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The social aspects of safety management: Trust and safety climate

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ABSTRACT

This study tested the contribution of trust between leaders and subordinates to safety. It is suggested that leaders who create a relationship of trust with their subordinates are more likely to create a safe working environment, and to achieve higher and stronger safety-climate perceptions among their subordinates. Hence, trust should be negatively related to injuries and positively related to safety climate. Questionnaires distributed among 2524 soldiers in three army brigades tested for trust and safety-climate variables and were then crossed with injury rate according to medical records at the platoon level of analysis ($N = 105$). Trust was found to be negatively related to injuries and positively related both to level and strength of safety climate. Furthermore, safety-climate level was found to mediate the relationship between trust and injury rates. Theoretical and practical implications are discussed.

1. Introduction

A large part of the literature and knowledge about safety concentrates on technical elements, sometimes referred to as "safety engineering". Previous works essentially argue that, in order to prevent accidents, one must eliminate risks from the physical environment (e.g. Woodside and Kocurek, 1997). In spite of great advances in safety engineering, accidents are never totally eliminated, and it is now clear that human behavior within the physical environment is a crucial factor in accident prevention. Behavior not according to safety regulations prevails during many routine jobs because of the short-term perceived benefits of unsafe behavior (such as comfort, time), which are assigned greater psychological weight in human decision making than the risk of accident (Barron and Erev, 2003; Erev, 1998). Safe behavior is thus an ongoing managerial challenge (Zohar, 2002).

Failure to use the protective gear provided at the workplace accounts for about 40% of work accidents, and this statistic has not changed in more than 20 years despite ongoing efforts (Nationsl Safety Council, 1999). This re-occurring risky behavior has been shown to be sensitive to managerial activities. In several intervention studies Zohar (2002), and Zohar and Luria (2003) have shown significant decrease in failures to use protective gear in departments where the direct manager interacts frequently with his or her employees about safety issues.

Aiming for better understanding of the human behavior component and the role of the manager in safety, a growing body of research concentrates on psychological variables and their relationship with safety behavior. Two important contributions of this body are that: (1) quality of social relationship between managers and employees contributes to employee safety (see for example Zohar, 2002; Wallace et al., 2006). These social variables include transformational leadership (Zohar and Luria, in press), and high quality of social relationship (Geller, 1991). (2) Facet-specific safety variables are related to safety outcomes. Implicit in this approach is that the psychological variables can be limited to specific organizational facets or domains (e.g. climate for service, innovation, ethics, safety; Schneider et al., 2000). That is, psychological variables should have a strategic focus (in this case safety). Such facet-specific safety variables include: safety climate (Clarke and Ward, 2006; Luria, 2008; Neal and Griffin, 2006; Zohar and Luria, 2004, 2005), safety leadership (O'dea and Flin, 2001; Barling et al., 2002), etc.

The safety-specific variables have proven to be valid predictors of safety outcomes. For example, a meta-analysis of safety climate identified significant relationships between safety climate and outcomes such as employee safety behavior and accident/injury rate (Nahrgang et al., 2007), while safety-specific transformational leadership predicted occupational injuries (Barling et al., 2002). Theoretically, facet-specific safety variables reflect the centrality of safety in an organization and therefore influence the behavior of organizational members (Zohar and Hofmann, in press).

In sum, studies of human safety have shown that where a safety is a central goal for managers/management in an organization, and when a good social relationship exists between managers and employees, members of that organization are less likely to be involved in accidents. In this study we aim to integrate these two lines of research and examine trust as a fundamental building block in the relationship (Mayer et al., 1995; Tzafrir and Dolan, 2004), together with safety climate as a safety-specific variable (Zohar, 1980). Thus we explore trust between subordinates and leaders

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as antecedent for the promotion of safety within an organization, focusing on safety climate as the mediator between social relationships and safety outcomes.

1.1. Trust in the leader and safety

Trust is defined as "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another" (Rousseau et al., 1998, p. 395). Similarly, McAllister (1995) defined interpersonal trust between managers and workers in organizational settings as the "individual's belief in, and willingness to act on the words, actions, and decisions of another" (p. 25). The individual's trust in the leader is thus likely to influence his/her perceptions and behavior. In relationships between a leader and followers, and in predicting unit performance the trust variable was also conceptualized at a higher level of analysis, i.e. the group level (see for example Simons and Peterson, 2000; Dirks, 2000; Webber, 2002). Accordingly, it is assumed that level of trust in a leader is shared by members of a group, and that when different members experience interactions with a trustworthy leader, high trust levels should emerge within the group.

