The first intervention is a general coaching model that incorporates personal feedback and goal setting. Feedback concerning the leader's transformational leadership style is obtained from employees and discussed with the leader in an individual coaching session between the leader and a coach. Inconsistencies between the leader's self-ratings and the employees' ratings are identified, and specific goals set to enhance the leader's transformational leadership behaviours.

The second training method described by Bass (1990) involves workshops for enhancing transformational leadership behaviour. The workshops require leaders to brainstorm and generate behaviours displayed by both effective and ineffective leaders. These behaviours are linked to active (e.g. transformational, transactional) and passive (e.g. laissez-faire) theories of leadership. Leaders participate in exercises and discussions aimed at enhancing transformational leadership including role playing and watching videos that characterize transformational behaviour. The workshop emphasizes the development of action plans for incorporating transformational leadership in leaders' everyday work activities.

Using both the feedback/goal setting method and training workshops, Barling *et al.* (1996) conducted a field experiment to assess the effects of transformational leadership

on employees' commitment to the organization and financial performance of the business unit. Their study showed the effectiveness of combining transformational leadership training and personal feedback, such that training branch managers in transformational leadership led to changes in employees' commitment to the organization and financial performance. Although the study resulted in positive organizational outcomes as reported by employees, the researchers did specifically focus on leader outcomes.

To assess the independent contributions of each element of transformational leadership training (workshop and feedback), Kelloway, Barling, and Helleur (2000) examined the effects of leadership workshops and the feedback on employees' perceptions of transformational leadership. Managers were randomly assigned to one of four groups: 2 (workshop vs. no workshop) or 2 (feedback vs. no feedback). The workshop and feedback sessions were effective methods for improving leadership. However, the results suggested that the combination of the workshop and personal feedback sessions did not interact to enhance employee perceptions of transformational leadership. These findings extend previous research (e.g. Barling *et al.*, 1996) suggesting that both methods can be implemented independently and still result in increased employee perceptions of transformational leader behaviour.

Safety-specific versus general transformational leadership

The leadership construct in the current study reflects leadership behaviours that specifically promote and develop a safe work environment. As Barling *et al.* (2002) described, each of the four components of transformational leadership theory (Bass, 1985) are relevant to improving workplace safety. Managers demonstrate individualized consideration for employees, for example, by engaging in behaviours that demonstrate their personal concern for the safety and well-being of employees. In addition, they suggest that idealized influence would encourage managers to communicate a vision of workplace safety and become role models by promoting work safety, rather than focusing on performance and profits at the expense of safe work practices. Managers demonstrate inspirational motivation when they challenge individuals to achieve exceptional levels of safety standards and exceed minimum safety requirements. Intellectual stimulation encourages managers to challenge employees to assess current safety practices and policies and develop innovative and improved practices for solving safety-related issues. In sum, a safety-specific transformational leader engages in behaviour that is characteristic of the components of transformational leadership, yet specifically focused on inspiring and promoting positive safety-related practices.

The issue of whether researchers should use a safety-specific or a general transformational leadership construct has recently been identified in the safety literature (see Kelloway *et al.*, 2006; Mullen & Kelloway, 2006). By definition, concern for an individual's safety and physical welfare at work is characteristic of general transformational leadership. However, there is empirical evidence suggesting that leaders may be transformational in one aspect of the job (achieving high production levels), yet passive in other areas (e.g. achieving safety standards). Both the specific and general styles of leadership lead to positive safety outcomes. However, there is evidence suggesting that the safety-specific leadership construct makes an incremental contribution in the prediction of safety outcomes beyond the general style of transformational leadership (Mullen & Kelloway, 2006). Furthermore, the finding that leaders may be considered transformational in some areas of work, yet passive with respect to other areas of work points to the need for a leadership style that focuses

specifically on inspiring and achieving positive safety attitudes and behaviour in organizations. Transformational leaders are not necessarily safety leaders. Thus, to ensure that safety in the workplace is a priority, we suggest that safety-specific transformational leadership behaviours will result in better safety outcomes than general transformational leadership.

Leader outcomes

Training effectiveness is typically assessed through the use of one or more of the criteria proposed in Kirkpatrick's (1976) training outcome model. The effectiveness criteria include: (1) trainee reactions (e.g. do trainees like the training); (2) knowledge or skill acquisition (e.g. did trainees learn the material); (3) behaviour/attitude change (e.g. did the trainees transfer the learned behaviour and attitudes to their job); and (4) individual/organizational results (e.g. fewer occupational injuries). The current study aims to examine level three criteria (changes in employee and leader safety behaviour and attitudes) and level four criteria (reports of safety-related events and injuries).

Organizations are showing an increased interest in assessing behavioural and attitudinal changes to determine whether training actually results in improved organizational outcomes (Haccoun & Saks, 1998). We assessed whether the transformational leadership training interventions affect leader and employee safety-related outcomes. To better understand the impact on safety-related outcomes, Ajzen's (1985, 1991) theory of planned behaviour was used to assess the likelihood that leaders will use what they learned through training to improve their transformational leadership behaviour. The theory of planned behaviour is used to examine a variety of behavioural intentions in the workplace including ethical behaviour (Flannery & May, 2000), recycling (Boldero, 1995), and social networking activity (Caska, 1998). The theory suggests that the key to predicting an individual's behaviour lies with their behavioural intentions. According to Ajzen's theory, an individual's behavioural intention directly predicts their future behaviour.

