Occupational driver safety: Conceptualising a leadership-based intervention to improve safe driving performance

Sharon Newnam, PhD (corresponding author)
Research Fellow
Centre of Accident Research and Road Safety
Queensland University of Technology
and
Research Fellow
Institute for Safety, Compensation and Recovery Research (ISCRR),
Building 70, Monash University, VIC 3800,
Tel: +61 (0) 3 99054370 | Fax: +61 (0) 3 99054363
Email: sharon.newnam@monash.edu

Ioni Lewis, PhD
Postdoctoral Research Fellow
Centre of Accident Research and Road Safety
Queensland University of Technology
Kelvin Grove, Queensland, Australia 4059
Tel: 61-7-3138 4966
Fax: 61-7-3138 0112
Email: i.lewis@qut.edu.au

Barry Watson, PhD
Professor and Director
Centre of Accident Research and Road Safety
Queensland University of Technology
Kelvin Grove, Queensland, Australia 4059
Tel: 61-7-3138 4955
Fax: 61-7-3138 0112
Email: b.watson@qut.edu.au

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Abstract

Occupational driving crashes are the most common cause of death and injury in the workplace. The physical and psychological outcomes following injury are also very costly to organizations. Thus, safe driving poses a managerial challenge. Some research has attempted to address this issue through modifying discrete and often simple target behaviors (e.g., driver training programs). However, current intervention approaches in the occupational driving field generally do not consider the role of organizational factors in workplace safety. This study adopts the A-B-C framework to identify the contingencies associated with an effective exchange of safety information within the occupational driving context. Utilizing a sample of occupational drivers and their supervisors, this multi-level study examines the contingencies associated with the exchange of safety information within the supervisor-driver relationship. Safety values are identified as an antecedent of the safety information exchange, and the quality of the leader-member exchange relationship and safe driving performance is identified as the behavioral consequences. We also examine the function of role overload as a factor influencing the relationship between safety values and the safety information exchange. Hierarchical Linear Modelling found that role overload moderated the relationship between supervisors' perceptions of the value given to safety and the safety information exchange. A significant relationship was also found between the safety information exchange and the subsequent quality of the leader-member exchange relationship. Finally, the quality of the leader-member exchange relationship was found to be significantly associated with safe driving performance. Theoretical and practical implications of these results are discussed.

Keywords: occupational driving, work-related driving, safety climate, safety values, leader-member exchange

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Considerable research has established the role of safety values/climate (Neal & Griffin, 2006; Newnam, Griffin, & Mason, 2008; Zohar, 2000; 2010), role demands (e.g., Hofmann, Jacobs, & Landy, 1995), supervisory safety practice (e.g., Zohar, 2002; Zohar & Luria, 2003; 2004), and social exchanges (Hofmann & Morgeson, 1999; Hofmann, Morgeson, & Gerras, 2003) in improving safety outcomes. However, with the exception of two papers (Griffin & Neal, 2000; Newnam et al., 2008) there has been minimal attempt to integrate these streams of research within a conceptual framework designed to distinguish the mechanism influencing safety performance. Utilizing the A-B-C framework of behavior modification (i.e., antecedents, behavior, consequences; see Luthans & Kreitner, 1985; Stajkovic & Luthans, 1997), the aim of this study is to examine the contingencies (i.e., antecedents and consequences) that promote effective supervisory safety practices. The performance of interest in the current study is occupational driving.

Supervisory safety practices have been referred to as the frequency of safety-oriented interactions, or task-oriented action patterns, between a supervisor and their subordinate (Zohar, 2002; Zohar & Luria, 2004). The role of modifying supervisory safety practices as a method of improving safety outcomes has been well established in the research literature (Zohar, 2002; Zohar & Luria, 2003; Zohar & Luria, 2004). Effective supervisory safety practices have been found to be associated with an increase in group-level safety climate perceptions (i.e., the priority given to safety over competing task demands) and a reduction in injury rates (Zohar, 2002; Zohar & Luria, 2003). Furthermore, context specific leader attributes have been identified as an indirect determinant of injury rate (Zohar & Luria,

2004). This research establishes strong support for the role of effective supervisory practices in improving safety outcomes.

Past research that has investigated supervisory practices has utilized samples with the capability of high visibility, which has been defined as the extent to which the layout of the department enables a supervisor to observe employees' behavior (see, Luria, Zohar, & Erev, 2008). This characteristic in the sample highlights an important consideration in conceptualizing a leadership intervention. In some high-risk workplace environments, job tasks are conducted independently, and supervisors are not always in close proximity to their employee. For instance, in the case of the occupational driving context, it is difficult for supervisors to collect objective information on employees' behavior and give appropriate feedback (i.e., Newnam & Watson, 2011). This context presents a challenge considering that recognition and feedback are among the most powerful incentives within the workplace (Stajkovic & Luthans, 2003), and inform employee perceptions of relative priorities given to conflicting demands, such as productivity and safety (e.g., Zohar, 2002).

Based on this consideration, supervisor safety practices in some high-risk workplace environments can more accurately be operationalized as the exchange of safety information, as opposed to more context specific leader attributes as identified by Zohar and Luria (2004). The purpose of this study is to examine the contingencies associated with the exchange of safety information. In achieving this task, this study will identify the individual and group-level psychological mechanisms directing change in driving performance and develop targeted interventions to improve safety outcomes in a context which is challenged in its accessibility to the more conventional behavior modification techniques.

Safety framework

Although individual difference variables (e.g., Hofmann, Jacobs, & Landy, 1995; Newnam et al., 2008; Wills et al., 2009) have been found to influence safety in the organizational context, this study will focus only on the role of organizational factors and their relationship with safe driving performance. Past research has identified the value given to safety by workgroup supervisors (e.g. Neal & Griffin, 2006; Newnam et al., 2008), perceived role overload (Kahn, Wolfe, Quinn, & Snoek, 1964), and the quality of the exchange relationship (Leader-Member Exchange [LMX]; Hofmann & Morgeson, 1999; Hofmann et al., 2003), as key factors operating with the occupational safety context. To systematically examine the effect of these group and individual-level factors on safe driving performance, this study explores these factors utilizing the A-B-C framework of behavior modification (Luthans & Kreitner, 1985; Stajkovic & Luthans, 1997).

