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A Multilevel Model of Safety Climate: Cross-Level Relationships Between Organization and Group-Level Climates

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Organizational climates have been investigated separately at organization and subunit levels. This article tests a multilevel model of safety climate, covering both levels of analysis. Results indicate that organization-level and group-level climates are globally aligned, and the effect of organization climate on safety behavior is fully mediated by group climate level. However, the data also revealed meaningful group-level variation in a single organization, attributable to supervisory discretion in implementing formal procedures associated with competing demands like safety versus productivity. Variables that limit supervisory discretion (i.e., organization climate strength and procedural formalization) reduce both between-groups climate variation and within-group variability (i.e., increased group climate strength), although effect sizes were smaller than those associated with cross-level climate relationships. Implications for climate theory are discussed.

Keywords: organizational climate, safety climate, multilevel theory, cross-level effects

Historically, the organizational climate construct has evolved from an all-inclusive to a facet-specific concept (i.e., climate for something such as service or safety). This construct refers to shared perceptions among members of an organization with regard to aspects of the organizational environment that inform role behavior, that is, the extent to which certain facets of role behavior are rewarded and supported in any organization (Reichers & Schneider, 1990; Schneider, Bowen, Ehrhart, & Holcombe, 2000). Because focal organizational facets such as customer service or work safety present competing operational demands with regard to other facets (e.g., service quality vs. transaction efficiency, worker safety vs. productivity), the most relevant indicators in this regard are enacted or instituted policies, procedures, and practices after they have been distinguished from formally declared counterparts and construed as emergent patterns indicative of true priorities at the workplace (Zohar, 2000, 2003). Facet-specific climates thus provide convergent measures of employees' appraisals or interpretations of relevant policies, procedures, and practices aggregated to the unit of analysis of theoretical interest, that is, the entire organization, or subunits such as local branches or workgroups (Kozlowski & Klein, 2000).

To date, organization and subunit climates have only been studied individually so that cross-level climate relationships in an organization remain poorly specified. This resembles other fields of organizational behavior research, where researchers focus either on micro- or macrolevels of analysis (O'Reilly, 1991). Nonetheless, it has been repeatedly argued that because organizations are social systems, they are characterized by interdependence between individuals and subunits across the organizational hierarchy (House, Rousseau, & Thomas-Hunt, 1995; Klein, Dansereau, & Hall, 1994; Kozlowski & Klein, 2000). The main objective of the present study is to investigate cross-level relationships between climates at two levels, with safety climate as the exemplar.

A Multilevel Model of Climate

The present study uses a recent multilevel model of climate as theoretical framework (Zohar, 2000, 2003). This model is based on level-of-analysis interpretation of climate as convergent, level-adjusted perceptions or appraisals of relevant policies, procedures, and practices as indicators of desired role behavior (i.e., climate emerges from consensual motive-relevant assessments of key features of the organizational environment, taking place in a Lewinian psychological field; see Lewin, 1951). It assumes that because employees are confronted with a multitude of (often inconsistent or contradictory) policies, procedures, and practices, they attempt to make sense of it all by construing discrete policies and procedures as global patterns indicative of bottom-line priorities at the workplace. The core meaning of climate relates, therefore, to socially construed indications of desired role behavior, originating simultaneously from policy and procedural actions of top management and from supervisory actions exhibited by shop-floor or frontline supervisors.

Policies, according to a multilevel interpretation, define strategic goals and means of their attainment, whereas procedures provide tactical guidelines for actions related to these goals and means. Practices, on the other hand, relate to the implementation of policies and procedures in each subunit. In other words, top managers are concerned with policy making and the establishment of procedures to facilitate policy implementation, whereas at lower hierarchical levels, supervisors execute these procedures by turn-

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ing them into predictable, situation-specific action directives (identified as supervisory practice).

The model also assumes that supervisory roles entail discretion in policy implementation, allowing between-groups variation within the boundaries identified by company policies (narrow or wide, clear or ambiguous). Supervisory discretion stems from several sources. Procedures rarely cover all situations because human–machine–environment interactions present innumerable contingencies, role facets present incompatible procedural indications stemming from the fundamental conflict between performance quantity versus quality (e.g., production speed vs. safety precautions, transaction efficiency vs. service quality, performance reliability vs. creativity or innovation), leader–member exchanges involve interpersonal dynamics that are only partially governed by formal procedures, and individual beliefs and attributions influence supervisory interpretation and implementation of formal procedures. Between-groups differences relating to different ways of implementing company policies and procedures are, therefore, to be expected in a single organization, creating a potential for distinct organization-level and group-level climate perceptions. For example, a supervisor who directs workers to disregard certain safety procedures whenever production falls behind schedule creates a distinction between company procedures and subunit practices, thus creating the potential for distinctive climates within one organization.

Employees may form complementary, coexisting perceptions concerning focal role facets at two levels of analysis, after adjusting the sources or referents of climate perceptions. That is, instituted policies and procedures (as opposed to those that have been formally declared) constitute the primary target or referent of organization-level perceptions, whereas supervisory practices constitute the target of group-level perceptions. Consequently, organization-level climate perceptions, referring only to instituted company procedures and top-management actions, should be aggregated across the company (assuming homogeneity or consensus for that unit of analysis), whereas group-level perceptions of supervisory practices should be aggregated within subunits, pending within-group homogeneity and between-groups variation (Kozlowski & Klein, 2000).

An additional aspect of the theoretical model relates to the idea that focal role facets present competing operational demands that stem from the fundamental conflict between performance quantity and quality. Thus, although a long-term perspective may reveal complementarities between role facets, pursuit of short-term operational goals at work usually involves competing demands. For example, safety concerns inherent in every manufacturing process compete daily with other concerns such as speed or productivity, although it has been argued that excellence in safety will eventually complement the other productivity parameters (Stewart, 2002), echoing similar arguments in the product-quality literature (Kaynak, 2003). Therefore, the most efficient or economical means for appraising policies and practices as indicators of desired role behavior is using the priority of competing operational goals as a pertinent comparison metric (Zohar, 2000). Considering parsimony as a guiding principle in theory construction, most climate scholars have postulated that safety climate perceptions refer to those attributes of policy and practice that indicate the priority of safety (which might diverge from formal declarations). Thus, climate level reflects a consensual priority of some focal facet, rather than objective assessment of procedures or practices associated with that facet.

Climate as a consensual priority suggests that because isolated procedures or practices cannot reveal priorities of competing facets, the priorities must be appraised by first construing procedures and practices as emergent patterns and then using pattern-level properties to assess implicated priorities. For example, if safety issues are repeatedly ignored or made contingent on production pressures, workers will infer low safety priority, leading them to assess that speed is more likely to be rewarded and supported than safe conduct. All that is required for such a practice to become a source of (low) climate perceptions is that it remains unequivocal and stable. This line of reasoning is supported by a recent study that indicated that the ratio of prosafety supervisory decisions in situations involving safety versus mission conflicts predicted safety climate level, just as the consistency of such decisions across different situations predicted climate strength (Zohar & Luria, 2004). Once priorities have been deduced by group members, they can inform which facets of role behavior are likely to be more frequently rewarded and better supported. This establishes an expected–utility link between climate level and modal role behavior in groups and also within entire organizations.

