Predictors of coach drivers' safety behaviour and health status

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Abstract

This study examined whether coach drivers' perceptions of organisational safety climate mediated the relationship between their supervisor's leadership style and a number of outcome measures including self-reported safety behaviour, number of accidents and near misses, occupationally-induced fatigue, job-related affective well-being, and symptoms of physical strain. Forty-nine coach drivers from three companies in Australia completed a cross-sectional survey. Standard multiple regression analyses were conducted and these revealed that safety climate directly predicted all of the outcome measures apart from the number of accidents and near misses drivers reported. Transformational leadership was also a predictor of organisational safety climate, confirming that organisational safety climate is a mediator of the link between leadership style and the outcome measures. Managers who emphasise the importance of safety to their drivers and who demonstrate a transformational leadership style that shows concern for the welfare of the drivers will encourage greater safety behaviour from drivers and better health outcomes for drivers.

Introduction

Safety is an important issue for coach drivers. In the last twenty-five years, there has been considerable turbulence in Australia's long distance coach industry. According to Raggatt (1991), increasing public demand for cheap travel and the deregulation of the industry during the early 1980s, led to the entry of new bus companies and a marked escalation of competition; so much so, that by 1988/1989 two of the largest and longest established national operators were experiencing major financial difficulties. Public confidence in long-distance coach was further eroded at the end of 1989, when the country witnessed in quick succession, its' two worst coach accidents on record. In all, fifty-six people died. Vigorous public debate over the issue of road safety and the responsibilities of the heavy transport industry followed.

The psychological health and well-being of coach drivers has been an area which has received considerable attention (e.g., Brent, 1998; Krause, Ragland and Fisher 1998; Machin and Hoare, no date; Meijman and Kompier, 1998). Research has indicated that coach drivers are prone to experiencing heightened levels of stress and fatigue which can be expressed as an emotional response, a physiological response, or a behavioural response

(Matthews, 2002). External factors which have been reported to influence coach driver well-being have included adhering to tight time schedules during peak hours, lack of sleep due to the type of shift, irregular meal times, and difficult passengers (Brent, 1998); bad weather, traffic jams, and other road users (Matthews, 2001); traffic congestion, noise, and climate conditions (Evans, Johansson and Rystedt, 1999).

A number of researchers have begun to take an integrative approach to improving workplace health and safety (Chu and Dwyer, 2002; Dugdill, 2000; Ettner and Grazywack, 2001), leading to the development of integrated models which investigate various organisational and individual factors influencing employees' safety behaviour and safety outcomes (Cheyne, Oliver, Tomás and Cox , 2002; Tomás, Melia and Oliver, 1999).

Safety behaviours in the workplace are strongly (and negatively) linked to the level of workplace injuries (Oliver, Cheyne, Tomás and Cox, 2002). Oliver et al. examined a model of antecedents of occupational accidents that included both general health and safety behaviour as direct predictors of accidents. Data were collected from 525 participants from a wide range of industrial sectors in Spain. Using structural equation modelling, these researchers tested various nested models to see whether organisational involvement (e.g., indicators of safety management, safety policy), work environment (e.g., working conditions, hazards), general health (e.g., anxiety, depression), and safety behaviours (e.g., use of equipment, taking shortcuts) influenced the level of occupational accidents directly and indirectly. Results indicated a direct negative relationship between the physical work environment and general health, and a direct positive relationship between organisational involvement and both general health and safety behaviour. All four constructs (physical work environment, organisational involvement, general health, and safety behaviour) also directly predicted frequency of accidents.

Employees' perceptions of the organisation's safety climate have been the focus of a number of studies which have shown that favourable perceptions of safety climate are associated with fewer work-related injuries and greater safety-related behaviours (Cheyne, et al., 2002; Hofmann and Stetzer, 1996; Tomás, et al., 1999; Zohar, 1980, 2000). Perceptions of safety climate reflect the current priority given to safety in the organisational (Zohar, 2003). Neal and Griffin (2002) described a series of studies that examined the linkages between safety climate and safety behaviour, as well as the role of general organisational climate, leadership factors, and individual factors that contribute to safety outcomes.

