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Foundational Effects of Organizational Climate on Perceived Safety Climate: A Multiple Mediation Model

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Abstract: Organizational climate is the ascribed psychological meanings and significance associated with the procedures, policies and practices that are recognized and rewarded in the workplace, and hence mediates the effects of environmental stimuli on individuals' response. Safety climate is a specific organizational climate, i.e., organizational climate for safety. Previous research claimed that organizational climate provides foundation for safety climate, but without elaboration on the foundational mechanisms. This paper attempts to fill up this knowledge gap. As organizational climate is a multi-dimensional phenomenon, this paper chooses two dimensions, i.e., perceived organizational support (POS) and participative decision-making (PaDM), for illustrative purposes. Drawing on an interactive approach to forming climate perceptions, this paper introduces two interactive constructs, i.e., leader-member exchange (LMX) and team member exchange (TMX), and establishes a multiple mediation model depicting the foundational effect of organizational climate on safety climate. A random sample of Hong Kong based construction personnel is used to validate the model. The results show that both POS and PaDM are positively associated with perceived safety climate, both LMX and TMX fully mediate the effect of PaDM on safety climate, and only LMX partially mediates the effect of POS on safety climate. This study sheds light on the foundational effects of organizational climate on safety climate. POS can improve the quality of reciprocal exchange about safety matters between construction personnel and their supervisors, and hence raise construction personnel's awareness of the priority of safety. PaDM can improve the quality of reciprocal exchange about safety matters vertically and horizontally, and hence have construction personnel aware the importance of safety. In practice, this paper suggests that project managers timely recognize and reward construction personnel's contribution, genuinely cares about their well-being, and take their suggestions seriously in making decisions. In this way, the quality of both vertical and horizontal exchange about safety matters improves, and a sound and positive safety climate ensues.

Keywords: organizational climate; safety climate; multiple mediation; construction personnel; random sample

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1. Introduction

Safety cannot be compromised in construction projects. In the British Standards Institution's 'Guide to project management in the construction industry' BS 6079 Part 4: 2006, safety is placed in the center of the project management triangle. This indicates that a project manager can change the priorities of performance, time, and cost according to the political climate, the client's commercial needs, or the life cycle of the project, but these project management goals cannot be achieved at the sacrifice of safety [1]. One way for the project manager to make safety a priority is to create a positive safety climate, which is a facet-specific organizational climate, on the construction site [2].

Organizational climate theory develops against the background of cognitive revolution in psychology. In the latter half of the twentieth century, psychology has seen a cognitive revolution, which features the perspective that "human cognition mediates the effects of environmental stimuli on human responses" [3] (p. 5). A prominent constituent of the mediating cognitions is psychological meanings and significance associated with the environment. In the organizational contexts, James and Jones [4] proposed the term of "psychological climate" to denote such psychological meanings and significance that organizational members derive through interpreting (making sense of) sensory information from the organizational environment (e.g., jobs, co-workers, leaders, pay, performance expectations, opportunities for promotion, equity of treatment, etc.) based on previously stored mental representations (i.e., schemas). It is noteworthy that these schemas in turn are based on personal, work-related values. In operationalizing the climate concept, scholars have proposed numerous dimensions [5] and several taxonomies of these dimensions (e.g. [6,7]). After exploratory factor analyses of psychological climate variables, James and colleagues [8,9] found four factors: role stress and lack of harmony; job challenge and autonomy; leadership facilitation and support; and work-group cooperation, friendliness, and warmth. This four-factor psychological climate model is consistent with Locke's [10] four-factor model of work-related values. From the dimensions, it can be inferred that psychological climate reflects the extent to which the work environment is believed to be personally beneficial or detrimental to the individual and organizational stakeholders. When psychological climate perceptions of members in an organization converge, shared organizational climate perceptions emerge. Thus, organizational climate can be considered as the outcome of aggregating individuals' psychological climates, reflecting the typical way members in an organization ascribe meanings and significance to that organization [3]. In this perspective, organizational climate can be viewed as emergent properties of organizations in that "it originates in the cognition, affect, behaviors, or other characteristics of individuals, is amplified by their interactions, and manifests as a higher-level, collective phenomenon" [11] (p. 55).

As the two constructs (i.e., psychological climate and organizational climate) have no specific referent, they are referred to as "global climate" (e.g., [12]), "molar climate" (e.g., [6]), "foundation(al) climate" (e.g., [13]), or "general climate" [14]. Although empirical studies before 1980 provided evidence that the organizational climate concept did mediate the effects of environment on human actions, researchers (e.g., [15]) contended that the organizational climate is too general to be meaningful. To make up for this theoretical deficiency, they proposed that the organizational climate should have a specific referent (or facet). Consequently, numerous facet-specific climates (or strategic climates) emerge. Safety climate, i.e., organizational climate for safety, was proposed in the hope that it helps curb unsafe acts, which are believed to be the main culprit for seemingly inevitable industrial accidents. Kuenzi and Schminke [12] categorized safety climate as a climate which focuses on core operation, since safety is an operational goal. Seemingly the safety climate concept has not failed its advocates, as numerous empirical studies show that the safety climate concept is able to predict safety outcomes [16].

Since the climate research focus shifted from the global (or molar, general) climate to facet-specific (or strategic) climates, each facet-specific climate is studied in isolation. The climate research remains fragmented. In view of this deficiency, Kuenzi and Schminke [12] call for integrating the global climate with the facet-specific climate literatures to have a more accurate understanding of how individuals conceptualize and react to their work environment. Further, extant research (e.g., [14,17]) claims that organizational climate provides a foundation for safety climate, but fails to

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elaborate on how such foundational mechanism works. Concurring with this, Stackhouse and Turner [18] observe that relatively little is known about the work-related predictors of the safety climate concept itself. In responding to researchers' [12,18] call, this paper attempts to explore how organizational climate impacts on safety climate in the construction sector.

To address the research question, an interactive approach to forming climate proposed by Moran and Volkwein [19] is used to explain the foundational effect of organizational climate on safety climate. As organizational climate is a multi-dimensional phenomenon, this paper chooses two organizational climate dimensions, i.e., perceived organizational support (POS) and participative decision-making (PaDM), to exemplify the foundational impact of organizational climate on safety climate. Besides the theoretical contribution, this study also has practical implications for construction project management, as it provides targeted and effective measures for cultivating safety climate which is conducive to improve safety performance in construction projects.