An individual's intent to perform a behaviour (e.g. promoting safety) increases, as their attitudes towards the behaviour become more favourable. Attitudes towards the behaviour stem from the individual's beliefs about the outcomes associated with performing the behaviour. Kraiger, Ford, and Salas (1993) also suggest that training effectiveness may be assessed through attitudinal outcomes such as self-efficacy (Colquitt, LePine, & Noe, 2000). Self-efficacy is defined as an individual's 'belief in one's capabilities to organize and execute the courses of action required to produce given attainments' (Bandura, 1997, p. 3). Considerable empirical evidence supports the relationship between self-efficacy, motivation to learn, and learning (e.g. Gist, Stevens, & Bavetta, 1991; Mathieu, Tannenbaum, & Salas, 1992), as well as task effort and persistence in task achievement (Gist & Mitchell, 1992). Moreover, a finding that has consistently resulted from training research is the role of self-efficacy for increasing training effectiveness and in the transfer process (Mathieu, Martineau, & Tannenbaum, 1993; Saks, 1997). Considerable empirical research on training and self-efficacy supports the notion that training increases self-efficacy, and self-efficacy predicts training outcomes (Colquitt *et al.*, 2000; Frayne & Latham, 1987; Gist, 1989; Gist *et al.*, 1991; Mathieu *et al.*, 1993; Saks, 1995). Finally, in their review of transformational leadership training, Kelloway and Barling (2000) suggest that transformational leadership training should result in higher leader self-efficacy beliefs. However, the relationship between transformational leadership and leader self-efficacy has yet to be empirically evaluated.

To summarize, the transfer of learned safety leadership behaviour will be assessed through leader safety attitudes, leader intentions to promote safety, and leader self-efficacy. Furthermore, based on the findings of previous studies suggesting that safety-specific transformational leadership makes an incremental contribution to the prediction of safety outcomes, over and above general transformational leadership the following hypothesis was developed:

> *Hypothesis 1:* Safety-specific transformational leadership training results in higher leader safety attitudes, intentions to promote safety, and perceptions of self-efficacy, than both the general transformational leadership training and the control group.

Employee outcomes

Although the literature on transformational leadership has grown rapidly, few studies have assessed the effectiveness of transformational leadership based training with respect to employee performance outcomes. For example, Barling *et al.* (1996) conducted a field experiment to assess the effects of transformational leadership on employees' commitment to the organization and financial performance of the business unit. Their study showed the effectiveness of combining transformational leadership training and personal feedback, such that training branch managers in transformational leadership led to changes in employees' commitment to the organization and financial performance.

Studies supporting causal statements about the positive effects of transformational leadership are rare; however, there is a growing body of empirical evidence based on cross-sectional data that supports the positive impact transformational leadership has on safety-related outcomes. Safety climate is one of the most frequently studied safety outcome variables and is defined as 'shared perceptions of managerial policies, procedures, and practices' (Zohar, 1980). Barling *et al.* (2002) examined the effects of safety-specific transformational leadership on young worker perceptions of safety climate, safety-related events, and occupational injuries. The results showed that safety-specific transformational leadership positively predicted perceptions of safety climate, which in turn mediated the negative relationship between perceptions of safety-specific transformational leadership and employee self-reports of safety-related events. Recently, Kelloway *et al.* (2006) extended this area of research through the inclusion of a passive leadership variable and found that it had an equal and opposite effect on employee perceptions of safety climate and safety-related events.

Studies have included additional safety outcomes including safety participation and safety compliance (Neal & Griffin, 1997). Safety compliance involves following required safety policies, whereas safety participation involves behaviours that indirectly contribute to developing a safe work environment such as voluntarily participating in safety programs (Cree & Kelloway, 1997), and voluntarily raising safety issues with managers to improve overall safety within the organization (Mullen, 2005). Hofmann, Morgeson, and Gerras (2003) examined factors that predict employee safety citizenship behaviour and safety role definition (e.g. safety is a job responsibility). They found that high-quality social exchanges between leaders and employees predicted perceptions of safety role definition, which in turn predicted safety citizenship behaviour. Furthermore, the relationship between leader–employee social exchange and employee safety role definitions was moderated by safety climate. Employee role definitions incorporated safety only when employees perceived a positive safety climate in their organization. Griffin and Neal (2000) also found that employee perceptions of safety climate positively predict both safety compliance and participation.

Thus, leader training that focuses primarily on improving safety-specific transformational leadership behaviour will enable leaders to focus directly on improving safety in their work units.

Hypothesis 2: Employee perceptions of their leader's safety-specific transformational leadership, perceived safety climate, safety participation, and safety compliance will be significantly higher in the safety-specific condition than ratings in both the general transformational leadership training group and the control group.

Hypothesis 3: Employee ratings of the frequency of safety-related events and injuries will be significantly lower in the safety-specific condition than in both the general transformational leadership training group and the control group.

