SAFETY CLIMATE AND ORGANIZATIONAL JUSTICE AS PREDICTORS OF OCCUPATIONAL INJURY RATES AND THE DECISION TO FILE FOR WORKERS' COMPENSATION BENEFITS

by

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(Under the Direction of Charles Lance)

ABSTRACT

This study explores the relationship between employees' group-level perceptions of safety climate and organizational justice and rates of occupational injuries and workers' compensation claiming. Society and organizations alike stand to gain considerably from the prevention and management of workplace disabilities. Because organizations may have at least partial control over factors which affect both rates of injury on the job and the decision to file a workers' compensation claim, a better understanding of the antecedents of accidents and workers' compensation claiming can potentially lead to a reduction in both. This paper examines the relationships between perceived safety climate, organizational justice, accident rates and workers' compensation claiming. Findings suggest that employees' perceptions of safety climate and organizational justice vary depending upon subgroup. Partial support was found for a negative relationship between safety climate and injury rates and claiming. Support was not found for the hypothesized negative relationship between justice perceptions and claiming. The hypothesized relationship between injury rates and days lost time claiming was also not supported,. Finally, results for tests of reverse causality were equivocal, with cross lagged panel

analyses showing some support for a reciprocal relationship between safety climate and injuries and claiming, but with latent growth modeling (LGM) analyses showing no significant relationships between these variables.

INDEX WORDS: Safety Climate, Organizational Justice, Workers' Compensation

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DEDICATION

To Al, whose love is my shelter, and to Hannah and Blake, who bring me joy

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CHAPTER 1

INTRODUCTION

Safety Climate and Organizational Justice as Predictors of Occupational Injury Rates and the Decision to File for Workers' Compensation Benefits

Millions of Americans are injured on the job each year. According to the Bureau of Labor Statistics (2007), in 2004 there were more than 4 million nonfatal workplace injuries or illnesses in the United States alone, a rate of 4.4 out of every 100 employees. The National Safety Council (2001) estimated the average cost of wage and productivity losses, medical expenses, and administrative expenses per work-related disabling injury to be $29,000. The cost of occupational injuries is a major concern for organizations, both in terms of productivity loss and workers' compensation claims as well as in terms of quality of life for the affected individuals and families. Additionally, workers' compensation insurance rates are tied to claiming activity, providing substantial motivation for organizations to prevent and manage workplace injuries and accidents.

Society and organizations alike stand to gain considerably from the prevention and management of workplace disabilities, yet research on workplace safety represents less than 1% of the studies published in top journals (Barling, Loughlin, & Kelloway, 2002). The relative neglect of occupational safety in the literature is particularly problematic because organizations may have at least partial control over factors which affect both rates of injury on the job and the subsequent decision to file a workers' compensation claim. Although previous research has shown that perceived safety climate is related to important organizational outcomes by its influence upon safety attitudes and behaviors, much of this research has been cross-sectional. Consequently, it is possible that the relationship may be due to reverse causation (Clarke, 2006;

Neal & Griffin, 2006). For example, a work environment with a record of one or more accidents may lead to individuals perceiving the climate as being less safe (Rundmo, 1996). Additionally, much of the research on the relationship between safety climate and organizational accidents has been hampered by the lack of studies using objective and verifiable measures of accident rates, with the majority of studies relying of self-report data (Zohar, 2000). Furthermore, little research has investigated the role of safety climate at the subgroup level in the prediction of accident rates.

Despite the practical and theoretical significance of disability management, to date management and organizational researchers have paid even less attention to how and why injured employees make the decision to file a claim than they have to the investigation of the organizational antecedents of workplace accidents. Organizational factors that can be controlled or influenced, and which may have the potential to reduce the number of claims filed and their associated costs, have received scant attention. To address these gaps in the literature, I examined the effects of organizational variables, using social exchange theory (Blau, 1964) as the lens, on both rates of injury as well as rates of days lost time workers' compensation claiming. Specifically, I examined the relationship between group-level perceptions of safety climate and organizational justice and rates of workplace injury as well as rates of days lost time claimed.

Organization-Level Factors

Safety Climate

Cooper and Phillips (2004) state that one of the objectives of measuring safety climate is to identify opportunities to improve the safety of organizations. Indeed, the literature on safety climate has established an empirical link between perceptions of safety climate and outcomes

such as rates of accidents, micro-accidents and near misses, severity of accidents, observations of safe behavior, and self-reported compliance with safety policies and procedures (Barlin et al., 2002; Brown & Holmes, 1986; Clarke, 2006; Cooper & Phillips, 2004; Gillen, Baltz, Gassel, Kirsch, & Vaccaro, 2002; Hofmann & Stetzer, 1996; Morrow & Crum, 2004; Neal & Griffin, 2006; Silva, Lima, & Baptista, 2004; Zohar, 2000, 2002). The work environment, as it is perceived by the individual, is known as the psychological climate, whereas shared perceptions comprise the organizational climate (L. A. James & James, 1989; L. R. James, 1982; Schneider, 1975), which can exist at the organizational level or at the subgroup level. These perceptions include organizational values, norms, beliefs, practices, policies, and procedures, and serve to help employees make sense of their work environment, as well as offer cues as to which behaviors and tasks are valued by the organization (Denison, 1996; Guldenmund, 2000; Zohar, 1980).

Safety climate, as a type of organizational climate, has been defined somewhat differently by different researchers. Some researchers have defined safety climate as employees' perceptions of organizational safety policies, procedures, and practices (Griffin & Neal, 2000; Rentsch, 1990). Others include shared perceptions of safety values, norms, and beliefs, in addition to practices, policies, and procedures in their conceptualization of safety climate (Flin, Mearns, O'Connor, & Bryden, 2000; Guldenmund, 2000; Zohar, 2000). This more comprehensive definition of safety climate takes into account employees' overall perceptions of how important safety is in the organization generally through perceived values, norms, and beliefs about safety as well encompassing perceptions that may relate to specific practices, policies, and procedures (Guldenmund, 2000; Silva et al., 2004). This definition of safety climate also more closely aligns with the generally accepted definition of organizational climate, which includes perceptions

about organizational values, norms, and beliefs. Safety climate perceptions at both the general (values, norms, and beliefs) and the specific (practices, policies, and procedures) levels have been show to relate to accident-rates. As such, I used the more comprehensive definition of safety climate for this study.

In addition to a lack of agreement regarding which elements comprise safety climate, Zohar (2000) argues for a distinction between an organizational-level model of safety climate and a group-level model, and that this distinction should be reflected in questionnaire items which cite the organization as a referent as well as items which cite the immediate manager as the referent. The group-level model of safety climate is thus defined as supervisory practices, or perceptions of how safety policies and procedures are implemented, rather than the employees' interpretation of the actual organizational policies and procedures (Neal & Griffin, 2006; Zohar, 2000). Formal policies and procedures are established at the organizational level. Zohar (2000) argues that these organizational-level safety policies and procedures are notably beyond the authority and control of supervisors, and cites the examples of procedures establishing organizational protocol for the use of protective equipment, having safety inspections and having corrective action for safety violations, as well as the inclusion of safety criteria in performance evaluations as examples of safety procedures and practices that clearly originate with the organization, rather than with the supervisor. However, employees may have little awareness of actual formal safety policies and procedures. Managers may choose not to reinforce policy prescribing the use of safety policies and procedures or may choose not to assign poor performance appraisal ratings for poor safety performance. Employees may also, if they are aware of formal policy and thus aware of any discrepancies between practice and policy, believe that safety policies are important to the organization on paper only if the manager is not disciplined for failing to comply with them.

Thus it is quite possible that employees may view even these safety procedures that Zohar (2000) believes are clearly at the organizational-level as being under the control or the supervisor. As such, employees may not consciously discriminate between an organizational-level and a group-level safety climate, even when questionnaire items list different referents. Consequently, safety climate may differ from subgroup to subgroup within the same organization with the same formal policies and procedures. Given such differences, it would be inappropriate to aggregate safety climate data to the organizational level (L. R. James, 1982).

In a similar vein, because organizations have competing goals, and because policies and procedures cannot possibly address every contingency, supervisors must continually make decisions which affect their employees' interpretation of company policy. For example, when managers direct employees to ignore safety policy for the sake of speed or efficiency, the employees are likely to conclude that efficiency is more important than safety, and the safety climate for those groups will be lower compared to the safety climate for groups where the manager is unwilling to compromise safety practices for the sake of efficiency. Thus even though safety-policy is the same company-wide, interpretations of safety climate are likely to vary due to differences in the implementation of company policies and procedures. Interactions with managers serve to inform employees as to which of the competing goals are most important for their group, and the aggregate of these interactions, provided they follow a consistent pattern, results in perceptions of safety climate at the group level (Zohar, 2000). The preceding ideas are summarized by the following hypothesis:

Hypothesis 1: Differences in perceived safety climate will be demonstrated across subgroups within the same organization.