This paper is structured as follows. First, a targeted literature review is conducted, and hence hypotheses are proposed. Second, the methods, including sample, instruments, and data analysis techniques, are introduced. Third, results, especially psychometric properties of scales and hypothesis testing, are presented. Finally, both theoretical and practical implications of the findings are discussed, along with limitations and future research directions.

2. Model Development

2.1. An Interactive Approach to Forming Safety Climate

As an overwhelming majority of climate studies are empirical instead of theoretical, the formation of climate remains to be elucidated. In view of this shortcoming, Moran and Volkwein [19] grouped approaches to the formation of climate into four general categories, i.e., structural, perceptual, interactive, and cultural. The structural approach essentially views climate as a characteristic of the organization, which exists independently of individual members' perceptions. Assuming that individuals interpret and respond to situational variables in a manner that is psychologically meaningful to them, the perceptual approach views climate as a psychologically processed description of organizational conditions. The interactive approach contends that the interaction of individuals in responding to their situation engenders shared climate perceptions. The cultural approach extends the interactive approach by maintaining that it is the shared culture that underlies the interaction of individuals. Among the four approaches, symbolic social interaction is identified as one primary antecedent of shared climate perceptions [20,21]. Moreover, organizational climate influences interactions among workers [22]. In particular, high-quality interaction between different organizational functions and hierarchical levels was identified as important constituents of safety standards in the construction sector [23]. Therefore, this paper adopts the interactive approach as a framework to organize relevant constructs, i.e., organizational climate→social interactions→perceived safety climate.

2.2. Dimensions of Organizational Climate

Organizational climate has multiple dimensions, and different authors propose different taxonomies to categorize those dimensions. For example, James et al. [3] designated organizational climate dimensions as role stress and lack of harmony; job challenge and autonomy; leadership facilitation and support; work-group cooperation, friendliness, and warmth; and organizational and subsystem attributes. Hart et al. [24] developed a school organizational climate scale which has 11 dimensions, i.e., appraisal and recognition, curriculum coordination, effective discipline policy, excessive work demands, goal congruence, participative decision-making, professional growth, professional interaction, role clarity, student orientation, and supportive leadership. D'Amato [25] identified 13 compelling dimensions at the foundation of the organizational climate construct, namely, communication, supervision/leadership, team cohesion, autonomy/self-governance, psycho-physical environment, reward systems/structures, innovation, decision-making, job description, role meaning and goals, coherence between strategy and operational implementation/fairness,

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integration and dynamism, and freedom of expression. Ostroff [26] identified 12 dimensions of organizational climate, i.e., participation, cooperation, warmth, social rewards, growth, innovation, autonomy, intrinsic rewards, achievement, hierarchy, structure, and extrinsic rewards. Further, she organized them into three facets, namely, affective, cognitive, and instrumental.

Nevertheless, we selected two dimensions, i.e., participative decision-making (PaDM), and perceived organizational support (POS), to exemplify how organizational climate exerts impact on safety climate. This is not only because both participation and organizational support are necessary enacted values in ensuring safe production [27,28], but also because they are relevant in construction practices.

2.2.1. Perceived Organizational Support

Top management support is an essential attribute for project teamwork effectiveness, which contributes to successful project delivery [29]. Particularly, POS is a critical element of an effective construction safety program [30]. POS refers to employees' global beliefs concerning the extent to which the organization values their contributions and cares about their well-being [31]. POS can be either general or specific, and both of general POS (POSg) and safety-specific POS (POSs) have been studied in the safety domain for a long time. Regarding POSg, Reader et al. [32] found that with more activities to support workforce health, offshore employees are more likely to gain higher POSg, which in turn stimulates their organizational commitment and hence induces more organizational and safety citizenship behaviors. Puah et al. [33] found that POSg is significantly related to employees' safety compliance behavior at chemical and petroleum process plants. Gyekye et al. [34] found that high levels of POSg lead to organizational citizenship behavior, safety compliance behavior, and a subsequent decrease in accident frequency. DeJoy et al. [35] found that POSg partially mediates the relationship between enacted safety policies and procedures and perceived safety climate. Mearns and Reader [36] found that general support from the organization (POSg) helps trigger offshore employees' safety citizenship behaviors. Gyekye and Salminen [22] found that POSg has impact on Ghanaian industrial workers' safety climate perceptions. Given that the reciprocal causal relationship between POS and safety climate is unclear, Bunner et al. [37] carried out a cross-lagged panel study with a sample of 162 safety professionals over one year. They found that safety professionals' POS was positively related to their perceived safety climate over time, and their perceived safety climate however did not contribute to POS. Therefore, it is hypothesized that

Hypothesis 1: POS is positively associated with perceived safety climate.

2.2.2. Participative Decision-Making

Participative decision-making refers to the extent to which leaders encourage and use team members' input when making decisions. It is relevant to construction projects. Construction projects are organized in a cross-functional way, i.e., project team members are from separated functional areas. Project team members' participation in goal formulation and decision-making processes enhances their performance and job satisfaction. Similarly, worker participation and involvement are critical for an effective construction safety program [30].

Participative decision-making contributes to employees' safety climate perceptions. Although both Sweden and Denmark are Scandinavian countries, considerable differences in construction accident rates exist between them. In order to explain such differences, Grill et al. [38] conducted a questionnaire survey among a random sample of construction workers in both countries, and found that participative leadership, with participative decision-making as primary component, is positively associated with safety climate. Therefore, we hypothesize that

Hypothesis 2: Participative decision-making is positively associated with perceived safety climate.

2.3. Interaction Perspective of Safety Climate

2.3.1. Leader-Member Exchange

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Since the inception of the climate concept, leadership has been supposed to be able to create and shape employee climate perceptions [39]. As leaders have limited supplies of personal and organizational resources (e.g., time, power, rewards, etc.), they cannot distribute such resources among their followers evenly. This uneven distribution engenders discrepant relationships between different followers and the leader (i.e., leader-member exchange, or LMX). High quality LMX is featured with high levels of attention, information exchange, support, informal influence, and trust from the leader [40]. LMX theory contends that with high quality LMX, followers exhibit high job satisfaction, organizational citizenship, work engagement and team performance [41,42]. As mentioned earlier, when members' psychological climate perceptions in an organization converge, shared organizational climate perceptions emerge. In contrast, when psychological climate perceptions of organizational members diverge, configural organizational climate perceptions ensue [11]. With low quality LMX, configural organizational climate perceptions may emerge (e.g., [40]).

