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Climate as a Moderator of the Relationship Between Leader–Member Exchange and Content Specific Citizenship: Safety Climate as an Exemplar

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The present study integrates role theory, social exchange, organizational citizenship, and climate research to suggest that employees will reciprocate implied obligations of leadership-based social exchange (e.g., leader-member exchange [LMX]) by expanding their role and behaving in ways consistent with contextual behavioral expectations (e.g., work group climate). Using safety climate as an exemplar, the authors found that the relationship between LMX and subordinate safety citizenship role definitions was moderated by safety climate. In summary, high-quality LMX relationships resulted in expanded safety citizenship role definitions when there was a positive safety climate and there was no such expansion under less positive safety climates. The authors also found that safety citizenship role definitions were significantly related to safety citizenship behavior. Implications for both social exchange theory and safety research are discussed.

Individuals within organizations are frequently confronted with multiple, and sometimes competing, role expectations. In fact, there is evidence to suggest not only that these different role expectations produce significant role ambiguity and conflict (Ilgen & Hollenbeck, 1991) but also that individuals vary in how they define their roles (Morrison, 1994). It remains an unanswered question, however, under what conditions individuals choose to define particular behaviors as part of their formal role. For example, individuals can be confronted with role expectations encouraging such competing goals as quality, efficiency, and safety. Why do individuals choose to integrate any of these goals into their role definition? We begin to investigate this question by examining the correlates of safety role definitions and behavior.

Although the role definition processes we discuss apply across virtually any context, the focus of the current study is on organizational safety. In many organizations, safe behavior is an important goal because of the human and financial costs associated with unsafe behavior, accidents, and injuries. In 1998 there were 5,100 workplace fatalities and 3.8 million disabling injuries in the United States alone. The costs of these injuries included $62.9 billion in lost wages and productivity, $19.9 billion in medical costs, and $25.6 billion in administrative expenses (National Safety Council, 1999). Obviously, these costs do not include the psychological costs (e.g., pain, suffering, grief, and loss) or the damage to an organization's reputation that might negatively impact recruiting and other efforts. Recently, a number of investigations have explored the role that leadership and climate can play in safe behavior and accidents (Hofmann, Jacobs, & Landy, 1995; Hofmann & Morgeson, 1999, in press; Hofmann & Stetzer, 1996, 1998; Neal, Griffin, & Hart, 2000; Williams, Turner, & Parker, 2000; Zohar, 2000).

The purpose of the current study was to investigate the combined influence of leader–member exchange (LMX) and safety climate on subordinate safety role definitions and behavior. Although previous research has consistently found a positive relationship between LMX and general organizational citizenship behavior, such as helping coworkers or doing favors for the leader (Liden, Sparrowe, & Wayne, 1997; Settoon, Bennett, & Liden, 1996; Wayne, Shore, & Liden, 1997), both the role theory and social exchange foundations of LMX research hint at a possible moderated relationship. For example, Dienesch and Liden (1986) suggested that the values and norms of an organization might influence which behavioral dimensions are emphasized within the LMX relationship. To date, however, no research has investigated the relationship between LMX and content specific role definitions and behavior.

Role Theory, Social Exchange, and Role Definitions

Both Katz and Kahn (1978) and Graen (1976) suggested that individuals accomplish work in organizations by engaging in roles that are expected of them by other individuals within the organization. Although differing in specifics of the role development

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process, both discussions emphasized that the relationship between the leader and subordinate is a particularly important influence on subordinate role behavior. For example, Katz and Kahn (1978) cited evidence suggesting that focal individuals more fully meet the expectations of role senders when focal individuals felt liking, admiration, and respect for the role-sender. Similarly, Graen and colleagues (Graen, 1976; Graen & Scandura, 1987) discussed the importance of leader–member relationships during the role-making stage of role development. In high-quality relationships, the leader and subordinate engage in collaborative problem solving, eventually resulting in a set of interlocking role behaviors that are mutually reinforcing. In low-quality relationships, however, this role-making stage fails to develop in the same way or ends early in the process. Thus, when there is a high-quality relationship and a fully developed role-making process, a richer and more elaborate set of role behaviors emerge. This results in significantly different enacted roles between high- and low-quality leader–member relationships.

Because LMX relationships are based in a social exchange, there is a perceived obligation on the part of subordinates to reciprocate high-quality relationships (Blau, 1964; Gouldner, 1960). One way in which subordinates can reciprocate these relationships is by enlarging their roles so that they extend beyond normal role requirements (i.e., engage in citizenship behaviors). Such citizenship behaviors are likely avenues for reciprocation because they reflect discretionary individual behavior that is not explicitly recognized by job descriptions or formal reward systems (Organ, 1988). In essence, subordinates in high-quality LMX relationships "pay back" their leaders by engaging in citizenship (i.e., discretionary) behaviors that benefit the leader and others in the work setting (see Liden et al., 1997; Settoon et al., 1996).