Method

Participants

Leaders

The pre-test sample consisted of nurses from 21 long-term health care organizations. Approximately 172 participants were identified by participating organizations. Of the 172 participants who received surveys, 84 participants responded (48.8% response rate). Due to listwise deletion of missing data on the pre-test measure, a sample of 60 leaders was obtained.

The sample of 60 participants (50 females; 10 males) were an average age of 48.03, $SD = 9.08$. The average number of years employed was 9.52, $SD = 8.77$ and participants worked an average of 39.28 hours per week ($SD = 3.67$).

We mailed the post-test survey to the 84 participants who participated in the training. Of the 84 participants, 56 completed the post-test measure (66% response rate). However, due to listwise deletion of missing data only 54 responses were retained. The sample of 54 participants (50 females; 4 males) were an average age of 49.73, $SD = 8.72$. The average number of years employed was 10.47, $SD = 7.78$ and participants worked an average of 38.36 hours per week ($SD = 5.56$). We retained all pre-test and post-test manager data to avoid considerable loss of data.

Employees

The pre-test sample of 1,822 health care workers consisted of the direct reports of the managers who participated in the experimental training interventions. Of the 1,822 health care workers who received surveys, 494 participants responded (27.2% response rate). Due to missing data on the pre-test measure, we retained a sample of 491 participants.

The sample of 491 participants (455 females; 36 males) were an average age of 42.47, $SD = 10.76$. The average number of years employed was 9.82, $SD = 8.67$ and participants worked an average of 35.65 hours per week ($SD = 7.39$). Examples of the types of jobs that participants held include health care staff and office support staff.

At the post-test, 269 participants completed the survey (approximately 14% response rate). Some of the respondents completed the post-test survey, but did not complete the pre-test survey. Thus, due to matching participant responses at both the pre-test and post-test and listwise deletion, 115 responses were retained.

The sample of 115 participants (113 females; 2 males) were an average age of 44.07, $SD = 10.63$. The average number of years employed was 11.27, $SD = 8.07$ and participants worked an average of 39.46 hours per week ($SD = 4.56$).

Design and procedure

In collaboration with an Association of Health Organizations, we identified hospitals in an Eastern Canadian region. A letter inviting the health care organizations to participate in the study was sent by the association to each hospital (drafted by the researchers). Participants were provided with minimal information regarding the training workshop prior to the training to ensure that they were not aware of the experimental conditions or hypotheses. The letter explained that a study on occupational safety was being conducted by researchers and their involvement would include attending a leadership training workshop and completing a pre- and post-training survey. If organizations and managers were interested, they were asked to contact the primary researcher directly. Follow-up correspondence included only the date and location of the leadership workshop.

To assess the effects of safety-specific versus general transformational leadership training versus no training interventions on changes in leader and employee safety-related outcomes, we conducted a field experiment. Prior to conducting the training interventions with managers, we administered a pre-test measure to obtain a base-rate measure of all study variables. The pre-test measure (time 1) included items that assessed managers' self-ratings of safety attitudes, intent to promote safety, and their self-efficacy to promote safety. Managers were asked to identify their organization, as well as record a six digit self-generated code for matching surveys at time 2. Managers completed the pre-test measure approximately 1 week before the delivery of the training programs, and completed the measure 3 months (post-test) following the training intervention. There does not appear to be a standard for the time intervals between measurements of safety attitudes and injuries. However, literature with comparable leadership interventions suggests that relatively short intervals (e.g. ranging between 3 and 6 months) are optimal for detecting significant intervention effects (Barling *et al.*, 1996; Kelloway *et al.*, 2000; Zohar, 2002). Due to ethical concerns about the anonymity of responses, we did not ask managers to include their name on the survey. Thus, we were unable to link the managers' responses with the employees' responses.

To assess the effects of each training condition on employee attitudes and behaviour, we asked the managers to identify the health care workers who report directly to them. Each health care worker completed a pre-test (approximately 1 week before training) and post-test survey (approximately 3 months following the training). The survey contained items that assessed the participant's perception of their direct manager's safety-specific transformational leadership, safety climate, safety compliance, safety participation, safety-related events, and injuries. Due to the longitudinal nature of the study, participants recorded a self-generated six-digit code to allow for matching surveys at time 2. Participants identified the name and position of their direct manager to keep track of which training session the manager completed.

Training intervention

We randomly assigned health care organizations and the managers to one of the training interventions (general vs. safety-specific) or control group (no training). We delivered the general and safety-specific training interventions approximately 1 week following the pre-test. Managers in the control group received the safety-specific transformational training after the post-test was completed.

The general transformational leadership training intervention consisted of a half day group-based training workshop for the managers (Barling, 1996; Kelloway *et al.*, 2000).

The purpose of the training was to familiarize managers with the theory of transformational leadership and goal setting. Through lecture format, discussions, and goal setting, managers gained an understanding of how to incorporate transformational leadership behaviours in their daily work. Following Barling *et al.*'s (1996) training format, we implemented the training as follows. First, managers identified the characteristics and behaviour of the best and worst leaders they encountered. These characteristics were categorized by the training facilitator as being transformational, transactional, or passive leadership behaviours. We provided an overview of the theories of leadership through lecture and discussion format, with the emphasis on transformational leadership and performance outcomes.