Trust is thus an indicator of the quality of social exchange, in which many theories of trust are grounded (Blau, 1964; Whitener et al., 1998). According to social exchange theory, gradual expansion of exchanges over time creates trust (Blau, 1964). Previous studies stress that, within social exchanges, trustworthy behavior consists of such actions such as showing consideration and sensitivity towards others and towards situations (McAllister, 1995). The quality of the social exchange relationship between leader and subordinates influences the leader's concern for subordinates' well-being (Austin and Vancouver, 1996). This is also consistent with the concept of the reciprocity that leaders develop with their subordinates (Yukl, 1998). In situations involving risk of injury, it also pertains to physical wellbeing and safety (Hofmann and Morgeson, 1999).

Group leaders who have a trusting relationship with subordinates should be concerned for their wellbeing and consequently practice better safety. For example, they should resist short-term production pressures which are often met at the cost of compromising subordinates' safety (Pate-Cornell, 1990). Eventually, leaders will create safer work conditions for subordinates, as demonstrated in previous studies in which high quality of social relationship was found to promote safety (Geller, 1991) and health (Heaphy and Dutton, 2008).

In this study we sampled soldiers in operational units. These soldiers are exposed to many safety risks, having to work day and night in outdoor conditions, using weapons and live ammunition, driving armored vehicles, etc. They mostly operate in platoons under the command of their platoon officer, who is also in charge of managing and monitoring safety in the platoon. Some officers develop better trust relationships with their subordinates, and it is predicted that these commanders will care more about the safety of their subordinates, who would consequently suffer less injury.

Hypothesis 1. Trust in the leader will be negatively related to injury rate.

1.2. Mediating effect of safety climate on the trust and injury rate relationship

The main reason for interest in trust is the conviction that it has significant impact on a variety of organizational outcomes (Dirks and Ferrin, 2002). This said, a review of the consequences of trust in leaders drew no conclusive findings concerning behavioral and performance variables, although some consistent evidence of relationship with attitudinal variables was found (Dirks and Ferrin, 2001). One such variable is climate, i.e. shared perceptions among members of an organization concerning the procedures, practices and kinds of behaviors that get rewarded and supported with regard to a specific strategic focus (Schneider, 1990). Searching for methods of improving safety, researchers also examined the impact of trust on safety outcomes. Slovic (1993) found that trust plays an important safety-related role by influencing communication of risk. Reason (1997) suggested that trust promotes safer behavior and reduces accidents in the workplace.

Though research into the link between safety climate and trust is still sparse, one can learn about it via the related concept of safety culture. Analysis of the 54 definitions of culture revealed that culture is a system of shared norms, beliefs and values that shape the way of doing things in an organization (Verbeke et al., 1998 p. 313). Zohar and Hofmann (in press) explained the link between climate and culture and suggested that organizational climate can be viewed as a bottom-up indicator of underlying core values and assumptions that form an organization's culture. Therefore, as suggested by Ostroff et al. (2003), climate can be viewed as a cognitive mechanism for the interpretation of culture by organizational members (Ostroff et al., 2003). These explanations of the relationships between climate and culture are consistent with Denison's (1996) insistence that culture and climate overlap.

Studies that measured safety culture and safety climate reported a positive relationship between the two (Luria and Rafaeli, 2008). According to Reason (1997), trust plays an important role in promoting a safety culture in which employees can report incidents without fear of being blamed for them, and feel that they can modify organizational safety hazards if necessary. Two recent studies show results that support the central role of trust in safety culture (Jeffcott et al., 2006; Cox et al., 2006). Cox et al. (2006) reported the results of two case studies. The first was in a nuclear organization in which the high levels of internal trust encouraged employees to take responsibility for safety within the organization and to develop an effective safety culture based on reporting safety events and learning from those events. In the second case (an offshore organization), low trust relationships between stakeholders were shown to have negative impact on safety culture, and to reinforce blame culture in which employees do not report safety-related information.

Trust thus promotes care for the safety of subordinates (see Hypothesis 1), while the safety climate model denotes managerial commitment to safety (Zohar and Luria, 2005). Climate is comprised of shared perceptions among organizational members concerning policies, procedures, practices, indicating which kinds of behavior are rewarded and supported with regard to specific strategic foci (Schneider, 1990). The core measure is *safety-climate level*, defined as the mean climate score of a group, aggregating individual perceptions to the required level of analysis (Reichers and Schneider, 1990). A high level of safety climate indicates high priority of safety in a unit (Zohar, 2000; Zohar and Luria, 2004). For example, when organizational members perceive that safety is highly important in their unit, each of them will report high levels on the safety climate scale, and the overall mean unit score (averaging all items and members of a unit) will be high.