The main premise of behavioral management utilizing the A-B-C framework is that behavior is a function of contingent consequences. Based on the principles of operant conditioning (Skinner, 1974), the behavioral approach to work motivation examines the relationship between environmental cues (e.g., reinforcers) and a desired behavior (Stajkovic & Luthans, 2003). That is, behaviors that positively affect performance must be contingently reinforced (Stajkovic & Luthans, 2001). The framework identifies three contingencies for behavior change: (1) the environment in which the behavior occurs, (2) the behavior, and (3) the behavioral consequence/s. These contingencies are interpreted as the A-B-C framework (Luthans & Kreitner, 1985).

The A-B-C approach to behavior management focuses on the role of reinforcers within the employee learning process. Specifically, the principle of this theory states that a reinforcer that produces a desired consequence within the environment in which the behavior occurs increases the frequency of the desired behavior (Stajkovic & Luthans, 2003). Through introducing antecedents with positive consequences, research has found support for this

approach in modifying employee task performance (Stajkovic & Luthans, 1997). Support has also been found for modifying the value function of safety behavior within the workplace context (e.g., Lingard & Rowlinson, 1997; Ludwig & Geller, 1991; Zohar, 2002).

Based on this research, we adopt the A-B-C framework to explore the contingencies (i.e., antecedent and consequences) associated with an effective supervisory information exchange within the occupational driving setting. This study identifies the exchange of safety information as the behavior capable of being modified within framework. Consistent with the A-B-C framework (Geller, 1996; McAfee & Winn, 1989; Zohar, 2002), we identify an antecedent in combination with a positive consequence to examine their role in modifying the safety information exchange.

This study devises a framework that examines the contingencies that promote an effective supervisory information exchange. This study identifies an antecedent which represents the environment in which the safety information exchange operates and behavioral consequences which reinforce the occurrence of this desired safety behavior. Specifically, this study examines safety values as an antecedent and the quality of the Leader-Member Exchange (LMX) and safe driving performance as the behavioral consequences. We also examine the function of role overload as an organizational factor influencing the diffusion of safety values into an effective safety information exchange.

In summary, this study will systematically explore the contingencies associated with the safety information exchange. To undertake this task, we utilize a multi-method research design (i.e., Griffin, Mathieu, & Jacobs, 2001). We operationalize safety values at the group-level through assessing supervisors' own safety values as an antecedent of the exchange of safety information. Given that past research has suggested that supervisors create climate (e.g., Lewin, Lippitt, & White, 1939; Zohar, 2000, 2010), we believe that assessing supervisors' safety values will provide a valid reflection of processes relevant to the social

context of the workgroup (see Bar-Tal, 1990). At the subordinate level, we examine role overload as a factor moderating the relationship between safety values and the safety information exchange, in addition to investigating the LMX relationship and safe driving performance as the behavioral consequence. Figure one details the main constructs under investigation within this study. We will review the evidence for including each of the constructs in the following literature.

Figure 1 about here

Safety values: antecedent

The antecedent identified in this study represents the context in which the exchange of safety information occurs within the occupational driving setting. This contingency influences the LMX relationship through its effects on the safety information exchange. In the following section, we argue that safety values are important in understanding the context which supports the frequency of the safety information exchange between supervisors and drivers.

Although individual difference variables, such as self-efficacy and attitudes have been found to play an important role in safety in the organizational context (e.g., Hofmann et al.,1995; Newnam et al., 2008), the majority of the literature has focused on contextual factors, including safety values. Safety values have been defined as the importance associated with safety within an organization (Neal & Griffin, 2006; Zohar, 2000; 2010). Research has identified that safety values, conceptualised at both the organizational (Zohar & Luria, 2005) and workgroup-levels (Neal & Griffin, 2006; Zohar, 2000) are antecedents to safety performance (e.g., Hofmann et al., 2003; Neal & Griffin, 2006; Zohar, 2000; 2002). Specifically, research has established that the value given to safety at the workgroup-level is indirectly associated with subordinate outcomes such as, safety behavior (Hofmann et al.,

2003) and a reduction in occupational accidents (Neal & Griffin, 2006; Zohar, 2000; Zohar & Luria, 2004). Research conducted in the occupational driving context has also found support for its indirect effect on safe driving outcomes (Newnam et al., 2008). Thus, research has established a cross-level effect, whereby processes operating at the workgroup-level influence individual safety performance.

Research has also found an effect whereby supervisory safety practices are associated with a stronger safety values and that leadership styles that promote value-based interactions (i.e., transformational leadership) strengthen this effect (Zohar & Luria, 2004). These results imply that supervisory safety actions are consistent with the value given to safety by the workgroup supervisor. That is, a supervisor who values safety is more likely to be committed to prioritizing safety within their work role tasks and this tendency is consistent with their safety actions. If this inference is correct, a relationship should exist between the value given to safety espoused by supervisors and their enacted safety practices. In this study, we examine whether the value given to safety by the workgroup supervisor is associated with the degree to which safety information is subsequently exchanged with drivers. For example, if a supervisor values safety, it is argued that this will have a positive influence on the frequency in the exchange of safety information. As such, we hypothesize;

H1: The value given to safety by workgroup supervisors will be positively associated with the frequency in the exchange of safety information.

Role overload: moderator

In this study, we also examine the relationship between safety values and the safety information exchange under particular workplace conditions. We argue that the degree to which safety is valued and frequency in the safety information exchange is influenced by the

perception of competing task demands within the workgroup. The experience of satisfying these role demands may offer insight into the priority given to frequency in the safety information exchange. Given that role overload has been identified as one of the most common workplace stressors in the general safety (e.g., French, Caplan & Harrison, 1997; Hofmann & Stetzer, 1995) and occupational driving safety literature (Adams-Guppy and Guppy 1995; Downs et al., 1999; Newnam et al., in press; Salminen & Lahdeniemi, 2002), this study examines the subjective experience of overload as a factor moderating the relationship between the value given to safety and frequency in the exchange of safety information.