In addition, we believe that subordinates reciprocate high-quality relationships in a manner consistent with the type of behavior valued in their work environment. Because safety is a paramount concern in high-risk environments, one such set of valued behavior would be performing the job safely. Therefore, it is likely that high-quality LMX relationships will prompt subordinates to expand their roles beyond what is formally expected and to engage in increased citizenship behaviors oriented around safety. Such safety citizenship behaviors are similar to organizational citizenship behaviors except that they are focused on improving the safety performance of other team members and the organization.

Although not focusing on safety citizenship behavior per se, recent research in high-risk environments suggests that high-quality LMX relationships are associated with increased safety communication, increased subordinate safety commitment, and fewer accidents (Hofmann & Morgeson, 1999). These findings, as well as the arguments above, suggest that safety is an avenue through which subordinates reciprocate high-quality LMX relationships, in part by expanding their safety citizenship role definitions and by engaging in greater safety citizenship behavior. Therefore, we made the following hypotheses:

Hypothesis 1: LMX will be positively related to the performance of safety citizenship behavior.

Hypothesis 2: LMX will be positively related to safety citizenship role definitions such that subordinates will report more discretionary safety-related activities as part of their formal role.

Hypothesis 3: Safety citizenship role definitions will be positively related to the performance of safety citizenship behavior.

Hypothesis 4: Safety citizenship role definitions will mediate the relationship between LMX and safety citizenship behavior.

Safety Climate as a Moderator

As noted above, we believe that the type of behavior valued in the work environment will provide the direction for subordinate reciprocation. This notion of valued behavior in the work environment is consistent with the definition of organizational climate. For example, Schneider (1990) defined climate as perceptions of the events, practices, and procedures, as well as the kind of behaviors, that get rewarded, supported, and expected in a particular organizational setting. This includes the behavioral routines (i.e., practices and procedures) as well as the rewards of the setting.

Although we believe that safety is emphasized to at least some degree within high-risk environments, safety climate research suggests that work groups vary significantly in the degree to which safe performance is viewed as expected, rewarded, and valued (see Hofmann & Stetzer, 1996, 1998; Zohar, 2000). If these group climates vary significantly in the degree to which safety is valued, then one would expect that the degree to which individuals reciprocate high-quality LMX relationships by expanding their safety citizenship role definitions will vary as well. In other words, within positive safety climates, safe performance will be more strongly valued, and as a result, safety will be viewed as a more legitimate avenue for reciprocating high-quality LMX relationships. This legitimatization of safety as an avenue for reciprocation, coupled with the perceived obligation arising from the social exchange (i.e., LMX relationship), will result in individuals expanding their safety citizenship role definitions.

Under conditions of a weaker safety climate, there is a reduced emphasis on safety performance. Despite the fact that leaders may have high-quality social exchanges with employees, subordinates will be less likely to view safety as an avenue to reciprocate the implied obligation resulting from the high-quality social exchange. As a consequence, they will be less likely to expand their safety citizenship role definitions. Therefore, we made the following hypothesis:

Hypothesis 5: The relationship between LMX and safety citizenship role definitions will be moderated by safety climate such that the relationship between LMX and safety citizenship role definitions will be stronger when there is a positive safety climate.

Figure 1 provides a graphical depiction of the relationships specified in the hypotheses.

Method

Research Setting

The research setting for this study was a military unit charged with transporting heavy equipment as part of the military deployment process. The types of equipment transported included combat equipment, such as tanks and artillery vehicles, along with logistics and sustainment equipment, such as trucks and containers of supplies. In this organization, team leaders are responsible for accomplishing operational goals as well as ensuring that soldiers perform safely. The teams participating in the current

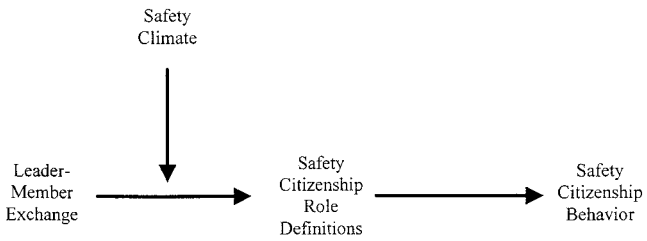

Figure 1. Hypothesized relationships.

study included both ground and ocean transportation teams. To control for any differences between these two types of teams, a dummy-coded variable was used as a control in the analyses.

Participants

The participants were 127 transportation team members in the U.S. Army. They were an average age of 26.03 years ($SD = 6.60$), had an average tenure in the U.S. Army of 6.02 years ($SD = 6.55$), and had an average tenure within the transportation unit of 4.22 years ($SD = 6.37$). A total of 82% of the team members were male. Team leaders ($N = 29$) rated the safety behavior of team members. Team leaders were an average age of 31.53 years ($SD = 5.57$), had an average tenure in the U.S. Army of 10.37 years ($SD = 5.09$), and had an average tenure within the transportation unit of 4.48 years ($SD = 5.79$). Of the 127 transportation team members, 118 returned completed surveys (93% return rate), and we were able to obtain team leader ratings of safety behavior for 101 team members. To ensure that there were enough respondents per team to provide reliable estimates of safety climate, we conducted analyses on teams with three or more respondents (average team size was 3–5 members). This resulted in a final sample of 25 teams and 94 individuals.

