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How Does Project Team Leaders' Intellectual Stimulation Associate with Construction Personnel's Psychological Safety Climate? A Partial Least Squares Structural Equation Modeling Approach

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Abstract

Background: Transformational leadership positively influences safety climate perceptions. Transformational leadership has four dimensions, and safety climate can be operationalized at different levels. Few research efforts, however, have been made to investigate the association between specific transformational leadership dimensions and safety climate at the individual level (i.e., psychological safety climate, PSC). **Methods**: Drawing on the interactive approach to forming safety climate, this study developed a multiple mediation model linking project team leaders' intellectual stimulation (IS) to construction personnel's PSC via safety-specific leader–member exchange (LMX) and team member exchange (TMX). A random sample (N = 292) of construction personnel based in Hong Kong is employed to validate the model. Partial least squares structural equation modeling (PLS-SEM) was used to analyze the data. **Results**: Both safety-specific LMX (specific indirect effect = 0.189) and safety-specific TMX (specific indirect effect = 0.032) significantly mediate the relationship between IS and PSC, although the direct association between them is insignificant. Age significantly moderates the IS–PSC relationship, with a stronger association for younger personnel (β = 0.481, p < 0.001) than for older personnel (β = 0.195, p = 0.029). **Conclusions**: The findings reveal that the relationship between IS and PSC is fully mediated by safety-specific LMX and TMX, with vertical exchange (LMX) playing a substantially more prominent mediating role than lateral exchange (TMX). These results suggest that improving construction personnel's PSC requires developing project team leaders' intellectually stimulating skills and fostering high-quality leader–follower safety exchange within project teams.

Keywords: intellectual stimulation; psychological safety climate; leader–member exchange; team member exchange; partial least squares structural equation modeling

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Academic Editor: Jaewook Jeong

Received: 12 April 2026
Revised: 12 June 2026
Accepted: 14 June 2026
Published: 17 June 2026

1. Introduction

Leadership is the ability to influence and guide a group of people toward achieving a common goal that otherwise cannot be achieved on their own [1]. It is widely accepted in the occupational health psychology (OHP) literature that organizational leadership influences employee health and safety [2]. Leadership styles refer to leaders' approach and manner in exercising their leadership. Among others, transformational and transactional leadership are the most widely studied leadership styles in OHP [2]. Transformational leaders inspire followers to move beyond their self-interests for the collective good, while transactional leaders guide and motivate followers toward goals by clarifying roles and task requirements, allocating rewards and punishments where needed, and intervening when needed [1]. The transactional–transformational leadership paradigm is broad enough to transcend organizational and national boundaries [3]. While the transactional–transformational leadership paradigm captures the behavioral aspect of leadership, leader–member exchange (LMX) theory proposed by Graen and colleagues accounts for leadership through the lens of relationship between leader and followers [4,5]. In general, LMX theory maintains that leaders develop individualized relationship or exchange with each follower. The relationships range from low (those based strictly on employment contracts) to high (those featured with mutual trust, respect, liking and reciprocal influence) [6].

Organizational climate is "a summary perception derived from a body of interconnected experiences with organizational policies, practices and procedures (e.g., from leadership and HR practices, and so forth) and observations of what is rewarded, supported, and expected in the organization with these summary perceptions becoming meaningful and shared based on the natural interactions of people with each other" [7] (p. 468). From this definition, it can be inferred that organizational climate is a multi-dimensional phenomenon. Yet it is still a multi-level phenomenon [8]. To differentiate organizational climate at different levels, different terms are used. "Psychological climate" refers to climate perceptions at the individual level, and "organizational climate" refers to the collective or shared perceptions of the workplace by a group, unit, or organization [9]. Psychological climate is the building block of organizational climate. With the natural interactions among members, their psychological climate perceptions tend to converge. Once consensus is reached, organizational climate emerges [10]. Safety climate is a facet-specific organizational climate (i.e., organizational climate for safety) [11], and it is also a multi-level phenomenon [12]. Accordingly, "psychological safety climate" refers to employees' individual perceptions of policies, procedures, and practices in the workplace regarding safety, whereas "organizational safety climate" refers to employees' shared perceptions of those safety infrastructures in the workplace.