Organizational Justice

As mentioned earlier, researchers have focused little attention on how employees arrive at the decision to file a workers' compensation claim, even though some of the variables influencing claiming decisions may be under at least partial control of the organization. There is a substantial body of literature linking perceptions of organizational justice to employee attitudes and behaviors. These perceptions affect a wide range of work-related outcomes such as job satisfaction, organizational commitment, organizational citizenship behaviors (OCBs), trust, performance, theft, retaliation, absenteeism, and turnover (Cohen-Charash & Spector, 2001; Colquitt, Conlon, Wesson, Porter, & Ng, 2001). Colquitt et al.'s (2001) meta-analysis of the organizational justice literature differentiates between four types of organizational justice: informational and interpersonal (often combined as interactional), procedural, and distributive. *Interpersonal justice* is the extent to which people are treated politely and with respect by authorities involved in implementing procedures or determining outcomes (Colquitt et al., 2001). Interpersonal justice acts to alter reactions to outcomes because sensitivity can buffer the effects of unfavorable outcomes. The perceived level of respect and sensitivity with which employees are treated should be related to perceptions of interpersonal justice. *Informational justice* is defined as the extent to which explanation or justification is given for decisions, and whether the explanation or justification is given at the appropriate time. Perceptions of informational justice are related to the legitimacy (perceived accuracy) of the explanation as well as to the timing of the explanations. *Procedural justice* is the extent to which procedures (both formal and informal) used to arrive at decisions are perceived as being fair. To the degree that a company's decision-making procedures demonstrate consistency, bias suppression, accuracy, correctability, representativeness, and ethicality they will be deemed fair (Leventhal, Karuza, & Fry, 1980).

Distributive justice refers to the perceived appropriateness of an individual's outcomes given his or her contributions (Colquitt et al., 2001). While perceptions of distributive justice are related to the aforementioned outcomes and an important part of organizational outcomes, the focus of this study is limited to the dimensions of procedural, informational, and interpersonal justice for the following reasons. Distributive justice has been widely studied and has not suffered from the problems of entanglement with other justice dimensions. Furthermore, because distributive justice is concerned with outcomes, and perceived as having little effect on subsequent outcomes, its effects are generally more temporary than the effects of informational, interpersonal, and procedural justice.

Managerial practices, which can be influenced by the organization, likely affect the claiming decision. Just as managers implement safety policies and procedures, thus affecting perceptions of safety climate, they also influence employees' perceptions of organizational justice. While the extent to which managers may serve to represent the organization for their employees may vary across dimensions of organizational justice, it is likely that managers, because they are often seen as a proxy for the organization, influence perceptions of *all* facets of organizational justice.

The preceding ideas are summarized by the following hypothesis:

Hypothesis 2: Differences in perceived informational, interpersonal, and procedural justice will be demonstrated across subgroups within the same organization.

Social Exchange Theory and the Norm of Reciprocity

Social exchange theory (Blau, 1964) and the norm of reciprocity (Gouldner, 1960) provide theoretical justification for the expectation that favorable perceptions of safety climate and organizational justice will be correlated with lower incidences of workplace injury and lower

levels of days lost time. Social exchange theory characterizes the relationship between the organization and its employees as an open-ended, discretionary exchange of valuable resources, in which the organization as well as the employee both give and receive benefits. Fair treatment and supervisory support are examples of valued resources organizations can offer to their employees (Eisenberger, Huntington, Hutchison, & Sowa, 1986; Kacmar & Carlson, 1997; Masterson, Lewis, Goldman, & Taylor, 2000). Employees draw conclusions regarding the organization's attitude and intentions toward them based upon their daily interactions with managers, and upon how those managers choose to implement the organization's formal policies and procedures. Managers are viewed by employees as agents of the organization, and as such their actions and attitudes towards their employees are seen as reflective of the organization itself. Favorable and beneficial actions on the part of the organization or its proxies contribute to the creation of positive exchange relationships, and create an obligation on the part of the employee to respond in kind in the form of affective commitment, greater effort in task performance, and greater levels of pro-social behaviors (Eisenberger, Fasolo, & Davis-LaMastro, 1990; Settoon, Bennett, & Liden, 1996).

Perceptions of Safety Climate and Organizational Justice and the Quality of the Social Exchange Relationship Applied to Occupational Injury and Days Lost Time Rates

A fundamental assumption that workers have of their employers is that the employer will take reasonable steps to ensure their safety at work. If employees perceive that their organization has a strong commitment to their safety, they should feel an implicit obligation to reciprocate by acting in ways that benefit the organization (Neal & Griffin, 2006), as well as by having positive feelings toward the organization. A positive social-exchange environment in turn leads to higher task performance and citizenship behaviors (Tsui, Pearce, Porter, & Tripoli, 1997). In the context

of safety, social exchange theory predicts that employees who perceive their organization to be committed to their safety should reciprocate by not only engaging in safe work behaviors, in the form of compliance with safety policies and procedures, but also in the form of safety-specific OCBs, such as promoting safety with coworkers and volunteering ideas for improving safety. Extant research illustrates the role of the quality of social exchange relationships in predicting task and citizenship behaviors (Eisenberger et al., 1990; LePine, Erez, & Johnson, 2002; Settoon et al., 1996). Once the safety climate has moved beyond one of bare compliance with safety policies and procedures to one in which there is a commitment to safe work practices, the relationship ceases to be a strictly economic exchange based upon the fulfillment of contractual requirements and becomes an open-ended social exchange.

Because interactions with managers provide cues to employees about expected behaviors, the perceived importance of safety at the subgroup level is likely to influence the priority which employees assign to safety, which in turn affects their attitudes about safety and their compliance with safety policies and procedures. To address the above limitations in the literature, I predict the following:

Hypothesis 3: Perceptions of safety climate at the subgroup level will be negatively related to percent of accidents.

While the decision to file a workers' compensation claim might, on the surface, seem like a relatively straightforward one, based upon factors such as the severity and duration of the injury, economic need, and whether or not the injury occurred on the job or as a result of employment, there are a number of factors which make the decision much more complex. The process of filing a claim can be daunting. Additionally, employers may discourage claiming, either explicitly or implicitly (Roberts & Markel, 2001). Because the extent of the injury and the ability to return to

work are often difficult to verify and rely on self-reported data, claimants may be regarded with suspicion by both the organization and coworkers if the need for the claim is not obvious. There is also some empirical evidence that an employee's decision to file a workers' compensation claim can be influenced by variables that are within the control or influence of the organization (Habeck, Leahy, Hunt, & Chan, 1991; Roberts & Markel, 2001). Specifically, Habeck et al. (1991) found lower incidences of claiming in organizations with a strong safety climate and with high performance work systems, including high-quality training, participative decision making, and information sharing. However, because data on safety and prevention and data on management climate were collected post hoc, it is not possible to rule out the possibility that an environment with low claim rates leads to perceptions of a favorable safety climate. Similarly, Roberts and Markel (2001) found lower incidences of claiming in organizations in which perceptions of interactional justice were high, though their hypotheses for a similar relationship between procedural and distributive justice and claiming were not supported. However, baseline measures of organizational justice perceptions were not taken until *after* employees had actually experienced an injury on the job, and thus fairness perceptions may already have been altered as a consequence of the injury.

A positive safety climate at the group level may signal employees that the manager is committed to and concerned for their well-being and should create a felt obligation on the part of the employee to reciprocate by demonstrating commitment to and concern for the well-being of the organization. Showing support for and engaging in safe work activities is one way in which employees can demonstrate their commitment. Refraining from filing a workers' compensation claim in the first place or taking additional days lost time when the decision is a subjective one may be another way. Thus in the case of an injury in a positive safety climate, the decision of

whether or not to file a workers' compensation claim or to take additional days lost time may also no longer be a decision based strictly upon the extent of injury and economic need, but may be an extension of OCBs when the decision is ambiguous. OCBs are "organizationally beneficial behaviors and gestures that can neither be enforced on the basis of formal role obligations nor elicited by contractual guarantee or recompense. OCBs consist of informal contributions that participants can proffer or withhold…" (Organ, 1990, p. 43). Declining to file a claim when injured at work may be viewed as an OCB. Conversely, in an economic exchange relationship, employees will likely have little motivation to withhold a claim when the decision of whether or not to file is a subjective one. In the case of a poor safety climate, employees may perceive the organization as having failed in its obligation to take the necessary steps to ensure the safety of its employees. In a strictly economic exchange relationship, in which the organization has failed to demonstrate a commitment to keeping its employees safe, employees may be motivated to file a claim or take the maximum number of days lost time possible as a way to exact payment from the organization, based upon a desire to "even the score," or to punish or retaliate against the organization. On the basis of this argument, I hypothesize the following:

Hypothesis 4: Group-level perceptions of safety climate will be negatively related to average days lost time.