It is proposed that in organizations or units in which a relationship of trust exists between leaders and their subordinates, high safety climate is more likely to emerge. The positive relationships between trust and safety climate are predicted because (as explained in Hypothesis 1) trust should be related to safety practices of the leader (Zohar and Luria, 2004). In other words, subordinates perceive the importance of safety by paying attention to leaders' decisions emphasizing the importance of safety. Hence, leaders who develop a high-trust relationship with their

subordinates will practice better safety, which will, in turn, influence subordinates' safety-climate perceptions. For example, Zacharatos and Barling (2004) suggested that trust should mediate the relationships between organizational practices (such as information sharing, training, contingent compensation) and occupational safety performance. Studies of perception variables that are similar to that of safety climate, such as perceptions of safe work environment, were found to be correlated with trust in the leader (Watson et al., 2005).

Safety climate literature offers an explanation for the link between trust and safety outcomes by presenting clear links between safety climate and behavioral and performance variables such as injuries (Barling et al., 2002; Zohar and Luria, 2004, 2005; Zohar, 1980, 2002). This link can be explained as follows: safety-climate perceptions are a source of facet-specific behavior-outcome expectancies (Zohar, 1980, 2000). That is, when members of an organization perceive that safety is important and central in the organization (high safety climate), they perceive that they will be rewarded for behaving in a safe manner, while on the other hand they anticipate negative organizational outcomes for unsafe behaviors.

Such expectations influence behavioral decision making, and are the cognitive determinants of motivation (Bandura, 1986; Vroom, 1964) regarding safe/unsafe behavior. In other words, they should lead to each organizational member feeling that it is psychologically beneficial to behave safely and therefore conducive to higher frequency of safe behaviors in the organization. Since human behavior is the prime reason for occupational accidents (Nationsl Safety Council, 1999), high safety-climate levels should reduce injuries by reducing unsafe behaviors.

Trust is thus related to higher safety climate, which in turn is related to safer behavior and fewer injuries. We hypothesize a partial mediation because trust is related to safety not only by the mediating effect of safety climate. As explained earlier, trust can be linked directly to injuries (see Hypothesis 1). When a leader cares for subordinates s/he will promote a safe working environment, eliminating risks on one hand, and conveying the message that safety is important.

Hypothesis 2. Safety-climate level will partially mediate the relationship between trust and injury rates.

1.3. Trust and climate strength

A second attribute of climate is *strength*, i.e. consensus in climate perceptions (Schneider et al., 2002). This climate strength is usually *weak* or *strong*. Climate strength was originally a validating criterion for aggregating individual-level climate perceptions to group level, as in Chan's (1998) direct consensus composition model, according to which climate level as a construct can be used only when sufficient homogeneity exists (Klein et al., 2001). According to James et al. (1984), climate exists in a group only if r_{wg} scores are higher than 0.7. Chan (1998) also discussed dispersion models concentrating on within-group variability. Recent studies have used dispersion models (Schneider et al., 2002; Zohar and Luria, 2005; Luria, 2008; Gonzalez-Roma et al., 2002) to demonstrate that the level of heterogeneity (climate strength) varies between groups, and that this variability is meaningful. Schneider et al. (2002) adopted the view that justification for aggregation (homogeneity) does not imply total lack of within-group variance (see also Bliese and Halverson, 1998; Luria, 2008; Zohar and Luria, 2005). Climate strength is also a moderator in the relationship between climate level and performance, predicting a stronger relationship in strong climate conditions (Schneider et al., 2002). Thus, in order to improve safety in organizations, climate should be both high level and strong.

Climate strength is a function of group members' perception of and relationship with their leader, so that trust in the leader can be regarded as an antecedent of climate strength. That is, because the quality of the relationship with the leader is related to the effectiveness of communication between leader and group members, it is likely that high levels of trust will increase the influence of the leader on members' perceptions, eventually creating homogeneity within the group.

Other variables that indicate quality of relationship and communication were found to be related to agreement in climate perceptions (climate strength), and demonstrate the hypothesized line of reasoning.

For example, based on vertical dyad-linkage theory, and using the negotiating latitude (NL) score, Kozlowski and Doherty (1989) found correlation between quality of relationship between leaders and subordinates and climate strength. The NL score measures the role-making variable signifying the nature and quality of a relationship developed through reciprocal interaction (Graen and Scandura, 1987). Kozlowski and Doherty (1989) also found that high NL scores are correlated with climate strength, explaining that the nature and quality of interactions with leaders are perhaps the key filters of interpretation that provide the basis for subordinates' climate perceptions.