Leaders create climate [13], and studies on safety climate almost unanimously support this proposition [7,8]. Despite that, still more efforts are called for to investigate the mechanisms whereby leadership impacts on safety climate [14,15]. Positive leadership styles have positive associations with employees' health and well-being. However, boundary conditions for the positive associations also warrant investigation [16]. Transformational leadership is multi-dimensional in nature, covering idealized influence, intellectual stimulation, inspirational leadership, and individualized consideration. To explore fine-grained mechanisms and boundary conditions in the relationship between transformational leadership and safety climate, recently scholars have turned to specific and observable dimensions of transformational leadership [4,17]. Hoffmeister et al. [17] found that different transformational leadership facets relate to safety climate to different degrees. As Dinh et al. [18] observed, leadership for creativity and innovation has proliferated since the start of the new millennium. Concurring with Dinh et al. [18], a recent McKinsey analysis of academic literature and a worldwide survey of around 200,000 people in 81 organizations showed that along with other three types of leadership behavior, seeking different perspectives accounts for 89% of leadership effectiveness [19]. Leaders in temporary organizations such as projects necessitate team members' creative input [20]. Hence, as an exploratory effort, this paper chooses the dimension of intellectual stimulation, and investigates the mediating mechanisms and boundary conditions involved in the association between project team leaders' intellectual stimulation and construction personnel's psychological safety climate.

This paper contributes to the literature in two ways. First, it contributes to the leadership literature. As Inceoglu et al. [21] observed, relatively few studies explore the mediators between leadership and well-being. Although prior studies have examined the effects of specific transformational leadership dimensions on safety-related outcomes (e.g., [17,22,23]), the mediating mechanisms and boundary conditions linking specific leadership dimensions to psychological safety climate remain largely unexplored. To address this gap, this study extends the leadership literature by developing and testing a multiple mediation model that delineates the pathways through which intellectual stimulation (IS) associates with psychological safety climate (PSC). Second, while recent reviews have called for more research into the antecedents of safety climate [15], the specific social exchange mechanisms through which leadership behaviors shape individual safety climate perceptions are not well understood. This study contributes to the safety climate literature by simultaneously examining safety-specific LMX and TMX as parallel mediators and demographic variables as moderators in the leadership–safety climate link, and hence providing a more nuanced understanding of the formation of safety climate.

In practice, this study aims to inform the design of more targeted safety climate interventions. Previous safety climate interventions have included vertical safety communication, education and training, employee engagement, and technology adoption [24]. While leadership is a common component of such interventions, the specific role of intellectual stimulation has not been examined. Given that modern construction projects increasingly require improvised solutions under uncertainty, understanding how intellectually stimulating leadership associates with safety climate perceptions brings forth more effective suggestions.

2. Literature Review and Hypotheses

2.1. Behavioral and Relationship Approach to Leadership

Transformational leadership and LMX have been two important paradigms in modern leadership since the early 1980s [25]. With the former, leaders inspire and motivate followers by means of behavior, character, and trait. Through the latter, leaders inspire and motivate followers by developing one-to-one relationship with each follower [5].

Transformational leadership has four dimensions, i.e., idealized influence, intellectual stimulation, inspirational leadership, and individualized consideration [2]. Leaders engaging in idealized influence act as a role model for their followers. When leaders encourage followers to think creatively, challenge assumptions, and approach problems from new perspectives, they are exhibiting intellectual stimulation. Usually through empowerment, inspiring leaders encourage followers to take on bold missions and hold them accountable for results. Leaders exhibiting individualized consideration attend to their followers' individual needs. Transformational leadership has dominated leadership research for over three decades [4]. However, the low construct validity of transformational leadership has been debated due to its high correlation with the contingent reward dimension of transactional leadership [4].