Formally, this multilevel framework qualifies as a referent shift consensus model in Chan's (1998) typology of composition models (see also Kozlowski & Klein, 2000). Complementary, globally aligned yet locally distinctive climates at successive levels of analysis are akin to the distinction between organization-level culture and subcultures in organizational units or occupational groups (Martin, 1992; Trice & Beyer, 1993). In both cases, it is assumed that individual employees, as members of the organization as a whole and of subunits in that organization, develop consensual multilevel assessments of the most significant environmental features in terms of desired role behavior, and then they act accordingly. Studies of organizational climate have repeatedly shown that distinctive group-level climates emerge within individual organizations, influencing outcome criteria such as service quality, innovation–creativity, and safety behavior (e.g., Anderson & West, 1998; Schneider & Bowen, 1985; Zohar, 2000).

Cross-Level Alignment

Though supervisory discretion allows for between-groups variation, the variation can only be limited, because company policies set the limits of permissible group-level interpretations. This follows the above proposition that policies and procedures are formulated at company level and executed at lower subunit levels. Because unit managers are expected to execute these procedures, rather than redefine them, organization and group climates should be globally aligned, resulting in a positive relationship between the two (though far from perfect fit). Furthermore, between-groups variation in a single organization will be restricted by comparison with total variation when groups from different organizations are included. (Considered a validation criterion for group-level climate, the latter proposition will be tested as such.) These conditions set the stage for cross-level mediation involving climate–behavior relationships.

Cross-Level Mediation

The definition of facet-specific climate suggests that employees attend to instituted policies, procedures, and practices because they provide important information concerning desired role behavior (e.g., "How important is it to act safely around here?"). Climate perceptions thus serve an adaptive function by providing information for behavior–outcome expectancies such as the probable consequences of working safely or fast. On the basis of constructs of role theory (Katz & Kahn, 1978), social learning (Bandura, 1986), and expected utility (Vroom, 1964), there should be a positive relationship between climate and role behavior, as demonstrated in many studies (e.g., Barling, Loughlin, & Kelloway, 2002; Griffin & Neal, 2000; Hofmann & Stetzer, 1996; Schneider, Salvaggio, & Subirats, 2002; Zohar, 1980, 2000). Organization-level expectancies relate to personnel consequences such as annual performance reviews, pay raise, or job transfer. Group-level expectancies relate to informal supervisory consequences such as praise–criticism, desired job–work-shift allocations, or, more rarely, formal commendations or filing complaints. Supervisory consequences are endemic to daily leader–member exchanges through which work in progress is being managed (Komaki, 1998), whereas personnel consequences are associated with procedurally based management of human resources in organizations.

A comparison of organization-level and group-level consequences suggests that they differ in terms of two important behavioral parameters, that is, outcome frequency and immediacy. Because supervisors offer feedback and consequences as part of their daily routines, this results in frequent and immediate outcomes. This is in contrast to delayed and often uncertain organization-level outcomes. The decision-making literature highlights two robust behavioral tendencies that would lead individuals to overweight frequent and immediate outcomes by comparison with delayed and infrequent outcomes, even when such a strategy results in suboptimal payoff over the long run. These tendencies include melioration bias (i.e., short-term or immediate outcomes influence expectancies more than long-term outcomes whose effect will take place weeks or months later; see Herrnstein, Loewenstein, Prelec, & Vaughan, 1993) and recency bias (i.e., recent outcomes influence current expectancies more than the overall payoff matrix associated with that decision; see Barron & Erev, 2003).

Shared expectancies associated with supervisory practice are thus likely to constitute the more powerful or proximal antecedent of role behavior in individual subunits, with organization-level expectancies providing the distal antecedent. Primacy of supervisory practice is corroborated by meta-analytic results indicating that the informal incentives delivered by superiors (e.g., personal attention and recognition) provide equal or stronger reinforcement value than the delayed personnel outcomes that they signal (Stajkovic & Luthans, 1997, 2001). In the context of safety, Simard and Marchand (1995, 1997) reported a similar pattern, indicating that safety behaviors are predicted primarily by supervisory safety practices, with top management's commitment providing limited incremental effect.

This line of reasoning suggests a mediation model whereby organization-level climate will predict group-level climates in individual work groups due to the orientating, boundary-setting effect of policies and procedures on supervisory practice. Group climate, in turn, will predict role behavior of group members by informing the priority of acting safely in reference to supervisory practice. It should be noted that personnel policies and supervisory practices may induce consensual expectancies in any direction. For example, personnel policies that reward mainly for meeting production targets regardless of safety records and supervisors who monitor safety aspects infrequently and reward subordinates mainly for speed create unfavorable behavior–outcome expectations concerning safety (Pate-Cornell, 1990), resulting in poor or low safety climate and unsafe behavior. This line of reasoning leads to the following cross-level mediation hypothesis:

> *Hypothesis 1*: The relationship between organization-level safety climate and safety behavior will be mediated by group-level climate.

Work Routinization and Climate Alignment

Job routinization is determined by the degree of variation in problems encountered during work and by the level of difficulty involved in problem solving (Perrow, 1967). For example, maintenance workers encounter more variations than production-line workers. Likewise, production workers who operate handheld tools away from fixed workstations encounter more variations than those involved in stationary work. Routinization, in turn, increases job formalization, that is, the degree to which job descriptions are specified, otherwise known as the *routinization-formalization* (RF) model (Hage & Aiken, 1969; Perrow, 1979).

According to the RF model, the proportion of routinized-hence-formalized jobs in an organization or subunit determines RF level. High formalization implies increased numbers and specificity of rules and procedures in an organization or subunit; that is, not only are there more procedures covering possible contingencies but the procedures themselves are more specific and rigid. This, of course, reduces supervisory discretion or decision latitude, because the range of tolerated variation within the rules is reduced (Hage, 1974). Because subunits with routine work have greater job formalization, which allows less supervisory discretion, this will result in better alignment between (formalized) procedures and supervisory practice, leading, in turn, to better cross-level alignment of climate levels. These arguments suggest the following hypothesis:

> *Hypothesis 2*: Routinization will moderate the relationship between organization climate levels and group climate levels (i.e., stronger positive relationship under high routinization).

Figure 1 provides a graphical depiction of the relationships specified in Hypotheses 1 and 2 (moderated mediation model).

Cross-Level Alignment of Climates' Strength

Our discussion so far has construed multilevel climates in terms of a referent shift model, which assumes consensus at each level of

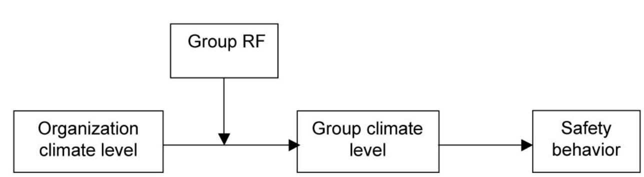

Figure 1. Hypothesized climate-level relationships (see Hypotheses 1 and 2). RF: routinization formalization.

analysis, that is, members' climate perceptions must exceed a threshold of homogeneity to index consensus and justify aggregation to the relevant unit of analysis (e.g., using $r_{wg} > .70$ as indication of within-group agreement; see review in Klein et al., 2000). However, Chan's (1998) typology of composition models includes also a dispersion model. In this model, the variation in climate perceptions among group members is meaningful, providing operationalization of an additional climate parameter, that is, climate strength (Lindell & Brandt, 2000; Schneider, Salvaggio, & Subirats, 2002). For example, high safety climate (referring to the first parameter, climate level) will emanate from safety-supportive managerial practices and may be strong or weak, depending on agreement among employees in each organization or subunit. Climate strength can thus be measured for both organization-level and group-level climates using within-unit homogeneity statistics.