Role overload has been defined by the degree to which role performance is affected by time, training and resources (Kahn et al., 1964). Research has established the deleterious effects of role overload on organizational performance (e.g., Gilboa, Shirom, Fried, & Cooper, 2008; Hofmann & Stetzer, 1996; Hofmann et al., 1995; Hurst et al., 1991; Lazarus & Folkman, 1984; Wright, 1986). A number of studies have also found that employees' perception of role overload negatively influenced safety behavior (Barling, Loughlin, & Kelloway, 2002; Clarke, 2006; Hofmann & Stetzer, 1996; Hofmann et al., 1995). Role overload, thus, presents an important challenge within high-risk workplace environments where safety is often competing with other performance pressures, such as speed and productivity (Hofmann et al. 1995; Pate-Cornell, 1990; Wright, 1986).

According to Zohar (2002a), the level assigned to safety within the workgroup is dependent on the varying number of tasks impacting on a supervisor's perception of their capability to assign safety within their job role. The conflict between safety needs and other performance pressures, and the ability to reconcile these internal tensions and conflicting demands, thus, becomes a core function of safety leadership. Consistent with Zohar's (2002) perspective on safety leadership, we argued that effective supervisors will prioritize and

integrate safety needs within existing role demands. However, given that past research has found strong support for the detrimental effect that role overload has on safety performance, we argue that the relationship between the value given to safety and safety practices will be stronger under conditions of low role overload, as opposed to conditions of high role overload; thus, role overload will moderate the relationship between safety values and the subsequent exchange of safety information.

In investigating this effect, we assess drivers' perceptions of role overload within their workgroup. We focus on drivers' perceptions, as opposed to supervisors' perceptions, as drivers' experience in which role performance is affected by time, training and resources within the workgroup is likely to affect the frequency in which safety information is exchanged with their supervisor. Furthermore, given that role overload is a subjective variable which may, or may not, reflect an individual's actual resource capacity to satisfy role demands (Sonnentag & Frese, 2003), subordinate perceptions would accurately represent individual effects within the workgroup structure. As such, we hypothesize;

H2: In conditions of low role overload, there will be a stronger relationship between the value given to safety and the safety information exchange, as opposed to conditions of high role overload.

Leader member exchange (LMX): consequence

One behavioral consequence identified within this study is Leader-Member Exchange (LMX). Based on social-exchange theory (Blau, 1964), LMX refers to the different types of relationships that form between a leader and their members (e.g., Dansereau, Graen, & Haga, 1975; Graen & Schiemann, 1978; Graen &Uhl-Bien, 1995). In this study, we argue that the quality of the LMX relationship is contingent upon the relationship between the reinforcers

(antecedents) and the effect of these on the desired behavior. It is proposed that the quality of the relationship between a supervisor and his/her driver/s is contingent upon the frequency in which safety information is exchanged within this relationship and the context (safety values and overload) in which the behavior occurs. Thus, we examine the quality of the LMX relationship as a positive consequence or, feedback mechanism, to the effectiveness of the safety information exchange and the organizational context which supports the exchange process.

While past research has primarily examined the social exchange as an antecedent to organizational safety processes (Hofmann & Morgeson, 1999; Hofmann et al., 2003), this study conceptualises LMX as the outcome of the collaborative nature of the relationship between a supervisor and his/her driver/s. Past research has supported the relationship between frequency of communication and the quality of the LMX relationship. Specifically, Fairhurst (1993) found that communication frequency improved the quality of the LMX relationship. The current study extends this literature and examines the focus of communication (i.e., safety-related communication, safety information exchange) between supervisors and drivers and the association with the subsequent quality of the LMX relationship.

Past research suggests that the quality of the exchange relationship is influenced through a range of individual, workgroup and organizational processes (see, Henderson, Liden, Glibkowski, & Chaudhry, 2009). This study will focus on the role of supervisory safety practices as a workgroup process capable of influencing the LMX relationship. Research within high-risk workplace environments has suggested that supervisory safety practices are indicative of concern for members' wellbeing (Zohar, 2002a). Other research has found that leadership styles that promote value-based interactions and concern for well-being are positively related to the quality of the LMX relationship (Henderson et al., 2009;

Wang et al., 2005). We argue that the exchange of safety information is indicative of leadership styles that promote value-based interactions, and the frequency of this exchange informs perceptions of mutual concern for well-being; mutual concern for well-being operating as a primary characteristic of high quality exchanges (Hofmann & Morgeson, 1999), which in the safety context relates to physical well-being. As such, we predict that frequency in the exchange of safety information within the supervisor-driver relationship provides declarative evidence for drivers to assess the extent to which their supervisor promotes value-based interactions and concern for physical well-being, which in this study is assessed through the quality of the LMX relationship. As such, we hypothesize;

H3: The safety information exchange will be positively related to the quality of the LMX relationship.

Safe driving performance: secondary consequence

A second behavioral consequence identified within this study is safe driving performance. As discussed previously, conventional behavior modification interventions traditionally operate within a system of performance-based monitoring and timely feedback. This practice presents a challenge within the occupational driving context as supervisors cannot monitor or directly observe driver behavior. As such, behavior change methods established on the principles of compliance with safe working practices are unlikely to be effective in this context. In workplace environments like the occupational driving context, we argue that participation-based intervention methods are more likely to promote safe working practices. Participation in safe driving practices is likely to be promoted through reciprocation of those behaviors valued by the supervisor which, in this study, is assessed by the quality of the LMX relationship.

A key premise of LMX theory is that the exchange relationship between a leader and a member influences organizational outcomes (Liden et al., 1993). Research in high-risk environments has found the quality of the LMX relationship to be related to improved safety communication and, in turn, safety commitment and a reduction in organizational accidents (Hofmann & Morgeson, 1999). Hofmann et al. (2003) also found a direct relationship between LMX and safety citizenship role definitions and safety citizenship behavior. An explanation for these results is that reciprocation is based on values such as trust, openness and loyalty (Yukl, 1998) and, particularly relevant to high-risk work environments, concern for well-being (Hoffman & Morgeson, 1999). The proposed relationship between LMX and safe driving performance within this study is explained through a process in which reciprocation of those behaviors valued by a supervisor is based on a relationship informed through mutual concern for well-being and safety. As such, it is hypothesized that;

H4: The quality of the LMX will be significantly associated with the degree to which drivers engage in safe driving behavior.