Transformational leadership often requires that followers identify with the leader [20]. Hence, a sound exchange relationship between leaders and followers is essential for the former exercising transformational leadership. In fact, LMX has been found to mediate the relationship between transformational leadership and followers' performance [26,27].

2.2. Interactive Approach to Forming Safety Climate in Construction Projects

Hofmann et al. [8] divided the more than 100 years of occupational safety research into three stages. In the first stage, from the introduction of factory laws (e.g., the Factory Acts of 1833 and 1844 in the United Kingdom) to the mid-1900s, safety research and practice focused on job monotony, industrial fatigue, and accident proneness. At the second stage, from the mid to late 1900s, the emphasis shifted to work analysis and worker selection, motivation, and safety training. The third stage (i.e., the late 1900s to early 21st century) witnessed a shift to a more multilevel and systems view of safety, and research began to focus on the surrounding team, leaders and broader organization. Safety climate research was an early endeavor at the third stage, and it recognized the influence of the broader organizational context on employees' safety. Safety climate is defined as "shared employee perceptions about the relative importance of safe conduct in their occupational behavior" [28] (p.96). A more recent cross-industry safety climate measure was developed by Beus et al. [29] and consists of seven core indicators, i.e., leader safety commitment, safety communication, safety training, coworker safety practices, safety equipment and housekeeping, safety involvement, and safety rewards. Positive safety climate perceptions are related to improved worker wellbeing and productivity [30].

The formation of safety climate is complex, involving a variety of organizational and psychological factors [31]. Moran and Volkwein [32] proposed four approaches to forming organizational climate, i.e., structural, perceptual, interactive, and cultural. Drawing on Moran and Volkwein's [32] framework, Shen et al. [10] quantified the impact of factors in these four categories on psychological safety climate, and found that interactive approach accounts for the largest variance in psychological safety climate. This paper, accordingly, investigates the formation of safety climate through the lens of the interactive approach.

Besides LMX, team member exchange (TMX) is another critical factor in the interactive approach. To complement the LMX theory, Seers [33] proposed TMX as a role-making construct and defined TMX as "the individual member's perception of his or her exchange relationship with the peer group as a whole" (p.119). Seers [33] intended the TMX construct to assess the reciprocity between a member and their team. Specifically, TMX is supposed to measure a member's perception of their willingness to assist other team members, to share ideas and feedback, and also their readiness to receive information, help and recognition from other team members. High-quality TMX occurs when team members unconsciously help each other, communicate openly, and provide constructive feedback. Low-quality TMX results if members focus on their own interests [34]. High-quality TMX is related to group cohesiveness, satisfaction with coworkers, general job satisfaction, and production efficiency [35].

TMX complements LMX. Both LMX and TMX measure the quality of reciprocal exchange among employees, and relate to four workplace outcomes, i.e., job performance, organizational commitment, job satisfaction, and turnover intentions. However, there was no empirical evidence regarding which one has more of an impact. In view of this knowledge gap, Banks et al. [36] conducted a meta-analysis and found that TMX shows incremental validity above and beyond LMX for two out of the four outcomes, and LMX shows greater relative importance across all these four outcomes.