Supervisors' role in creating perceived safety climate on construction sites has been well documented [2,43]. As first-line supervisors have contact with construction workers on a daily basis, they are supposed to exert more influence on workers' interpretation of enacted safety policies, procedures and practices than senior managers. In other words, daily interaction with first-line supervisors contributes to workers' safety climate perceptions. Contextual variables usually predict LMX, and LMX frequently plays a mediating role in various relationships [42]. In a longitudinal study, Cheung and Zhang [44] found that supervisory safety-specific transformational leadership mediates the relationship between organizational support and group-level safety climate. Hence, we hypothesize that:

Hypothesis 3: LMX mediates the relationship between POS and perceived safety climate.

Hypothesis 4: LMX mediates the relationship between participative decision-making and perceived safety climate.

2.3.2. Team Member Exchange

Team member exchange (TMX) refers to the quality of relationships between employees and their team members. TMX quality can be high or low, in terms of content and process of exchange among individual team members [45]. For instance, low-quality TMX is restricted to exchanges based on task requirements, while high-quality TMX involves exchange of resources and support which is beyond task requirements. High-quality TMX is related to high individual and team performance, since employees with high-quality TMX are more willing to help each other and to share information, ideas, and feedback within work teams. When parties behave in a way which benefits each other, the quality of exchange relationships improves.

Employees' perceptions of TMX may help employees develop shared perceptions of safety policies, procedures, and practices in the construction sector. Construction work is carried out by work crews, and daily interactions with crew members shape workers' interpretation of organizational safety policies and procedures. Like LMX, organizational climate exerts contextual influence on TMX as well. Therefore, we hypothesize that:

Hypothesis 5: TMX mediates the relationship between POS and perceived safety climate.

Hypothesis 6: TMX mediates the relationship between participative decision-making and perceived safety climate.

The conceptual model featuring the above mentioned six hypotheses is shown in Figure 1.

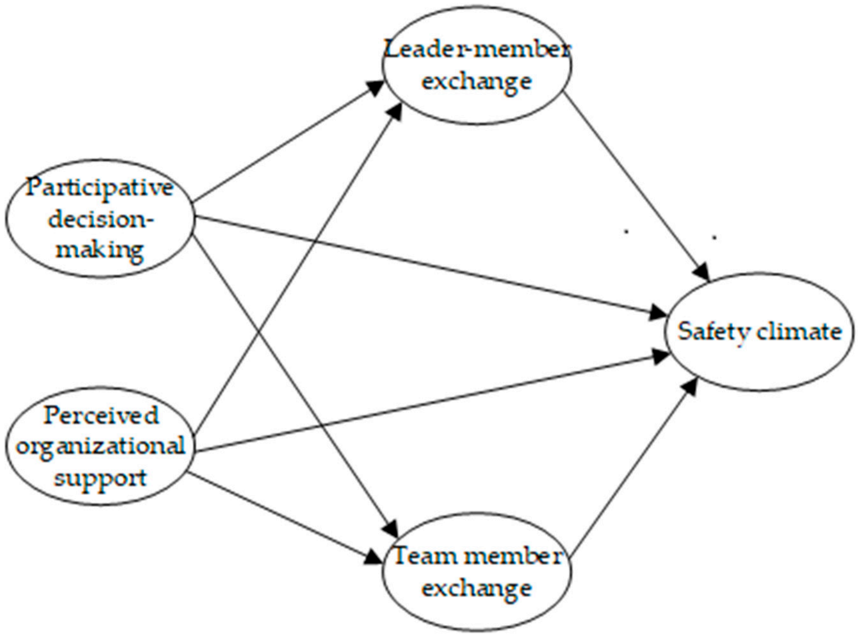

Figure 1. Conceptual framework.

3. Methods

3.1. Population and Sample

The target population was construction personnel based in Hong Kong. A sampling frame was composed of those members who were affiliated with local trade associations, professional institutions, governmental agencies, and property developers. In view of low response rate with paper-and-pencil surveys, 2996 prospective respondents were drawn from the sampling frame and sent hardcopy questionnaire for completion. After five months and two rounds of reminder emails, 292 valid responses were finally secured. Response rate, demographic characteristics of respondents, and a chi-square test which ruled out nonresponse bias, were recorded in other papers [2,46,47].

3.2. Measures

Perceived organizational support

This construct reflects the extent to which construction personnel believe that the project management team values their contributions and cares about their well-being. It was measured by an adapted version of the supportive leadership subscale from Hart et al.'s [24] School Organizational Health Questionnaire. A sample item was "There is always support from the leadership."

Participative decision-making

This construct reflects leaders' encouragement and use of team members' input in making decisions. It was measured by an adapted version of the participative decision-making subscale from Hart et al.'s [24] School Organizational Health Questionnaire. A sample item was "There is opportunity for staff to participate in making decision and policy."

Leader-member exchange

The construct captures interactions between leaders and their subordinates. It was measured by an adapted version of LMX-7 [48]. A sample item was "My immediate supervisor understands my job problems and need."

Team member exchange

This construct captures the exchange relationship between employees and their colleagues. It was measured by an adapted scale used by Tuuli [49]. A sample item was "My peers are willing to finish work assigned to me."

Safety climate

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This construct reflects employees' individual perceptions of safety policies, procedures and practices. It was measured by a short scale developed by Fang and colleagues [50–52]. A sample item was "Accidents and incidents which happen here are always reported."

Control variables

In addition to the main constructs mentioned earlier, several control variables were introduced due to their possible confounding effects on the hypothesized relationships. Considering that this study deals with individuals' perceived organizational and safety climate, both organization-level and individual-level control variables were examined. For instance, types and sizes of organizations may determine the organizational climate and ultimately affect individuals' organizational and safety climate perceptions. Individuals' interactions with peers and their climate perceptions may also be influenced by their hierarchical positions and the project stage they are involved in. Thus, this study incorporates organization type, organization size, hierarchical position, and project stage as control variables.