Methods

Participants

This research was conducted in collaboration with one of the largest community oriented nursing populations in a state of Australia. Following ethical approval obtained through the university, supervisors and drivers within their workgroups were recruited to participate in the research program. In regards to the drivers, inclusion criteria was that they were an occupational driver, which in this study was classified as those who drive at least once per week for occupational purposes, including driving between home and work (Murray et al., 2003; Newnam & Watson, 2011). The driver sample consisted of 105 community-

oriented nurses who drove work vehicles to care for patients in the community. The majority were female (90%), with an average age of 46 years (*SD* = 10.09 Range = 24 to 65 years), while they drove an average of 244 kilometres per week (*SD* = 153.3; Range = 25 to 780km/week).

Supervisors were defined as those responsible for the daily management of occupational drivers, both in regards to on-road and off road (e.g., in home care) job-related tasks. Twenty-two supervisors participated in the study. The majority of the sample were female (95%), with an average age of 45 years (*SD* = 10.77; Range = 21 to 62 years). The average tenure in the agency was 8.5 years (*SD* = 5.72 Range = 1 to 21 years), with an average tenure within their current work role of 2 years (*SD* = 1.84 Range = 3 months to 8 years).

Procedure

This study was conducted as part of a larger safety project designed to increase the exchange of safety information within the supervisor-driver relationship. The intervention was focused on utilizing existing relationships and processes operating within the organizational context to improve safe driving performance. While the majority of past research in the occupational driving context has utilized interventions modifying discrete and often simple target behaviors (e.g., driver training programs), the aim of this intervention was to examine key aspects of the workplace environment; in particular, the role of effective supervisory safety practices. For more information on the development of the intervention and feedback received from a qualitative perspective see Lewis and Newnam (in press).

As part of this project, the safety information exchange between supervisors and drivers were monitored over a three month period. This study required matching supervisor and subordinate data over multiple time points. In doing this, there were three main stages of

data collection: Stage one involved the completion of surveys, which were distributed to supervisors and drivers; Stage two involved three months of monitoring the safety information exchange between supervisors and drivers and; Stage three involved the completion of surveys, which were distributed to drivers only. Figure 2 presents a diagram of the stages of data collection.

Figure 2 about here

At Stage one, surveys were distributed to gain baseline data from drivers and supervisors. Following survey collection, the exchange of safety information between supervisors and drivers were monitored over a three month period (Stage two). In undertaking this approach, members of the research team engaged in two weekly discussions (n = 6) with the majority of, if not all, the drivers within each supervisory workgroup to ascertain the total number of safety exchanges they had engaged in with their supervisor in the previous two weeks. Following the second stage of research, surveys were distributed to drivers to examine the impact of the safety information exchange on the LMX relationship and safe driving performance (Stage 3). The following will describe the recruitment of the participants for this study.

Supervisors were initially approached by members of the research team and based on their completion of a survey, which is described below, the supervisors were subsequently asked to randomly distribute similar surveys to drivers within their workgroups. Participation from drivers was obtained through the completion of these surveys. In addition to providing responses to scale items, the surveys also asked for drivers' names and contact details. Through this process, we were able to match drivers' responses over the course of the research. One-hundred and five drivers were matched to 22 supervisors at Stage one. Drivers' responses at Stage one were subsequently matched to 105 responses reported by drivers at

Stage two. Finally, the average number of the safety information exchange responses from each subordinate was matched to 85 drivers at Stage three. As such, we were able to retain 61% of the sample over the duration of the project.

Measures

Safety Values: At Stage one, supervisors rated their perceptions of their own value given to safety using Zohar and Luria's (2005) sixteen item safety climate scale. The items were reworded to suit the driving context. An example item is "I am strict about driving safely when workers are tired or stressed". These items were measured on a 5-point Likert scale, ranging from *strongly disagree* (1) to *strongly agree* (5). As safety values were measured as a group-level attribute, no compositional model was required (see Chan, 1998).

The safety information exchange: The safety information exchange as reported by drivers in the two weekly discussions, were assessed using an item specifically designed for the research. Drivers were asked, "Over the past two weeks, approximately how many times did you engage in discussions about driver safety with [supervisor's name]?" As this study was interested in examining the role of the safety information exchange in influencing safe driving behavior, as opposed to assessing change in the safety information exchange across time, the frequency of the safety information exchange was averaged over the six time points. We believe an average score provided the most reliable estimate of the usual number of exchanges of safety information, controlling for any effects of the broader safety project (and other extraneous variables) at any particular point of time across the three months of monitoring.

Leader-member exchange (LMX): Drivers rated the LMX relationship with their supervisors at Stage one and three, both times using the LMX7 measure (Graen & Uhl-Bien, 1995). An example item was "How well does your supervisor understand your job problems

and needs? These items were measured on a 5-point Likert scale, ranging from *strongly disagree* (1) to *strongly agree* (5). Higher scores indicate a more positive exchange relationship.

Safe driving performance: Drivers rated their safety performance at Stage one and three, both times using the 12-item occupational driver behavior scale developed by Newnam, Greenslade, Newton, and Watson (in press). The items were designed to measure speeding, rule violation, inattention and tiredness while driving. Example items of each scale include: Speeding "Deliberately exceed the speed limit when travelling to clients or the office"; Rule Violation "Fail to come to a complete standstill at a stop sign"; Inattention "Drive while thinking about work-related problems/issues and; Tiredness while driving "Find yourself nodding off while driving". The items were measured on a 5-point Likert scale, ranging from *rarely or never* (1) to *very often* (5). Higher scores indicate unsafe driving practices.

Role overload: At Stage one, drivers rated their experience of role overload with four items adopted from Caplan et al. (1980). The items were designed to measure drivers' experience of role overload within their workgroup. Items included were "How often does your job require you to work very fast?", "How often does your job require you to work *very hard*?", "How often is there a *great deal* of work to be done?" and "How often does your job leave you with *little* time to get things done?" These items were measured on a 5-point Likert scale, ranging from *rarely or never* (1) to *very often* (5). Higher scores indicate elevated role overload.

Control measures: Kilometres per week (reported at Stage one) when driving for work purposes was used as a control variable in this study. Past research has found that occupational drivers, on average, accumulate higher mileage in comparison with the average

private motorist (Downs et al., 1999) which may impact on the attention given to safe driving in the vehicle. Furthermore, the average number of kilometres driven per week for occupational purposes may also influence the frequency in the exchange of safety information. For example, individuals who drive higher kilometres per week may be less likely to have frequent contact with their supervisor. A space was provided for the participants to indicate how many kilometres they drove per week.