We worked with the group of managers to help them apply the concept of transformational leadership to their own work context through goal setting (Locke & Latham, 1984). Managers developed a personalized plan for setting specific, challenging, and yet attainable goals with respect to transformational leadership behaviour. Examples of goals for each of the components of transformational leadership were provided. For example, individualized consideration is comprised of leadership behaviours that show concern and caring for others. Behaviours characteristic of a leader demonstrating individualized consideration include providing feedback about performance and responding to concerns as soon as possible. Participants were encouraged to develop personal goals to help them achieve these leadership behaviours.

The safety-specific training intervention also consisted of a half-day group-based training workshop for the managers. The program adapted the general transformational leadership training intervention (Barling *et al.*, 1996; Kelloway *et al.*, 2000) to reflect safety issues in the health care profession. The purpose of the training was to familiarize managers with safety-specific transformational leadership. Using the same format as the general leadership training (lectures, discussions, and goal setting), managers gained an understanding of ways to incorporate safety-specific transformational leadership behaviours in their daily work. Similar to the general training, we assisted the managers with applying the concept of safety-specific transformational leadership to their own work context through goal setting (Locke & Latham, 1984). Managers in the safety-specific condition developed a personalized plan for setting specific, challenging, and yet attainable goals with respect to safety-specific transformational leadership behaviour. The components of transformational leadership were discussed using the same examples as in the general workshop. The only difference is that the goals in the safety-specific workshop focused on behaviours characteristic of safety transformational leadership. For example, when discussing individualized consideration, the goals relate to providing feedback about safety performance and responding to safety concerns as soon as possible. Both the general and safety-specific transformational leadership training interventions were standardized in format, length, and method of delivery. The only difference between the two types of training was the experimental manipulation (general vs. safety-specific content).

Measures

All items for each of the following measures were rated using a seven-point response scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The reliability for the measures at the pre-test and post-test are presented in Table 1 (leader) and Table 2 (employee).

Table 1. Leader pre-test and post-test inter-item correlations and reliabilities

Variable	1	2	3
		Pre-test ($N = 60$)	
1. Self-efficacy	(.77)	.49**	.67**
2. Intent to promote safety		(.79)	.51**
3. Safety attitudes			(.89)
Grand mean	5.71	5.86	6.21
SD	0.65	0.75	0.63
		Post-test ($N = 54$)	
1. Self-efficacy	(.79)	.75**	.90**
2. Intent to promote safety		(.81)	.66**
3. Safety attitudes			(.80)
Grand mean	4.61	4.29	5.03
SD	0.93	0.92	0.79

Note. **$p < .01$. Remaining correlations are *ns*. Reliabilities for each scale are presented on the diagonal in parentheses.

Leader safety attitudes

Leader safety attitudes were assessed using 11 items developed by Kelloway, Francis, Schat, and Iverson (2005). An example of an item includes, 'I think it is more important to work safely than it is to work quickly'.

Leader intentions to promote safety

Leader intentions to promote safety were assessed using a three-item scale. An example includes, 'It is very likely that I will promote safety in my workplace'.

Table 2. Intercorrelations and reliabilities of the variables at pre-test and post-test for the employee sample

Variable	1	2	3	4	5	6
			Pre-training			
1. Safety-specific transformational leadership	(.94)	−.52	.24	.30	−.30	−.27
2. Safety climate		(.72)	.28	.25	−.53	−.44
3. Safety compliance			(.87)	.41	−.22	−.12
4. Safety participation				(.71)	*.05*	*.01*
5. Safety-related events					(.89)	.73
6. Safety injuries						(.79)
$N = 491$						
			Post-training			
1. Safety-specific transformational leadership	(.95)	−.47	.34	.30	−.33	−.32
3. Safety climate		(.71)	.44	.40	−.44	−.37
4. Safety compliance			(.92)	.51	−.30	−.31
5. Safety participation				(.74)	.13	*.02*
6. Safety-related events					(.91)	.76
7. Safety injuries						(.82)
$N = 115$						

Note. Correlations in italic are *ns* at the $p = .05$ level. Remaining correlations are significant at the $p = .01$ level. Cronbach's α for each scale is presented on the diagonal in parentheses.

Leader self-efficacy

Leader self-efficacy was assessed using Chen, Gully, and Eden's (2001) nine-item new general self-efficacy scale. The items for this study were adapted to reflect safety self-efficacy. An example item includes, 'I feel confident that I will be able to achieve the safety goals that I set for myself'.

General transformational leadership

Employee perceptions of general transformational leadership were assessed with seven items from Carless, Wearing, and Mann's (2000) global transformational leadership scale (GTL). An example of the items includes 'My direct manager communicates a clear and positive vision of the future'.

Safety-specific transformational leadership

Employee perceptions of safety-specific transformational leadership were assessed with Barling *et al.*'s (2002) 10-item measure. The 10-item scale was adapted from the MLQ-5 (Bass & Avolio, 1990). An example of an item includes, 'My direct manager talks about his/her values and beliefs of the importance of safety'.