3.3. Data Analysis

The data were processed in two steps. In the first step, the measurement model was validated adopting partial least square structural equation modeling (PLS-SEM). PLS-SEM is suitable for confirmatory factor analysis as it is flexible for data distribution and sample size [53], and efficient in automating many analytical functions [54]. The second step used regression analysis and bootstrap approach for hypothesis testing. The size of a representative sample, calculated by the ratio of observation to independent variables, affects the generalizability of the regression analysis results. According to Hair et al. [55], the desired ratio is between 15 to 20 observations for each independent variable. Since the maximum number of independent variables in the regression model is eight as shown later in Table 4, the sample size of this study, i.e., 292, was sufficient for regression analysis. In terms of mediation effect analysis, the improved Baron and Kenny's [56] causal steps approach with bootstrap test [57] was employed, because this approach garners higher statistical power in assessing mediating effects [58]. Bootstrap test was achieved by a PROCESS macro (Model 4) developed by Hayes [59].

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

4. Results

4.1. Measurement Model Evaluation

To evaluate individual item reliability, loadings were assessed using SmartPLS 3.0, which is one leading software for PLS-SEM. As suggested by Hair et al. [60], indicators with low loadings (below 0.4) should always be eliminated from the construct. After removing an inconsistent item, the remaining items and their outer loadings are shown in Table 1. All the loadings are above 0.7, showing that the indicators are reliable [61]. Furthermore, as shown in Table 1, all values of calculated composite reliability and Cronbach's alpha are between 0.7 and 0.9, suggesting a satisfactory level of internal consistency for each construct [60].

The convergent validity is evaluated using average variance extracted (AVE). All AVE values in Table 1 are higher than 0.5, indicating that each construct can explain more than half of the variance sum of its indicators. Hence, each construct secures convergent validity [62].

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Table 1. Measurement model evaluation.

Construct	Items	Outer loadings	Cronbach's alpha	Composite reliability	AVE
PaDM	PaDM1: I am happy with the decision-making processes.	0.811	0.797	0.867	0.620
	PaDM2: There is opportunity for staff to participate in making decision and policy.	0.774			
	PaDM3: Others take an active interest in my professional growth and career development.	0.779			
	PaDM4: I am encouraged to seek further professional development.	0.785			
POS	POS1: I receive support from my colleagues.	0.842	0.757	0.860	0.672
	POS2: I am clear about my professional responsibilities.	0.800			
	POS3: There is always support from the leadership.	0.817			
LMX	LMX1: My immediate supervisor understands my job problems and need.	0.761	0.843	0.888	0.613
	LMX2: My immediate supervisor recognizes my potential.	0.813			
	LMX3: My immediate supervisor uses his/her power to help me solve problems regardless of how much formal authority he/she has.	0.709			
	LMX4: I have enough confidence in my immediate supervisor that I would defend and justify his/her decision if he/she were not present to do so.	0.782			
	LMX5: My working relationship with my immediate supervisor is very good.	0.843			
TMX	TMX1: My peers understand my problems and needs.	0.833	0.803	0.871	0.628
	TMX2: My peers are willing to finish work assigned to me.	0.739			
	TMX3: My peers recognize my potential.	0.804			
	TMX4: My peers let me know when I affect their work.	0.791			
SaCl	SaCl1: Accidents and incidents which happen here are always reported.	0.775	0.794	0.866	0.619
	SaCl2: The project encourages people to make some suggestions to improve safety.	0.798			
	SaCl3: The project really cares about the safety of the people who work here.	0.727			
	SaCl4: All the people who work in my team are fully committed to safety.	0.842			

Note: PaDM = Participative decision-making; POS = Perceived organizational support; TMX = Team member exchange; LMX = Leader-member exchange; SaCl = Safety climate; and AVE = Average Variance Extracted.

The discriminant validity of constructs is evaluated using cross-loadings and Fornell-Larcker criterion. As Table 2 shows, each indicator's outer loading on the associated construct is greater than any of its cross-loadings on other constructs, demonstrating the discriminant validity of the constructs [60]. Additionally, as shown in Table 3, the square root of the AVE of each construct is higher than its highest correlation with any other construct. All these results indicate that discriminant validity is satisfactory and the constructs are different from each other.

Table 2. Cross-loadings.

	LMX	POS	SaCl	PaDM	TMX
POS1	0.509	0.842	0.416	0.421	0.434
POS2	0.406	0.800	0.397	0.303	0.327
POS3	0.514	0.817	0.402	0.524	0.400
PaDM1	0.453	0.455	0.354	0.811	0.356
PaDM2	0.291	0.358	0.279	0.774	0.297
PaDM3	0.369	0.393	0.190	0.779	0.410
PaDM4	0.379	0.399	0.333	0.785	0.318
LMX1	0.761	0.350	0.316	0.424	0.367
LMX2	0.813	0.455	0.344	0.435	0.353
LMX3	0.709	0.342	0.204	0.298	0.335
LMX4	0.782	0.467	0.369	0.333	0.344
LMX5	0.843	0.612	0.430	0.385	0.419
TMX1	0.424	0.382	0.346	0.367	0.833
TMX2	0.254	0.302	0.192	0.306	0.739
TMX3	0.461	0.405	0.311	0.400	0.804
TMX4	0.304	0.404	0.277	0.310	0.791
SaCl1	0.367	0.381	0.775	0.295	0.240
SaCl2	0.346	0.375	0.798	0.334	0.286
SaCl3	0.316	0.360	0.727	0.271	0.263
SaCl4	0.347	0.434	0.842	0.270	0.347

Note: PaDM = Participative decision-making; POS = Perceived organizational support; TMX = Team member exchange; LMX = Leader-member exchange; and SaCl = Safety climate.

Table 3. Fornell-Larcker criterion.

	LMX	POS	SaCl	PaDM	TMX
LMX	**0.783**				
POS	0.585	**0.820**			
SaCl	0.437	0.494	**0.787**		
PaDM	0.480	0.514	0.371	**0.788**	
TMX	0.466	0.476	0.363	0.440	**0.792**

Note: PaDM = Participative decision-making; POS = Perceived organizational support; TMX = Team member exchange; LMX = Leader-member exchange; and SaCl = Safety climate.