A multilevel perspective suggests that, in addition to alignment in terms of climate levels, organization and group climates will also be aligned in terms of the strength parameter. Congruent with our conceptualization of climate, the strength parameter follows the extent to which management displays an internally consistent pattern of action, providing clear indication of priorities at the workplace with regard to competing facets. Thus, organization-level consensus arises from enacted policies and procedures that are unambiguous and stable (Reichers & Schneider, 1990), inasmuch as group-level consensus arises from supervisory practices that are similarly unambiguous and stable (Zohar, 2003). The more coherent the pattern of managerial action, the stronger the climate will be.

This analysis is supported by data indicating that supervisory action patterns, characterized by consistent and clear prioritization of competing goals (safety vs. mission accomplishment), resulted in stronger safety climates in army field units (Zohar & Luria, 2004). These data support the interpretation of climate strength as indication of situational strength (Mischel, 1976), that is, strong situations lead people to similarly perceive focal features and develop convergent expectations concerning appropriate behavior (Schneider et al., 2002). If strong organization-level climate derives from internally consistent and unambiguous policies and procedures, resulting in a strong situation, supervisory interpretation of these procedures will also be affected. Thus, if organizational policies form a coherent pattern providing clear indication of priorities at the workplace (hence, strong organization-level climate), supervisory practices will also be more coherent, promoting emergence of strong group-level climates. These arguments lead to the following hypothesis:

> *Hypothesis 3*: Organization climate strength will be positively related to group climate strength.

The above hypothesis suggests that organization climate strength, by virtue of reflecting a strong situation stemming from procedural coherence, will predict supervisory coherence and hence will predict group climate strength. This relationship will be arguably affected, or moderated, by unit-level routinization. As noted above, RF delimits supervisory interpretation of company policies and procedures, creating stronger cross-level relationships. Thus, if the procedures that form a coherent pattern in terms of priorities at the workplace are also more formalized, cross-level effects on group climate strength will be enhanced (i.e., RF will moderate the relationship between organization climate and group climate strengths). Note, however, that formalized procedures do not necessarily fall into a coherent pattern, thus RF is not expected to exert a main effect on climate strength. These arguments lead to the following hypothesis:

> *Hypothesis 4*: Routinization will moderate the relationship between organization climate strengths and group climate strengths (i.e., stronger positive relationship under high routinization).

Figure 2 provides a graphical depiction of the relationships specified in the moderation model outlined in Hypotheses 3 and 4.

A Between-Units Dispersion Model

The multilevel interpretation of organizational climate suggests a second type of dispersion model in which the variation in climate levels between (rather than within) work groups constitutes the attribute of focal interest. As noted above, global cross-level alignment does not preclude between-groups variation in a single organization because of the inherent discretion in supervisory roles. Although organizational policies and procedures define a permissible boundary, residual supervisory discretion will result in meaningful (i.e., nonrandom) variation. Such a between-groups dispersion model outlines a new parameter for studying climate as a multilevel construct, which we identify as *climate variability*. Formally, climate variability is an organization-level variable, operationalized by the variance of group climate levels in individual companies.

One application of the climate variability parameter involves examining some additional effects of organizational climate strength. In this case, it can be argued that a strong organizational climate, stemming from a coherent pattern of policies and procedures, will not only induce stronger group-level climates but it will also reduce between-groups climate variations. This argument is based on the idea that strong situations delimit the range of possible interpretations by presenting an internally consistent pattern, which provides clear indication of priorities at the workplace. If competing demands relating to safety versus productivity goals are assigned clear priorities by top management, such coherence should reduce supervisory-level variations. This line of reasoning leads to the following hypothesis:

> *Hypothesis 5*: Organization climate strength will be negatively related to (between-groups) climate variability.

A second application of the climate variability parameter concerns the relationship between work routinization and safety climate. Whereas group-level RF was not expected to exert main

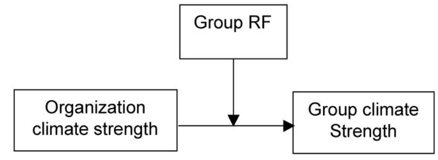

Figure 2. Hypothesized climate–strength relationships (see Hypotheses 3 and 4). RF: routinization formalization.

effects on (group) climates' level or strength, its organization-level counterpart is expected to influence the third climate parameter, that is, climate variability. According to the RF model, the proportion of routinized-hence-formalized jobs can be computed at any level of analysis, resulting in organization- or group-level RF scores (Hage, 1974). At the organization level, if procedures are formalized—implying increased numbers and specificity of rules and procedures—discretion or decision latitude of the entire supervisory personnel will be reduced because the range of tolerated variation within the rules has been reduced. Consequently, (organization-level) RF is expected to limit climate variability in a single organization, leading to the following hypothesis:

> *Hypothesis 6*: Organization-level formalization will be negatively related to (between-groups) climate variability.

The last two hypotheses suggest that organization climate strength and organization-level RF will offer incremental prediction of climate variability because formalized procedures do not necessarily fall into a coherent pattern. However, co-occurrence should result in mutually reinforcing (i.e., interactive) effects. If formalized procedures prescribe required role behavior for a large proportion of jobs in the organization and if they also fall into a coherent pattern that clearly identifies priorities, supervisory discretion will be further restricted, resulting in smallest climate variability. Using the game theory construct of equilibrium (Erev & Roth, 1998), when both conditions coexist, organizational players will better converge on a single equilibrium behavior emphasizing safety or speed, such that individual deviations become easy to detect (and correct) by peers or superiors. The equivalent role theory term suggests that co-occurrence of both conditions will promote clearer role expectations for line supervisors (Katz & Kahn, 1978), with attendant rewards and/or pressure for compliance. This social control function would account for reduced supervisory discretion beyond the main effects of individual conditions. These arguments suggest the following hypothesis:

> *Hypothesis 7*: Organization climate strength and (organization-level) formalization will provide interactive prediction of climate variability.

Figure 3 provides a graphical depiction of the relationships specified in the interaction model outlined in Hypotheses 5 to 7.

Conceptualization and Measurement Issues

The multilevel model presented above focuses on managerial policies, procedures, and practices as primary sources or referents of level-adjusted climate perceptions (i.e., policies and procedures provide organization-level referents, whereas their daily implementation by frontline supervisors provides group-level referents). Notably, however, there are other sources of climate perceptions that can inform role behavior, thus, its exclusion from the foregoing discussion (and subsequent measurement scales) must be discussed.

Empirically, factor analytic studies of safety climate scales suggest a hierarchical structure consisting of various first-order factors and a global, higher order factor (Griffin & Neal, 2000; Mueller, DaSilva, Townsend, & Tetrick, 1999). Whereas there is limited agreement among researchers concerning first-order factors (e.g., social standing, worker involvement, competence level, safety knowledge, communication flow, status of safety issues; see review in Flin, Mearns, O'Connor, & Bryden, 2000), the global factor is generally identified as management commitment. Given that the global factor represents the core meaning of safety climate and that managerial policies and practices constitute the proximal manifestation of that commitment, it follows that we have focused on the core meaning of safety climate, excluding the open set of first-order factors.