To provide a more robust test of the model, we included LMX at Stage one as a control variable for H1 and H2. In these analyses, we predicted a relationship between the value given to safety and the safety information exchange (H1) and that a stronger relationship between the value given to safety and the safety information exchange would exist under conditions of low role overload (H2). However, it was possible that the quality of the LMX relationship, prior to monitoring the safety information exchange, between supervisors and their drivers may have influenced the frequency of safety interactions. For example, a driver who did not have a high LMX relationship, to the extent that the relationship was negative or antagonistic, may have underreported the safety information exchange so that their supervisor was viewed negatively in their safety practices. As such, LMX at Stage one was used a control in these analyses.

We also included safe driving performance and LMX at Stage one as control variables in H4. Without controlling for past safe driving behavior and the LMX relationship it was possible that drivers who perceived a low quality exchange did so as a result of being repeatedly reprimanded for unsafe practices. As such, in controlling for past safe driving behavior and perceptions of the LMX relationship, we were able to test for change in the LMX relationship and safe driving behavior over the duration of the intervention process, and reduce the possibility of reverse causation as an explanation for our findings.

Analyses

This study utilized hierarchical linear modelling (HLM; Bryk & Raudenbush, 1992) to examine the hypotheses. Prior to conducting the analyses, Level 1 variables were group-mean centred while the Level 2 variable was grand-mean centred. In regards to H1 and H2, the data were clustered into two levels wherein drivers (Level 1) were nested within supervisory workgroups (Level 2). Specifically, at Level 1 the safety information exchange reported by drivers was the dependent variable and drivers' experience of role overload was a Level 1 predictor variable (kilometres driven per week and LMX at Stage one were entered as the control variables). At Level 2, predictor variables included safety values. The data received from 105 drivers and 22 supervisors were utilized for this analysis (M = 4.5 drivers within each workgroup). In regards to H3 and H4, HLM was also utilized to examine the nested structure of the data. In these analyses, the final dataset was based on a sample size of 85 drivers within 22 supervisory workgroups[1].

Results

Descriptive Statistic

Table 1 presents the means, standard deviations, and correlations among the driver-level measures and the disaggregated safety values. This table provides initial support for some of the hypotheses. There were significant correlations between workload and the safety information exchange (r = -.21), the safety information exchange and LMX (Stage 3) (r = .28), and LMX (Stage 3) and safe driving behavior (r = -.24). Given that drivers were

[1] As this study was conducted at multiple time points, there were more respondents to test H1 and H2 than H3 and H4. As such, analysis was conducted on demographic and key study variables (i.e., safety discussions, role overload) and no difference was found between those participants who had responded and those who had not at the pre-intervention survey and the safety information exchange data collection stages.

nested within supervisory workgroups, the multilevel nature of the data must be considered. Thus, the hypotheses were examined via multi-level modelling.

Table 1 about here

HLM Analysis

Four models were conducted to test the hypotheses. Model one examined the direct relationship between safety values and the safety information exchange, controlling for kilometres driven and LMX at Stage one. In this model, safety values (Level 2) were incorporated as a predictor of the safety information exchange (Level 1):

Level 1: Safety information exchange = β_o + β_1 (Kilometres driven) β_2 (LMX-Stage one) + r_{ij}

Level 2: $\beta_{o=} \gamma_{oo+}$ γ_{o1} (Supervisors safety values) + $\mu_{o,}$ $\beta_{1=} \gamma_{1o+}$ μ_1

Results are reported in Table 2. This table demonstrates that the relationship between safety values as a level 2 predictor of the level 1 intercept was non-significant (t = .53, p = .48). This finding does not support Hypothesis 1 which states a positive relationship between safety values and the safety information exchange.

Model two examined the moderating effect of role overload (Level 1 predictor), on the relationship between safety values (Level 2 predictor) and the safety information exchange (Level 1 predictor). Specifically, the main effect of safety values was entered at Level 2 while role overload was entered in at Level 1 (in addition to kilometres driven and LMX at Stage one). Following entry of the main effect, safety values was entered as a

predictor of the role overload intercept (the cross-level interaction term). We analysed the moderation, with centering of predictors, as recommended by Enders and Tofighi (2007):

Level 1: Safety information exchange = β_o + β_1 (Kilometres driven) + β_2 (LMX-Stage one) + β_3 (Role overload) + r_{ij}

Level 2: $\beta_o = \gamma_{oo} + \gamma_{o1}$ (Supervisors safety values) + γ_{o2} (Role overload) + γ_{o13} (Supervisor safety values * Role overload) + μ_o, $\beta_1 = \gamma_{1o} + \mu_1$, $\beta_2 = \gamma_{2o} + \mu_1$, $\beta_3 = \gamma_{3o} + \mu_1\gamma_{31}$ (Supervisors safety values) + μ_3

As demonstrated in Table 2, the cross level interaction between role overload and safety values was significant after controlling for the main effects (i.e., safety values and role overload), kilometres driven and LMX at Stage one (t = -2.80, p > .05). Figure 3 provides the graph of the relationship between safety values and role overload for the safety information exchange. Simple slope analysis (analogous to performing simple main effects in ANOVA designs; see Aiken & West, 1991 and Preacher, Curran, & Bauer, 2003) was used to analyse the two-way interaction. Simple slope analysis indicated that the positive relationship between safety values and the safety information exchange was significant for low role overload (t = 2.47, p =.02). However, the relationship between safety values and the safety information exchange was not significant for high role overload (t = 2.00, p = .05). This finding supports H2 stating that in conditions of low role overload, there would be a stronger relationship between safety values and the safety information exchange, as opposed to conditions of high role overload.

Table 2 about here

Figure 3 about here

Model three examined the safety information exchange (IV) as a predictor of the LMX (DV), controlling for kilometres driven:

Level 1: $LMX = \beta_o + \beta_1 (\text{Kilometres driven}) + \beta_2 (\text{Safety information exchange}) + r$

Level 2: $\beta_o = \gamma_{oo} + \mu_o, \beta_1 = \gamma_{1o} + \mu_1, \beta_2 = \gamma_{2o} + \mu_2$

Results are reported in Table 3. This table demonstrates that the relationship between the safety information exchange and the LMX was significant ($t = 3.62$, $p > .05$). These results suggest that a higher frequency in the safety information exchange was significantly associated a higher quality LMX relationship. Thus, these results support Hypothesis 3.