Similar to the aforementioned social exchange process by which I predict safety climate to be negatively related to days lost time, perceptions of informational, interpersonal, and procedural justice should also be negatively related to days lost time. Employees view fairness as a valuable contribution to the exchange relationship, whether the fair treatment is viewed as originating with the organization or with one's manager (Masterson et al., 2000; Settoon et al., 1996). When employees view the formal policies and procedures of an organization as fair, or

view the implementation of those policies and procedures by managers as fair, or both, they should be more inclined to participate in OCBs. OCBs are comprised of sportsmanship, civic virtue, altruism, conscientiousness, and courtesy (Cohen-Charash & Spector, 2001). When levels of perceived fairness are high, employees should be motivated to engage in sportsmanship and civic virtue, in an effort to reciprocate in kind for positive behaviors directed towards them. They should also be more inclined towards altruistic behavior when they feel that others have acted altruistically toward them. Finally, when levels of perceived fairness are high, employees should also behave more conscientiously than when levels of perceived fairness are low.

Although there has been little empirical research on the relationship between organizational variables and workers' compensation claiming, Roberts and Markel's (2001) study is a notable exception. Their research investigates the relationship between perceptions of organizational justice and claiming. However, they surveyed only those employees who were injured on the job, and their first measure of organizational justice was taken shortly after each employee was injured on the job, at which point their perceptions may have been colored by the experience of being injured. They found support only for a negative relationship between interactional (informational and interpersonal) justice and claiming. They interpret these results as suggesting that employees may use limited information about organizational policies and procedures (in this case, the fairness of disability policy) and instead rely on interactions with their manager to form perceptions about the fairness of the organization and its procedures. However, other studies have found procedural justice to be a significant predictor of a number of organizational outcome variables. For example, Konovsky and Cropanzano (1991) found that perceptions of procedural justice predicted organizational commitment, loyalty, and the possibility of fair treatment from the organization in the future. When perceptions of procedural, informational, and interactional

justice are high, employees expect fair treatment in the future and these expectations generalize to other attitudes toward the organization (Konovsky & Cropanzano, 1991; Lind & Tyler, 1988). Outcomes, however, are viewed as being context specific, and thus would not be expected to generalize to other situations, suggesting that perceptions of distributive justice are unlikely to extend to other contexts (Konovsky & Cropanzano, 1991). For example, perceptions of pay equity are unlikely to generalize to perceptions of the fairness of disability outcomes. Accordingly, the fifth hypothesis is as follows:

Hypothesis 5: Perceptions of organizational justice climate at the subgroup level will be negatively related to average days lost time.

Finally, it stands to reason that the greater the number or percentage of injuries in a given subgroup, the greater the number of days lost time. Therefore, I predict the following:

Hypothesis 6: Percent injuries at the subgroup level will be positively related to average days lost time.

Reverse Causality

The assumption underlying most of the research in this area is that safety climate influences rates of accidents, injuries, and fatalities through its influence on safety behavior and compliance with safety policies and procedures. Safety behavior and compliance, in turn, affect accident rates. Because much of the previous research in this area has been cross-sectional (Clarke, 2006; Neal & Griffin, 2006), however, the possibility of reverse causality cannot be ruled out. The occurrence of an accident or accidents, particularly those involving one or more fatalities, may act to make individuals feel less safe, regardless of whether or not they were directly involved in the accident. Therefore, I also tested for reverse causality.

CHAPTER 2

METHOD

Participants

Participants in this study were employees of a large transportation company located in the United States and surveyed over five annual administrations of a corporate-wide employee attitude survey. All employees were invited to participate and participation was voluntary. The total sample size for years 2003-2007 ranged from 32,035 to 42,716, with a response rate ranging from 86% to 92%. Because this study is concerned with workplace accidents and injuries, I limited inclusion to those employees in positions likely to be at risk for a workplace injury: sorters, loaders, and drivers. Prior to aggregating Safety Climate and organizational justice ratings to the group level, the r_{wg} statistic was used to assess within-group agreement (James, Demaree, & Wolf, 1984, 1993). I initially calculated interrater agreement (IRA) using $r^*(WG)(J)$. However, a large number of groups showed composite values for justice that were lower than .70, the value traditionally cited as being generally adequate for aggregation (Lance, Butts, & Michels, 2006). Because theory suggests that there should be at least moderate inter-rater agreement for work groups on perceptions of both safety and justice, and because $r(WGj)$ is also considered an acceptable index of inter-rater agreement, I then calculated $r(WGj)$ using the rectangular uniform null distribution, which assumes no systematic response biases among raters. Groups with a mean $r(WGj)$ of less than .70 on either safety or justice were not considered sufficiently homogeneous to justify aggregation, and thus these groups were also excluded from further analyses. Although somewhat arbitrary, a cut point of .70 was considered adequate justification for aggregation based

upon the suggestion of LeBreton and Senter (2008) that the researcher take into account both the quality of the scales used and the seriousness of the consequences resulting from the aggregation of scores. In the present case, items were not taken from validated scales and no decisions with serious consequences for individuals will result from aggregation of these scores. Finally, groups with fewer than 10 employees for any of the five waves of data collection were also excluded from the study. These restrictions brought the total sample size for five waves of data to 76, 930 employees from a total of 134 groups.

Measures

A survey consisting of items related to perceived safety climate and perceived organizational justice, as well as items unrelated to this study, was administered during the fall from 2003-2007 as part of the organization's annual employee attitude survey. All measures were assessed using 5-point Likert scales with response options ranging from 1=strongly disagree to 5=strongly agree. The survey was filled out and returned via the company intranet. Participants were informed that their participation was both voluntary and anonymous. The organizational justice and safety items on the survey were modified from existing safety climate and organizational justice scales to suit the needs of this particular organization. Due to concerns that demographic data might either make it possible to identify individual respondents, or that employees might believe that providing this information would prevent their responses from being anonymous, these data were not collected by the organization and thus are unavailable.

Analyses

Because not all items on the survey were from validated scales, several steps were taken to ensure that items measured the construct they were purported to measure. First, a Q-sort was conducted, with two advanced industrial and organizational psychology students sorting each item into the following categories: “safety,” “justice,” or “other.” Disagreements regarding the classification of variables were discussed until evaluators were able to reach consensus. As a result of the Q-sort, two justice items were dropped. All safety items were retained.

Next, an exploratory factor analysis (EFA) was conducted to examine the underlying factor structure. To identify the latent variables of all items potentially representing safety or organizational justice, survey items which appear to measure either perceived safety climate or interpersonal, informational, or procedural justice were taken from an earlier administration of the online survey and submitted to maximum likelihood EFA with Oblimin rotation. Because some researchers (c.f., Zohar, 2000) have argued that safety climate will vary depending upon whether the referent is the organization as a whole or one’s direct supervisor, I was interested in determining whether EFAs for perceived safety climate support this distinction. However, this distinction was not supported by the data. Employees at this organization at least appear to conceptualize safety climate as having only one underlying dimension. This may be because the safety climate items used in this organization’s employee attitude survey were not written to test this assumption, thus items do not necessarily make a clear distinction between whether the referent is the organization or one’s immediate manager.

Additionally, because there is some debate in the literature regarding the factor structure of organizational justice, with some researchers (e.g., Colquitt et al., 2001) arguing that what has previously been conceptualized as interactional justice is actually composed of two factors,

interpersonal and informational justice, and because these items were not taken from a validated scale, EFAs were conducted on all potential organizational justice items as well. Employees of this organization also appear to conceptualize justice as being one-dimensional, at least when responding to justice items as measured by the employee attitude survey. Parallel analysis, scree plot, and comprehensibility of the factor solution were used to determine the number of factors represented by the data. While parallel analysis results suggested the retention of three factors, Catell's scree test suggested the retention of only two factors. Given these differing results, both two- and three-factor solutions were requested, and the two-factor solution was clearly more comprehensible. In identifying the factors, items that had high factor loadings (.50 or higher) and low cross-loading (.25 or lower) were retained. The two factors retained are identified as (a) Safety Climate (7 items; e.g., "My company is a safe place to work") and Organizational Justice (10 items; e.g., "My management team treats employees with respect").