Safety climate

Safety climate (10 items) was assessed with a short form of Zohar's (1980) safety climate scale. An example of an item includes 'My direct manager assigns high priority to safety issues'.

Safety participation

Safety participation was assessed using Neal, Griffin, and Hart's (2000) (four item) safety participation scale. An example of one of the items includes, 'I voluntarily perform tasks that help improve workplace safety'.

Safety compliance

Safety compliance was assessed by Neal *et al.*'s (2000) (four item) safety compliance scale. An example item includes, 'I use the correct safety procedures for my job'.

Safety-related events

Safety-related events were assessed using 17 items taken from the Nova Scotia Association Health Organization database of reported causes of injuries among health care workers. Respondents rated the frequency in which they experienced the injury on a seven-point scale ranging from 1 = not at all to 7 = very frequently. An example of a safety-related event includes 'an object fell on me while I performed my job'.

Injuries

Injuries were assessed with 11 items based on a Workers' Compensation Board Database that outlines the nature of the injuries suffered by health care workers. Respondents rated the frequency in which they experienced the injury on a seven-point scale ranging from 1 = not at all to 7 = very frequently. Examples of injuries include needle pricks, bruises, sprains, and cuts.

Results

Leaders' outcomes

Multivariate analysis of variance (MANOVA) showed no significant differences among the three groups on the pre-training dependent variables, $F(2, 57) = 1.48$, $p > .05$. However, a second analysis suggested a significant difference among the groups on the post-training ratings, $F(2, 54) = 2.69$, $p < .05$. We assessed the effects of training group on the post-training dependent variables using a series of univariate analyses of variance. Significant univariate effects were obtained for safety attitudes, $F(2, 50) = 5.58$, $p = .01$, partial $\eta^2 = .174$; intent to promote safety, $F(2, 50) = 6.60$, $p = .016$, partial $\eta^2 = .152$; and self-efficacy, $F(2, 50) = 7.80$, $p = .011$, partial $\eta^2 = .175$.

Manager post-training ratings of safety attitudes in the safety-specific transformational leadership group ($M = 5.41$, $SD = 0.96$) were significantly higher than both the general transformational leadership training group ($M = 4.73$, $SD = 0.54$), and the control group ($M = 4.78$, $SD = 0.14$). Furthermore, manager ratings of intention to promote safety ($M = 4.63$, $SD = 0.99$) in the safety group, were significantly higher than the control group ($M = 3.78$, $SD = 0.69$). Although the manager ratings of intentions in the safety-specific transformational leadership group were higher than manager ratings in the general transformational leadership group ($M = 4.26$, $SD = 0.69$), the difference was not significant at the .05 level. Finally, manager ratings of self-efficacy were significantly higher in the safety-specific transformational leadership group ($M = 5.04$, $SD = 1.17$), than they were in both the general transformational leadership group ($M = 4.31$, $SD = 0.52$), and managers in the control group ($M = 4.24$, $SD = 0.36$). The group means at both pre-test and post-test are summarized in Table 3.

Table 3. Descriptive statistics of the study variables at pre-test and post-test for the intervention and control groups for the leader sample

	Group 1		Group 2		Control	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*
			Pre-test			
1. Self-efficacy	5.69	0.49	5.51	1.10	5.85	0.64
2. Intent to promote safety	6.07	0.55	5.74	0.68	5.65	0.94
3. Safety attitudes	6.31	0.46	5.94	0.91	6.24	0.57
N	27		13		20	
			Post-test			
1. Self-efficacy	5.04	1.17	4.31	0.52	4.24	0.36
2. Intent to promote safety	4.63	0.99	4.26	0.69	3.78	0.69
3. Safety attitudes	5.41	0.96	4.73	0.54	4.78	0.14
N	26		14		14	

Note. Group 1 = safety-specific transformational leadership training group; Group 2 = general transformational leadership training group; Control = no training.

Employee outcomes

We conducted a CFA demonstrating the empirical distinctiveness of the safety-specific and general transformational leadership constructs. The results demonstrate that safety-specific and general transformational leadership are related, yet empirically distinct

constructs. The confirmatory factor analysis was estimated with maximum likelihood estimation using LISREL 8.53 (Joreskog & Sorbom, 2002). The first confirmatory factor analysis assessed a unidimensional model on which all items were expected to load. The unidimensional model was compared to a model with two correlated, yet empirically distinct factors on which the items load. The models are nested, thus the χ^2 difference tests the null hypothesis that the correlation between the two factors is 1.00. A significant χ^2 difference allows for the null hypothesis to be rejected, indicating that the factors are empirically distinct, as the two factor model provides a significantly better fit than the unidimensional model.

The unidimensional model provided a poor fit to the data, $\chi^2(119) = 1,128.42$, $p < .01$; GFI = 0.70; NFI = 0.95; CFI = 0.95; PNFI = 0.83; RMSEA = 0.17. In contrast, the two factor model provided a significantly better fit to the data, $\chi^2(118) = 623.15$, $p < .01$; GFI = 0.85; NFI = 0.97; CFI = 0.94; PNFI = 0.84; RMSEA = 0.10; $\chi^2_{\text{difference}}(1) = 505.27$, $p < .01$. The standardized parameter estimates for the two factor model were all significant ($p < .01$) and the disattenuated correlation between the two factors is $r = .91$, $p < .01$.