To investigate alternative explanations for our results, we investigated whether teams differed in demographic composition. We found that the teams did not differ in terms of team tenure, $F(24, 64) = 1.09$, *ns;* tenure in the unit, $F(24, 66) = 1.48$, *ns;* or tenure in the military, $F(24, 66) = .97$, *ns.* There were marginally significant differences with respect to gender composition, $F(24, 67) = 1.61$, $p = .07$. Follow-up analyses revealed, however, that gender was not significantly correlated with LMX ($r = .04$), safety climate ($r = .07$), safety citizenship role definitions ($r = .00$), or safety citizenship behavior ($r = -.08$). Given this pattern of relationships, gender could not serve as a problematic omitted variable in our analyses (James, 1980).

Measures

Leader–member exchange. Because we were interested in the overall exchange relationship, we asked subordinates to rate the LMX relationship with their supervisor by using the LMX7 measure (Graen & Uhl-Bien, 1995; Scandura & Graen, 1984) as recommended by Gerstner and Day (1997). A 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) was used such that higher scores reflected higher quality exchanges. Scale scores were created by computing the mean across the seven items. Internal consistency reliability was .94.

Safety climate. Safety climate was assessed by using a revised and updated version of the original Zohar (1980) safety climate measure. In particular, safety climate was measured by using items from the management attitude toward safety (12 items; e.g., "my crew leader views safety violations very seriously even when they do not result in apparent damage"), effect of safe behavior on social standing (6 items; e.g., "the best soldiers in my crew expect other soldiers to behave safely"), and safety reward (5 items; e.g., "my crew leader negatively evaluates soldiers who behave recklessly") scales identified by Mueller, DaSilva, Townsend, and Tetrick (1999). Because our interest was in overall safety climate, we combined these three subscales into an overall measure. All 23 items used a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) with high scores representing more positive safety climates. Internal consistency reliability was .94.

Our level of theory for safety climate was the work group. Thus, in keeping with recommendations regarding multilevel research (e.g., Chan, 1998; Klein, Dansereau, & Hall, 1994; Morgeson & Hofmann, 1999), we focused the items on the appropriate level of analysis (i.e., reference the group and supervisor) and investigated the degree to which these perceptions were shared within each of the 25 teams. An investigation of within-group agreement (r_{wg}) with a uniform distribution revealed acceptable levels of agreement (average .98; Bliese, 2000; Hofmann, 2002; James, Demaree, & Wolf, 1993). In addition, intraclass correlations (ICCs) were as follows: ICC(1) was .30, ICC(2) was .62, and there was significant between-group variance in safety climate, $F(24, 69) = 2.66$, $p < .01$. Thus, there were acceptable levels of within-group agreement (r_{wg} and ICC[1]) as well as a reliable mean score (i.e., ICC[2]). Given this, we aggregated employee responses to form a single climate score for each group.

Safety citizenship role definitions. Safety citizenship role definitions were measured by modifying several organizational citizenship behavior measures. Drawing on theoretical and empirical work by Van Dyne and colleagues (Van Dyne, Cummings, & McLean-Parks, 1995; Van Dyne, Graham, & Dienesch, 1994; Van Dyne & LePine, 1998), we developed items reflecting safety-related helping, voice, stewardship, and whistleblowing. We also developed three items focused on maintaining an up-to-date knowledge of safety issues (i.e., safety-oriented civic virtue; see Podsakoff, MacKenzie, Moorman, & Fetter, 1990) and a four-item measure of initiating safety-related workplace change (Morrison & Phelps, 1999). When possible, we used existing and validated citizenship scales, with the only alterations being to make them safety specific; the Appendix contains the items. In total, 27 safety citizenship items were developed for the current study. Team members used a 5-point Likert-type scale to assess the degree to which each behavior was considered to be part of the job. Scale anchors consisted of 1 (*expected part of my job*), 3 (*somewhat above and beyond what is expected for my job*), and 5 (*definitely above and beyond what is expected for my job*). For analysis, items were recoded so that higher scores reflected more in-role behavior. Because our hypotheses involved overall levels of safety citizenship role definitions and the separate scales were highly intercorrelated (average $r = .78$), we combined the subscales into an overall measure (internal consistency reliability = .98).[1]