As recommended by Vandenberg and Lance, (2000) measurement equivalence and invariance (MEI) was assessed across the five time points of data collection using the augmented covariance matrix approach. The omnibus test of the equality of the covariance matrices for both safety and justice items was conducted using LISREL 8.7 (Jöreskog & Sörbom, 2004). The chi-square goodness-of-fit test is traditionally used for assessing model goodness-of-fit. However, because the chi-squared value is well known for its sensitivity both to minor differences between groups' factor patterns and sample size (Bentler & Bonett, 1980), it is supplemented with other fit indices in order to infer model goodness-of-fit. Fit indices most commonly reported in the organizational literature were used (e.g., Medsker, Williams, & Holahan, 1994): the standardized root mean residual (SRMR), the root-mean-square error of approximation (RMSEA), the Tucker-Lewis index (TLI, also referred to as the "non-normed fit index" or NNFI), and the

comparative fit index (CFI). The omnibus test for the equality of the variance-covariance matrices over the five measurement occasions was conducted first for all safety items and showed reasonably good fit $\chi^2(434, N = 134) = 1030.24,\ p \leq .01$ CFI = .96, RMSEA = .08, SRMR = .06, and TLI = .94. Although chi-square is significant, as mentioned previously it is well known for its sensitivity and all other fit indices used show reasonably good fit. The omnibus test for the equality of the variance-covariance matrices over the five measurement occasions was also conducted for all justice items and showed excellent fit: $\chi^2(860, N = 134) = 795.22, p = 0.94$, CFI = 1.00, RMSEA = 0.0, SRMR = .09, and TLI = 1.00. Because failure to reject the null hypothesis indicates that overall measurement equivalence exists and that further tests are superfluous, tests of specific aspects of ME/I were not conducted (Vandenberg & Lance, 2000).

Hypotheses one and two predict differences in perceived safety climate and organizational justice across subgroups. Between-groups variance was tested using multivariate analysis of variance (MANOVA). This analysis was conducted using facility affiliation as the independent variable. Because the number of employees in each subgroup varies in this organization, accident rates and incidences of claiming were converted to percentages of the total number of employees at each facility. Otherwise facilities with greater numbers of employees will likely have more accidents and subsequent claiming than facilities with fewer employees simply because they have more employees. Additionally, because the organization converts all responses on the employee attitude survey to the percentage of employees who agree/strongly agree with the given statement, these numbers are in the form of percentages as well. The MANOVA revealed a significant overall effect for subgroup in perceptions of safety climate: $F(1148, 179{,}988) = 412.12, p \leq .01, \eta_{\lambda}^{2} = .90.$ MANOVA results for perceptions of

organizational justice also revealed a significant overall effect for subgroup membership: $F(1968, 179{,}988) = 339.83, p \leq .01, \eta_{\lambda}^{2} = .96$. Not only do these results suggest that there are differences between groups on perceptions of both safety climate and organizational justice, but they also suggest that these differences are practical as well as statistical.

LISREL 8.7 was used to test hypotheses 3-5 as well as the overall model shown in Figure 1 using structural equation modeling (SEM) analyses with data aggregated at the region/district/operation level. Two of the constructs in the model (safety climate and organizational justice) had multiple indicators, and were modeled as latent factors with their respective manifest variables as indicators. The other two constructs in the model (percent of injuries and days lost time) were single indicator items, and thus were included directly in the model as observed variables. Tenure was statistically controlled for in all models by using regression analyses to partial out the effects of tenure before conducting the SEM analyses.

I first tested the overall model for years 2003 to 2004, with perceptions of safety climate and organizational justice in 2003 modeled as predictors of percent of injuries and average days lost time in 2004. This model had poor fit: $\chi^2(149, N = 134) = 1126.95, p \leq .01$, CFI = .81, RMSEA = .26, SRMR = .13, and TLI = .78. Tests of the overall model with a one-year lag for years 2004-2007 resulted in slightly improved, but still poor, overall fit. Because it is possible that there may be some delay between changes in perceptions of safety and organizational justice, I also examined the fit of the overall model for years 2003 to 2007 with a two-year lag. Fit remained poor with a two-year lag as well.

Hypothesis three states that perceptions of safety climate at the subgroup level will be negatively related to accident rates, and was tested by examining the path estimates between safety climate and injuries. Tests of parameter estimates for hypothesis 3 are generally not

supported. This coefficient was in the hypothesized direction, but nonsignificant (-0.08) for years 2003 to 2004. This path was also in the hypothesized direction but nonsignificant when looking at a one-year lag for years 2004 to 2005 and years 2005 to 2006, but was significant at the .01 level (-0.31**) for 2006 to 2007. As with overall model fit, I also examined path estimates between safety climate and injury rates over a two-year time period for years 2003 to 2007. Results were similar to those for a one-year lag, with negative but nonsignificant paths for years 2003 to 2005, 2004 to 2006, and 2005 to 2007. These path estimates are summarized in Table 2.

Hypothesis four states that Group-level perceptions of safety climate will be negatively related to average days lost time (DLT), and was tested by examining the path estimates between safety climate and DLT. Support for this hypothesis was also mixed. This path was in the hypothesized direction, but nonsignificant (-0.22) for 2003 to 2004. There was a significant negative relationship shown for a one-year time lag between 2004 to 2005 (-0.49**), but results for 2005 to 2006 and for 2006 to 2007 were nonsignificant. Results for this relationship for a two-year time lag were similarly mixed, with a significant negative relationship between Safety Climate and DLT for the time periods 2003 to 2005 and 2004 to 2006, but not for 2005 to 2007. These results are also summarized in Table 2.

Hypothesis five states that perceptions of Organizational Justice climate at the subgroup level will be negatively related to average DLT. This hypothesis was not supported. However, for a one-year time lag for years 2003 to 2006 there was a significant relationship between perceptions of Organizational Justice and DLT, but in a positive direction. For 2006 to 2007 the relationship was nonsignificant. Hypothesis five was also not supported when looking at the relationship between Organizational Justice and DLT over a two year time period. The

relationship for 2003 to 2005 and for 2004 to 2006 was significant, but in a positive direction. The relationship for 2005 to 2007 was nonsignificant.

The SEM results did not provide support for hypothesis six, which states that injuries will be positively related to average DLT. Injuries were not significantly related to DLT for 2003 to 2004 (β = -0.30), 2004 to 2005 (β = -0.02), 2005 to 2006 (β = -0.02) or 2006 to 2007 (β = 0.06). This relationship also failed to be supported over a two-year time lag for years 2003 to 2005 (β = -0.01), 2004 to 2006 (β = 0.0), and 2005 to 2007 (β = 0.01). These results are summarized in Table 2 as well.

To test for reverse causation, a cross-lagged panel design (e.g., Schmitt, Oswald, Friede, Imus, & Merrit, 2008) with the latent variables Safety Climate and injuries or Safety Climate and DLT was specified to determine whether Safety Climate can be regarded as the antecedent of safety outcomes or vice versa (see Figures 2 for an example). To create a composite Safety Climate variable seven indicator variables representing Safety Climate were averaged to create an overall score. The variables injuries and DLT were calculated by dividing the number of injuries or the number of DLT occurring in that facility in a given year by the number of employees in each facility. Although multi-wave panel designs cannot conclusively demonstrate causality (Burkholder & Harlow, 2003; Farrell, 1994), this approach allowed me to explore and compare these two competing causal hypotheses. This approach allows for the assessment of multiple dependent variables over time and for an examination of total effects rather than testing independent regression equations. Causal priority is suggested by examining the efficacy with which earlier values of one variable (e.g., Safety Climate) predict subsequent values of another variable (e.g., injury rates) above and beyond the influence of earlier measures of that same

variable (e.g., injury rates), and vice versa. The structural equation models were analyzed with LISREL 8.7 (Jöreskog & Sörbom, 2004) using the maximum likelihood estimation procedure.

My first step in testing for reverse causality was to systematically test competing structural models to explore competing hypotheses. If earlier values of perceived Safety Climate exert a greater influence on later values of injury rates than injury rates exert on Safety Climate, as is commonly assumed to be the case in the literature in this area, then time-lagged correlations should be stronger for perceived Safety Climate as a predictor of injury rates than vice versa. I compared the "assumed" model (paths leading from perceptions of Safety Climate to injuries) with the reverse causality model (paths leading from injuries to perceptions of Safety Climate).

In addition to examining time-lagged correlations between "predictor" and "outcome" variables, I also used comparisons of model fit between three different models, one of which allowed all parameters to be freely estimated (Model 1), one in which the relationships hypothesized in figure 2 were constrained to equality over each time period (Model 2), and a third in which the hypothesized relationships were not only constrained to equality for each time period, but the time-lagged relationships between safety and injuries as well as the time-lagged relationships between injuries and Safety Climate were set equal to each other as well (Model 3). The comparison between Model 1 and Model 2 serves as a test of the stationarity assumption that beta weights do not vary significantly over time. A significant difference chi-square value between Model 1 and Model 2 supports the rejection of the stationarity assumption, and suggests that there are changes in the hypothesized relationships over time. The comparison between Model 2 and Model 3 is a test of whether the lagged regression coefficients are significantly different from each other, or a test of causal priorities. The goodness-of-fit indices and model comparisons for each of these competing models are summarized in Table 3. Each model

demonstrated fairly good fit. Although each had a significant chi-square value, all values of SRMR and RMSEA were below .09, and all values of TLI and CFI were between .95 and .96. A comparison between the first and second models was essentially a test of the stationarity of the time-lagged relationships, or, in other words, a test of whether the regression coefficients are invariant over time. For the relationship between Safety Climate and Injuires, a nonsignificant difference chi-square between Model 1 and Model 2 suggests that there is a stationary process. The chi-square difference test with 12 degrees of freedom was nonsignificant. To test whether perceptions of safety climate lead to injuries or the reverse, I next compared Model 2 to a model in which the lagged correlations between Safety Climate and injuries and between injuries and Safety Climate were constrained to equality. This allowed me to determine whether the effect of Safety Climate on injuries is significantly different than the effect of injuries on Safety Climate, and as such serves as a test of reverse causality. The chi-square difference results for this comparison were also nonsignificant; the effect of Safety Climate on injuries was not significantly different from the effect of injury rates on Safety Climate, which also suggests that the relationship is a reciprocal one. These results are summarized in Table 3.