4.2. Hypothesis Testing

Regression analysis results were reported in Table 4. Both PaDM and POS are positively related to SaCl (path c_1, $B_1 = 0.175$, $p < 0.01$; path c_2, $B_2 = 0.502$, $p < 0.005$ in Model 2), supporting Hypotheses 1 and 2. The R^2 values for LMX, TMX, and SaCl are 0.348, 0.260 and 0.281, all higher than 0.25, suggesting that the effect size is large and the explanatory power of the structural model is strong [63]. Control variables are not significantly associated with SaCl, except for NoEpyee. NoEpyee has significant effect on SaCl, implying that respondents from large-scale organizations tend to perceive strong safety climate. Nevertheless, in other models all coefficients are assessed controlling for the potential confounding effects by control variables.

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In terms of mediation effects, Table 4 shows that coefficients of PaDM→LMX (path a_{1_1}), PaDM→TMX (path a_{1_2}), POS→LMX (path a_{2_1}), POS→TMX (path a_{2_2}), and LMX→SaCl (path b_1) are significant, whereas the coefficient of TMX→SaCl (path b_2) is not significant. Following Wen and Ye's [58] suggestion, bootstrap approach is needed to further test the mediation effects. The results in Table 5 show that the 95% confidence intervals for indirect paths do not include zero, except for path POS→TMX→SaCl. It indicates that both LMX and TMX positively mediates the effects of PaDM on SaCl, whereas only LMX positively mediates the relationship between POS and SaCl. Thus, the results support Hypotheses 3, 4 and 5, but Hypothesis 6 is not tenable. Furthermore, since the coefficient of PaDM→SaCl in Model 5 (path $c_{1'}$) is not significant, LMX and TMX jointly play full mediation roles in the relationship between PaDM and SaCl. The coefficient of path POS→SaCl in Model 5 (path $c_{2'}$) is significant and positive (coefficients of path a_{2_1} and b_1 are also positive), showing partial mediation effect of LMX in the relationship between POS and SaCl.

Table 4. Regression analysis results.

	Model 1	Model 2	Model 3	Model 4	Model 5
	SaCl	SaCl	LMX	TMX	SaCl
AffRes	0.033	0.038	-0.022	0.002	0.041
RespHier	0.041	0.089	0.049	0.086	0.071
StgProj	0.022	-0.002	-0.017	0.013	-0.001
NoEpyee	0.229**	0.184**	0.020	-0.004	0.181**
PaDM		0.175** (c_1)	0.209*** (a_{1_1})	0.250*** (a_{1_2})	0.110 ($c_{1'}$)
POS		0.502*** (c_2)	0.444*** ($a_{2\text{-}1}$)	0.371*** (a_{2_2})	0.383*** ($c_{2'}$)
LMX					0.177** (b_1)
TMX					0.110 (b_2)
R^2	0.032	0.258	0.348	0.260	0.281
Adjusted R^2	0.018	0.242	0.334	0.244	0.260
p-value	0.058	0.000	0.000	0.000	0.000

Note: 1) *p < 0.5, **p < 0.01, ***p < 0.001; 2) AffRes = Affiliation of respondents; RespHier = Respondent's hierarchical position; StgProj = Project stage in which the respondent is involved; NoEpyee = Number of employees in respondent's organization; PaDM = Participative decision-making; POS = Perceived organizational support; TMX = Team member exchange; LMX = Leader-member exchange; and SaCl = Safety climate.

Table 5. Bootstrapping results for indirect effects.

Indirect path	Effect	SE	95% CI	Mediation type
PaDM→LMX→SaCl	0.146	0.041	[0.073, 0.234]	Full mediation
PaDM→TMX→SaCl	0.076	0.031	[0.017, 0.139]	Full mediation
POS→LMX→SaCl	0.131	0.053	[0.030, 0.242]	Partial mediation
POS→TMX→SaCl	0.067	0.038	[-0.008, 0.140]	No mediation

Note: 1) Bootstrap sample size = 5000; SE = standard error; and CI = confidence interval; 2) PaDM = Participative decision-making; POS = Perceived organizational support; TMX = Team member exchange; LMX = Leader-member exchange; and SaCl = Safety climate.

5. Discussion

There are two categories of climate in the climate literature, i.e., molar and specific climate. The former is also referred to as global, general, or foundation(al) climate, and the latter as strategic or facet-specific climate. Organizational climate belongs to the former, and safety climate is one specific climate. Organizational climate provides foundation for safety climate, but the literature rarely dwells on such foundational mechanism. This paper aims to fill up this knowledge gap. As there are many dimensions of organizational climate, this paper chooses two dimensions, i.e., POS and PaDM, for illustrative purposes. Using the interactive approach to forming climate perceptions, this study further introduces two interactive constructs, i.e., leader-member exchange and team member exchange, to explain the foundational mechanism.

The results show that both POS and PaDM are positively associated with individual's perceived safety climate. Previous studies support the positive relationship between POS and perceived safety climate. Specifically, in a longitudinal study with safety professionals Bunner et al. [37] confirmed that POS causes perceived safety climate, instead of perceived safety climate causing POS. Concurring with these studies, this study also supports the positive relationship between POS and perceived safety climate. Although previous studies have proposed and confirmed many mechanisms to explain how POS affects safety climate, still more mechanisms need to uncover so that more targeted measures can be developed. Similarly, there is also a positive association between PaDM and perceived safety climate. Management style has implications for safety climate at the worksite. Compared with directive-styled managers, those managers with a participative style are more likely to perceive employees' safety attitudes, and more confident in their ability to develop and maintain a positive safety climate across the workplace [64]. In health care organizations, it is essential for staff to perceive that senior and supervisory leadership support patient safety, because such perceptions (i.e., patient safety climate) can help reduce medical errors. In order to foster patient safety climate, Zaheer et al. [65] called senior and supervisory leadership to transform their traditional bureaucratic decision-making approach to participative approach. Also, more mechanisms explaining the effect of PaDM on perceived safety climate need to explore.