Zohar (1980) was one of the first researchers to study the concept of safety climate. Results of Zohar's exploratory analysis identified seven dimensions of safety climate. These were the perceived importance of safety training programs, management attitudes towards safety, effects of safe conduct on promotion, level of risk at the workplace, status of safety officer, effects of safe conduct on social status, and the status of the safety committee. Flin, Mearns, O'Connor and Bryden (2000) examined all previously published research that had been conducted to identify the common factors comprising safety climate. Flin et al. identified three

common factors which emerged from their overall summary. These were safety systems, risk, and management/supervision factors. Griffin and Neal (2000) identified five first-order safety climate factors: perceptions of management values, safety communication, safety practices, safety training, and safety equipment. However, these factors all loaded on a second-order factor indicating that perceptions of safety climate can be differentiated according to the specificity of the items. Griffin and Neal concluded that it is premature to propose a definitive structure for the first-order dimensions of safety climate.

Zohar (2002) investigated the relationship between specific leadership styles and safety climate. In particular, leadership style was assessed as to the degree of concern the leader had for an employee's (physical) welfare. Zohar proposed a leadership-climate-injury model whereby a supervisor's leadership style would influence safety climate due to the concern that the leader would have for the employee's (physical) welfare. Furthermore, safety climate was proposed to influence the safety behaviour of the employee due to the climate perceptions he/she would have as to the importance of acting safely (Zohar). Four hundred and eleven production workers in a metal processing plant responded to a questionnaire involving categories of group-level safety climate, leadership, assigned safety priority, risk level and injuries. Leadership was assessed using the Multifactor Leadership Questionnaire (MLQ-5X-Revised: Bass and Avolio, 1997) which identifies three main types of leadership, transformational leadership, transactional leadership, and laissez-faire leadership, a discussion of which follows.

These three styles of leadership can be easily ordered in terms of the level of concern a supervisor has for an employee's (physical) welfare, with transformational indicating the highest level of concern (Zohar, 2002). Results from this study indicated significant positive relationships between transformational and contingent-reward (one aspect of transactional leadership) leadership and climate scales and negative relationships between transactional leadership (less contingent-reward) and laissez-faire leadership and climate scales. Zohar found that transformational and contingent-reward leadership, and not transactional (less contingent-reward) or laissez-faire leadership predicted employee injury rate. Partial support was given for the hypothesis that transformational and contingent-reward leadership predicted injury rate, and that these effects were mediated by safety climate. This result was not found for transactional (less contingent-reward) or laissez-faire leadership, as they initially did not directly predict injury rate. Zohar cautioned that due to a small sample size and restricted between-group variance, his research may be subject to the decreased likelihood of finding significance. Zohar encouraged further research into the area surrounding managerial practice and safety behaviour.

Barling, Loughlin and Kelloway (2002) replicated Zohar's (2002) results 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. Barling et al. researched 174 participants in the food and beverage

industry by using ten items from the Multifactor Leadership Questionnaire (Bass and Avolio, 1997) to assess safety-specific transformational behaviours, and ten items from Zohar's (1980) scale to assess perceived safety climate. As no appropriate scales were identified to measure safety-related events or occupational injuries, the authors developed their own five-point likert scale for measurement. As indicated above, results supported a fully mediated model, whereby the effect of leadership on safety outcomes was fully mediated by safety climate (and safety consciousness). In particular, injuries were predicted by safety events, and events were predicted by safety climate. Safety climate was, in turn, predicted by safety-specific transformational leadership. Like Zohar (2002), Barling et al. highlighted the importance for replication of their findings, as very little research has been conducted in this area.

For the present study, a model of the relationships between different organisational factors and individual outcomes was proposed to explain some of the risks and hazards associated with coach driver safety. Based on previous research, it was proposed that the supervisor's leadership style would predict coach drivers' perceptions of their organisation's safety climate. Both leadership style and safety climate would predict health and safety outcomes for coach drivers. A graphical representation of the proposed model is outlined in Figure 1.