Results for the relationship between Safety Climate and DLT were similar. A nonsignificant difference chi-square between Model 1 and Model 2 suggests that there is a stationary process for this relationship as well. The chi-square difference test with 12 degrees of freedom was nonsignificant. To test whether perceptions of safety climate lead to DLT or the reverse, I next compared Model 2 to a model in which the lagged correlations between Safety Climate and DLT and between DLT and Safety Climate were constrained to equality. This allowed me to determine whether the effect of Safety Climate on DLT is significantly different than the effect of DLT on Safety Climate, and as such serves as a test of reverse causality. The

chi-square difference results for this comparison were also nonsignificant; the effect of Safety Climate on DLT was not significantly different from the effect of DLT on Safety Climate. This suggests that this relationship is also a reciprocal one. These results are summarized in Table 4 The paths from Safety Climate to injury rates were significant and in the hypothesized direction (-.08). However, paths from injuries to Safety Climate were also negative and significant (-.08). This suggests that while the relationship is not one of reverse causality, it is a reciprocal relationship. Paths leading from Safety Climate at time 1 to Safety Climate at time 2 and so on were significant as well, but in a positive direction (.67). I also compared the paths leading from perceptions of Safety Climate to DLT and from DLT to Safety Climate. The paths from Safety Climate to DLT were non-significant (.01), as were the paths leading from DLT to Safety Climate (.01). Paths from DLT at time 1 and DLT at time 2 and between each subsequent administration were significant (.42). Finally, paths from DLT at time one to DLT at time 2 and so on were also significant and positive (.76). These results are summarized in Figures 2 and 3.

The reverse causality hypothesis was also evaluated using latent growth modeling (LGM), an example of which is shown in Figure 4 for five measurement waves. In line with the five-wave cross-panel design, a latent growth model (LGM) was specified that includes the latent variables Safety Climate and injury rates. My first step was to determine the best fitting model for each variable individually. As is typical, loadings for the first factor were fixed equal to 1.0 to represent initial status (IS), or the intercept of the latent change trajectory. The second factor's loadings in Figure 4 were also fixed so as to parameterize linear change (CH). The steps I followed in selecting an appropriate LGM for each focal variable were (a) determining whether change was linear or nonlinear over time (e.g., by relaxing constraints on the T4 and T5 CH factor loadings to be freely estimated), and (b) determining whether the FOF uniquenesses were

hetero- or homoscedastic (see Lance et al., 2000). The goodness-of-fit indices and model comparisons for each of these competing models are summarized in Table 5. The most appropriate LGM for Safety Climate was one in which change is linear and in which the FOF uniquenesses were homescedastic. Although the chi-square for safety with FOF uniquenesses modeled as heteroscedastic was slightly smaller (54.66) than that for Safety with FOF uniquenesses modeled as homoscedastic (58.84), the difference is slight, and thus the more parsimonious model was selected. LGMs for Safety with change modeled as being non-linear yielded improper solutions and thus were excluded from further consideration. The best fitting model for injury as the focal variable was one in which change was linear, but in which the FOF uniquenesses were heteroscedastic. Model fit for injury in which change was optimal and uniquenesses were either hetero- or homoscedastic yielded smaller chi-square values, but did not yield proper solutions. Finally, the most appropriate model for DLT as the focal variable was one in which change was linear and with FOF uniquenesses modeled as homoscedastic. Fit was not significantly better for the model in which was linear and uniquenesses were heteroscedastic, and so the more parsimonious model was selected.

Next a concomitant LGM was used as an additional test of reverse causality to examine the possible mutual effects of Safety Climate and injuries as well as Safety Climate and DLT across five different time periods. Significant paths from Safety Climate to injuries and non-significant paths from injuries to Safety Climate would suggest support for the generally accepted model which assumes that Safety Climate exerts a causal effect upon accident rates. Significant paths from injuries to Safety Climate and non-significant paths from Safety Climate to injuries, however, would suggest support for the reverse causality model. These same relationships were also

tested for the relationship between Safety Climate and DLT. Paths were not significant for any of the above relationships. While results for tests of reverse causality using a cross-lagged panel design were somewhat equivocal and suggestive of a reciprocal relationship between Safety Cimate and injuries and between Safety Climate and DLT claiming, results for the concomitant model suggest that there is no relationship between these variables.

Table 1

Means, standard deviations, and intercorrelations of study variables

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Saf-1	71.90	4.73	1.00														
2. Saf-2	73.24	4.89	.67	1.00													
3. Saf-3	73.67	4.53	.54	.72	1.00												
4. Saf-4	75.31	4.34	.60	.57	.66	1.00											
5. Saf-5	77.53	4.23	.46	.47	.44	.66	1.00										
6. Inj-1	15.61	8.04	-.13	-.16	-.07	-.18	-.24	1.00									
7. Inj-2	16.45	7.39	-.26	-.24	-.19	-.35	-.29	.61	1.00								
8. Inj-3	14.98	7.98	-.21	-.16	-.15	-.31	-.26	.38	.71	1.00							
9. Inj-4	11.69	5.83	-.20	-.15	-.15	-.28	-.23	.41	.75	0.76	1.00						
10. Inj-5	22.65	10.98	-.18	-.12	-.16	-.29	-.21	.40	.67	0.61	0.83	1.00					
11. DLT1	3.20	2.91	.06	-.02	.10	.22	.16	-.01	-.13	-0.06	-0.14	-0.20	1.00				
12. DLT2	2.59	2.63	-.03	-.02	.09	.09	-.08	.08	-.01	0.00	-0.11	-0.15	0.34	1.00			
13. DLT3	2.49	2.27	.06	-.18	.02	.10	-.06	.18	-.09	-0.01	-0.24	-0.21	0.42	0.39	1.00		
14. DLT4	2.47	2.57	.01	-.08	.09	.14	.04	.29	.07	0.08	-0.01	-0.06	0.27	0.41	0.48	1.00	
15. DLT5	2.80	2.61	-.07	-.03	.09	.13	.12	.20	.05	0.04	-0.04	0.00	0.45	0.27	0.45	0.44	1.00

Table 2

Completely standardized results of lagged analyses of safety and outcomes

Variables	Parameter	Variable	Parameter
Saf1 → Inj2	-0.89	Inj1 → DLT2	-0.30
Saf2 → Inj3	-0.06	Inj2 → DLT3	-0.02
Saf3 → Inj4	-0.12	Inj3 → DLT4	-0.02
Saf4 → Inj5	-0.31**	Inj4 → DLT5	0 .06
Saf1 → Inj3	-0.05	Inj1 → DLT3	-0.01
Saf2 → Inj4	-0.09	Inj2 → DLT4	0.00
Saf3 → Inj5	-0.15	Inj3 → DLT5	0.01
Saf1 → DLT2	-0.22		
Saf2 → DLT3	-0.49**		
Saf3 → DLT4	-0.19		
Saf4 → DLT5	0.18		
Saf1 → DLT3	-0.34*		
Saf2 → DLT4	-0.58**		
Saf3 → DLT5	0.01		
Jus1 → DLT2	-0.32*		
Jus2 → DLT3	-0.41**		
Jus3 → DLT4	-0.33*		
Jus4 → DLT5	0.02		
Jus1 → DLT3	0.53**		
Jus2 → DLT4	0.62**		
Jus3 → DLT5	0.10		

Table 3
Model Goodness-of-Fit Summary for Cross-Lagged Panel Analyses: Safety Climate and Injuries

Model	*df*	χ^2	SRMR	RMSEA	TLI	CFI	Δdf	$\Delta\chi^2$	ΔCFI
1. Model 1	30	70.01**	.08	.09	.95	.96	----	----	----
1 versus 2	----	----	----	----	----	----	12	17.39	.01
2. Model 2	42	87.40**	.09	.08	.96	.96	----	----	----
2 versus 3	----	----	----	----	----	----	1	.36	.01
3. Model 3	43	87.76**	.09	.08	.96	.96	----	----	----

Note. n = 134; *df* = model degrees of freedom; SRMSR = standardized root mean squared residual; RMSEA = root mean squared error of approximation; TLI = Tucker-Lewis Index; CFI = comparative fit index; *p < .05; **p < .01.