[1] One would expect these safety citizenship role definitions to be viewed as more discretionary than more core safety role definitions (i.e., those specified on the job description, such as wearing personal protection equipment). Thus, in an effort to provide additional construct validity for our safety citizenship role definition measure, we also included a six-item measure of core safety role definitions based on the work of Burke, Sarpy, Tesluk, and Smith-Crowe (2001). These core safety role definitions consisted of safety activities that are part of the formal work procedures (e.g., using personal protection equipment as indicated by policies and procedures, using personal protection equipment correctly, properly using lockout and tag-out procedures, using appropriate lifting techniques, applying appropriate work practices to reduce exposure to potential hazards and injury, and generally following safety policies and procedures). When using the same measurement procedures as the safety citizenship role definitions, these six items assessed the degree to which team members viewed core safety role definitions as part of their job. Internal consistency reliability was .97. The scale was coded such that higher scores were associated with the behaviors being more in-role. As expected, these core safety role definitions were viewed as being more required ($M = 4.15$) than the safety citizenship role definitions ($M = 3.95$), $t(94) = 3.33$, $p < .01$. Thus, respondents distinguished between those aspects considered a required part of the job and those considered beyond the formal job requirements. Given the focus of our hypotheses, only the safety citizenship measure is included in subsequent analyses.

Leader ratings of safety citizenship behavior. Safety citizenship behavior was measured by having the team leaders rate each team member's performance of the safety citizenship behaviors (i.e., the 27 safety citizenship items). A 5-point Likert-type frequency rating scale was used with anchors ranging from 1 (*does not engage in this behavior*) to 5 (*very frequently engages in this behavior*). Scale scores were created such that higher scores reflected more frequent performance of the behavior. Once again, each of the subscales demonstrated high average intercorrelations (average $r = .71$). Thus, to be consistent with our measure of safety citizenship role definitions, we created an overall measure of safety citizenship behavior consisting of all 27 safety citizenship items (internal consistency reliability = .96).

Analytical Approach

The data in the present study were multilevel in nature, with safety climate at the group level and LMX, employee role definitions, and employee behavior at the individual level of analysis. The most appropriate analytical method is one that takes into account this multilevel data structure. Thus, our primary analytical technique was hierarchical linear modeling (HLM; Bryk & Raudenbush, 1992; Hofmann, 1997; Hofmann, Griffin, & Gavin, 2000). In addition, HLM is particularly well suited for estimating the type of cross-level interactions hypothesized here (Hypothesis 5). HLM Version 5.0 reports both generalized least squares (GLS) standard errors as well as more robust standard errors. Given our Level 2 sample size, we reported only the *t* values based on the more conservative GLS estimates.

Although our level of theory and our treatment of LMX was at the individual level of analysis, there was meaningful between-group variance, $F(24, 93) = 3.42$, $p < .01$; ICC(1) = .39; ICC(2) = .71; mean $r_{wg} = .91$, which is consistent with recent research (Cogliser & Schriesheim, 2000). Given this between-group variance, it is important—particularly in the testing of cross-level interactions (i.e., Hypothesis 5)—to investigate whether the safety climate moderation of the LMX–safety citizenship role definitions relationship constituted a cross-level or between-group interaction (Hofmann & Gavin, 1998). We report these analyses in the Results section.

Because the teams involved in the current study were rather small (averaging 3–5 respondents), there might be some problems with the estimation of the HLM models. For example, James and Williams (2000) noted that the HLM estimation strategy is somewhat complex and that, "simpler is sometimes better" (p. 423). Thus, we also analyzed the data by using the more traditional cross-level operator in ordinary least squares regression. The results of these ordinary least squares analyses were consistent with the HLM results reported below.

Results

Table 1 presents the means, standard deviations, and intercorrelations of the study variables. Although not hypothesized, but as one might expect, there was a significant relationship between safety climate and both safety citizenship role definitions and safety citizenship behavior ($r = .23$ and $r = .48$, respectively). Table 1 also provides initial support for Hypotheses 1–3. There were significant correlations between LMX and safety citizenship behavior ($r = .40$; Hypothesis 1), LMX and safety citizenship role definitions ($r = .29$; Hypothesis 2), and safety citizenship role definitions and safety citizenship behavior ($r = .35$; Hypothesis 3). These correlations, however, do not take into account the multilevel nature of the data nor the dummy code control for the type of team. Thus, we turn to the HLM analyses.

Table 2 provides a summary of the models and results used to test Hypotheses 1–4. As can be seen in Table 2, we controlled for type of work setting ($dummy_j$) in our tests of each hypothesis. This control variable was significant in all of the models.

Hypothesis 1 predicted that LMX would be significantly related to safety citizenship behavior. HLM revealed that LMX was significantly related to safety citizenship behavior ($\gamma_{10} = .20$, $p < .01$, $R^2 = .14$), supporting Hypothesis 1. Hypothesis 2 predicted that LMX would be positively related to safety citizenship role definitions. Once again, HLM analyses ($\gamma_{10} = .32$, $p < .05$, $R^2 = .08$) provided support for Hypothesis 2. Hypothesis 3 predicted that safety citizenship role definitions would be significantly related to safety citizenship behavior. Once again, the results of the analysis provided support for Hypothesis 3 ($\gamma_{10} = .09$, $p < .05$, $R^2 = .07$).