This paper finds that the effect of PaDM on safety climate perceptions is fully mediated by LMX and TMX. PaDM is a defining feature of organizations with lower rates of lost time injuries. The PaDM approach reduces the power distance between leaders and their followers, and hence improves the exchange quality. PaDM promotes equality perceptions among peers, and therefore facilitates lateral communications. Consequently, with high quality LMX and TMX, construction personnel are able to freely voice safety concerns without fear of reprimand or ridicule.

The effect of POS on safety climate is partially mediated by LMX, but not by TMX. Those construction personnel who secure more support from the project management team (i.e., high level POS) are more likely to enhance their skills and abilities. With such skills and abilities, they may bring more benefits to their immediate supervisors and hence develop high quality exchanges with their immediate supervisors (i.e., high quality LMX). In this way, they are more likely to identify with the immediate supervisors and realize the importance of safety (i.e., positive safety climate perceptions). This phenomenon once again reflects the important mediating role played by supervisory staff. It is through supervisors that construction personnel receive favorable treatment from the project management team. However, contrary to the hypothesis, TMX doesn't mediate the effect of POS on safety climate. This may be due to the TMX scale fails to capture all aspects of team member exchange that have implications for perceived safety climate. Therefore, the impact of team member exchange in creating a positive safety climate needs further examination in future.

Respondents from large scale organizations tend to develop positive safety climate perceptions. This is probably because their affiliated organizations have ample resources to improve their safety awareness.

This paper has both theoretical and practical implications. In theory, this paper explains the foundational effects of organizational climate on safety climate through the lens of the interactive approach to forming safety climate. Other approaches (i.e., structural, perceptual, and cultural) are also worthy of exploring, so that diversified theories can be established. In practice, project managers shall endeavor to improve supervisors' team building skills and encourage communications among construction personnel. Without high quality exchange between supervisors and construction personnel, it is difficult to have construction personnel realize that their contribution and well-being are always placed at the top of project managers' agenda, and their suggestions are seriously considered in making decisions and policies.

The findings should be interpreted with some limitations in mind. First, this study adopted a cross-sectional design, which cannot make cause-effect inferences. Second, the sample was from Hong Kong, and whether the findings apply in other cultural backgrounds needs further investigation. Third, this paper focuses on the project-level phenomena. For example, POS refers to the perceived support from the project management team. However, at the same time construction personnel may also perceive support from their affiliated organizations. So, whether POS from their affiliated organizations have impact on their safety climate perceptions in the project is worth investigating in the future.

6. Conclusions

Previous research claimed that organizational climate provides foundation for safety climate, but without elaboration on the foundational mechanisms. This paper attempts to explain the foundational effect through the lens of an interactive approach to forming climate perceptions. As organizational climate is a multi-dimensional phenomenon, this paper chooses two dimensions, i.e., perceived organizational support (POS) and participative decision-making (PaDM), for illustrative purposes. Based on the interactive approach, this paper introduces two constructs, i.e., leader-member exchange (LMX) and team member exchange (TMX), and establishes a multiple mediation model. With a random sample of Hong Kong based construction personnel, this paper finds that both POS and PaDM are positively associated with perceived safety climate, both LMX and TMX fully mediate the effect of PaDM on safety climate, and only LMX partially mediates the effect of POS on safety climate.

In practice, this study calls for high quality reciprocal exchange about safety matters among construction personnel and their supervisors. POS can improve the quality of reciprocal exchange about safety matters between construction personnel and their supervisors, and hence raise construction personnel's awareness of the priority of safety. PaDM can improve the quality of reciprocal exchange about safety matters vertically and horizontally, and hence have construction personnel aware the importance of safety.

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References

1. Lester, A. Project management, planning and control: Managing engineering, construction and manufacturing projects to pmi, apm and bsi standards. 7th. Cambridge, MA, US: Elsevier, 2017,
2. Shen, Y. Z., T. Y. Koh, S. Rowlinson and A. J. Bridge. "Empirical investigation of factors contributing to the psychological safety climate on construction sites." Journal of Construction Engineering and Management 141 (2015): 04015038. 10.1061/(asce)co.1943-7862.0001021. <Go to ISI>://WOS:000363088900006.
3. James, L. R., C. C. Choi, C.-H. Ko, E., P. K. McNeil, M. K. Minton, M. A. Wright and K. Kim. "Organizational and psychological climate: A review of theory and research." European Journal of Work and Organizational Psychology 17 (2008): 5-32.