Another example is quality of communication. One of the leader's roles is to mediate the link between organizational features, events, and processes, and subordinates' perceptions of the context (Kozlowski and Doherty, 1989). Gonzalez-Roma et al. (2002) found a positive correlation between leaders' conveyance of information and climate strength; and that by communicating with their followers, group leaders serve as interpretive filters of work-unit events and processes, thus promoting within-unit consensus.

Also in support of the proposed hypotheses, trust is an essential factor in communication (Dirks, 1999; Kimmel et al., 1980), having a positive effect on openness and information exchange (Kimmel et al., 1980; Zand, 1972), and involving conviction that the information communicated is accurate (Roberts and O'Reilly, 1974; Dirks and Ferrin, 2002; Fulk et al., 1985). We suggest that, like the above-mentioned quality of relationship variables, if trust exists between a leader and followers, the leader will become a 'filter' of the organizational environment for his/her subordinates and thus promote consensus. In other words, the leader's communications about safety issues will be accepted by followers, and similar perceptions are more likely to emerge within groups under such a high-trust relationship. On the other hand, under low levels of trust, safety information communicated by the leader will be interpreted by each follower, thereby creating different perceptions within a group (weak climate).

Filtering is important in regard to safety. Clarke (1999) discovered that management and employees alike underestimate the importance of safety to others, and argued that, when there is greater trust, employees appreciate instances of management taking safety seriously. This is especially relevant to safety climate. Zohar and Luria (2004) suggested that employees evaluate whether the espoused safety priorities in their organization are really enacted. Employees evaluate information about importance of safety in an organization, and in order to rely on the leader, who acts as the filter between them and the organizational environment, the employees must trust that leader.

Thus, trust in the leader should promote consensus by influencing the quality of communication. The quality of information is associated with the extent to which subordinates believe that the information supervisors communicate is accurate. Conversely, if a leader is not trusted, the information s/he communicates may be interpreted as not reliable, and within-group agreement is unlikely, suggesting that trust should be positively related to

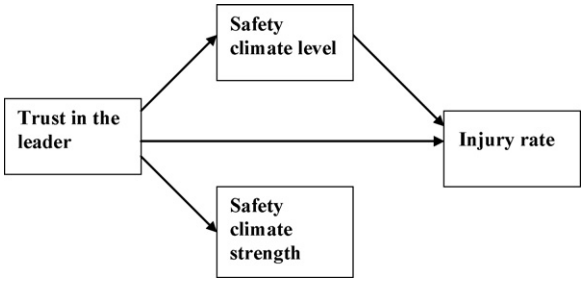

Fig. 1. Proposed theoretical model of this research.

climate strength. In our sample, soldiers see their platoon commander on daily basis; part of the platoon commanders' duty is to conduct safety briefing before every military maneuver. Since commanders frequently communicate safety to the soldiers, it is predicted that these communications will be more effective under high-trust relationship and eventually lead to similar perceptions among the soldiers themselves.

Hypothesis 3. Trust will be positively related to climate strength.

The theoretical model is presented in Fig. 1.

2. Method

2.1. Participants

The all-male participants included 2024 infantry and 500 armored-brigade soldiers (in 105 platoons), 18–21 years old, members of the Israel Defense Forces (IDF). The sample included an armored brigade, a paratrooper brigade, and an infantry brigade, all engaged in various non-combat duties in different geographical locations. All the soldiers were drafted after finishing high school, and underwent basic military training before completing specialized training as infantry soldiers or tank crews. The platoon commanders are junior officers, 20–23 years old (slightly older than the soldiers). As part of their officer training they agreed to extend their military service by at least 1 year.

The setting was chosen because of the high levels of risk in the military operations, and thus the relevance of safe behavior. Soldiers operate heavy machines (e.g. tanks and armored vehicles) in outdoor conditions, work with explosives and live ammunition, etc. Statistically, the risks of injury, was found to be higher than fighting the enemy, and casualties due to accidents exceed those incurred in battle (Center for Army Lessons Learned, 1999). The necessity for behavioral safety is very relevant to a military organization, because soldiers may be called on operate in outdoor conditions that change constantly, making it difficult to control for risks in the physical environment, and making it even more necessary to concentrate on safe behavior in order to prevent accidents.

The military is a vast, hierarchical organization scattered over a large geographical area. The leader or commander of a unit is the central channel for conveying organizational communications. The platoon commanders frequently brief their soldiers about the goals and orders communicated to them from higher command. Therefore, the quality of relationships between commanders and soldiers is an essential factor in how soldiers perceive their organization, and about the relative importance of facets such as safety in the organization.