Organizations are abundant with paradoxes. The paradox between workplace safety and general performance (e.g., safety vs. production) is a pronounced theme in safety research. Based on such organizational paradox theory, two categories of constructs are involved in empirical studies on safety, i.e., context-free and context-specific. For example, drawing on the organizational paradox theory, Nguyen et al. [37] noted that transformational leadership in both context-free (e.g., "general transformational leadership") and context-specific (e.g., "safety-specific transformational leadership") forms has been used in exploring the relationship between transformational leadership and safety. Simultaneously, they also noted two forms of work outcomes in the literature. One is context-free (e.g., in-role performance, organizational citizenship behaviors), and the other is context-specific (e.g., safety compliance, safety participation). Through two studies (one cross-sectional, one short-term longitudinal), Nguyen et al. [37] found that the two forms of transformational leadership are psychometrically distinct albeit highly correlated. Furthermore, safety-specific transformational leadership explained statistically more variance than general transformational leadership in both safety participation and organizational citizenship behaviors, while general transformational leadership accounted for more variance in in-role performance than safety-specific transformational leadership. However, the distinction between general transformational leadership and safety-specific transformational leadership is significant only in contexts where safety is not a major concern. Context-specific constructs are usually believed to be more predictive of behavior or performance than general constructs. Therefore, Mo et al. [38] examined the mediating role of safety-specific self-efficacy in explaining the impact of proactive personality on construction workers' safety behavior. Similarly, Shen et al. [10] grouped safety-specific LMX and TMX into the interactive category of factors contributing to psychological safety climate. Accordingly, this paper investigates the mediating role of safety-specific LMX and TMX in the association between intellectual stimulation and psychological safety climate.

2.3. The Link Between Intellectual Stimulation and Safety-Specific LMX

Project managers tend to exhibit adaptive leadership styles, depending on project characteristics, their own personality, and the context [39]. They may exhibit transformational leadership in complex projects, and transactional leadership in simple projects. Compared with transactional leadership, transformational leadership is rare in construction projects [40]. However, leaders in projects have to stimulate creativity in team members [20]. Given the temporary nature, the outcome of a project is unique. The path to the unique outcome is often marked with uncertainty. To accommodate such uncertainty, novel practices are often essential.

Transformational leadership is positively associated with leader–member exchange, because leader behaviors affect followers' perceptions and responses to the leader [27]. Specifically, intellectually stimulating leaders create an environment which is conducive to developing high-quality LMX relationships. First, they encourage open communication in the team so that members can improvise creative solutions. Second, they must raise team spirit because creative ideas can hardly flourish in a low-morale environment [41]. Third, intellectual stimulation involves encouraging followers to rethink about assumptions and explore new approaches, which inherently include reviewing existing work practices—including safety practices [41]. When project leaders engage in such intellectually stimulating behaviors, they signal a genuine interest in followers' well-being and professional development. This perceived care and openness, in turn, fosters trust-based, high-quality exchange between leaders and followers in the safety domain. Therefore, we propose the following hypothesis:

H1. *There is a positive association between intellectual stimulation and safety-specific LMX.*

2.4. The Link Between Safety-Specific LMX and Psychological Safety Climate

Cognition is one of the most commonly studied outcomes of leadership, and climate perceptions are an example of such cognition [25]. In the safety domain, three types of teams (i.e., health and safety committees (HSCs), autonomous work teams, and airplane cockpit crews) are often involved [42]. Their positive effects on safety outcomes were often observed, and possible mechanisms discussed. Among others, two possible mechanisms are relationships between work group and supervisor (conceptualized as LMX) and those between colleagues (conceptualized as TMX). Therefore, the association between LMX and psychological safety climate warrants investigation. In fact, perceptions have been studied as consequences of LMX [27]. Using Bayesian network analysis, Huang et al. [43] found that LMX is one of the most influential predictors of trucking safety climate. A primary indicator of psychological safety climate is management commitment to safety [44]. When project team leaders engage in high-quality exchange with followers regarding safety (i.e., high-quality safety-specific LMX), followers can immediately sense that project team leaders take safety seriously (i.e., high-level psychological safety climate). Hence, we propose the following hypothesis:

H2. *There is a positive association between safety-specific LMX and psychological safety climate.*