Hypothesis 4 predicted that safety citizenship role definitions would mediate the relationship between LMX and safety citizenship behavior. Given the results of Hypotheses 1–3, the preconditions for mediation were supported (Baron & Kenny, 1986). The final step in the test for mediation showed that, when regressed onto safety citizenship behavior, both LMX and safety citizenship role definitions were significant (LMX: $\gamma_{10} = .15$, $p < .05$, one-tailed; safety citizenship role definitions: $\gamma_{20} = .07$, $p = .06$, one-tailed; overall $R^2 = .14$). This indicates that both safety citizenship role definitions and LMX were related to safety citizenship behavior, thereby not supporting the mediated relationship specified in Hypothesis 4.

Hypothesis 5 suggested that safety climate would moderate the relationship between LMX and safety citizenship role definitions. This moderated hypothesis constitutes a cross-level relationship. As Hofmann and Gavin (1998) noted, it is possible to find spurious cross-level relationships if one does not appropriately separate out the cross-level from the between-groups interaction, particularly when the variable being moderated contains both individual- and group-level variance (as LMX did; see *Analytical Approach* section). Given this, the cross-level interaction was investigated by using group–mean centering in HLM with the between-group variance in LMX included in the Level 2 intercepts model (Hofmann & Gavin, 1998). This had

Table 1
Means, Standard Deviations, and Intercorrelations Among Study Variables

Variable	*M*	*SD*	1	2	3	4
1. Safety climate	3.90	0.37	(.94)			
2. Leader–member exchange	3.90	0.85	.55**	(.94)		
3. Safety citizenship role definitions	3.95	1.09	.23*	.29**	(.98)	
4. Safety citizenship behaviors	3.10	0.85	.48**	.40**	.35**	(.96)

Note. $N = 94$. Internal consistency reliabilities appear in parentheses along the diagonal. Although the correlations between safety climate and all other variables were computed by using $N = 94$, safety climate scores for individual groups were assigned down to individuals within those groups. Thus, the effective *N* for safety climate is 25.
* $p \leq .05$. ** $p \leq .01$.

Table 2
Hierarchical Linear Modeling Models and Results for Hypotheses 1–4

Model	Parameter estimates[a]							
	γ_{00}	γ_{01}	γ_{10}	γ_{20}	σ^2	τ_{00}	τ_{11}	τ_{22}
Hypothesis 1								
L1: $SCB_{ij} = \beta_{0j} + \beta_{1j}(LMX_{ij}) + r_{ij}$								
L2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(dummy_j^a) + U_{0j}$	4.74†††	−1.05†††	0.20†††		0.12	0.26†††	0.12††	
L2: $\beta_{1j} = \gamma_{10} + U_{1j}$								
Hypothesis 2								
L1: $SCRD_{ij} = \beta_{0j} + \beta_{1j}(LMX_{ij}) + r_{ij}$								
L2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(dummy_j^a) + U_{0j}$	4.73†††	−0.51††	0.32††		1.00	0.01	0.08††	
L2: $\beta_{1j} = \gamma_{10} + U_{1j}$								
Hypothesis 3								
L1: $SCB_{ij} = \beta_{0j} + \beta_{1j}(SCRD_{ij}) + r_{ij}$								
L2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(dummy_j^a) + U_{0j}$	4.60†††	−0.96†††	0.09††		0.13	0.28†††	0.01††	
L2: $\beta_{1j} = \gamma_{10} + U_{1j}$								
Hypothesis 4								
L1: $SCB_{ij} = \beta_{0j} + \beta_{1j}(LMX_{ij}) + \beta_{2j}(SCRD_{ij}) + r_{ij}$								
L2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(dummy_j^a) + U_{0j}$	4.56†††	−0.99†††	0.15††	0.07†	0.12	0.25†††	0.04	.00
L2: $\beta_{1j} = \gamma_{10} + U_{1j}$								
L2: $\beta_{2j} = \gamma_{20} + U_{2j}$								

Note. L1 = Level 1; L2 = Level 2; SCB = safety citizenship behavior; LMX = leader–member exchange; SCRD = safety citizenship role definitions; γ_{00} = Intercept of Level 2 regression predicting β_{0j}; γ_{01} = Slope of Level 2 regression predicting β_{0j}; γ_{10} = Intercept of Level 2 regression predicting β_{1j} (pooled Level 1 slopes); γ_{20} = Intercept of Level 2 regression predicting β_{1j} (pooled Level 1 slopes); σ^2 = Variance in Level 1 residual (i.e., variance in r_{ij}); τ_{00} = Variance in Level 2 residual for models predicting β_{0j} (i.e., variance in U_0); τ_{11} = Variance in Level 2 residual for models predicting β_{1j} (i.e., variance in U_1); τ_{22} = Variance in Level 2 residual for models predicting β_{2j} (i.e., variance in U_2).
[a] Dummy code representing type of work (i.e., ocean vs. ground crews).
† $p = .06$, one-tailed. †† $p < .05$, one-tailed. ††† $p < .01$, one-tailed.

the effect of partitioning the total variance of LMX into its within- and between-group components to investigate which source of variance was interacting with safety climate.