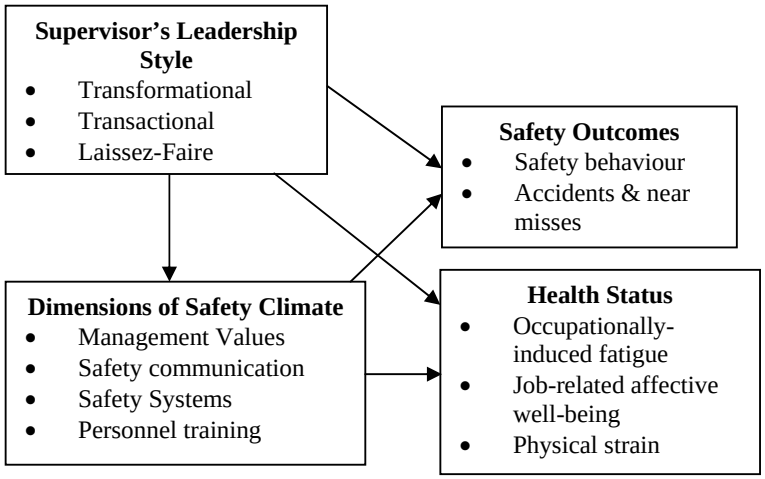


Figure 1: Proposed model of relationships between drivers' perceptions of supervisor's leadership style, dimensions of safety climate, safety outcomes, and health status.

Method

Participants

Three hundred surveys were distributed to coach drivers with only forty-nine of the surveys returned (forty-five were males, one female, and three not indicating), representing a response rate of only 16.33%. The majority of drivers (approx. 78%) were aged between forty and sixty. The majority of drivers (approx 53%) had been in their current position for five years or more, with many of those drivers having worked in their current position for nine years or more. Approximately 80% of the drivers worked between forty and sixty hours a week, with a further 10% of drivers reporting that they work over sixty hours a week. Of particular interest to this study, the vast majority (approx. 73%) of drivers reported no collisions or near misses. Five reported having had one collision or near miss, three reported having had two collisions or near misses, while five reported having had three or more collisions or near misses.

Materials

A cross-sectional survey was used for this study and included demographic questions and the measures outlined in the following sections.

Multifactor Leadership Questionnaire (MLQ-5X-Revised: Bass and Avolio, 1997). This section of the questionnaire asked about employees' perceptions of their supervisor's leadership style, based on the employee's judgement of how frequently their supervisor engages in certain activities. It is a 45-item questionnaire that asks employees to rate on a five point scale how frequently each statement applies to their supervisor, such as "Fails to intervene when problems become serious", or "Provides me with assistance in exchange for my efforts". Ratings range from "Not at all", to "Frequently, if not always". Results from this section define the perceived leadership style of the supervisor as being transformational, transactional, or laissez-faire. Coefficient alpha reliability for the three main scales ranged from .71 for transactional leadership to .97 for transformational leadership.

Organisational Safety Climate (Griffin and Neal, 2000). Sixteen items were included that assessed the safety climate of the organization. The dimensions of safety climate that are measured include: Management Values, Safety Communication, Personnel Training, and Safety Systems. Four questions assessed perceptions of Management Values (e.g., Management is concerned for the safety of employees), five questions assessed perceptions of Safety Communication (e.g., There is frequent communication about safety issues in this workplace), four questions assessed perceptions of Safety Training (e.g., Safety issues are given a high priority in training programs), and three questions assessed perceptions of Safety Systems (e.g., Safety procedures and practices are sufficient to prevent incidents occurring). The five-point response scale ranged from Strongly Disagree to Strongly Agree.

The respective Cronbach alpha reliability coefficients were .90, .87, .91, and .82.

Safety Behaviour at Work (Griffin and Neal, 2000). This subscale comprises eight questions concerning how employees usually behave when at work. It asks respondents to indicate how often they usually engage in certain activities when driving (e.g., I ensure the highest levels of safety when I carry out my job, or I put in extra effort to improve the safety of the workplace). Employees respond to each item by answering how often they engage in the behaviours on a 5-point scale from "Never" to "Extremely Often". The Cronbach alpha reliability coefficient for this scale was .80.