2.5. The Link Between Intellectual Stimulation and Safety-Specific TMX

Seers [33] found that variation in TMX between groups is affected by the autonomy granted by management. In order to stimulate creativity in team members, leaders should allow followers some degree of independence, encourage them to think critically and share knowledge and learning [20]. Intellectually stimulated teams often exhibit high collaboration in many aspects, including safety. Hence, intellectually stimulating project leaders also tend to encourage TMX in their teams regarding safety matters. Accordingly, we propose the following hypothesis:

H3. *There is a positive association between intellectual stimulation and safety-specific TMX.*

2.6. The Link Between Safety-Specific TMX and Psychological Safety Climate

TMX influences employees' team commitment and intention to share knowledge in R&D projects [45]. In evaluating nonprofit organizations' effectiveness, top leaders need to develop shared mental models in defining relevant evaluation criteria. Willems [34] found that TMX among top leaders in nonprofit organizations is conducive to developing both individual and shared mental models. In other words, interactions among nonprofit organizations' top leaders contribute to their individual and shared perceptions of the organizations' effectiveness. Employees usually work in teams and they need to face workplace safety challenges collectively rather than individually [42]. Cooperation and communication among team members are consistently related to safety performance [8]. Using a pre–post intervention-control design with five construction crews, Kines et al. [46] found that group safety climate can be improved with more safety communication between foremen and workers. Therefore, we propose the following hypothesis:

H4. *There is a positive association between safety-specific TMX and psychological safety climate.*

2.7. The Link Between Intellectual Stimulation and Psychological Safety Climate

The impact of general and safety-specific transformational leadership on safety outcomes has been studied, and in general the research suggests that transformational leadership exerts a stronger impact on extra-role safety behaviors (such as safety citizenship and participation) than on compliance with minimum safety standards and rules (i.e., safety compliance) [47]. Meta-analyses have found a positive association between transformational leadership and safety climate (e.g., [48]). Leaders shape climate. Lingard et al. [47] found that intellectual stimulation significantly and positively associates with workgroup safety climate. Hofmann et al. [8] provided both group- and organizational-level mechanisms to explain the connection between leadership and climate. Moreover, safety climate has often been taken as a linking mechanism through which leaders' behaviors influence safety outcomes [47,48]. Although it is possible that intellectual stimulation could have deleterious effects on safety, this possibility has not been supported by empirical evidence. On the contrary, the positive association between intellectual stimulation and safety outcomes has received empirical support [48]. Given that the interactive approach—encompassing both vertical (LMX) and lateral (TMX) exchange—has been found to account for the largest variance in psychological safety climate [10], it is plausible that the association between intellectual stimulation and psychological safety climate is largely supported by these social exchange mechanisms. Therefore, we propose the following hypotheses:

H5. *There is a positive association between intellectual stimulation and psychological safety climate.*

H6. *Safety-specific LMX mediates the relationship between intellectual stimulation and psychological safety climate.*

H7. *Safety-specific TMX mediates the relationship between intellectual stimulation and psychological safety climate.*

2.8. Age, Education Level, Industry Experience, and Psychological Safety Climate

A gap in research on the demographics–safety relationship may undermine safety measures' relevance and effectiveness. In view of this, He et al. [49] conducted an exploratory study using a sample of construction workers based in the Chinese mainland and found that all of the five demographic variables (i.e., gender, age, work experience, education level, and employer size) have impacts on (part of) safety climate.

As age closely relates to industry experience, He et al. [49] took them together in discussing their impact on safety outcomes. In general, there is a seemingly U-shaped relationship between age/industry experience and safety climate [49,50]. Construction safety induction training usually contains slightly horrifying accident scenes. These tragedies remind fresh construction personnel not to take safety risks. Hence, the junior construction personnel usually prioritize safety over other competing goals (high psychological safety climate). With work pressure accumulating and especially few accidents happening to themselves directly, construction personnel in the middle of their career begin to neglect or even ignore safety (low psychological safety climate). After experiencing many accidents (in)directly and gaining more safety knowledge, construction personnel come to sense the importance of safety (high psychological safety climate). In general, senior construction personnel have higher levels of safety climate perceptions [51–53].