To investigate this interaction, two models were estimated (see Table 3). First, safety citizenship role definitions were regressed on leader–member exchange and safety climate. This model provided an overall assessment of the relationship between LMX and safety citizenship role definitions as well as estimated a main effect for safety climate. Most important, however, this model provided an assessment of the variability in the relationship between LMX and safety citizenship role definitions across groups. Assuming there is significant variance in this relationship across groups, then the test of Hypothesis 5 is the extent to which safety climate explains this variability (Bryk & Raudenbush, 1992; Hofmann, 1997; Hofmann et al., 2000).

The results of this first model are shown in the top part of Table 3. The results revealed (a) a significant within-group relationship between LMX and safety citizenship role definitions ($\gamma_{10} = .44$, $p < .05$, one-tailed), (b) a significant effect for our dummy-coded control variable for type of work ($\gamma_{03} = -.52$, $p < .05$), and (c) significant variance in the Level 1 slopes relating LMX to safety citizenship role definitions (U_1 variance = .56), $\chi^2(24) = 39.90$, $p < .05$. From these findings, one can conclude that there is a significant within-group relationship between LMX and safety citizenship role definitions and that the magnitude of this relationship varies significantly across groups. In the second model (see the bottom of Table 3), safety climate was added as a predictor of the variance in the slopes relating LMX to safety citizenship role definitions. In addition, this model also investigated the possibility of a significant between-group interaction between LMX and safety climate (i.e., group mean LMX interacting with safety climate).

The results of this model revealed that the between-group interaction was not significant ($\gamma_{04} = .48$, *ns*), whereas the cross-level interaction was significant ($\gamma_{11} = 1.64$, $p < .05$). After including safety climate in the model, the residual variance in the Level 1 slopes was no longer significant (U_1 variance = .28), $\chi^2(23) = 29.67$, *ns*. Using these two variance components, we calculated that the R^2 for safety climate was .50 (i.e., [.56 − .28]/.56).[2] This significant cross-level interaction is shown in Figure 2, where the relationship between LMX and safety citizenship role definitions is plotted for high and low safety climates (defined as +1 and −1 standard deviation from the mean, respectively; Aiken & West, 1991). In addition to plotting the interaction,

[2] To provide an effect size assessment comparable with other research investigating moderator variables, we estimated the interaction by using ordinary least squares (OLS) regression (with group-level climate scores assigned down to individuals within the group). Although this model likely violates the assumed independence of error terms (consequently biasing the parameter tests), the overall R^2 value provides an unbiased assessment of the percentage of variance the interaction accounts for using a slightly different estimation method (OLS vs. GLS). The results of this OLS moderated regression demonstrated that the interaction term accounted for an addition 8% of the variance (i.e., R^2 change = .08). According to McClelland and Judd (1993), an R^2 change of this magnitude should be considered rather large. Specifically, McClelland and Judd stated that "even when reliable moderator effects are found, the reduction in model error due to adding the product term is often disconcertingly low. Evans (1985), for example, concluded that moderator effects are so difficult to detect that even those explaining as little as 1% of the variance should be considered important. Champoux and Peters (1987) and Chaplin (1991) reviewed much of the social science literature and reported that field study interactions typically account for about 1–3% of the variance" (p. 277).

Table 3
Hierarchical Linear Modeling Models and Results for Hypothesis 5

Model	Parameter estimates[a]									
	γ_{00}	γ_{01}	γ_{02}	γ_{03}	γ_{04}	γ_{10}	γ_{11}	σ^2	τ_{00}	τ_{11}
Preliminary model L1: $SCRD_{ij} = \beta_{0j} + \beta_{1j}(LMX_{ij}^{a}) + r_{ij}$ L2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Mean LMX}_j) + \gamma_{02}(\text{Safety climate}_j) + \gamma_{03}(\text{dummy}_j^{b}) + U_0$ L2: $\beta_{1j} = \gamma_{10} + U_1$	3.09††	−0.09	0.53	−0.52††		0.44††		0.86	0.02	0.56††
Hypothesis 5 L1: $SCRD_{ij} = \beta_{0j} + \beta_{1j}(LMX_{ij}^{b}) + r_{ij}$ L2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Mean LMX}_j) + \gamma_{02}(\text{safety climate}_j) + \gamma_{03}(\text{dummy}_j^{a}) + \gamma_{04}(\text{Mean LMX}_j \times \text{safety climate}_j) + U_0$ L2: $\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{safety climate}_j) + U_1$	10.60††	−1.94	−1.47	−0.55††	0.48	−5.90††	1.64††	0.86	0.01	0.28