Need for Recovery Scale (NR; Van Veldhoven & Meijman, 1994). The Need for Recovery Scale is an 11-item questionnaire that assesses an employee's occupationally-induced fatigue level. Essentially, it is an indication of an employee's need for some form of recovery after working. The items are all statements that require a "yes" or "no" response, and include statements such as "My job causes me to feel rather exhausted at the end of a working day", or "I find it hard to show interest in other people when I have just arrived home from work". The Cronbach alpha reliability coefficient for this scale was .88.

Job-Related Affective Well-Being Scale (JAWS: Van Katwyk, Fox, Spector and Kelloway, 2000). This section provided a measure of how often employees felt certain emotional reactions as a result of some particular aspect of their job. These emotions may have been a reaction to co-workers, a supervisor, passengers, or even the work itself. The scale was designed to assess individuals' emotional reactions to their job along the dimensions of pleasurableness (i.e., pleasure – displeasure) and arousal (high and low). The 30 items ask employees to respond on a 5-point scale how often they have felt a particular emotion in the past 30 days, with items such as "My job made me feel energetic", or "My job made me feel intimidated". The Cronbach alpha reliability coefficient for this scale was .96.

Physical Symptoms Inventory (Spector and Jex, 1998). This subscale asked the employee if they had experienced a range of physical health symptoms in the past month, and whether they sought medical treatment from a doctor. The inventory used 18 symptoms involving discomfort, such as chest pain, headache, fever, trouble sleeping. It did not incorporate symptoms that cannot be directly experienced by the individual, e.g. high blood pressure.

The Number of accidents and near misses was assessed by one of the demographic questions which asked drivers to indicate the number of collisions or near collisions during the past six months (results are reported above).

Procedure

A total of eleven Australian coach companies were contacted regarding the research. Only three of the eleven companies were willing to participate in the survey and were subsequently sent survey packages to be distributed among their coach drivers. Each survey packet contained a cover letter

explaining the aims of the study, a consent form explaining about confidentiality and anonymity of responses, the survey, and a reply-paid envelope.

Approximately two weeks after the survey distribution, a follow-up phone call was made to each organization in an attempt to increase the response rate. The final response rate was a low 16%. This response is only half that of the expected response rate of 30% for mailed surveys (Tabachnick and Fidell, 2001).

The drivers were advised through their information packages that participation was voluntary and that they could withdraw from the study at any time. They were also assured that their responses would remain confidential and anonymous and that no individual results would be reported. A contact number for the researcher was provided on the consent form so respondents could make inquiries about the study if they wished. Upon receipt of the surveys, the consent forms were detached to ensure confidentiality and anonymity of responses.

Results

In order to assess which of the organisational factors was able to predict the two safety outcomes, each of these outcomes was regressed on the three measures of supervisors' leadership styles as well as the total of the safety climate scale. The results are presented in Table 1.

Table 1: Regression of safety behaviour at work and number of accidents and near misses on the four predictor variables.

Predictors	Dependent Variable					
	Safety Behaviour at Work			Number of Accidents and Near Misses		
	β	*t*	*sr*	β	*t*	*sr*
1. Transformation -al Leadership	.29	1.39	.20	-.03	-.12	-.02
2. Transactional Leadership	.00	.00	.00	-.04	-.19	-.03
3. Laissez-Faire Leadership	.15	.68	.10	.02	.07	.01
4. Organisational Safety Climate	.18	1.07	.15	-.19	-1.11	-.16
After all variables were entered:	R^2 = .13, Adj. R^2 = .05, $F(4,44)$ = 1.70, *NS*			R^2 = .05, Adj. R^2 = .00, $F(4,44)$ = .57, *NS*		

Note. **p* < .05. ***p* < .01. ****p* < .001. *sr* = semi-partial correlation.