Table 4

Model Goodness-of-Fit Summary for Cross-Lagged Panel Analyses: Safety Climate and Days Lost Time

Model	*df*	χ^2	SRMR	RMSEA	TLI	CFI	Δdf	$\Delta\chi^2$	ΔCFI
1. Model 1	30	113.24**	.12	.13	.81	.87	----	----	----
1 versus 2	----	----	----	----	----	----	12	14.72	.01
2. Model 2	42	127.96**	.12	.12	.86	.87	----	----	----
2 versus 3	----	----	----	----	----	----	1	.51	.01
3. Model 3	43	128.47**	.12	.12	.86	.87	----	----	----

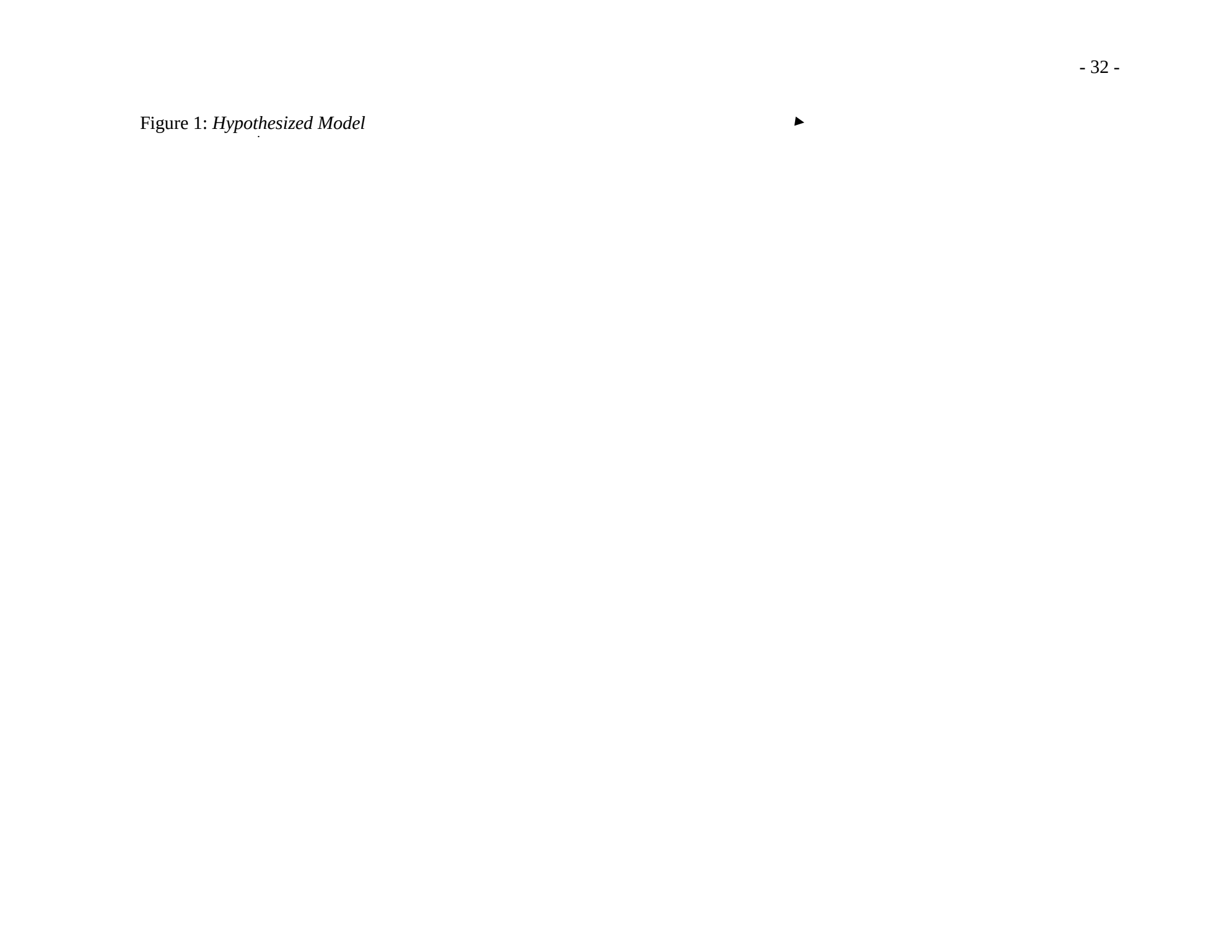
Note. n = 134; *df* = model degrees of freedom; SRMSR = standardized root mean squared residual; RMSEA = root mean squared error of approximation; TLI = Tucker-Lewis Index; CFI = comparative fit index; *p < .05; **p < .01.

Table 5
Model Goodness-of-Fit Summary for First Order Factor Latent Growth Model Comparisons

	Injuries			Days Lost Time			Safety		
Model	Proper	*df*	χ^2	Proper	*df*	χ^2	Proper	*df*	χ^2
1. Linear Heteroscedastic	Yes	10	289.05	Yes	10	12.63	Yes	10	54.66
2. Linear Homoscedastic	Yes	14	416.46	Yes	14	14.46	Yes	14	58.84
3. Optimal Heteroscedastic	No	7	38.27	Yes	7	3.75	No	7	41.32
2. Optimal Homoscedastic	No	11	170.19	Yes	11	6.20	No	11	50.34

Note. n = 134; *df* = model degrees of freedom; SRMSR = standardized root mean squared residual; RMSEA = root mean squared error of approximation; TLI = Tucker-Lewis Index; CFI = comparative fit index; *p < .05; **p < .01.

Figure 1: *Hypothesized Model*



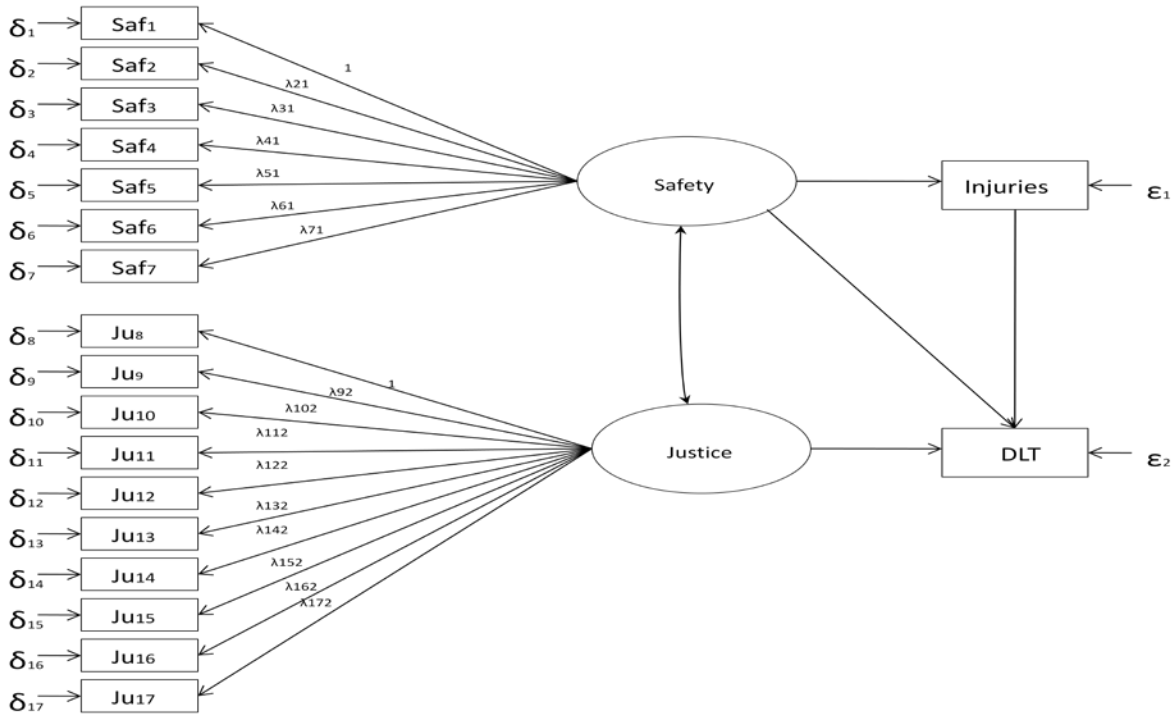

δ1
δ2
δ3
δ4
δ5
δ6
δ7
Saf1
Saf2
Saf3
Saf4
Saf5
Saf6
Saf7
1
λ21
λ31
λ41
λ51
λ61
λ71
Safety
Injuries
ε1
δ8
δ9
δ10
δ11
δ12
δ13
δ14
δ15
δ16
δ17
Ju8
Ju9
Ju10
Ju11
Ju12
Ju13
Ju14
Ju15
Ju16
Ju17
1
λ92
λ102
λ112
λ122
λ132
λ142
λ152
λ162
λ172
Justice
DLT
ε2

Figure 2: *Cross-Lagged Panel Used to Evaluation Reverse Causation: Safety Climate and Injury Rates*