Note. L1 = Level 1; L2 = Level 2; SCRD = Safety citizenship role definitions; LMX = leader–member exchange; γ_{00} = Intercept of Level 2 regression predicting β_{0j}; γ_{01}–γ_{04} = Slopes of Level 2 regression predicting β_{0j}; γ_{10} = Intercept of Level 2 regression predicting β_{1j}; γ_{11} = Slope of Level 2 regression predicting β_{1j}; σ^2 = Variance in Level 1 residual (i.e., variance in r_{ij}); τ_{00} = Variance in Level 2 residual for models predicting β_{0j} (i.e., variance in U_0); τ_{11} = Variance in Level 2 residual for models predicting β_{1j} (i.e., variance in U_1).
[a] In the Level 1 analyses, LMX was group mean centered.
[b] Dummy code representing type of work (i.e., ocean vs. ground crews).
†† $p < .05$, one-tailed.

we also conducted a simple slopes analysis (Aiken & West, 1991). The simple slope of the regression of safety citizenship role definitions onto LMX within high safety climates was significant (simple slope = 1.22), $t(23) = 3.29$, $p < .01$. Within low safety climates, the relationship between LMX and safety citizenship role definitions was nonsignificant (simple slope = −.33), $t(23) = -.90$, *ns*. Thus, in keeping with our hypothesis, the relationship between LMX and safety citizenship role definitions was strong and positive in work groups with a positive safety climate. Alternatively, this relationship is much weaker and nonsignificant in poorer safety climates.

Given our discussion of both cross-level and between-group interactions, it is important to discuss briefly the type of interaction that is plotted in Figure 2 and how to interpret it. The cross-level interaction plotted in Figure 2 represents how the within-group relationship between LMX and safety citizenship role definitions changes as a function of safety climate. Thus, we are investigating the relationship between LMX and safety citizenship role definitions within groups as a function of between-group differences in safety climate.

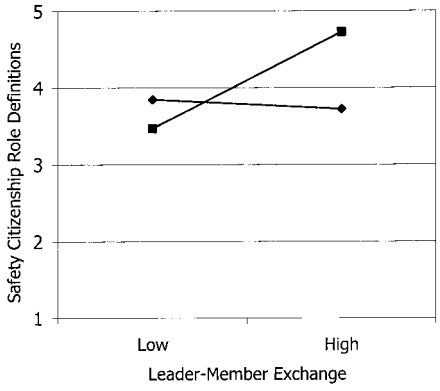

Figure 2. Safety climate as a moderator of the relationship between leader–member exchange and safety citizenship role definitions. The line with a diamond symbol represents low-safety climate and the line with a square symbol represents high-safety climate.

Discussion

To summarize the results, we found that (a) LMX was significantly related to safety citizenship role definitions, (b) this relationship between LMX and safety citizenship role definitions was moderated by safety climate, and (c) both LMX and safety citizenship role definitions were significantly related to safety citizenship behavior. Perhaps the most notable finding of the current investigation was that organizational climate acted as a contextual moderator of the relationship between LMX and safety citizenship role definitions. Specifically, in work contexts where there was a more positive safety climate, employees were more likely to view safety behaviors as part of their formal role responsibilities. When safety climate was not as positive, this relationship was not found. These findings are consistent with the view that organizational climate establishes a context that emphasizes certain role behaviors as being important and that LMX then predicts the degree to which individuals integrate behaviors within this domain into their formal roles. In addition to these findings regarding safety citizenship role definitions, we found that safety citizenship role definitions were positively related to the performance of safety citizenship behaviors.

We believe that this study has significant implications for LMX and social exchange research. In particular, our focus on content-specific role definitions and citizenship behavior provides an interesting new direction for LMX and social exchange research. Although Dienesch and Liden (1986) noted that an organization's values or norms could influence which behavioral dimensions are emphasized within LMX relationships, no research to date has investigated this idea within the context of employee role definitions. Our findings suggest that climates within work groups serve to emphasize or de-emphasize certain content-specific role expectations, and that members within these groups experiencing high-quality LMX relationships reciprocate consistent with these expectations. Although we focused on safety climate, other types of strategically focused climates could be explored, such as service quality. One avenue for future research would be to investigate multiple climates within a given work group (e.g., safety and productivity), LMX, and subsequent role definitions.

We did not find support for the mediating effect of safety citizenship role definitions; instead we found that LMX and safety citizenship role definitions jointly predicted safety citizenship behavior. This is at odds with the work of Morrison (1994), who found some support for role definitions mediating the relationship between organizational variables (e.g., organizational commitment) and citizenship behaviors but consistent with the recent work of Tepper, Lockhart, and Hoobler (2001), who also failed to find support for a mediated relationship. Future research needs to further explore the relationship between organizational and leadership factors, role definitions, and citizenship behavior.

We also believe that the results have implications for safety research. Recently, both engineers and social scientists have become increasingly interested in the role that social–organizational factors play in safety performance (e.g., Embrey, 1992; Hofmann et al., 1995; Zohar, 1980, 2000). Although the role of leadership has been much discussed, it is only recently that researchers have empirically investigated these relationships (e.g., Hofmann & Morgeson, 1999, in press; Williams et al., 2000). Our findings add to this emerging body of research, suggesting that front-line leaders, and the climates they help create within their work groups, can have a significant impact on the safety performance of their subordinates.