The results of these regression analyses show that none of the four predictors was able to significantly predict either of the two safety outcomes when all predictor variables were entered simultaneously. An examination of the correlations between the predictors and the outcomes confirmed that

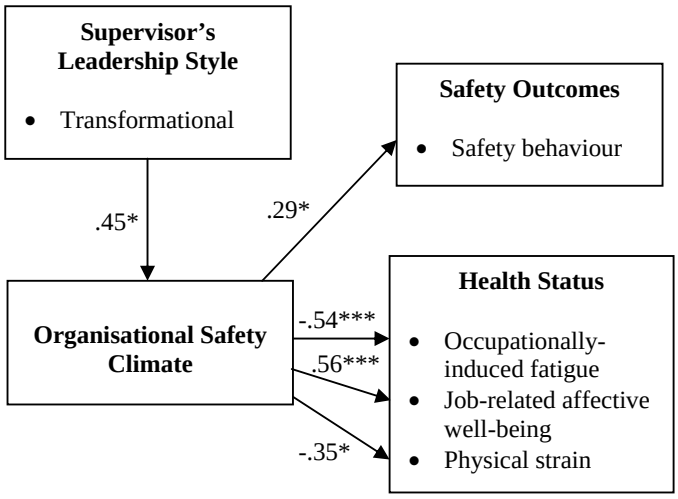
Number of Accidents and Near Misses was not correlated with any of the predictor variables, although it was correlated significantly with Safety Behaviour at Work (r = -.43, p < .01). In other words, where drivers reported that they behaved more safely, they also reported fewer accidents and near misses. Safety Behaviour at Work was also significantly correlated with Transformational Leadership (r = .31, p < .05) and with Organisational Safety Climate (r = .29, p < .05). Therefore, the lack of significant results in the regression analyses for these two predictors can be explained by the fact that both were entered at the same step and therefore the test of significance was quite stringent (that is, what did each variable contribute after all of the other variables were entered?). If Organisational Safety Climate is entered at step 1, followed by the three leadership variables at step 2, then Organisational Safety Climate is a significant predictor of Safety Behaviour at Work (β = .29, t = 2.06, p < .05). If Organisational Safety Climate is then regressed on the three leadership variables, we find that Transformational Leadership is a significant predictor of Organisational Safety Climate (β = .45, t = 2.59, p < .05). Therefore, part of the model in Figure 1 is supported with Transformational Leadership predicting Organisational Safety Climate and Organisational Safety Climate predicting Safety Behaviour at Work (which is also correlated with Number of Accidents and Near Misses). However, the unique variance (i.e., sr^2) that Organisational Safety Climate accounts for in each of the two safety outcomes is quite low (2-3%).

In order to assess which of the organisational factors was able to predict the three measures of health status, each of these outcomes was regressed on the three measures of supervisors' leadership styles as well as the total of the safety climate scale. The results are presented in Table 2.

The results of these regression analyses show that Organisational Safety Climate was able to significantly predict both Need for Recovery (β = -.58, t = -4.02, p < .001) and Job-Related Affective Well-Being (β = .57, t = 3.92, p < .001) when all predictor variables were entered simultaneously. An examination of the correlations between the predictors and the outcomes showed that Number of Physical Symptoms was significantly correlated with Organisational Safety Climate (r = -.35, p < .05). Therefore, the lack of significant results in the regression analyses where this predictor did not significantly predict Number of Physical Symptoms can again be explained by the fact that it was entered at the same step with the three leadership variables and therefore the test of significance was quite stringent (that is, what did each variable contribute after all of the other variables were entered?). If Organisational Safety Climate is entered at step 1, followed by the three leadership variables at step 2, then Organisational Safety Climate is also a significant predictor of Number of Physical Symptoms (β = -.35, t = 2.55, p < .05). Entering Organisational Safety Climate by itself at step 1 when predicting Need for Recovery results in a similar regression coefficient as before (β = -.54, t = -4.43, p < .001), while entering Organisational Safety Climate by itself at step 1 when predicting Job-Related Affective Well-Being also results in a similar regression coefficient to the one previously obtained (β = .56, t = 4.62, p < .001). Therefore, the part of the model in Figure 1 in which Organisational Safety Climate predicts the three measures of health

status was supported (and, in addition, these three measures were also significantly correlated with one another). The unique variance (i.e., sr^2) that Organisational Safety Climate accounts for in each of the three health outcomes is much higher (24% and 23% for Need for Recovery and Job-Related Affective Well-Being, falling to 7% for Number of Physical Symptoms).

The revised model which is depicted in Figure 2 shows which relationships were supported by the data and the strength of the relationship.