4. James, L. R. and A. P. Jones. "Organizational climate: A review of theory and research." Psychological Bulletin 81 (1974): 1096-112.
5. Benzer, J. and M. Horner. "A meta-analytic integration and test of psychological climate dimensionality." Human Resource Management 54 (2015): 457-82. https://doi.org/10.1002/hrm.21645. https://onlinelibrary.wiley.com/doi/abs/10.1002/hrm.21645.
6. Carr, J. Z., A. M. Schmidt, J. K. Ford and R. P. DeShon. "Climate perceptions matter: A meta-analytic path analysis relating molar climate, cognitive and affective states, and individual level work outcomes." Journal of Applied Psychology 88 (2003): 605-19.
7. Parker, C. P., B. B. Baltes, S. Young, J. W. Huff, R. A. Altmann and H. A. Lacost. "Relationships between psychological climate perceptions and work outcomes: A meta-analytic review." Journal of Organizational Behavior 24 (2003): 389-416.
8. James, L. A. and L. R. James. "Integrating work environment perceptions: Explorations into the measurement of meaning." Journal of Applied Psychology 74 (1989): 739-51.
9. James, L. R. and S. B. Sells. "Psychological climate: Theoretical perspectives and empirical research." In Toward a psychology of situations: An interactional perspective. D. Magnusson. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc., 1981, 275-95.
10. Locke, E. A. "The nature and causes of job satisfaction." In Handbook of industrial and organizational psychology. M. D. Dunnette. Skokie, IL: Rand McNally, 1976, 1297-350.
11. Kozlowski, S. W. J. and K. J. Klein. "A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes." In Multilevel theory, research and methods in organizations: Foundations, extensions, and new directions. K. J. Klein and S. W. J. Kozlowski. San Francisco, CA: Jossey-Bass, 2000,
12. Kuenzi, M. and M. Schminke. "Assembling fragments into a lens: A review, critique, and proposed research agenda for the organizational work climate literature." Journal of Management 35 (2009): 634-717. 10.1177/0149206308330559. <Go to ISI>://WOS:000266729600006.
13. Ostroff, C., A. J. Kinicki and R. S. Muhammad. "Organizational culture and climate." In Industrial and organizational psychology. 2nd, N. W. Schmitt and S. Highhouse. Handbook of psychology. I. B. Weiner. 24. 12. Hoboken, New Jersey: John Wiley & Sons, Inc., 2013, 643-76.
14. Wallace, J. C., E. Popp and S. Mondore. "Safety climate as a mediator between foundation climates and occupational accidents: A group-level investigation." Journal of Applied Psychology 91 (2006): 681-88. 10.1037/0021-9010.91.3.681. <Go to ISI>://WOS:000238081300013.
15. Schneider, B. and A. E. Reichers. "On the etiology of climates." Personnel Psychology 36 (1983): 19-39.
16. Christian, M. S., J. C. Bradley, J. C. Wallace and M. J. Burke. "Workplace safety: A meta-analysis of the roles of person and situation factors." Journal of Applied Psychology 94 (2009): 1103-27. 10.1037/a0016172. <Go to ISI>://WOS:000269374700001.
17. Neal, A., M. A. Griffin and P. M. Hart. "The impact of organizational climate on safety climate and individual behavior." Safety Science 34 (2000): 99-109.
18. Stackhouse, M. and N. Turner. "How do organizational practices relate to perceived system safety effectiveness? Perceptions of safety climate and co-worker commitment to safety as workplace safety signals." Journal of Safety Research 70 (2019): 59-69. 10.1016/j.jsr.2019.04.002. <Go to ISI>://WOS:000506724300008.
19. Moran, E. T. and J. F. Volkwein. "The cultural approach to the formation of organizational climate." Human Relations 45 (1992): 19-47.
20. Zohar, D. "Thirty years of safety climate research: Reflections and future directions." Accident Analysis & Prevention 42 (2010): 1517-22.
21. Klein, K. J., A. B. Conn, D. B. Smith and J. S. Sorra. "Is everyone in agreement? An exploration of within-group agreement in employee perceptions of the work environment." Journal of Applied Psychology 86 (2001): 3-16.
22. Gyekye, S. A. and S. Salminen. "Workplace safety perceptions and perceived organizational support: Do supportive perceptions influence safety perceptions?" International Journal of Occupational Safety and Ergonomics 13 (2007): 189-200. <Go to ISI>://WOS:000247356300008.
23. Törner, M. and A. Pousette. "Safety in construction - a comprehensive description of the characteristics of high safety standards in construction work, from the combined perspective of supervisors and experienced workers." Journal of Safety Research 40 (2009): 399-409.
24. Hart, P. M., A. J. Wearing, M. Conn, N. L. Carter and R. K. Dingle. "Development of the school organisational health questionnaire: A measure for assessing teacher morale and school organisational climate." British Journal of Educational Psychology 70 (2000): 211-28.
25. D'Amato, A. "From research to action and back again: The long journey of organizational climate – a review of the literature and a summative framework." Journal of General Management 0 (2023): 03063070231152010. 10.1177/03063070231152010. https://journals.sagepub.com/doi/abs/10.1177/03063070231152010.

26. Ostroff, C. "The effects of climate and personal influences on individual behavior and attitudes in organizations." Organizational Behavior and Human Decision Processes 56 (1993): 56-90. https://doi.org/10.1006/obhd.1993.1045. https://www.sciencedirect.com/science/article/pii/S0749597883710459.
27. Johnston, D., M. Pagell, A. Veltri and R. Klassen. "Values-in-action that support safe production." Journal of Safety Research 72 (2020): 75-91. 10.1016/j.jsr.2019.11.004. <Go to ISI>://WOS:000528045600009.
28. Pagell, M., D. Johnston, A. Veltri, R. Klassen and M. Biehl. "Is safe production an oxymoron?" Production and Operations Management 23 (2014): 1161-75. 10.1111/poms.12100. <Go to ISI>://WOS:000339499700006.
29. Yap, J., W. J. Leong and M. Skitmore. "Capitalising teamwork for enhancing project delivery and management in construction: Empirical study in malaysia." Engineering Construction and Architectural Management 27 (2020): 1479-503. 10.1108/ecam-10-2019-0581. <Go to ISI>://WOS:000525847500001.
30. Winge, S., E. Albrechtsen and J. Arnesen. "A comparative analysis of safety management and safety performance in twelve construction projects." Journal of Safety Research 71 (2019): 139-52. 10.1016/j.jsr.2019.09.015. <Go to ISI>://WOS:000506723600014.
31. Eisenberger, R., R. Huntington, S. Hutchison and D. Sowa. "Perceived organizational support." Journal of Applied Psychology 71 (1986): 500-07.
32. Reader, T. W., K. Mearns, C. Lopes and J. Kuha. "Organizational support for the workforce and employee safety citizenship behaviors: A social exchange relationship." Human Relations 70 (2017): 362-85. 10.1177/0018726716655863. <Go to ISI>://WOS:000394761500005.
33. Puah, L. N., L. D. Ong and W. Y. Chong. "The effects of perceived organizational support, perceived supervisor support and perceived co-worker support on safety and health compliance." International Journal of Occupational Safety and Ergonomics 22 (2016): 333-39. 10.1080/10803548.2016.1159390. <Go to ISI>://WOS:000381281900006.
34. Gyekye, S. A., S. Salminen and A. Ojajarvi. "A theoretical model to ascertain determinates of occupational accidents among ghanaian industrial workers." International Journal of Industrial Ergonomics 42 (2012): 233-40. 10.1016/j.ergon.2012.01.006. <Go to ISI>://WOS:000302512900006.
35. DeJoy, D. M., L. J. Della, R. J. Vandenberg and M. G. Wilson. "Making work safer: Testing a model of social exchange and safety management." Journal of Safety Research 41 (2010): 163-71.
36. Mearns, K. J. and T. Reader. "Organizational support and safety outcomes: An un-investigated relationship?" Safety Science 46 (2008): 388-97. 10.1016/j.ssci.2007.05.002. <Go to ISI>://WOS:000254058100005.
37. Bunner, J., R. Prem and C. Korunka. "Perceived organizational support and perceived safety climate from the perspective of safety professionals: Testing reciprocal causality using a cross-lagged panel design." Journal of Safety Research 78 (2021): 1-8. https://doi.org/10.1016/j.jsr.2021.06.006. https://www.sciencedirect.com/science/article/pii/S0022437521000839.
38. Grill, M., A. Pousette, K. Nielsen, R. Grytnes and M. Torner. "Safety leadership at construction sites: The importance of rule-oriented and participative leadership." Scandinavian Journal of Work Environment & Health 43 (2017): 375-84. 10.5271/sjweh.3650. <Go to ISI>://WOS:000405256100010.
39. Zohar, D. "A group-level model of safety climate: Testing the effect of group climate on microaccidents in manufacturing jobs." Journal of Applied Psychology 85 (2000): 587-96.
40. Roberson, Q. M. and J. A. Colquitt. "Shared and configural justice: A social network model of justice in teams." Academy of Management Review 30 (2005): 595-607.
41. Graen, G. B. and W. A. Schiemann. "Leadership-motivated excellence theory: An extension of lmx." Journal of Managerial Psychology 28 (2013): 452-69.
42. Dulebohn, J. H., W. H. Bommer, R. C. Liden, R. L. Brouer and G. R. Ferris. "A meta-analysis of antecedents and consequences of leader-member exchange: Integrating the past with an eye toward the future." Journal of Management 38 (2012): 1715-59.
43. Newaz, M. T., P. Davis, M. Jefferies and M. Pillay. "Using a psychological contract of safety to predict safety climate on construction sites." Journal of Safety Research 68 (2019): 9-19. 10.1016/j.jsr.2018.10.012. <Go to ISI>://WOS:000463306100002.
44. Cheung, C. M. and R. P. Zhang. "How organizational support can cultivate a multilevel safety climate in the construction industry." Journal of Management in Engineering 36 (2020): 04020014. doi:10.1061/(ASCE)ME.1943-5479.0000758. https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29ME.1943-5479.0000758.
45. Tse, H. H. M. and M. T. Dasborough. "A study of exchange and emotions in team member relationships." Group & Organization Management 33 (2008): 194-215.
46. Shen, Y., C. Ju, T. Y. Koh, S. Rowlinson and A. J. Bridge. "The impact of transformational leadership on safety climate and individual safety behavior on construction sites." International Journal of Environmental Research and Public Health 14 (2017): 10.3390/ijerph14010045.