Theoretically, focusing on the core meaning of climate offers the advantage of parsimony in theory development. In the present case, managerial commitment as the sole climate referent has allowed the development of a composition model that uses a single organizing principle in defining level-adjusted climate perceptions. The inclusion of first-order factors would have resulted in a mixed (compilation and composition) model because many of these factors are level specific or assume different meanings across levels of analysis. For example, the six-factor model for Zohar's (1980) original scale, which is reported in Mueller et al. (1999), includes first-order factors that relate either to the organization level (e.g., status of safety issues such as safety officers–committees, effect of safe conduct on promotion) or to the group level (e.g., effect of safe conduct on social standing). Thus, inclusion of first-order variables would have made the delineation and testing of cross-level hypotheses appreciably more complicated. The level-adjusted measurement scales adopted in this study reflect this analytic approach, focusing on policies and procedures indicative of strategic resource allocations and on supervisory practices indicative of priorities under competing operational demands to the exclusion of other climate indicators.

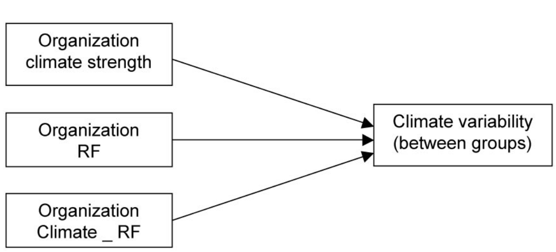

Figure 3. Hypothesized climate variability relationships (see Hypotheses 5, 6, and 7). RF: routinization formalization.

Method

Participants and Procedure

The participants in this study were 3,952 production workers in 401 work groups nested in 36 small- to medium-sized manufacturing plants in the metal, food, plastics, and chemical industries. The workforce was largely male (68%), and the average age was 42.2 years ($SD = 8.9$). The sample included member plants in a local manufacturers' association whose management agreed to participate after it was made clear that the climate questionnaires were to be filled on the premises during work hours. In return, we offered a 3-hr workshop for top and middle management after collecting and analyzing the data from the entire sample, allowing for elaborate feedback.

Safety climate, RF, and other work-related scales were completed during work hours, supervised by members of the research team. The questionnaires were filled out in the dining hall or training facility of each of the premises at prearranged times, usually before or after lunch or the work shift (in the latter case, workers' transportation and hourly pay were adjusted for extra time). Questionnaires were completed anonymously and collected immediately by members of the research team who guaranteed absolute confidentiality before data were processed for group- and organization-level analyses. Workers could decline participation by avoiding the scheduled sessions. We ensured that management had no way of knowing who participated, eliminating potential pressure in this regard. Overall response rate was 88%.

Over the 3-month period following completion of the questionnaire, members of the research team conducted seven independent, randomly timed observations of safety behavior in each department or work group. These observations were based on a checklist of nine behavior categories (e.g., horizontal–vertical movement, machine handling, housekeeping, materials handling, use of protective equipment), adapted from the European Commission's (1995) safety-audit guide for small- to medium-sized companies. During the same time, a senior safety inspector used this guide to conduct independent safety audits for each plant, covering 14 engineering-oriented parameters associated with hazard identification and control (e.g., noise, fire, toxic hazards) and relevant worker safety behavior (the latter served only for testing the reliability of behavior observations by the research team). Safety engineering parameters relate to hazards whose assessment and control depend on top management's procedural action. Workers' safety behaviors are influenced by both procedural and supervisory contingencies, with the latter providing the proximal or most influential agent.

We thus used the safety engineering scores to validate organization-level climate and used the safety behavior scores (average of seven observations) both for group climate validation and for testing relevant hypotheses. Scoring reliability was tested by comparing the average behavior observation score for each plant with the score provided by the safety inspector on behavior items (otherwise deleted before computing the final safety engineering score), resulting in $r_s = .84$ ($p < .01$).

Measures

Organization-Level Safety Climate was measured with a 27-item questionnaire (subsequently reduced to 16 items as explained below; see Appendix A for item descriptions). Items were accompanied by a 5-point rating scale, ranging from 1 (*completely disagree*) to 5 (*completely agree*). The items included a range of indicators that reflect top management's commitment to safety or the priority of safety over competing operational goals such as production speed and costs. Items covered the range of activities outlined in the British Standards Institute's (2000) safety management code, known as OHSAS 18001. This code is compatible with the ISO-9001 and ISO-14001 codes for quality and environmental management systems and provides a systemic description of the managerial activities that comprise a benchmark safety program. The code lists active management practices (monitoring and control) and proactive practices (promoting learning and improvement), reflecting similar distinctions between safety compliance and participation (Griffin & Neal, 2000); compliance and initiative (Marchand, Simard, Carpentier-Roy, & Ouellet, 1998); and control versus commitment (Zacharatos & Barling, 2003). Because discipline and compliance provide reliability in routine situations, whereas learning improves capacity for safe conduct in less predictable circumstances, safety management programs must include both. The Multilevel Safety Climate (MSC) Scale incorporates another distinction concerning declarative versus procedural action, which is akin to the distinction between espoused and enacted action plans (Argyris & Schon, 1996). Declarative action has to do with public declarations, represented by items such as "Top management in this plant . . . Provides workers with a lot of information on safety issues" and "Regularly holds safety awareness events (e.g., presentations, ceremonies)." Procedural action concerns (reactive or proactive) implementation, for example, "Top management . . . Provides all necessary safety equipment for workers" and "Reacts quickly to solve the problem when told about safety hazards."

Exploratory factor analysis yielded three rotated factors identified as Monitoring–Enforcement, Learning–Development, and Declaring–Informing. However, substantial item cross-loadings and high intercorrelations among factor scores (exceeding .80) suggested a global factor relating to managerial commitment. This resembles the global safety climate factor reported by Griffin and Neal (2000). Given item redundancy, 16 items were retained on the basis of theoretical and statistical considerations (i.e., representation of content themes and item loadings). The average scale score provides the climate level parameter, resulting in highly significant correlation between the long and short versions ($r = .94$, $p < .001$). Alpha reliability of this scale was .92.

Group-Level Safety Climate was measured with a 27-item questionnaire (subsequently reduced to 16 items as explained below; see Appendix B for item descriptions). Items were accompanied by a 5-point rating scale commensurate with the organization-level scale. Items cover a range of interaction modes between supervisors and group members by which supervisors can indicate the priority of safety versus competing goals such as production speed or schedules. The MSC Scale is based both on the above-mentioned safety management modes of control–compliance and commitment–participation, and on the People subscale in the Dictionary of Occupational Titles (1991). The Dictionary of Occupational Titles subscale identifies a range of supervisory interaction modes, progressing from helping–serving to monitoring–controlling to instructing–guiding. Items for the MSC Scale were derived from a previously published group climate scale that covered the same content categories (Zohar, 2000) and from the descriptions accompanying the various interaction modes in the Dictionary of Occupational Titles. The new scale offers a wider range of climate indicators relating to supervisory practice in the context of competing demands. The new scale does not include negatively worded items associated with passive or avoidant practices due to evident reluctance of workers to fill negatively worded items. To allow cross-level comparisons, we added items representing declarative, verbally oriented practices, including items such as "My direct superior . . . Frequently tells us about the hazards in our work" and "Frequently talks about safety issues throughout the work week."