* $p < .05$, *** $p < .001$

Figure 2: Revised model of relationships between supervisor's transformational leadership style, organisational safety climate, safety behaviour, and indices of health status.

Table 2: Regression of need for recovery, job-related affective well-being and number of physical symptoms on the four predictor variables.

Predictors	Dependent Variable								
	Need for Recovery			Job-Related Affective Well-Being			Number of Physical Symptoms		
	β	*t*	*sr*	β	*t*	*sr*	β	*t*	*sr*
1. Transformational Leadership	.14	.80	.10	-.01	-.07	-.01	-.05	-.25	-.03
2. Transactional Leadership	.12	.70	.08	-.16	-.95	-.12	.01	.06	.01
3. Laissez-Faire Leadership	.16	.81	.10	-.04	-.18	-.02	.05	.22	.03
4. Organisational Safety Climate	-.58	-4.02***	-.49	.57	3.92***	.48	-.31	-1.82	-.26
After all variables were entered:	R^2 = .35, Adj. R^2 = .29, F(4,44) = 5.98, p < .001			R^2 = .35, Adj. R^2 = .29, F(4,44) = 5.79, p < .001			R^2 = .13, Adj. R^2 = .05, F(4,44) = 1.62, *NS*		

Note. *p < .05. **p < .01. ***p < .001. *sr* = semi-partial correlation.

Discussion

The first regression analysis examined the relationships between the four predictor variables and the safety-related outcomes, that is, safety behaviour and number of accidents and near misses. Organisational safety climate predicted safety behaviour at work (which was also correlated with number of accidents and near misses). In addition, transformational leadership predicted overall organisational safety climate. The second regression analysis focused on the relationships between the four predictor variables and the indices of driver health. Organisational safety climate also predicted all three health outcomes. In particular, organisational safety climate uniquely accounted for much more of the variance in the three health outcomes (24% and 23% for Need for Recovery and Job-Related Affective Well-Being, falling to 7% for Number of Physical Symptoms) than what it accounted for in the safety outcomes (2-3%). This result suggests that additional variables need to be included in the model. For example, Neal and Griffin (2002), proposed that safety knowledge and motivation would be mediators of the link between safety climate and safety behaviour. Dalziel and Job (1997) in a study of taxi drivers found that aggression and risk-taking intentions were two specific individual factors influential in predicting drivers' accident involvement. Machin and De Souza (2004) found that aversion to risk-taking was a negative predictor of unsafe behaviours such as cutting across traffic to get to someone who was hailing a taxi, even when there is a slight risk of an accident, ignoring safety regulations to get the job done, and running a red light.

The current study has emphasised the role of organisational factors (such as supervisory leadership style and organisational safety climate) in understanding the determinants of occupationally-induced fatigue, perceived health status and safety behaviour of coach drivers. While individual coping strategies that drivers adopt will influence their responses to occupational risk factors, it is also necessary to emphasise the important role that the company management plays in creating and maintaining a satisfactory safety climate in the company. The development and implementation of a fatigue management strategy for coach drivers is one practical method for a company to demonstrate a proactive and strong commitment to safety. Such a strategy should be clearly communicated to drivers and carefully integrated with existing recruitment and selection practices, workplace health and safety strategies, and training policies. Therefore, it is recommended that all drivers who are at risk of experiencing occupationally-induced fatigue should be provided with access to individually-focused training programs directed at assisting them to develop more effective fatigue-management strategies (see Machin, 2003 for an example).

The difficulty of obtaining sufficient respondents should also be mentioned. Maxwell (2004) has clearly demonstrated that underpowered research runs the risk of failing to detect real relationships and may lead to erroneous conclusions. This is especially the case when multiple hypotheses

are proposed. The solution seems clear: increase the sample size so that adequate power is achieved. However, when studying specific populations of workers such as coach drivers, it may be practically impossible to recruit sufficient numbers of participants, especially if the companies are not willing to express strong support for the study or safety issues have a lower priority. The researcher has also contacted the Transport Workers Union in order to obtain their support for collecting additional data and is currently negotiating with them. However, when safety research is conducted outside of large organisational settings, the problems of insufficient power will remain a major obstacle.

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