Another implication of the current findings is the way in which LMX and safety climate can interact to influence organizational learning and innovation. Recall that our measure of citizenship behavior included a number of items focused on initiating safety-related change within the organization. Given this, our findings suggest that employees will be more likely to initiate change consistent with the climate of the organization when they experience high-quality LMX relationships. Thus, if an organization wants to encourage significant learning and improvement in a particular area (e.g., safety, quality, customer service), it appears that positive leader–subordinate relationships need to be coupled with the relevant strategically focused climate (e.g., safety, quality, customer service).

The current study has several potential limitations. First, because there was only one administration of the survey, we were unable to investigate how social exchanges develop over time. This clearly limits the degree to which we can make causal inferences. Second, we were unable to obtain accident data for the participants in the study. Thus, it is an open question as to whether safety citizenship role definitions and behavior will lead to reductions in accidents. Other research, however, has found significant relationships between safety behavior and accidents (Hofmann & Morgeson, 1999; Hofmann & Stetzer, 1996). Third, the context of the current study was one where the risks are high and safety is strongly emphasized. To the extent that this context resulted in a relatively high level of overall safety climate (despite the significant variability across groups), this could have served to attenuate the magnitude of the relationships observed in the current study.

A final potential limitation is that LMX and safety citizenship role definitions were measured with a common method and source. It might be argued that common method bias is responsible for the observed results. Given the complexity of the hypothesized relationships (i.e., the cross-level moderation), however, it seems unlikely that common method bias could account completely for our pattern of findings. In addition, the leader ratings of safety citizenship behavior constituted an independent data source, and both LMX and safety citizenship role definitions were significantly associated with these independent ratings, further ameliorating concerns about common method bias.

Notwithstanding these arguments, we directly tested the potential problem of common method variance by conducting an additional empirical investigation. Although our primary focus was on safety citizenship role definitions and their relationship with LMX, safety climate, and safety citizenship behavior, one might argue that safety climate could moderate the relationship between LMX and safety citizenship behavior as well. Given this, we investigated whether the interaction depicted in Figure 2 held when safety citizenship role definitions were replaced with safety citizenship behavior. These results revealed a significant cross-level interaction and a nonsignificant between-group interaction.[3] Follow-up simple slopes analyses and plotting of the interaction revealed a similar pattern to that depicted in Figure 2. Thus, the interaction that is depicted in Figure 2, which does involve data gathered from the same source, was replicated across independent data sources. This further suggests that common method variance is not responsible for the significant effects observed.

Conclusion

In summary, the results of the current study have important implications for organizational researchers as well as for safety researchers and practitioners. With respect to organizational researchers, it appears that organizational climate and the quality of leader–subordinate exchange relationships interact to predict the degree to which employees view citizenship behaviors as part of their formal role and the degree to which they engage in these citizenship behaviors. With respect to safety, our results suggest that not only do leaders need to have effective working relationships with their subordinates but they also must create a climate within the team that emphasizes and stresses the importance of safety. As such, the goal for safety researchers and practitioners is to impress on organizations that both effective working relationships and a continued emphasis on safety are necessary to produce the highest levels of safety behavior.

[3] Details regarding this analysis can be obtained by contacting David A. Hofmann.

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Appendix

Safety Citizenship Role Definition and Behavior Items

Twenty-seven items were used to investigate employee safety citizenship role definitions and safety citizenship behavior. The same items were used for both measures, with the employees rating each item as to the degree it was in-role versus extra-role and with the leaders rating each item with respect to the frequency of performance. The items were as follows:

1. *Helping:* Volunteering for safety committees, helping teach safety procedures to new crew members, assisting others to make sure they perform their work safely, getting involved in safety activities to help my crew work more safely, helping other crew members learn about safe work practices, and helping others with safety related responsibilities.
2. *Voice:* Making safety-related recommendations about work activities, speaking up and encouraging others to get involved in safety issues, expressing opinions on safety matters even if others disagree, and raising safety concerns during planning sessions.
3. *Stewardship:* Protecting fellow crew members from safety hazards, going out of my way to look out for the safety of other crew members, taking action to protect other crew members from risky situations, trying to prevent other crew members from being injured on the job, and taking action to stop safety violations in order to protect the well-being of other crew members.
4. *Whistleblowing:* Explaining to other crew members that I will report safety violations, telling other crew members to follow safe working procedures, monitoring new crew members to ensure they are performing safely, reporting crew members who violate safety procedures, and telling new crew members that violations of safety procedures will not be tolerated.
5. *Civic Virtue (Keeping Informed):* Attending safety meetings, attending nonmandatory safety-oriented meetings, and keeping informed of changes in safety policies and procedures.
6. *Initiating Safety-Related Change:* Trying to improve safety procedures, trying to change the way the job is done to make it safer, trying to change policies and procedures to make them safer, and making suggestions to improve the safety of a mission.

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