MANOVA was also used to test for group differences on all subordinate pre-test variables (safety transformational leadership, safety climate, safety participation, safety compliance, safety-related events, and injuries). The overall multivariate effect for the pre-test data was significant, $F(2, 488) = 2.65, p < .01$. A series of univariate tests were conducted to examine the group differences on the measures. The univariate analyses revealed only one significant effect for group on employee ratings of safety participation, $F(2, 489) = 6.78$, $p < .01$. To further explore the differences in the pre-test measure, a series of Roy-Bargman step-down analyses were conducted. The step-down analysis indicated that there was a significant difference between employee ratings of safety participation, $F(2, 487) = 7.68$, $p < .01$ and for employee ratings of safety climate, $F(2, 488) = 6.65, p < .01$.

To control for pre-test differences, the effect of training condition (general transformational leadership vs. safety-specific transformational leadership vs. control) on the safety outcome variables (safety transformational leadership, safety climate, safety participation, safety compliance, safety-related events, and injuries) was assessed using multivariate analysis of covariance (MANCOVA). The employees' post-test ratings of safety transformational leadership, safety climate, safety participation, safety compliance, safety-related events, and injuries were entered as the dependent variables and training condition was entered as the independent variable. The pre-test measures of safety climate and safety participation were entered as the covariates in the analysis to control for the differences between groups on these variables.

A significant multivariate effect for training was found, $F(14, 208) = 2.18, p < .01$. We assessed the effect of training on the dependent variables using a series of univariate analysis of variances. Significant univariate effects on the post-test measures were obtained for safety-specific transformational leadership, $F(2, 110) = 5.07$, $p < .01$, partial $\eta^2 = .084$; safety climate, $F(2, 110) = 8.51$, $p < .01$, partial $\eta^2 = .134$; safety participation, $F(2, 1, 110) = 3.55$, $p < .01$, partial $\eta^2 = .070$; safety-related events, $F(2, 110) = 6.71$, $p < .01$, partial $\eta^2 = .109$; and safety injuries, $F(2, 110) = 4.84$, $p < .01$, partial $\eta^2 = .081$. No significant effects were obtained for safety compliance $F(2, 110) = 2.51, p > .05$, partial $\eta^2 = .044$.

To account for the correlations among the dependent variables, we conducted Roy-Bargman step-down analysis to explore post-test group differences. The effect of leadership training was only retained for the safety-specific transformational leadership

and safety climate outcomes. There was a significant effect of training on employee perceptions of safety-specific transformational leadership, $F(2, 110) = 5.07$, $p < .01$. Secondly, there was a significant effect of leadership training on safety climate, $F(2, 108) = 3.55$, $p < .05$.

The safety-specific transformational leadership ratings were significantly higher in the safety-specific transformational leadership group ($M = 5.18$, $SD = 1.35$) than in the general transformational leadership group ($M = 4.97$, $SD = 1.25$) and the control group ($M = 4.48$, $SD = 1.60$). Employee ratings of safety climate in the safety-specific transformational leadership group ($M = 5.40$, $SD = 0.76$) were also significantly higher than the control group ($M = 4.89$, $SD = 0.66$). However, employee ratings of safety climate in the safety-specific transformational leadership group were not significantly higher than those of general transformational leadership training group ($M = 5.26$, $SD = 0.70$). The group means at the pre-test and post-test are summarized in Table 4.

Discussion

This study extends previous experimental studies of the effects of transformational leadership training by assessing both leader and employee safety-related outcomes. Furthermore, unlike previous studies (e.g. Zohar, 2002), the current study extends leadership research through the examination of both safety-specific and general transformational leadership. The pre-training and post-training design of this study allowed for an evaluation of leader and employee safety-related outcomes, as described in Kirkpatrick's (1976) training outcome model (levels 3 and 4). Furthermore, assessing employee reports of safety-related events and injuries allow for the potential to evaluate whether training leads to an improved bottom line for organizations (Haccoun & Saks, 1998) resulting from reduced human and financial costs associated with injuries.

The results of the training interventions showed that leaders' safety attitudes were highest among managers who received the safety-specific transformational leadership training, as opposed to managers who participated in the general transformational leadership training or the control condition. The same was found for both self-efficacy and intentions to promote safety, thus supporting Hypothesis 1. Hypothesis 2 was partially supported as employee ratings of leader safety-specific transformational leadership were significantly higher in the safety-specific transformational leadership group, than ratings in both the general transformational leadership training group and the control group. Employee perceptions of safety climate in the safety-specific condition were also significantly higher than the ratings in the control group. Furthermore, Hypothesis 3 was partially supported as employee perceptions of safety-related events and injuries were significantly lower for individuals who were under the direct supervision of managers who participated in the safety-specific transformational leadership training than the other groups. However, once we accounted for the relationships between the dependent variables in the analysis, employee ratings of their manager's safety-specific transformational leadership behaviour and perceptions of safety climate were the only significant effects retained following the training intervention.