Exploratory factor analysis yielded three rotated factors matching the organization-level factors, that is, Active Practices (Monitoring–Controlling), Proactive Practices (Instructing–Guiding), and Declarative Practices (Declaring–Informing). Here too, substantial item cross-loadings and high intercorrelations among factor scores suggested a global safety priority or commitment factor. Therefore, 16 items were retained on the basis of theoretical and statistical considerations (i.e., representation of content themes and item loadings). The correlation between scale means representing climate level for the long and short versions was .95 ($p <$ .001). Alpha reliability of this scale was .95.

Climate strength was operationalized as the standard deviation of employee perceptions of safety climate. The choice of standard deviation over the $r_{wg(j)}$ homogeneity statistic is based on recent discussions suggesting theoretical and practical problems associated with the latter. For example, there is no obvious null distribution for representing expected random variance when calculating r_{wg}. The rectangular distribution, which is the most frequent choice, overlooks the tendency toward using only a restricted segment of the response range (Bliese, 2000). The r_{wg} statistic may also overestimate the degree of agreement and result in values greater than one, which are difficult to interpret. Consequently, we follow the strategy suggested by Schneider et al. (2002) and adopt (sign-reversed) standard deviation values as the measure of choice for indexing consensus.

Climate variability was operationalized as the standard deviation of group climate levels in each company.

RF was measured with five items referring to job repetitiveness and formalization. Sample items include "My work must be done according to very detailed procedures," "There is only one way to do my work," and "I do my work every day in exactly the same way." A 5-point rating scale commensurate with the Safety Climate Questionnaire accompanied the items. The average score per subunit or the entire company provided the RF score for testing relevant hypotheses. Alpha reliability of this scale was .85.

Outcome criteria were measured from independent safety engineering audits and safety behavior sampling in the participating manufacturing plants, described above. The data were collected concurrently by a senior safety inspector and a team of three experienced observers during the 3-month period following questionnaire administration. Both sets of data were collected according to the European Commission's (1995) safety audit guide for small- to medium-sized companies. Safety engineering audits present global scores ranging from 1 (*poor*) to 10 (*excellent*), whereas safety behavior observations provide the percentage of safe behavior out of the total number of observations in each work group.

Risk level associated with the technology and raw materials for each plant was assessed by an independent safety inspector as part of the safety audit process described above. This assessment, ranging from 1 (*low risk*) to 10 (*high risk*), was based on the European Commission's (1995) safety audit guide, covering safety hazards associated with agents such as fire, explosion, transport of heavy loads, and vertical movement. Risk level is used here as an organization-level control variable in statistical models and represents the various industries and production technologies in our sample.

Results

Predictive validity of the MSC Scale was assessed by correlating climate scores with outcome criteria, that is, organization-level climate was correlated with safety engineering audit scores, resulting in .46 ($p < .01$), and group-level climate was correlated with averaged safety behavior observations (percentage safe), resulting in .38 ($p < .01$). Homogeneity of climate perceptions was assessed with r_{wg} (Bliese, 2000), resulting in *Mdn* $r_{wg(j)} = .84$ for organization-level climate (range: .56 to .97) and *Mdn* $r_{wg(j)} = .80$ for group-level climate (range: .60 to .98). Intraclass correlation (ICC1) and reliability of the mean (ICC2; Bliese, 2000) for respective climates were as follows: ICC1 = .22 and ICC2 = .77 for organization-level climate; ICC1 = .17 and ICC2 = .80 for group-level climate. Between-units variance was tested with one-way analysis of variance. This analysis was conducted with unaggregated data, using work group and organizational affiliation of each respondent as the independent variable. Results indicated that both MSC Scales exhibited significant between-units variance, Group-Level scale: $F(399, 3950) = 4.97$, $p < .001$; Organization-Level scale: $F(34, 3950) = 4.39$, $p < .001$. Jointly, these statistics suggest sufficiently high within-group homogeneity and between-groups variance to justify consideration of scale scores as safety climate perceptions and warrant aggregation to organization and group levels.

Descriptive statistics of group- and organization-level data are presented in Table 1. As shown in this table, organization climate and group climate were significantly correlated ($r = .41$, $p < .01$), as expected. Climate level and strength were also correlated ($r = .35$, $p < .01$, for organization climate; $r = .32$, $p < .01$, for group climate), agreeing with other reports in this regard (e.g., Lindell & Brandt, 2000; Schneider et al., 2002). In addition to safety climate, both outcome criteria correlated significantly with RF, suggesting that the formalization that follows routinization allows better control of safety hazards and of workers' behavior. Group RF also correlated with climate level ($r = .33$, $p < .01$) but not climate strength ($r = .04$, *ns*), suggesting that higher formalization promotes greater supervisory emphasis on safety, which might relate to the fact that safety deviations become more conspicuous. The same pattern is evident for organization-level RF and climate.

Hypothesis 1 suggests that the effect of organization climate on safety behavior in work groups will be mediated by group climate. Because mediation takes place across levels, we analyzed the data by means of multilevel random coefficient modeling (see review in Hofmann, Griffin, & Gavin, 2000). We adopted the procedure recommended by Bliese (2002) and Singer (1998), using SAS Proc Mixed (Littell, Milliken, Stroup, & Wolfinger, 1996). This approach is used for all further hypotheses to test cross-level mediation or moderation effects. In all cases, we used the unstructured variance–covariance matrix, which offered the best fit based on Akaike's information criterion (Verbeke & Molenberghs, 2000). To estimate effect sizes for multilevel random coefficient models, we used ordinary least squares regression estimates, following the procedure recommended by Hofmann, Morgeson, and Gerras (2003). As noted by these authors, although ordinary least squares regression models violate the assumed independence of error terms in nested data structures, the overall R^2 values provide unbiased estimates of the percentage of variance accounted for by mediation or moderation effects. This method allows comparison with other research investigating mediator and moderator variables, unlike

Table 1
Intercorrelations and Descriptive Statistics of Variables in Statistical Models

Variable	1	2	3	4	5	6	7	8	9
1. OC level	—								
2. GC level	0.41	—							
3. OC strength	0.35	0.10	—						
4. GC strength	0.11	0.32	0.20	—					
5. RF group	0.19	0.33	0.01	0.04	—				
6. RF organization	0.58	0.32	0.10	0.11	0.39	—			
7. GC variability	0.07	0.20	−0.19	0.08	−0.13	−0.24	—		
8. Safety group	0.20	0.38	0.11	0.14	0.21	0.18	0.12	—	
9. Safety organization	0.46	0.20	0.12	0.05	0.19	0.42	−0.02	0.25	—
M	3.69	3.37	0.79	0.88	3.75	3.81	0.60	66.2	6.87
SD	0.36	0.72	0.11	0.31	0.65	0.24	0.20	12.9	1.36

Note. Sample size depends on level of analysis: $n = 401$ for group-level variables; $n = 36$ for organization-level variables (varies depending on missing data). If $r > .13$, then $p < .05$; if $r > .18$, then $p < .01$. OC = organization climate; GC = group climate; RF = routinization formalization.

the more complex estimates of effect size in multilevel random coefficient models (e.g., Snijders & Bosker, 1999).