Model four examined the LMX (Stage three) as a predictor of safe driving behavior (Stage three), controlling for kilometres driven, LMX (Stage one) and safe driving behavior (Stage one):

Level 1: $\text{Safe driving behavior} = \beta_o + \beta_1 (\text{Kilometres driven}) + \beta_2 (\text{LMX – Stage one}) + \beta_3 (\text{LMX – State three}) + \beta_2 (\text{Safe driving behavior – Stage one}) + r$

Level 2: $\beta_o = \gamma_{oo} + \mu_o, \beta_1 = \gamma_{1o} + \mu_1, \beta_2 = \gamma_{2o} + \mu_2, \beta_3 = \gamma_{2o} + \mu_3, \beta_4 = \gamma_{2o} + \mu_4$

Results are reported in Table 4. This table demonstrates that the relationship between the LMX at Stage three was a significant predictor of safe driving behavior at Stage three, after controlling for kilometres driven and Stage one measures of LMX and safe driving behavior ($t = -3.71$, $p > .01$). As such, these results support Hypothesis 4.

Table 3 about here

Table 4 about here

Discussion

Utilizing the A-B-C framework, this study examined key organizational contingencies (i.e., antecedents and consequences) associated with the safety information exchange, and the function of role overload as an organizational factor influencing these relationships. This study is, therefore, unique as it has utilized a multi-method design to establish the contingencies of an effective safety information exchange at the workgroup and individual-levels of analysis. Furthermore, this study extends existing intervention frameworks (i.e., Newnam & Watson, 2011a) within the occupational driving context by identifying the exchange of safety information as a leadership practice that may be capable of improving safe driving performance.

This study did not find a significant relationship between the value given to safety and the safety information exchange. This finding is somewhat inconsistent with past research which infers that supervisory safety practices correspond with strong safety values (Zohar, 2002a; Zohar & Luria, 2003). However, past research has also stated that the value given to safety is a judgement on the relative priority given to safety over competing task demands (Zohar, 2000; 2010), which suggests that workplace factors, such as role overload, may impact on the safety value-safety information exchange relationship. This study found support for this notion as role overload moderated the relationship between safety values and the safety information exchange. Specifically, under conditions of low role overload, supervisors who valued safety were more likely to engage in a greater exchange of safety information as reported by their drivers.

An important finding that emerged from this research was that there was no significant relationship between safety values and the safety information exchange under conditions of high role overload. A possible explanation for this result is that employees under high role overload may not have been attentive to aspects of their work role unrelated to their perceived primary job task (i.e., productivity or profitability). That is, a conflict

between safety and productivity did not exist under conditions of high role overload as safety was not considered a priority. In the broader safety context, research has established that safety needs are often considered a source of conflict with demands for profitability in organizations (Reason, 1998). Thus, these results may be indicative of a workplace which is challenged in reconciling internal tensions and conflicting demands to ensure that one goal is not sacrificed for the other.

This study found that the exchange of safety information had a significant relationship with the subsequent quality of the LMX relationship. This finding is consistent with past research that has found safety communication to be a critical component within a safety program (Cigularov, Chen, & Rosecrance, 2010) and that the frequency of communication promotes a positive exchange relationship (Fairhurst, 1993; Hofmann & Morgeson, 1999; Kacmar et al., 2003). This study extends this literature by examining the role of context-specific communication (i.e., safety-related) and the LMX. Our findings suggest that leadership styles that advocate value-based interactions and concern for physical well-being, which in the occupational driving context is presented in the safety information exchange, promotes the quality of the LMX relationship between a driver and their supervisor.

It is important to note that the LMX relationship, as a control variable in hypothesis two, was also a significant predictor of the safety information exchange. Consistent with previous research (Zohar, 2002a), this finding suggests that value-based interactions not only promote the quality of the LMX relationship but provide a contingency for an effective exchange of safety information between a driver and their supervisor. Consistent with the LMX literature (Sin, Nahrgang, & Morgeson, 2009), future research could examine the specific dimensions of the dyadic structure between supervisors and drivers that support a quality safety exchange relationship.

This study also established a significant relationship between the quality of the LMX relationship and safe driving performance. This finding suggests that the relationship between LMX and safe driving performance is influenced by a process in which reciprocation of those behaviors valued by a supervisor is informed through mutual concern for well-being and safety. This finding is consistent with past research which established that a high-quality exchange relationship, which is characteristic of leadership styles that promote concern for well-being, are associated with safer working practices (Zohar, 2002a). This finding also supports the argument that driving behavior can be modified through intrinsic motivators as opposed to compliance-based methods based on supervisory control.

Implications

Through utilizing a multi-method design, we identified the contingencies associated with the safety information exchange. From a theoretical perspective, these results extend our current understanding of behavior modification techniques within the workplace context. The psychological mechanisms directing change in individual behavior within workplace environments similar in organizational structure to the occupational driving context remain unexplored in the literature. Traditional methods of behavioral change that rely on supervisory control are unlikely to be effective within organizational contexts where supervisors are not in close proximity to their subordinates. Thus, the results of this study extend our current understanding of behavior change techniques. The results also offer an avenue for future research to examine other psychological processes operating within the A-B-C framework. Specifically, future research could extend the framework to examine individual difference variables operating at both the workgroup (e.g., leader attributes) and individual levels (e.g., self-efficacy, attitudes) and their role in influencing the safety information exchange and the relationship with safety outcomes.

In addition to presenting strong theoretical contributions, the results offer some practical suggestions for safety interventions within the workplace. Industry is continuously searching for interventions that are on-going, cost effective, and sustainable with the potential for long-term behavioral change. Leadership interventions offer all of these advantages. The results of this study support the development of a leadership-based intervention designed to strengthen the skill of supervisors in identifying and managing situations in which their drivers may be at risk of a crash. Based on the psychological mechanisms identified within this study, such an intervention has the potential of improving safety outcomes for occupational drivers.