We evaluated a particular form of leadership training. However, the possibility that leadership in general or some component of the training (i.e. focus on safety, goal setting) is at work remains to be investigated. We believe that our focus on safety-specific transformational leadership is appropriate because a closely related programme (i.e. general transformational leadership) had no discernible effect on safety outcomes. Empirically our results, which show an effect for safety-specific but no effect

Table 4. Descriptive statistics for the study variables at pre-test and post-test for the intervention and control groups for the employee sample

	Group 1		Group 2		Control	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*
			Pre-test			
1. Safety-specific transformational leadership	4.55	1.50	4.73	1.38	4.37	1.47
2. Safety climate	5.16	0.92	4.97	0.99	5.03	0.88
3. Safety compliance	6.07	0.83	6.13	0.77	6.09	0.70
4. Safety participation	5.34	1.07	5.68	1.07	5.57	0.85
5. Safety-related events	1.91	0.67	2.10	0.93	1.98	0.72
6. Safety injuries	1.79	0.66	1.90	0.73	1.79	0.62
N	182		186		123	
	Subset Pre-test (matched responses)					
1. Safety-specific transformational leadership	4.87	1.48	5.06	1.31	4.79	1.68
2. Safety climate	5.29	0.85	5.51	0.77	5.49	0.68
3. Safety compliance	6.07	0.75	6.29	0.76	6.08	0.81
4. Safety participation	5.42	0.90	5.72	0.83	5.63	0.96
5. Safety-related events	1.90	0.80	1.66	0.51	1.88	0.63
6. Safety injuries	1.76	0.69	1.60	0.46	1.69	0.54
N	48		40		27	
			Post-test			
1. Safety-specific transformational leadership	5.18	1.35	4.97	1.25	4.48	1.60
2. Safety climate	5.40	0.76	5.26	0.70	4.89	0.66
3. Safety compliance	6.28	0.66	6.30	0.59	6.03	0.79
4. Safety participation	5.74	1.12	5.51	0.85	5.34	1.11
5. Safety-related events	1.38	0.48	1.50	0.57	1.80	0.68
6. Safety injuries	1.25	0.41	1.52	0.62	1.52	0.48
N	48		40		27	

Note. Group 1 = safety-specific transformational leadership training group; Group 2 = general transformational leadership training group.

for general transformational leadership training, support the specificity of the required training. It is possible that a subcomponent of our training (i.e. the emphasis on individual goal setting and behaviour) is the operative mechanism. However, we ensured that the goal setting procedure was the same in the general and safety-specific leadership training. If goal setting is the operative mechanism, as opposed to leadership, it should have the same effect on the safety outcomes in both experimental groups. This was not the case, so we conclude that safety leadership is the operative mechanism.

Although the results indicate that leader ratings on the safety outcomes were highest in the safety-specific condition, it is important to address the small decline in ratings on the post-test measures. Manager post-test ratings were slightly lower than pre-test ratings on each of the safety outcome variables. The decrease was also consistent across experimental conditions, including the control condition. Given that the decline occurred across all conditions the trend is not likely a result of the training interventions. A possible explanation for this finding is that managers simply could not sustain high levels of intentions to promote safety, self-efficacy, and safety attitudes for a prolonged period of time. There may be additional confounding organizational variables that explain the decrease in ratings on the post-test measures. For example, we collected

the post-test data during the summer vacation period and perhaps leaders were facing staffing shortages to cover vacations. According to Quinn's (1988) competing values framework, managers may have found it difficult to balance safety needs and performance demands when facing other staffing challenges. However, despite the small decline in ratings it is important to note that significant differences were not found between the experimental conditions at the pre-test, yet there were significant overall and univariate effects for training at the post-test. As discussed earlier, this suggests that the safety-specific transformational leadership training was effective and results in higher leader safety attitudes, self-efficacy, and intent to promote safety, than both the general condition and control.

Implications for future research

There are several issues that warrant further investigation. Future research on the effectiveness of safety-specific transformational leadership training needs to broaden the types of safety outcomes that are assessed. It is important to identify and empirically evaluate other potential outcomes associated with safety-specific transformational leadership training. For example, Kraiger *et al.* (1993) suggest that training effectiveness may be assessed through post-training motivation, which Noe and Schmitt (1986) define as 'the trainee's desire to use the knowledge and skills mastered in the training programme on the job' (p. 502). Managers would be more likely to use the knowledge and skills that they attained through safety-specific transformational leadership training when they have the desire and motivation to do so. Noe and Schmitt (1986) suggest that this desire or increased motivation results when individuals perceive that the learned behaviour will help them solve work-related issues (e.g. safety-related challenges). Thus, future research that examines the effectiveness of safety-specific transformational leadership training will benefit from the inclusion of post-training motivation of leaders to transfer safety leadership behaviour to the work environment as an outcome measure.

Future research should incorporate safety outcome measures at the organizational level to assess the effectiveness of the transformational leadership based training interventions. Geyer and Steyrer (1998), for example, found that general transformational leadership training leads to improved objective outcomes for the organization. Thus, future researchers may also consider examining alternative financial outcomes such as reduced workers' compensation costs, or the costs associated with time away from work as a result of a work-related injury, and organizational reports of injuries and lost time perhaps to corroborate employee perceptions.