To test mediation, we used a three-step procedure based on Baron and Kenny (1986). First, organization-level climate must predict group-level safety behavior (percentage safe) after controlling for risk level. Second, organization climate must also predict group-climate level, with risk included in the statistical model. Third, the relationship between organization climate and behavior must be significantly reduced or eliminated after controlling for group climate level and for risk. Results of this procedure met these conditions as follows: (a) organization climate predicted safety behavior after controlling for risk, $F_{\mathrm{III}}(1, 378) = 12.7$, $p < .001$, $R^2 = .05$; (b) organization climate predicted group climate level after controlling for risk, $F_{\mathrm{III}}(1, 378) = 41.1$, $p < .001$, $R^2 = .16$; and (c) the effect of organization climate on behavior was eliminated after controlling for group climate and risk, organization climate $F_{\mathrm{III}}(1, 378) = 2.56$ (*ns*) and group climate $F_{\mathrm{III}}(1, 378) = 44.3$, $p < .001$, $R^2 = .19$. These results suggest complete mediation, agreeing with evidence in the safety (Simard & Marchand, 1995, 1997) and decision-making (Barron & Erev, 2003) literatures concerning the overriding effect of outcome frequency and recency on role behavior.

Hypothesis 2 specifies RF as (group-level) moderator of climate relationships (see Figure 1). When testing moderation effects in this and subsequent hypotheses, we first tested the effect of centering of variables in the statistical models (see discussion of centering decisions in Hofmann & Gavin, 1998). This operation resulted in no improvement, and thus it was not performed in the final model. Furthermore, risk level, our control variable, exerted no main or interaction effects. Thus, it was removed from the final model. The statistical model for testing Hypothesis 2 was therefore as follows (subsequent moderation hypotheses were tested with similar models):

$$\text{Level 1: GC} = \beta_{0j} + \beta_{1j} \times \text{RF} + e_{ij},$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01} \times \text{OC} + \nu_{0j},$$

and

$$\text{Level 2: } \beta_{1j} = \gamma_{10} + \gamma_{11} \times \text{OC} + \nu_{1j},$$

where GC refers to group climate, β_{0j} refers to intercept, β_{1j} refers to slope of RF, e_{ij} refers to overall error term, γ_{00} refers to intercept of Level 2 regression predicting β_{0j}, γ_{01} refers to slope of Level 2 regression (organizational climate [OC]) predicting β_{0j}, ν_{0j} refers to error term for Level 1 intercept (β_{0j}), γ_{10} refers to intercept of Level 2 regression predicting β_{1j}, γ_{11} refers to slope of Level 2 regression (OC) predicting β_{1j}, and ν_{1j} refers to error term for Level 1 slope (β_{1j}).

Table 2 (top section) presents the results for Hypothesis 2. As shown in this table, RF resulted in main and interaction effects, suggesting both incremental prediction of group climate level after controlling for organizational climate and an interactive effect. The shape of interaction is provided in Figure 4a. As can be seen in this figure, high RF results in a stronger cross-level climate relationship, as expected.

Hypotheses 3 and 4 amount to a cross-level moderation model similar to the one described above (i.e., RF as moderator), except for dealing with climate–strength relationships on both sides of the statistical equation (see Figure 2). Consequently, we used the same statistical approach after replacing the relevant climate parameters. The pertinent results are presented in Table 2 (bottom section). As shown in this table, organization climate strength provided a main effect on group climate strength, as predicted in Hypothesis 3 (supported also by a zero-order correlation of .20, $p < .01$; see Table 1). Furthermore, the lack of a similar main effect for RF supports our line of reasoning, suggesting that climate strength stems from the patterning of policies and procedures (i.e., whether they fall into a coherent pattern), rather than from their formalization. The significant interaction term in Table 2 (bottom section) and its depiction in Figure 4b support Hypothesis 4. As can be seen in Figure 4, when strong organization climate, indicative of managerial coherence, is coupled with high RF, this results in stronger cross-level climate–strength relationships, as hypothesized. However, it should be noted that effect sizes are considerably smaller than those involved in climate-level relationships.

Table 2
Multilevel Random Coefficient Model of Main and Interaction Effects of Organization Climate and RF on Group Climate Level and Strength (i.e., Cross-Level Climate Relationships)

Predictor variable	Estimate (*SE*)	$F_{\mathrm{III}}(1, 378)$	R^2
Group climate level (dependent variable)			
OC level	0.86 (0.12)	51.67***	
RF	0.29 (0.07)	17.49***	0.22
OC × RF	0.27 (0.12)	4.69*	0.25
Group climate strength (dependent variable)			
OC strength	0.66 (0.19)	11.66***	
RF	0.32 (0.04)	0.86	0.09
OC × RF	0.28 (0.31)	3.80*	0.11

Note. Type III *F* values are from multilevel random coefficient models. R^2 values refer to ordinary least squares estimates. OC = organization climate; RF = routinization formalization.
* $p < .05$. *** $p < .001$.

The last group of hypotheses (i.e., Hypotheses 5 to 7) relate to between-groups variance of climate levels as the focal dependent variable (see Figure 3). Notably, this is an organization-level outcome suggesting a single level of analysis. Consequently, we shifted our statistical approach to using ordinary least squares regression models at the organization level of analysis, and we used RF as an organization-level construct and risk as a control variable. The zero-order correlations in Table 1 provide initial support for Hypotheses 5 and 6, resulting in −.19 ($p < .01$) for the relationship between organization climate strength and climate variability, and in −.24 ($p < .01$) for the relationship between organization RF and climate variability. Further support is provided by the significant main effects for the same predictors in the regression model presented in Table 3. The significant interaction term in that model (see Table 3) and the graphical depiction of that interaction in Figure 5 offer empirical support for Hypothesis 7—that is, the combination of strong organizational climate and high procedural formalization resulted in lowest group-level variability, as hypothesized.

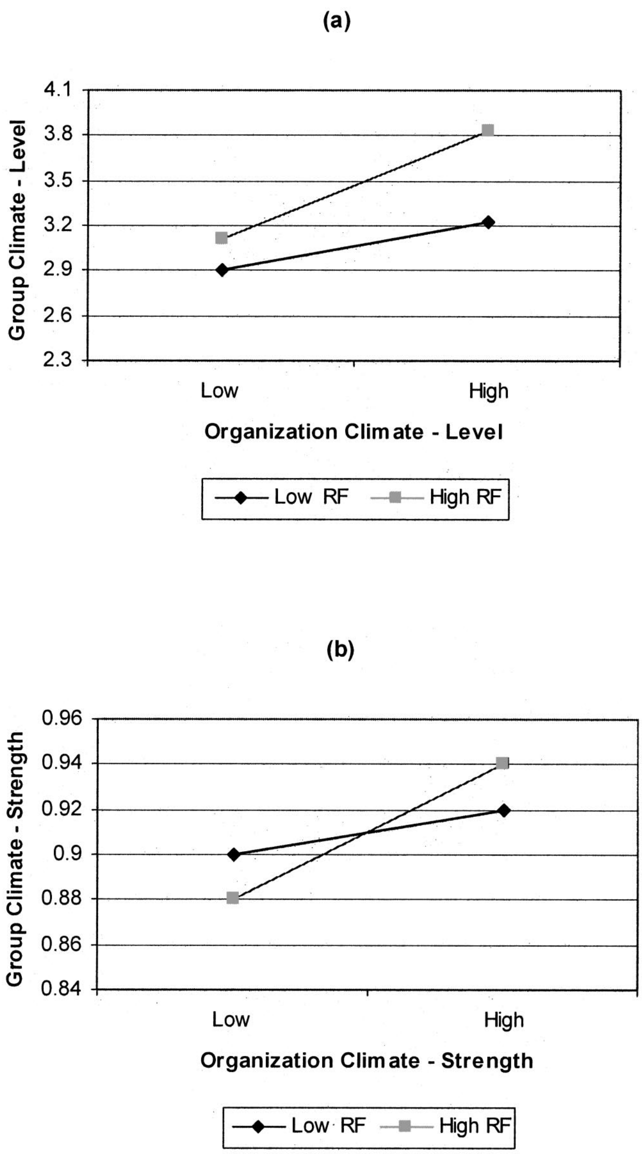

Figure 4. a: Moderation effect of (group) routinization formalization (RF) on climate-level relationships. b: Moderation effect of (group) RF on climate–strength relationships.