47. Shen, Y. Z., M. M. Tuuli, B. Xia, T. Y. Koh and S. Rowlinson. "Toward a model for forming psychological safety climate in construction project management." International Journal of Project Management 33 (2015): 223-35. 10.1016/j.ijproman.2014.04.009. <Go to ISI>://WOS:000347595200020.
48. Gerstner, C. R. and D. V. Day. "Meta-analytic review of leader-member exchange theory: Correlates and construct issues." Journal of Applied Psychology 82 (1997): 827-44.
49. Tuuli, M. M. Empowerment and control dynamics in project teams: A multilevel examination of the antecedents and job performance consequences. Hong Kong: The University of Hong Kong, 2009, PhD thesis.
50. Fang, D., Y. Chen and L. Wong. "Safety climate in construction industry: A case study in hong kong." Journal of Construction Engineering and Management 132 (2006): 573-84.
51. Choudhry, R. M. and D. Fang. "Why operatives engage in unsafe work behavior: Investigating factors on construction sites." Safety Science 46 (2008): 566-84.
52. Choudhry, R. M., D. Fang and S. M. Ahmed. "Safety management in construction: Best practices in hong kong." Journal of Professional Issues in Engineering Education and Practice 134 (2008): 20-32.
53. Hair, J. F., J. J. Risher, M. Sarstedt and C. M. Ringle. "When to use and how to report the results of pls-sem." European business review 31 (2019): 2-24.
54. Hair, J. F., C. M. Ringle and M. Sarstedt. "Pls-sem: Indeed a silver bullet." Journal of Marketing theory and Practice 19 (2011): 139-52.
55. Hair, J., W. Black, B. Babin and R. Anderson. Multivariate data analysis. 8th. Hampshire, UK: Cengage Learning, 2019,
56. Baron, R. M. and D. A. Kenny. "The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations." Journal of Personality and Social Psychology 51 (1986): 1173-82.
57. Preacher, K. J. and A. F. Hayes. "Spss and sas procedures for estimating indirect effects in simple mediation models." Behavior research methods, instruments, & computers 36 (2004): 717-31.
58. Wen, Z. and B. Ye. "Analyses of mediating effects: The development of methods and models." Advances in psychological Science 22 (2014): 731-45.
59. Hayes, A. F. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford publications, 2017,
60. Hair, J. F., G. T. M. Hult, C. M. Ringle and M. Sarstedt. A primer on partial least squares structural equation modeling (pls-sem). 2nd. Los Angeles, USA: SAGE Publications, Inc., 2017,
61. Chin, W. W. "The partial least squares approach to structural equation modeling." Modern methods for business research 295 (1998): 295-336.
62. Fornell, C. and D. F. Larcker. "Structural equation models with unobservable variables and measurement error: Algebra and statistics." Journal of Marketing Research 18 (1981): 382-88. 10.2307/3150980. http://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=5012893&site=ehost-live.
63. Cohen, J. Statistical power analysis for the behavioral sciences. Hillsdale, NJ: Lawrence Erlbaum Associates, 1988,
64. O'Dea, A. and R. Flin. "Site managers and safety leadership in the offshore oil and gas industry." Safety Science 37 (2001): 39-57.
65. Zaheer, S., L. Ginsburg, Y. T. Chuang and S. L. Grace. "Patient safety climate (psc) perceptions of frontline staff in acute care hospitals: Examining the role of ease of reporting, unit norms of openness, and participative leadership." Health Care Management Review 40 (2015): 13-23. 10.1097/hmr.0000000000000005. <Go to ISI>://WOS:000346120400003.