The results of this research also offer a number of specific safety interventions for the workplace. First, there was a positive relationship between the value given to safety and the safety information exchange under conditions of low role overload. This result suggests that management should ensure that workplace demands do not impact on the priority given to safety needs by workgroup supervisors. A possible intervention strategy targeting this issue could be regular safety meetings. These meetings could be designed as a platform to (1) exchange safety information with drivers, (2) generate strategies to avoid situations of role overload in daily work routines, and (3) promote concern for employee well-being. A second intervention strategy could focus of training workgroup supervisors to identify and manage safety needs under conditions of high role overload. This intervention approach could focus on developing the skill of leaders in the safety management of employees. In the occupational driving context, the training program could focus on improving supervisors' ability to identify situations in which their drivers may be at risk on the road (e.g., drivers are tired, stressed, under pressure to meet deadlines) and manage these situations effectively.

Second, the safety information exchange was found to play a direct role in influencing the quality of the LMX relationship and driving performance. This finding suggests that

drivers will reciprocate the behaviors valued by their supervisor based on the quality of the safety information exchange. As such, this result suggests an intervention could be designed to raise awareness (e.g., safety campaign) and educate supervisors on effective methods of engaging with their drivers on issues relating to safety practices. This process, in turn, has the potential of strengthening the exchange relationship and safer driving performance.

Limitations

Although this study offers a number of practical applications, there are some limitations to be acknowledged. First, self-report data was utilized for the outcome measure, which is open to socially desirable responding. However, research has found that self-report driving questionnaires are associated with minimal social desirability bias (Lajuen & Summala, 2003). Furthermore, organizational records of driving behaviors are known to be unreliable, as they are insufficiently sensitive, inaccurate, retrospective, and ignore risk exposure (Glendon & McKenna, 1995). Based on these arguments, self-report driving behavior was believed to be a suitable outcome measure. To overcome this issue, however, future research could attempt to collect objective measures of occupational driving behaviors, through utilizing advancing technologies, such as in-vehicle telemetry devices [e.g., intelligent speed adaptation, eye-tracking devices (i.e., attentional behaviors)] or utilizing distal measures, such as driving infractions (e.g. being stopped for speeding, running lights, illegal left-turns).

A second limitation relates to the representativeness of the sample. Specifically, the sample utilized was predominantly female drivers from a community-based organization. Such drivers may not be typical of all occupational drivers who are male and working in commercial or government sectors (i.e., Murray et al., 2003). While studies in the occupational driving setting have found that gender does not impact on driving behaviors (e.g., Newnam, Watson, & Murray, 2004), further research should employ a broader sample

of drivers from a variety of organizational settings to provide additional validity for the findings.

Third, the relationship between the LMX relationship and driving behavior relied on cross-sectional measurement and, as such, it was not possible to test the causal relationships between these two factors. Therefore, reverse causation could also explain this relationship; for example, it is possible that drivers who perceive a low quality exchange do so as a result of being repeatedly reprimanded for unsafe practices. However, we did provide a more robust test of the model by controlling for past safe driving behavior and perceptions of the LMX relationship and, as such, we have been able to improve the validity of the findings.

It should also be noted that cross sectional measurement may have also inflated the relationship between the safety information exchange and the LMX relationship (see Podsakoff et al., 2003; Spector, 2006). It is possible that a driver who reported a high safety information exchange, would be uncomfortable reporting a low LMX relationship. These alternative explanations for the results were minimalized as the measurements were separated in time. However, common-method variance could have inflated this relationship and caution should be taken in the inferences drawn from these results.

Fourth, there was an issue of attrition. As such, some of the results could be attributed to a sample of highly committed and more safety aware drivers. Fifth, there was a small sample size (n=22) for the level two analysis involving safety values. By collecting data from a larger sample, the possibility that lower statistical power was responsible for the non-significant relationship between safety values and the safety information exchange would be minimized.

Conclusion

This research presented the results of a multi-method study designed to examine the contingencies associated with the safety information exchange. The results of this research

both confirm and challenge the utility of some of the more conventional behavior modification techniques traditionally utilized in workplace behavior change programs and offer suggestions for future research in the development of leadership interventions. Finally, the results of this study offer practical suggestions for improving safety outcomes in an organizational context that presents with unique challenges.

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Table 1. *Means, standard deviations, and correlations among the subordinate-level measures and disaggregated supervisors' safety values*.

	M	SD	1	2	3	4	5	6	7	8
Stage one variables										
1. Safety values	2.94	.56	α= .86							
2. Role overload	2.71	.99	.16	α=.84						
3. LMX	3.74	.72	-.33	-.19*	α=.85					
4. Kilometers driven	233	167	-.34	.15	-.03	-				
5. Safe driving behavior	1.71	.45	-.08	.02	-.21	-.05	α=.79			
Stage two variable										
6. Safety information exchange	5.50	5.56	.24	-.21*	.24**	-.21*	-.13	-		
Stage three variables										
7. LMX	3.75	.75	-.46	.01	.53**	-.04	-.21	.28*	α=.88	
8. Safe driving behavior	1.64	.38	-.10	.32*	.01	.12	.56**	-.08	-.24*	α=.75

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

Table 2.

Fixed effect coefficients, standard errors and t ratios for the model predicting the safety information exchange

Fixed Effect	Coefficient	*SE*	*t* Ratio
Model one (Hypotheses 1)			
Intercept	5.87	0.85	6.88**
Level 1 variables			
Kilometres driven	0.00	0.00	-.217
LMX (Stage one)	1.72	.77	2.23*
Level 2 variables			
Safety values	0.61	1.14	.531
Model two (Hypotheses 2)			
Intercept	5.59	.79	7.00**
Level 1 variables			
Kilometres driven	.00	.00	.42
LMX (Stage one)	1.78	.52	3.39**
Role overload	-.48	.34	-1.39
Level 2 variables			
Safety values	.35	1.11	.32
Role overload	-1.74	.79	-2.22*
Safety values * Role overload	-1.89	.87	-2.18*
Cross-level interaction			
Role Overload * Safety values	-1.53	.55	-2.80**

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

Table 3.

Fixed effect coefficients, standard errors and t ratios for the model predicting LMX (Stage three).

Fixed Effect	Coefficient	*SE*	*t* Ratio
Model one (Hypotheses 3)			
Intercept	3.72	0.09	37.05**
Kilometres driven	0.00	0.00	.064

Safety information exchange	0.40	1.11	3.62

*p < .05. **p < .001.