Discussion

This study tests a multilevel model of climate, which suggests that employees interpret or appraise instituted policies and procedures by construing them as facet-specific patterns indicative of the priorities of competing operational goals at their workplace (which may differ from formal counterparts). Company policies and procedures thus provide the primary source of organization-level climate perceptions, also setting the boundaries for permissible supervisory variation in implementing these procedures. Implementation takes place through supervisory practices that provide, in turn, the main source of group-level climates in individual subunits.

Results indicate that climates at both levels of analysis are globally aligned, so that organization climate predicts group climate level, which predicts role behavior, that is, cross-level alignment resulted in a fully mediated effect. Furthermore, we found that organizational climate strength resulting from procedural coherence predicted group climate strength, apparently by creating a strong situation for supervisory personnel in terms of priorities at the workplace. This relationship was moderated by routinization of the main work performed in subunits, that is, there was a stronger cross-level relationship between organization and group climate strengths under high RF, stemming from greater constraint on supervisory discretion in implementing formal procedures. However, effect sizes for climate–strength relationships were substantially smaller than those associated with climate-level relationships.

The study incorporated also a new dispersion model that focuses on between-groups climate variability in individual organizations, showing that climate variability was negatively related to organization climate strength and procedural formalization. Furthermore, the significant interaction of both predictors indicated that, if company procedures fall into a coherent pattern that is also composed of increasingly formal procedures, supervisory discretion is greatly reduced, resulting in diminishing climate variability.

Table 3
Ordinary Least Squares Model of Main and Interaction Effects of Organization Climate Strength and Organizational RF on Climate-Level Variability

	Group climate variability	
Predictor variable	β	ΔR^2
Risk	0.13*	.01
OC strength	2.42**	
RF	1.37**	.05
OC × RF	2.59**	.08**

Note. $N = 36$. OC = organization climate; RF = routinization formalization.
* $p < .05$. ** $p < .01$.

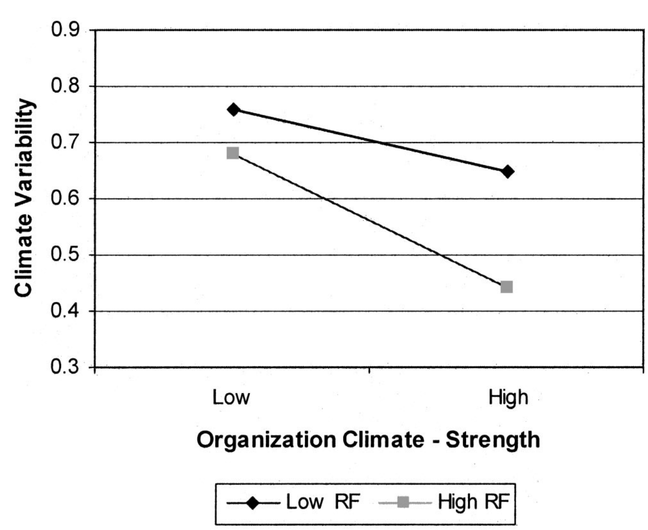

Figure 5. Moderation effect of (organization) routinization formalization (RF) on group-level climate variability.

These results support the premise that individual employees develop complementary climate perceptions relating to successive levels of analysis, amounting to a within-group (and within-individual) referent shift model. That is, in their dual role as members of an organization and of subunits in that organization, employees attend to formal procedures and to supervisory implementation of those procedures, setting the stage for complementary consensual perceptions with regard to both (where the extent of consensus depends largely on managerial coherence). The referent shift is offered here as the basic heuristic that allows for the formation of distinctive climates relating to successive levels of analysis. It should be noted, though, that the referent shift model as defined by Chan (1998) accounts for conceptual modifications of a construct across levels of analysis in formal scientific research (e.g., from individual learning to organizational learning). We adopted this model to define the functionally equivalent yet informal process of company employees who attempt to make sense of their (hierarchically ordered) environment by using hierarchically adjusted referents.

This view of ordinary people as practical scientists (Kruglanski, 1990) and the data reported above are consistent with organizational climate as a social–cognitive construct emanating from effortful sense-making activities (Drazin, Glynn, & Kazanjian, 1999; Weick, 1995), rather than a passive observation of discrete formal procedures and isolated practices. As noted by Rentsch (1990), "the basic sense-making process involves observing organizational events, detecting or abstracting patterns of relationships among the events, and interpreting these events in psychologically meaningful terms" (p. 669). For example, if supervisors repeatedly make safety procedures contingent on production pressures, workers will infer low safety priority even if management's overt policy is that safety has top priority. All that is required for such a practice to become a source of (low) climate perceptions is that it remains unequivocal and stable (i.e., coherent). Given that supervisory practices and procedural patterns indicative of priorities at the workplace are an abstraction, this requires concerted individual- and group-level assessments.

Just as scientific inquiry requires collaborative effort, individual employees in work organizations must interact in order to create mutual understanding of extracted cues (Kozlowski & Doherty, 1989; Morgeson & Hofmann, 1999; Naumann & Bennett, 2000). Similarly, Weick (1995) emphasizes that sense making is a fundamentally social process that focuses on relevant cues in an organizational environment whose complexity results in a wealth of transient, conflicting, and unexpected cues. As such, this environment is conducive to negotiated (i.e., socially construed) agreements that make it more comprehensible. Given the assumption that organizations present employees with competing operational demands stemming from the inherent conflict between quantity and quality, the notion that employees must face complex and often conflicting cues seems to suggest the rule rather than the exception. Similar ideas have been raised in discussions of symbolic social interaction as an antecedent of climate emergence (e.g., Schneider & Reichers, 1983).

Directions for Future Research

Although this work considers only two levels of analysis, the same line of reasoning can be extended into a multilevel cascade model. If top management defines formal policies on key issues, then each management level will interpret them before conveying its own priorities to the level immediately below it during role-related interactions. This interpretation process will be intensified with regard to equally legitimate yet incompatible operational goals. Thus, the concept of supervisory practice as discretionary implementation of formal policies and procedures can be expanded to include midlevel managerial practices, serving as the referents for supervisory perceptions and expectations. This is similar to Likert's (1967) linking pin model of organizations and other interactional models of role behavior (e.g., Katz & Kahn, 1978). Supervisors whose immediate superiors put greater emphasis on safety will execute formal safety procedures more diligently than those whose superiors are less interested in such issues, although they continue to exercise discretionary power (Zohar, 2002).

This line of reasoning suggests that, in addition to using workers or frontline employees as data source, it is possible to collect (multilevel) climate data also from frontline supervisors. These supervisors should be asked to report their perceptions of midlevel and top level managerial practices concerning the same focal facets (e.g., safety, service). At the same time, because the middle manager to whom frontline supervisors report is often known to the work group, workers are likely to be aware of this person's priorities and the extent to which they are respected and implemented. This may create a three-level climate structure in workers' appraisals of their organizational environment (as opposed to the two-level climate we have studied). Thus, the complete multilevel structure of organizational climate awaits further study.