2.2. Procedure

Safety climate and trust questionnaires were completed and collected, supervised by members of the research team, but not in the presence of officers. Due to previous studies that found significant relationships between leadership and safety climate (Zohar, 2002), and between trust and leadership (Shamir et al., 1998), a short leadership scale was added for control in order to ensure that trust relationships with safety climate and injuries overrule the effect of leadership. More than 90% of soldiers completed the questionnaire. Respondents were asked to record their military ID number in order to match them with injury records for analysis. The research team guaranteed absolute confidentiality, and all questionnaires collected (92%) included ID numbers. Group affiliation was added later, based on where the questionnaire had been completed. The safety-climate measure was tested and validated in earlier studies with the same data—part of a large Israel Defense Forces (IDF) research project (see Zohar and Luria, 2004; Luria, 2008).

The questionnaires were aggregated to provide a mean score for each platoon—the basic army unit. A platoon is a clearly defined group averaging 24 soldiers. Three or four platoons comprise a company; three or four companies comprise a battalion; three battalions comprise a brigade. All analyses in this study were done at platoon level, therefore the valid N is the number of platoons (105). Because all members of the group perceive the behavior of the same leader, group level is the appropriate level of analysis. Moreover, the aggregated unit construct is a more reliable measure of unit (group) level constructs than any single rating from a unit member (Bliese, 2000). To test whether the platoon could be reliably differentiated on the constructs (trust and climate) ICC(2) values were estimated (Bliese, 2000). The ICC(2) values ranged from 0.71 to 0.81, meeting the 0.6 cutoff recommended by Glick (1985), and are thus acceptable. In addition, ICC(1) values are in the range suggested by Ostroff and Schmitt (1993) for group-level variables.

Both trust and safety climate were measured from the same source (soldiers), and therefore common method bias may accrue. A Confirmatory factor analysis (CFA) was conducted according to Harman's single-factor test in order to diagnose the extent to which common method variance might be a problem. A comparison between a one-factor model with all items, and a two-factor model (safety climate and trust as separate factors) revealed that the two-factor model provided better fit for the data, and in all the CFAS' fit measures (e.g.: CFI1 = 0.729, CFI2 = 0.79; NFI1 = 0.708 vs. NFI2 = 0.767). The differences were found to be significant by comparing the chi-square values and degrees of freedom of both models (difference chi-square score 683, df 1, $p < 0.001$). According to these results, no evidence for common method bias was found in the data.

2.3. Measures

Trust was measured with a 3-item army scale (Yagil, 1990), accompanied by a 5-point scale ranging from 'Completely Agree' to 'Completely Disagree'. Sample items included: 'I trust my commander's decisions during real combat missions'. This scale describes soldiers' willingness to act on the basis of the words, actions, and decisions of their platoon commander, as suggested by McAllister (1995). It resembles the themes in civilian trust scales such as the Mayer and Davis (1999) scale, which concentrates on trust in management. The primary difference between the two is that the measure used in the present study (Yagil, 1990) relates major trust concepts to military activities, whereas the Mayer and Davis (1999) scale concentrates on managerial trust themes. Alpha-reliability coefficient of this scale was 0.87. In line with past multilevel research (Curral and Inkpen, 2002; Davis et al., 2000), trust in the leader was measured at the group level. As noted earlier, this is consistent with other trust studies (Dirks, 2000; Mach et al., in press) and Rousseau's suggestion (1985) that level of analysis should be the focal unit of the study. Focusing on group level is important because all the other variables (safety climate, injury rate, lead-

Table 1
Descriptive statistics and correlations of aggregated data.

Variable	*M*	SD	1	2	3	4
1. Trust	3.8	0.88				
2. Safety-climate level	3.89	0.56	0.48***			
3. Safety-climate strength	0.76	0.19	0.46***	0.35***		
4. Injury rate	5.53	3.56	−.17†	−0.1	−0.21*	

Sample size $N = 105$.
† $p < 0.1$.
* $p < 0.05$.
*** $p < 0.001$.

ership) are measured in the group level. Furthermore, all group members were asked about the level of trust in the same leader, and it is logical that they would be similar. Group level aggregation is supported by aggregation statistics: ICC1 = 0.26, ICC2 = 0.81.

Group-level safety climate was measured on a 25-item questionnaire (Zohar and Luria, 2004) completed by the soldiers, accompanied by a 5-point rating scale ranging from 'Completely Agree' to 'Completely Disagree'. The items referred to a range of supervisory safety practices and organizational events associated with operational duties. Sample items included: 'My commander is strict about safety procedures, even during extended field activities'. Alpha-reliability coefficient of this scale was 0.84.