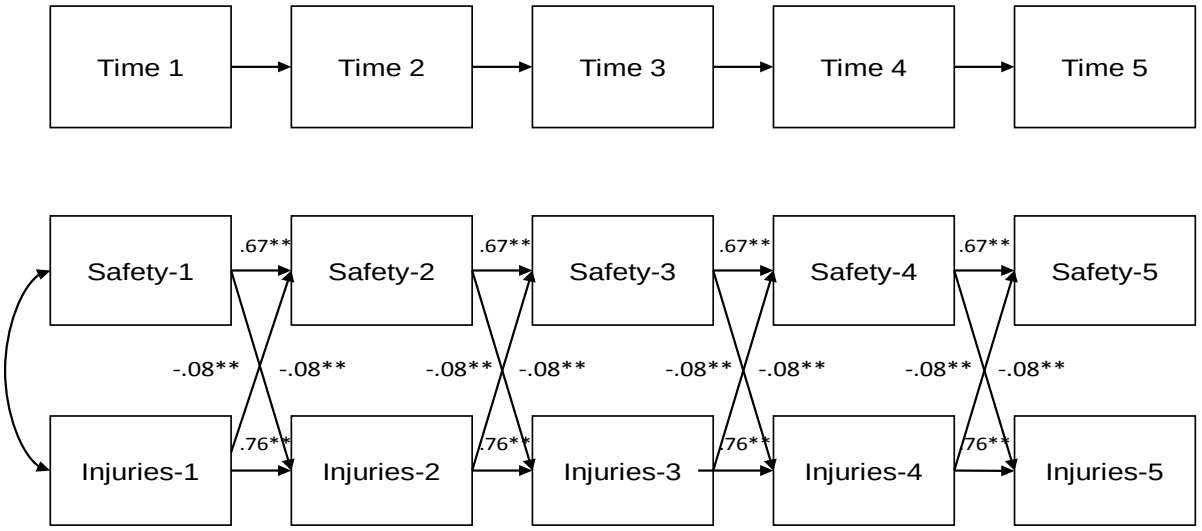

Time 1
Time 2
Time 3
Time 4
Time 5
Safety-1
Safety-2
Safety-3
Safety-4
Safety-5
Injuries-1
Injuries-2
Injuries-3
Injuries-4
Injuries-5
.67**
.76**
-.08**

Figure 3: *Cross-Lagged Panel Used to Evaluation Reverse Causation: Safety Climate and Days Lost Time Rates*

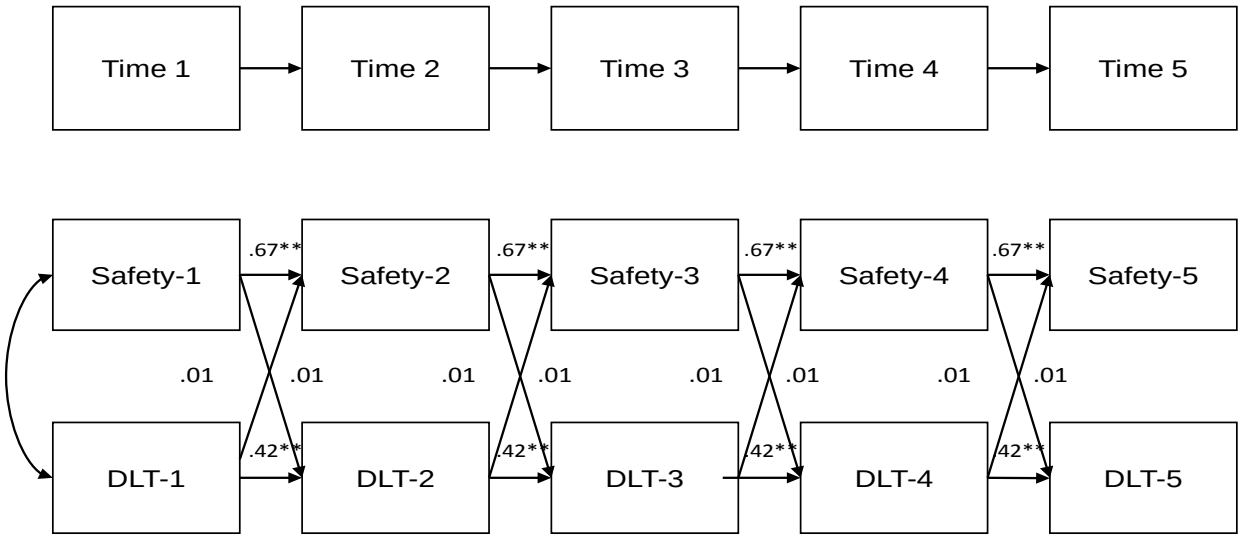
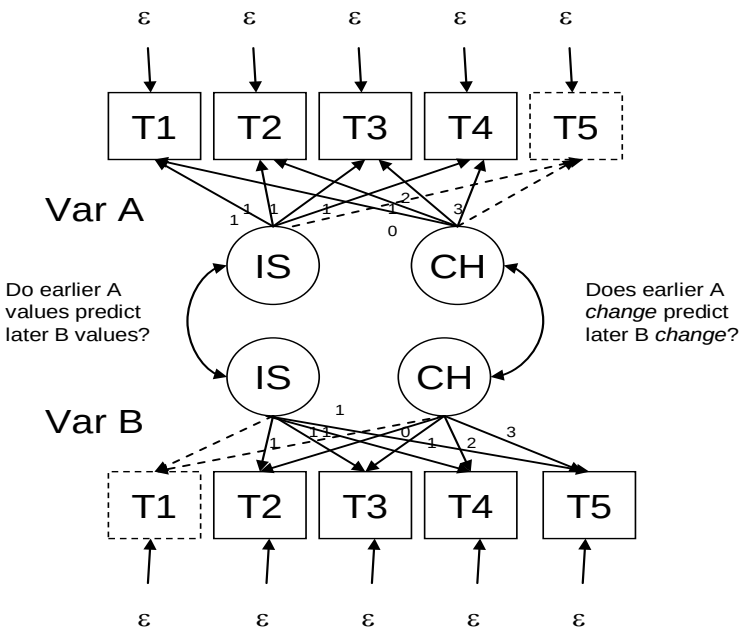

Time 1
Time 2
Time 3
Time 4
Time 5
Safety-1
Safety-2
Safety-3
Safety-4
Safety-5
DLT-1
DLT-2
DLT-3
DLT-4
DLT-5
.67**
.42**
.01

Figure 4: *Concomitant Latent Growth Model Used to Evaluate Reverse Causation* ►


ε ε ε ε ε
T1 T2 T3 T4 T5
Var A
IS CH
Do earlier A values predict later B values?
Does earlier A *change* predict later B *change*?
IS CH
Var B
T1 T2 T3 T4 T5
ε ε ε ε ε

CHAPTER 3

DISCUSSION

Despite the importance of the prevention and management of workplace disabilities for individuals, organizations, and society as a whole, surprisingly little research has been dedicated to the topic of occupational safety (Barling et al., 2002). This study sought to advance the literature by addressing a number of important questions. My first two hypotheses state that differences in perceived Safety Climate and in Informational, Interpersonal, and Procedural Organizational Justice will be demonstrated across subgroups within the same organization. Differences in Safety Climate and Organizational Justice were found across subgroups. Although safety policies and procedures are set at the organization level, managers are responsible for implementing those policies and procedures. These finding suggest that managers differ in the value they place on safety, and in their implementation of safety-related policies and procedures. This is important because managers may indirectly communicate to their employees that safety is not valued by the organization, and organizations should consider the possibility that safety policies and procedures may be being undermined by managers who fail to enforce them, or who prioritize other goals over safety. This finding is important because perceptions of safety have been found to predict outcomes such as accidents, micro-accidents, near-misses, and the severity of accidents as well as safety compliance (Barling et al., 2002). If organizations are able to influence perceptions of safety climate by influencing the actions of their

managers, they can reduce the number of accidents and injuries, as well as their associated costs.

Differences in perceptions of Organizational Justice were also found across subgroups, although employees at this organization did not distinguish between Informational, Interpersonal, and Organizational Justice. Although the justice literature has traditionally focused on specific justice dimensions, some research suggests that employees also consider justice as a whole (e.g., Ambrose & Arnaud, 2005; Greenberg, 2001; Hauenstein, McGonigle & Flinder, 2001; Lind, 2001; Shapiro, 2001). Holtz and Harold (2009) argue that there are compelling reasons to consider justice as a whole, including that overall justice may more accurately and parsimoniously reflect how employees experience organizational justice. Employees at this organization seem to experience organizational justice as a whole, and their experiences also vary depending upon which subgroup they belong to, which suggests that perceptions of safety climate are also largely influenced by one's manager rather than the organization.