Another issue awaiting clarification is the dynamics of cross-level climate relationships. Theories of organizational change indicate that when parties in hierarchical exchange disagree about goals and/or the means to their attainment, organizations are in an unstable state (Bacharach & Mundell, 1993). In such cases, change is to be expected, leading to realignment of logics of action among the parties involved, which can be achieved by modifying the means or the goals, including reassessment of priorities (Bacharach, Bamberger, & Sonnenstuhl, 1996; Weick & Roberts, 1993). The climate variability data in our sample suggest that although organization and group climates are globally aligned, resulting in full-mediation effects on safety behavior in work groups, there is also significant variance, implying cross-level discrepancies. Analysis of the raw data indicates that among discrepant group climates (i.e., deviating from organization climate by 1.0 *SD* units or more), 84.2% were higher than the organization climate, indicating that supervisors were more committed to safety than those at top management. This statistic suggests that top management is more tolerant of upward (prosafety) supervisory adjustment of company policies than a downward (prospeed) adjustment. However, it is possible that such adjustment is tolerated within certain boundaries, that is, as long as it is not too costly in terms of competing goals such as production speed or schedules. The dynamics of cross-level climate relationships thus present an interesting research agenda.

Methodologically, construing competing facets in terms of their relative priorities constitutes a parsimonious means for identifying those role behaviors that are likely to be rewarded and supported (e.g., speed vs. safety)—both in formal scientific inquiry and in the sense-making processes through which employees generate distinctive climates. Because the same applies to other facet-specific climates, this suggests a first step toward a general theory of organizational climate. For example, service quality generally competes with transaction efficiency (Schneider, White, & Paul, 1997; Singh, 2000), inasmuch as innovation in work groups competes with performance reliability and predictability (Anderson & West, 1998; West, 2002). Reconceptualizing the climates for service and for innovation in terms of agreed indicators of relative priorities at the workplace would enable integration of the literatures and offers a potential for better understanding of additional social–cognitive processes in organizations.

Integration of Climate and Leadership

Our strategy of focusing on the core meaning of safety climate (i.e., perceived managerial commitments or priorities) highlights the integrated nature of climate and leadership, which has been implicit in climate research since its inception (Kozlowski & Doherty, 1989). Therefore, a discussion of the discriminant validity of climate versus leadership constructs is in place.

Factorial structures associated with the two constructs highlight key distinctions. Leadership factors represent the quality and effectiveness of interpersonal relationships between leader and members. For example, leader–member exchange reflects psychological distance, openness, and reciprocity as indicators of relationship quality (Graen & Uhl-Bien, 1995). Full-range leadership factors elicited with the Multifactor Leadership Questionnaire represent the continua of passive–active–proactive and of effective–ineffective exchanges (Bass & Avolio, 1997). By contrast, the global safety climate factor that underlies the major measurement scales represents managerial commitment to employees' safety (Flin et al., 2000), rather than referring to the quality or effectiveness attributes of interpersonal exchanges.

Such distinctions have led Kozlowski and Doherty (1989) to suggest that leadership serves as the proximal antecedent of climate, with the two research domains being implicitly entwined. Such proximity stems from the fact that leader interactions with group members constitute the primary source of information about the organizational environment, in addition to being the most salient attribute of that environment. Put differently, leader interactions provide the medium in which policies are implemented, yet the medium, although influencing the message (e.g., greater emphasis on safety under high-quality leader–member interactions), is not to be confused with it (to interpolate Marshall McLuhan's, 1964, dictum).

This conceptual framework has received considerable support in safety research, indicating that, although higher quality relationships between leader and members predict higher safety climate (e.g., Barling et al., 2002; Hofmann et al., 2003), this relationship is moderated by contextual factors. For example, Zohar (2002) showed that relationships between Multifactor Leadership Questionnaire factor scores and safety climate (with the exception of high-transformational leadership) were moderated by the priority of safety, as communicated by group leaders' immediate superior. Transactional and avoidant leadership thus predicted widely divergent climate levels, depending on the safety expectations of their immediate superior. By default, such data indicate that group members discriminate between the two constructs, that is, employees will use relationship-based referents for leadership perceptions and commitment-based referents for climate perceptions. Congruently, factor analysis of climate items in the present study, where items have been designed to cover a wide range of leader behaviors, resulted in a factorial structure characteristic of climate, rather than leadership, constructs.

It is important to note the newer construct of safety leadership. This construct was operationalized by Barling and colleagues (2002) with the Transformational Leadership subscales of the Multifactor Leadership Questionnaire, after modifying scale items to include safety as primary context. Although this approach minimizes conceptual differences between leadership and climate as discussed above, the authors tested (and supported) safety leadership as an antecedent of safety climate, using the core meaning of climate as defined above. These developments highlight the need for clarifying the relationships between leadership and climate, including the utility of facet-specific leadership constructs and congruent facet-specific climates.

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Appendix A

Organization-Level Safety Climate

Top management in this plant–company . . .

1. Reacts quickly to solve the problem when told about safety hazards.
2. Insists on thorough and regular safety audits and inspections.
3. Tries to continually improve safety levels in each department.
4. Provides all the equipment needed to do the job safely.
5. Is strict about working safely when work falls behind schedule.
6. Quickly corrects any safety hazard (even if it's costly).
7. Provides detailed safety reports to workers (e.g., injuries, near accidents).
8. Considers a person's safety behavior when moving–promoting people.
9. Requires each manager to help improve safety in his–her department.
10. Invests a lot of time and money in safety training for workers.
11. Uses any available information to improve existing safety rules.
12. Listens carefully to workers' ideas about improving safety.
13. Considers safety when setting production speed and schedules.
14. Provides workers with a lot of information on safety issues.
15. Regularly holds safety-awareness events (e.g., presentations, ceremonies).
16. Gives safety personnel the power they need to do their job.

Note. Items cover three content themes: Active Practices (Monitoring, Enforcing), Proactive Practices (Promoting Learning, Development), and Declarative Practices (Declaring, Informing).

Appendix B

Group-Level Safety Climate

My direct supervisor . . .

1. Makes sure we receive all the equipment needed to do the job safely.
2. Frequently checks to see if we are all obeying the safety rules.
3. Discusses how to improve safety with us.
4. Uses explanations (not just compliance) to get us to act safely.
5. Emphasizes safety procedures when we are working under pressure.
6. Frequently tells us about the hazards in our work.
7. Refuses to ignore safety rules when work falls behind schedule.
8. Is strict about working safely when we are tired or stressed.
9. Reminds workers who need reminders to work safely.
10. Makes sure we follow *all* the safety rules (not just the most important ones).
11. Insists that we obey safety rules when fixing equipment or machines.
12. Says a "good word" to workers who pay special attention to safety.
13. Is strict about safety at the end of the shift, when we want to go home.
14. Spends time helping us learn to see problems *before* they arise.
15. Frequently talks about safety issues throughout the work week.
16. Insists we wear our protective equipment even if it is uncomfortable.

Note. Items cover three content themes: Active Practices (Monitoring, Controlling), Proactive Practices (Instructing, Guiding), and Declarative Practices (Declaring, Informing).

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