Climate strength was computed by applying the $r_{wg(j)}$ homogeneity statistic (James et al., 1993) to individual scores on these items, so that higher within-group homogeneity represents a stronger climate. This statistic is considered the most appropriate index of climate strength (Lindell and Brandt, 2000).

Injuries were recorded by the infirmary medical staff according to standard military procedures. A military doctor screened the records according to the following criteria: injury suffered during operational activity; of sufficient severity to discount unjustified visit to the infirmary; due to behavioral (vs. technological or environmental) reasons. The recording period lasted 6 months, commencing after all questionnaires from the sample had been collected. *Injury rate* was computed as the total number of platoon injuries meeting the above criteria over the 6-month period, divided by group-size.

Control variable leadership was measured with the Multifactor Leadership Questionnaire (MLQ-5X-Revised: Bass and Avolio, 1997), using the 9-item transformational leadership questionnaire (TL, Alpha = 0.89, ICC1 = 0.25, ICC2 = 0.80). The scale was completed by all soldiers, using a 5-point rating scale ranging from 'Completely Agree' to 'Completely Disagree'. A high score on the transformational leadership scale indicates a high degree of transformational leadership behaviors.

3. Results

The climate measures used in this study had previously been validated on the same sample by Zohar and Luria (2004). Homogeneity of climate perceptions was assessed with r_{wg} (James et al., 1993), intra-class correlation (ICC[1]), and reliability of mean (ICC[2]; James, 1982). Glick (1985) argued that the aggregation of individual responses requires an above-threshold consensus ($r_{wg} > 0.70$, assuming uniform null distribution). Results suggest acceptable homogeneity, i.e. median $r_{wg(j)} = 0.82$, ICC[1] = 0.19, ICC[2] = 0.74. Although some groups did not meet Glick's criterion, they were included in the analysis of the hypotheses, using the r_{wg} as a dependent variable. This is consistent with Lindell and Barant's (2000) suggestion that homogeneity statistics reflect the extent of consensus (e.g. climate strength) and should not be considered as aggregation criteria.

Descriptive statistics and correlations of aggregated data are provided in Table 1. Because the sample included platoons nested within companies, which are nested within brigades, which are nested within battalions, multilevel modeling was utilized after checking that no significant battalion-level variance was found in between-group variance, with nested analysis of variance (ANOVA) models. This was done with SAS Mixed Procedure, using a level-nested random-effect model (Littell et al., 1996), which is appropriate for samples in which several levels of analysis exist. A composition model was used to aggregate data from individual to group level, taking into consideration the group to which the individual belongs (Chan, 1998). Although only one level of analysis was used (platoon level), it was necessary to use multilevel analysis because reciprocal effects exist between levels which must be controlled for. Higher levels (battalions, brigades) can influence the lower, platoon level, and vice versa. The mixed model, in contrast to simpler regressions or correlations, controls for the slopes and intercepts of other levels within the model, and therefore is better suited for analyzing nested data (for more detailed discussion of nested data see Castro, 2002).

As shown in Table 1, climate strength was positively correlated with climate level ($r = 0.35$, $p < 0.001$). Trust was positively correlated with climate level ($r = 0.48$, $p < 0.001$) and strength ($r = 0.46$, $p < 0.001$). Injury rate was negatively correlated with climate level, but with only marginal significance ($r = -0.17$, $p < 0.1$). Injury rate was also negatively correlated with climate strength ($r = -0.21$, $p < 0.05$).

Hypothesis 1 predicted that trust would be negatively related to injury rate. The results support the hypothesis after controlling for transformational leadership ($\beta = -0.35$, $R^2 = 0.05$, $p < 0.05$). These results are also aligned with Reason's (1997) premise that trust is an essential condition in safety management.

Hypothesis 2 predicted that climate level would partially mediate the relationship between trust and injury rates. A mediation model was tested, using a procedure based on Baron and Kenny (1986). To confirm mediation, trust in the leader must predict climate level and injury rate, and the relationship between trust and injury rate must be significantly reduced after controlling for climate level.

Results presented in Table 2 show that: (a) trust predicted injury rate ($\beta = -0.35$, $R^2 = 0.05$, $p < 0.05$); (b) trust predicted safety-climate level ($\beta = -0.16$, $R^2 = 0.15$, $p < 0.001$); and (c) the effect of trust on injury rate was reduced after controlling for safety-climate level ($\beta = -0.13$, n.s., climate level: $\beta = -1.44$, $R^2 = 0.19$, $p < 0.001$). These results suggest full mediation, and do not support partial mediation. It is evident that trust in the leader is related to high climate level, which in turn is related to better safety performance. To the best of the authors' knowledge, such mediation has not been tested previously.