Table 4.

Fixed effect coefficients, standard errors and t ratios for the model predicting safe driving behavior (Stage three).

Fixed Effect	Coefficient	*SE*	*t* Ratio
Model one (Hypotheses 4)			
Intercept	1.58	.013	118.13**
Kilometres driven	.000	.000	4.23**
LMX (Stage one)	.17	.07	2.56*
Safe driving behavior (Stage one)	.49	.05	9.71**
LMX (Stage three)	-.14	.04	-3.71**

*p < .05. **p < .001.

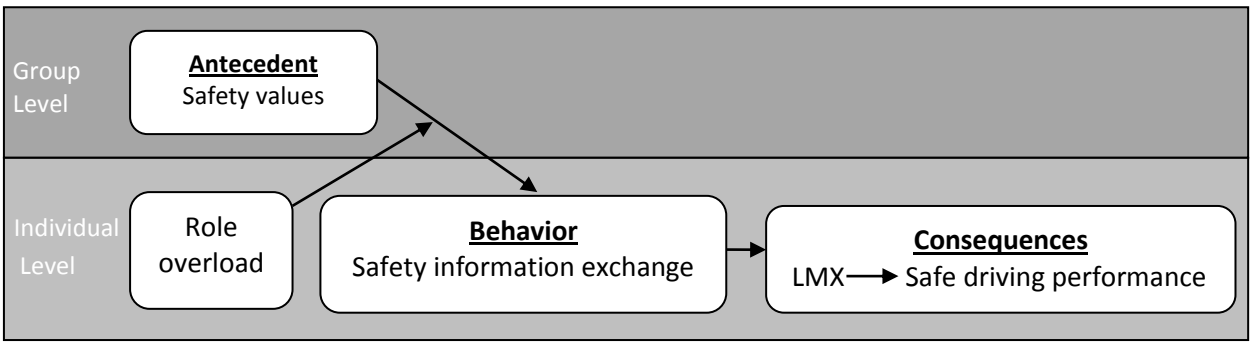

Figure 1: Conceptual model of relationships

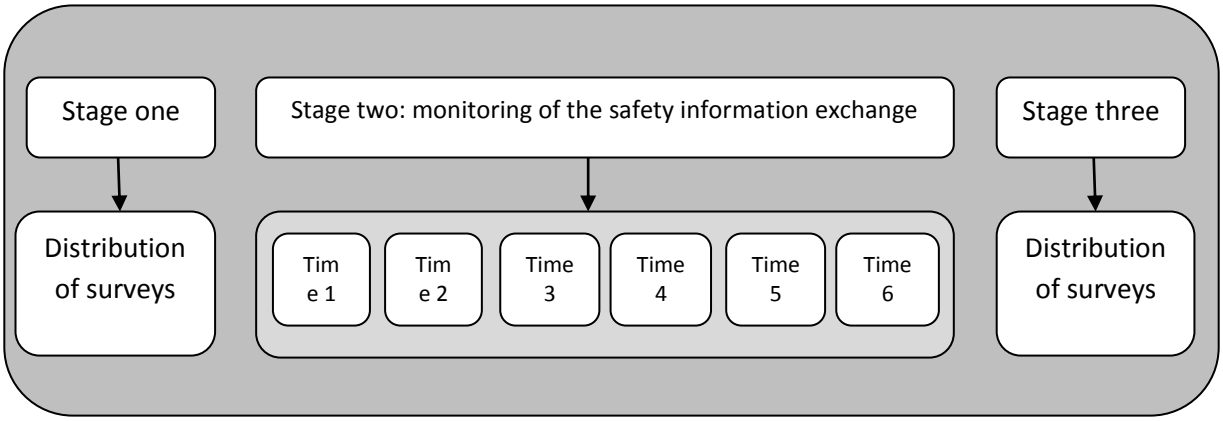

Figure 2: Stages of data collection

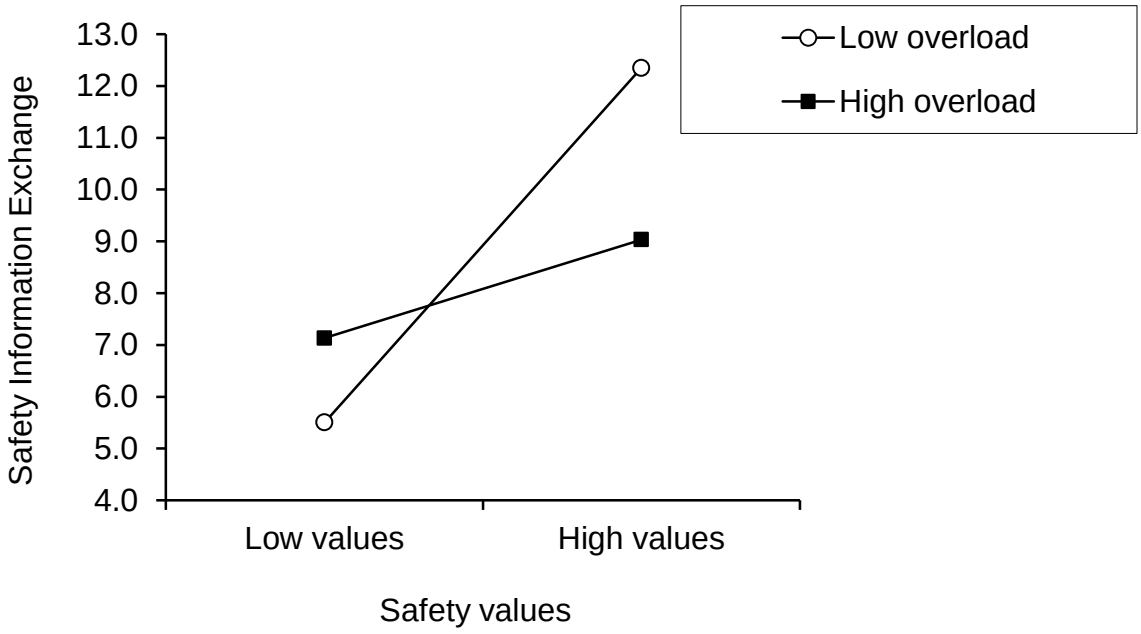

Figure 3: Interaction depicting the relationship between safety values and role overload on the safety information exchange.