Future research should also examine the effects of combining training interventions and ongoing personal feedback over extended time periods (e.g. 1 year) to determine the unique contribution of each. Researchers examined whether ongoing individual feedback and goal setting sessions enhanced the results of the training intervention. The results of Barling *et al.*'s (1996) study suggest that training and individual feedback sessions enhance transformational leadership. However, Kelloway *et al.* (2000) found that both training and feedback sessions led to changes in leadership behaviour. Nevertheless, they did not have interactive effects (combining the two does not result in enhanced leadership behaviour). We note that managers may not be able to sustain the leadership behaviour over prolonged periods of time due to competing organizational demands, and as Barling *et al.*'s study suggests, ongoing feedback sessions may be helpful to maintain transformational leadership behaviour.

Implications for practice

There are several important practical implications resulting from the current study. In recognition of the global magnitude of occupational injuries, deaths, and illnesses there is a need to develop policies and practices that continuously promote preventative health and safety culture (International Labour Organization, 2007). Interventions and research aimed at improving safety promotion and leadership represent a fundamental shift in the approach to workplace safety within organizations. Occupational health and safety management systems worldwide increasingly support top management accountability for safety in the workplace. For example, the International Labour Organization (2001), Canadian Standards Association (2001), British Standards Institute (2007), and the Australian/New Zealand Council of Standards (2001) management models all support senior management responsibility for safety. The Canadian Criminal Code affecting the criminal liability of organizations (Department of Justice, Canada, 2004) was amended with the introduction of Bill C-45, which states that individuals, including supervisors or anyone who directs how work is done, are responsible for the safety of employees. Thus, in addition to providing employee safety training, organizations must recognize the importance and value of educating organizational leaders in safety leadership. Safety-specific transformational leadership behaviours are critical given the recent focus on safety leadership and senior management accountability. The results of this study suggest that training a small portion of organizational members (e.g. managers) has a significant impact on a large number of individuals within the organization. The safety-specific approach to training leaders is a very cost effective and efficient way to move forward in safety management within organizations.

Potential limitations

Non-response bias poses a potential threat to the validity of the results since the perceptions of the individuals who participated in the study may not be representative of the perceptions held by non-respondents. However, the potential threat of non-response bias is minimal as recent data suggest that a low response rate does not jeopardize sample representativeness (Schalm & Kelloway, 2001). Furthermore, attrition over the duration of the study is a concern and is likely a self-selection process for reasons that are difficult to determine. We do not have information directly from non-respondents at the post-test explaining why they discontinued participation in the study. However, the surveys were administered during summer vacation period in the long-term health care organizations and many of the individuals who participated in the first phase of the study may have been on vacation leave.

Another potential limitation is the reliance on self-report injury data, which poses an internal validity threat. Some researchers suggest that self-reports of occupational accidents and illnesses are under-reported (Glenn, 2003; Pransky, Snyder, Dembe, & Himmelstein, 1999; Schenzer, Rugulies, & Krause, 2005; Zaroff, Levenstein, & Wegman, 2002). Others suggest that self-report data may be more appropriate for safety research as organizational safety records may also be inaccurate (Eisenberg & McDonald, 1988). In their examination of safety records of a sample of 200 manufacturing companies, Eisenberg and McDonald (1988) found that 15% of injuries were over-recorded, meaning that injuries that are not required to be recorded under the occupational health and safety guidelines were included in the safety records. Furthermore, 20% of the injuries were under-recorded - injuries that should have been recorded were not. Lusk, Ronis,

and Baer (1995) conducted a study to compare observations, supervisor reports, and self-report data of safety behaviour among blue-collar workers and found that supervisor reporting of safety behaviour varied significantly from both the observed and self-report injury data. However, self-report data and observations were highly and positively correlated. Thus, when assessing behavioural safety outcomes self-reports of safety-related events and injuries appear to be more accurate than the use of alternative organizational safety records or manager safety ratings.

The small sample of participants in the study is also a potential limitation and may contribute to a conservative bias. The sample size in each group may not have been sufficient to detect the effect of the intervention on several of the safety-related outcomes, thus leading us to erroneously conclude that the intervention was not effective with respect to several of the safety-related outcomes.

Conclusion

This study makes an important contribution to the occupational safety and leadership literature. We build on transformational leadership theory by assessing an intervention aimed at enhancing safety-specific transformational leadership using a design from which causal inferences are possible. Such assessments are rare in the general leadership literature (for exceptions see Barling *et al.*, 1996; Kelloway *et al.*, 2000) and, thus far, non-existent in the realm of safety leadership. Thus, this research constitutes the first known assessment of a transformational leadership based intervention on safety outcomes.

Evidence suggests that safety training is one of the most effective strategies for improving workplace safety (Colligan & Cohen, 2003). Safety-specific transformational leadership training appears to be a very low cost intervention that has positive effects on a variety of safety outcomes. Although the reported effect sizes were small, the potential implications of the findings must not be underestimated. The human suffering and financial costs that are associated with an accident or injury can be extremely high. Thus, even a small effect can translate into significantly lower costs for the individual and organization if an injury is prevented because of the safety-specific leadership intervention.

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