Hypothesis 3 predicted a positive relationship between trust and climate strength. The results presented in Table 2 supported the hypothesis, and trust was found to be positively related to climate strength after controlling for transformational leadership (trust: $\beta = 0.06$, $R^2 = 0.21$, $p < 0.05$). To the best of my knowledge, the trust–safety-climate strength relationship has not been tested before.Fig. 2 presents a model summarizing the main results.

Table 2
HLM models of mediation using a 3-step procedure derived from Baron and Kenny (1986); safety-climate level as mediator of trust and injuries relationships.

Variable	Dependent	Mediator
Step 1	β	β
Trust–injury	−0.35*	
$R^2 = 0.05$		
Step 2		
Trust–CL	−0.16***	
$R^2 = 0.15$		
Step 3		
Trust–safety-climate level–injury	−0.13	−1.44***
$R^2 = 0.19$		

Sample size $N = 105$.
* $p < 0.05$.
*** $p < 0.001$.

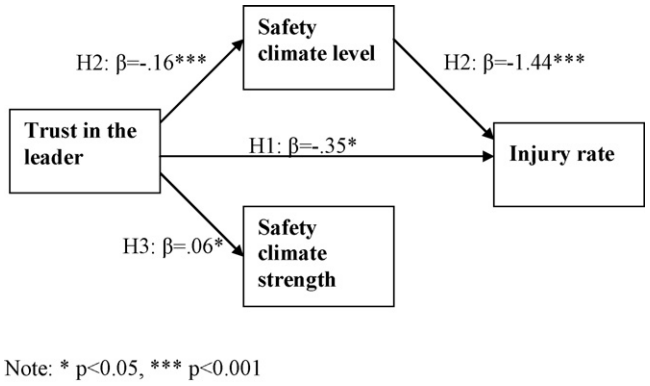

Fig. 2. Summary of the support found for the research hypotheses (the values are the mixed-models regression estimates). Note: $^{*}p < 0.05$ and $^{***}p < 0.001$.

4. Discussion

The intention of this study was to test the role of trust between leaders and subordinates in regard to safety. The study is based on the premise that reciprocal trust between leader and followers will influence the safety practices of the leader. Thus, leaders having a high-trust relationship with their subordinates should create a safer environment for them. Eventually, employees will also perceive the importance of safety to their leader, as evidenced by his/her safety practices. Such perceptions are defined as safety climate, which is known to be conducive to fewer injuries. The study demonstrates that employees are also influenced by the trust relationship, so that they believe the information communicated to them by their leader, and ultimately a strong safety climate emerges. This suggests both a model in which climate level partially mediates the relationship between trust and injury rate, and that trust is also related to climate strength.

The results provide support for direct relationships. Trust was found to be negatively related to injury rate and positively related to safety-climate strength. However, safety-climate level fully mediated the trust–injury rate relationship (and not partially, as hypothesized). A possible reason for full mediation may be the military setting of this study. Military leaders are less involved in improving the physical environment because they are not permanently located (a platoon may operate in different location every day). Therefore, they may be more focused on controlling the behavior of the soldiers than on controlling work conditions.

It is important to note that according to Barling et al. (2003) there may be a reverse causal relationship to that of the current study. That is, accident occurrence is an *antecedent* of distrust in the leader rather than the outcome of trust or distrust in her/him. Trust and safety climate were measured at the same point in time and from the same source (soldiers), thus it is possible that safety climate is an antecedent of trust. The strength of the current study regarding these causalities is its reliance another source—injury rate collected by medical staff for 6 months following the trust measurement. Although Barling et al. (2003) used data from a single source, their results and logic call for further research based on injury data collected before measuring trust.

Conchie and Donald (2008), add to the understanding of the relationship, and challenge the positive direction of the relationship between trust and safety outcomes. They suggest that trust may not only be functional but also dysfunctional for safety. For example, trust may reduce personal responsibility, lead to undetected mistakes, and to less monitoring for safety behaviors (Conchie and Donald, 2008). It is possible that the functional effects of trust are stronger than the negative effects on safety, which is why, in this study, only evidence for trust as a functional variable was found.

The findings shed light on how trust is related to safety outcomes and to the fact that social or managerial processes that are not safety-oriented eventually relate to low levels of safety climate and high rate of injuries. The results also suggest that subordinates cognitively evaluate the information communicated to them. If they trust their leader, they believe the information they are given, and are more likely to reach similar conclusions about the importance of safety, i.e. strong safety climate. Trust is thus shown to be related to both strong and high climates, both of which are mandatory for safety.