My third hypothesis states that perceptions of Safety Climate at the subgroup level will be negatively related to injury rates. Results for this hypothesis were equivocal. Path estimates for this relationship were in the hypothesized (negative) direction, but nonsignificant for all but one of the time-lagged intervals. Because a negative relationship between Safety Climate and Injuries has both strong theoretical and empirical support, I also looked at the correlations between Safety Climate and Injuries. Several of the items used to measure Safety Climate did not correlate significantly with injury rates, though the remaining items showed

strong negative correlations. Given this, it appears that the items that were not operating as expected effectively reduced the overall effect of Safety Climate on injuries, rendering it nonsignificant. Because the data used were archival field data, not all of the items were taken from validated scales, and these findings are probably unique to this data set and these employees at this organization.

Findings for my fourth hypothesis were also equivocal. Path estimates between Safety Climate and DLT were in the hypothesized (negative) direction, but were nonsignificant for some paths and significant for others. Again, because there is strong theoretical and empirical support for these relationships, and because these data were not collected using items from validated scales, I am inclined to suspect that the reason for these findings is due to the idiosyncrasies of these data, rather than because these relationships do not exist.

Hypothesis five states that perceptions of Organizational Justice at the subgroup level will be negatively related to DLT. This hypothesis was not supported. There was in fact a significant relationship between perceptions of Organizational Justice and DLT for three out of the four one-year time lags, but this relationship was a positive one. Results over a two-year time lag were similar. While it is possible that these relationship are artifacts resulting from the use of items which are not from validated scales, this seems unlikely. Correlations between individual Organizational Justice items and DLT behaved consistently. In the one other study that I am aware of which investigate the relationship between organizational justice and workers' compensation claiming, Roberts and Markel (2001) found support for a negative relationship only between

interactional (informational and interpersonal justice) and claiming. Furthermore, perceptions of organizational justice were not collected until after an employee had been injured on the job, which is likely to have colored their perceptions of organizational justice. It is possible that only perceptions of informational and interpersonal justice, or just one of the two, negatively influence the number of DLT claimed by employees. However, perceptions of procedural justice have been found to be related to other important organizational outcomes (Konovsky & Cropanzano, 1991). It is also possible that employees may be more likely to return to work before they are fully ready in an environment in which perceived justice is low, because they may fear the consequences of claiming workers' compensation for days not worked due to injury. Employees in an organization with high levels of organizational justice may be less fearful of retaliation or the loss of their job, and may be more likely to take the full number of DLT that they feel are necessary because they are less concerned about the potential negative consequences for doing so. Finally, it also may be that the effects of injuries severe enough to require time off from work are strong environmental situations. As such justice perceptions may not exert the influence on outcomes that they might otherwise because employees' actions are constrained by factors such as the extent of their injury and economic need.

Finally, results also failed to show support for hypothesis six, which predicts a positive relationship between injury rates and DLT. None of the paths between injuries and DLT were significant for either a one-year time lag or a two-year time lag. While this hypothesis seems reasonable, it may be that there is a good

deal of variability in the number of DLT claimed per injury, and thus the degree of injury exerts more influence on the number of DLT claimed than the rate of injuries.

In addition to my hypothesis, I also tested post hoc analyses for reverse causality using a cross-lagged panel design. I compared a model in which each of the hypothesized relationships is constrained to equality over each time period to one in which injuries at time one is constrained to be equal to Safety at time 2 and Safety at time 1 is constrained to be equal to Injuries at time 2. This allowed me to test whether the effect of Safety on injuries was significantly different from the effect of injuries on Safety. The fact that the difference chi-square tests was nonsignificant suggests that the models do not differ significantly, and that the relationship between Safety and injuries is a reciprocal one, rather than that injuries are caused by perceptions of organizational safety.

Reverse causality was also evaluated using LGM. While results for the cross-lagged panel analyses are not unequivocal, they do suggest that the relationship between Safety Climate and Injuries is a reciprocal one. Results are not as clear for the relationship between Safety Climate and DLT, but there is some support for that relationship being reciprocal as well. Tests for reverse causality using LGM were less clear. If the assumed relationship exists, model paths from earlier values of Safety Climate to later values of injuries should be significant. However, they were not. If there were support for the reverse causality hypothesis, model paths from earlier values of injuries to later values of Safety should have been significant. These paths were not significant either. Findings for

the relationships between Safety Climate and DLT were similar; none of the causal relationships were significant. There was support for neither the assumed model relationship, nor for the reverse causality relationship in the LGM analyses.

Clearly these findings suggest that the question of reverse causality has yet to be answered conclusively. While the cross-lagged panel analyses showed some support for a reciprocal relationships between Safety Climate and injuries and days lost time claiming, the LGM analyses suggest that there is no relationship between these variables. While these findings may be due to anomalies with this particular data set, they do strongly suggest the need for additional research into the question of causality using longitudinal field data with objective outcome variables and with Safety Climate and Organizational Justice items taken from validated scales.

This investigation contributes to the literature in several ways. Despite the potential for society, organizations and individuals alike to gain from the prevention of workplace injuries, this topic has been surprisingly under-researched. Because organizations are likely to have at least some control over factors which affect both accident rates as well as subsequent decisions to file workers' compensation claims, it behooves organizations to develop a better understanding of the antecedents of both on-the-job injuries as well as workers' compensation claiming activity. This study highlights the importance of measuring justice perceptions across subgroups, and provides a theoretical framework for why differences might occur. If employees' perceptions of safety and justice vary across organizational subgroups, this suggests that these

perceptions can and are influenced by managers. This has important implications not only for safety, but also for a number of other important outcomes which have been found to relate to perceptions of organizational justice. Organizations may be able to influence both safety and justice perceptions, and thus organizational outcomes, by influencing the way mangers interact with their employees. This study also suggest that, barring any major organizational events such as a restructuring, employees within subgroups do not fundamentally change either their conceptualization or organizational safety or justice over time or the metric they use to asses these constructs. This was done by establishing measurement equivalence over time.

While the results of the hypothesized relationships between Safety and Injuries and DLT were equivocal, this is probably due more to the fact that the data were field data and items used to assess Safety were not from a validated scale than because relationships do not exist. The fact that a number of item correlations between Safety and injuries were significant and in the hypothesized direction suggests the need for additional longitudinal field research in this area using validated scale items. Additional research and theory are also needed to determine why the hypothesized relationship did not exist between Safety and DLT. It may be that other factors such the seriousness of injury are greater predictors of the number of workers' compensation DLT that are claimed. Additional research which controls for the seriousness of injuries would help in determining the antecedents of workers' compensation claiming.

The relationship between perceptions of organizational justice and the number of DLT claimed was significant, but in the opposite direction as hypothesized. Additional research is needed in this area as well. Similar to the relationship between perceptions of Safety climate and claiming for days lost from work, the seriousness of injuries may be a stronger predictor of the number of days claimed than justice perceptions. It is also possible that in an environment in which perceptions of organizational justice are high, employees may be willing to take the number of days necessary to fully recover from a work-related injury because they trust that they will not face retaliation for doing so.

Finally, additional research into the direction of the relationship between safety climate and injuries is necessary. This relationship was assessed by both a cross-lagged panel design as well as a lagged LGM in this study, but findings were equivocal, with the cross lagged panel design suggesting a reciprocal relationship.

There are a number of limitations to this study. The first and perhaps the most critical is the failure to use items from validated scales. This is not uncommon for studies which use field data, but the fact that items were not from validated scales likely had serious negative consequences for the results of this study. More longitudinal studies of both perceptions of safety and organizational justice are needed, but future field research should be conducted using items from validated scales. Another limitation of this study was the inability to connect individual safety and justice data to injury data. Individuals who are injured on the job may experience a fundamental shift in their conceptualization of organizational justice

and safety. Additionally, all of the data for this study were collected from employees in a limited number of job groups at one specific organization, and thus findings may be endemic to the employees of this organization, and may not generalize to other organizations. Finally, I was not able to control for a number of factors which may have influenced the results of this study. Perhaps most importantly, the extent of injury may have been a greater determinant of the number of DLT claimed by employees than either perceptions of safety climate or organization justice were. Economic need may also be a determining factor, as might individual differences. However, the limitations of using archival data precluded an investigation into these potential antecedents.

In conclusion, the results of this study clearly suggest that perceptions of organizational justice and safety differ across subgroups, which has important implications for organizations. Although safety policies and procedures are decided at the organizational level, they are implemented by managers, and how they are implemented appears to have a greater influence on how employees perceive safety culture than does formal policy. Findings also suggest that additional research and theory building are necessary to determine the antecedents of workers' compensation claiming. Finally, the findings of this study support the need for additional research into the nature of the relationship between safety climate and injuries. Findings for the tests of reverse causality were equivocal, suggesting that we should not have complete confidence in the assumption that a poor safety climate causes injuries. This relationship may in fact be reciprocal. Both the antecedents of safety outcomes as well as the direction of the relationship between safety perceptions and these outcomes warrant further research.

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