Extending this line of reasoning, it is possible that trust is related not only to strong safety climate, but also to strong situations in organizations (Mischel, 1973, 1976). This is because when followers trust their leader and act according to her or his direction in regard to standard, every day or repetitive tasks, consensus develops regarding appropriate behavior in these situations, and members of the group behave similarly (i.e. strong situation).

The findings are also supported by Clarke and Ward's (2006) results concerning the relationship between leaders' influence and safety climate. One of the influence tactics tested in Clarke and Ward's study is 'inspirational appeal'. Clarke and Ward (2006) explain that such tactics increase trust in the leader, which in turn influences safety performance. The findings are also in line with the literature about the relationship between leadership and safety climate, which indicates correlation between leadership styles that create trust (transformational leadership) and safety climate (Zohar, 2002). The leadership literature also suggests that transformational leaders in particular influence their followers through trust, which is why transformational leadership was controlled for in the statistical models. In the presence of trust, transformational leadership was non-significant in all models.

Connecting the construct of trust with climate theory presents a new climate antecedent. Climate literature can also increase understanding of the influence of trust in the leader on performance. As noted above, reviewing the consequences of trust in leaders offered no conclusive finding for behavioral and performance variables, although some consistent evidence of relationships with attitudinal variables was found (Dirks and Ferrin, 2001).

It is important to note that trust may be only one factor among many others that relate to safety outcomes. Although the results of this study presented a significant relationship between trust and injury rate, these relationships explain only a small percentage of the variance in injury rate (see Table 2). Nevertheless, trust is related to safety even when controlling for as central a variable in safety research as leadership. It is therefore suggested that future research on trust together with other variables is required in order to better understand the relationship of trust with safety in the organizational context.

These findings have implications for work environments. According to the results, trust is related to a high, strong safety climate which leads to lower injury rates. Based on these findings, safety interventions such as the supervisor-based safety (SBS) intervention model were conducted (Luria et al., 2008; Zohar, 2002; Zohar and Luria, 2003). The evidence that a good relationship between leaders and subordinates is important to safety in the unit is not trivial. I suggest examining whether intervention and improvement of quality of relationships between leaders and followers can improve SBS interventions.

This is the first study to have empirically tested the relationship between trust and safety climate. Its significant results suggest that further research should be undertaken to replicate these findings. It should be noted that neither had the mediation model used in this study been tested previously.

4.1. Limitations of the study

The study is based on a sample of soldiers performing military duties, and should thus be replicated in a civilian organization in order to improve its external validity. It is not, however, anticipated that the results are strongly dependent on the sample because previous studies have reported similarity between civilian and military contexts (Bass, 1998; Dvir et al., 2002; Shamir et al., 1998). Indeed, similar unmediated relationships have been found for civilian samples, e.g. between leadership safety climate and safety performance (Zohar, 1980; Zohar and Luria, 2005), and trust and safety performance (Cox et al., 2006; Conchie et al., 2006).

Climate level and trust were measured from questionnaires completed by the same individuals at the same point in time, thus creating single-source bias. Although statistical steps (Harman's single-factor test) provided an indication that a single factor does not account for all co-variances among the items, it would be better to control for this effect at the research design stage, i.e. future research should collect the ratings at different times and from separate sources (if this is logistically possible). Climate strength, which is an expression of similarity between individual raters, and injury rate, which is the outcome of a medical examination, does not suffer from single-source bias. The fact that the hypotheses correlating trust with climate strength and injury rate are significant provides concrete evidence that the effects did not derive from single-source bias.

This study has also been unable to confirm the possibility that leaders' safety practices influence trust in the leader. However, it is logical to assume that it is the quality of relationship with the leader that creates trust, rather than the safety practices themselves. Prior researches have shown that trust's main antecedents are: delegation of control (Deci et al., 1989), integrity (Dasgupta, 1988; Mayer et al., 1995), consistency (Butler, 1991; Robinson and Rousseau, 1994), and responsibility (Cook and Wall, 1980), all of which are associated with social attitudes and are not related to safety practice per se.

4.2. Conclusions

The results demonstrate that trust relationships between leaders and subordinates are related to safety outcomes and safety climate. These results reinforce the assumption that safety is also related to social relationships, such as trust in a leader. It appears that trust is related to effective communication about the importance of safety, (i.e. strong safety climate), and trust relationships are also related to the perceived importance of safety to unit leaders (safety-climate level), which will ultimately contribute to fewer injuries. It appears that safety management is linked to a broad spectrum of social relationships between leaders and subordinates. Future research should continue the investigation of how social ties between individuals within an organization relate to safety. It is possible that quality of relationship between peers may also be related to peers' commitment to each others' physical wellbeing.

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