Education level also affects psychological safety climate. Although the effect of education is still debated, it is sensible that construction personnel with higher education levels tend to be more safety-conscious and more sensitive to safety hazards [49,52,54]. Therefore, we propose the following hypotheses:

H8. *There is a U-shaped relationship between age and psychological safety climate.*

H9. *There is a positive association between education level and psychological safety climate.*

H10. *There is a U-shaped relationship between industry experience and psychological safety climate.*

Stoilkovska et al. [55] found that age moderates the relationship between construction employees' job satisfaction and their safety climate perceptions. Until now there seemed to be no empirical evidence supporting the moderating role of industry experience in the relationships regarding (psychological) safety climate. This study attempts to make up for this deficiency. Specifically, younger construction personnel, who typically possess less industry experience and are still forming their professional identities, may be more receptive to leaders' intellectually stimulating behaviors. In contrast, senior personnel with extensive experience may have already developed relatively stable safety perceptions, making them less susceptible to the influence of any single leadership behavior. Hence, we propose the following hypotheses:

H11. *Construction personnel's age moderates the positive relationship between intellectual stimulation and psychological safety climate.*

H12. *Construction personnel's education level moderates the positive relationship between intellectual stimulation and psychological safety climate.*

H13. *Construction personnel's industry experience moderates the positive relationship between intellectual stimulation and psychological safety climate.*

The conceptual model is shown in Figure 1.

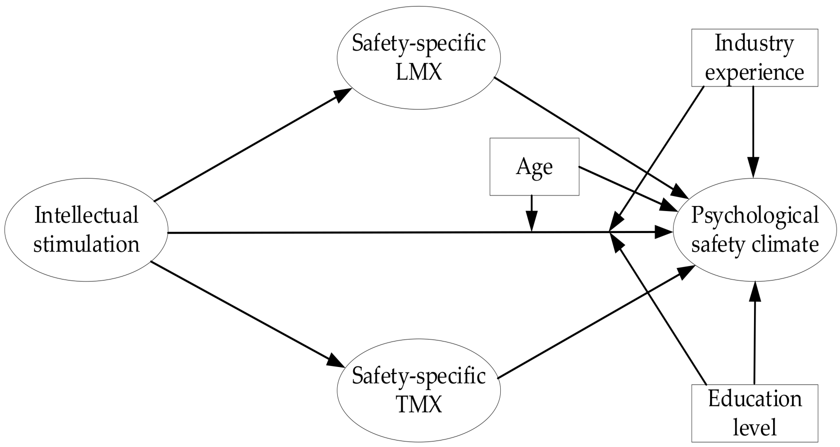

Figure 1. Conceptual model.

3. Materials and Methods

3.1. Population and Sample

Construction personnel in Hong Kong were the target population. They are affiliated with trade associations, professional institutions, governmental departments, property developers or trade unions. The research team accessed the websites of these professional bodies, obtained the member lists, and constructed a sampling frame. The sampling frame consisted of clients, contractors, and consultants. Considering the relatively low response rate with paper-and-pencil surveys, the research team drew 2996 prospective respondents from the sampling frame.

The study used a questionnaire to collect data. It was conducted in accordance with the Declaration of Helsinki, and the questionnaire was submitted to the Human Research Ethics Committee for Non-clinical Faculties, University of Hong Kong, for approval (code EA011011, 6 October 2011). In November 2011, hardcopy questionnaires were distributed to those 2996 prospective respondents for their completion. After five months, 292 valid questionnaires were obtained. The demographics of the respondents are shown in Table 1. In total, 76% of the respondents were above 40, and this is not surprising given the prevalent aging workforce in the Hong Kong construction sector [56]. Additionally, 87.7% had been working in industry for more than 10 years. A majority of them had received tertiary education. Obviously, although the sample covered manual workers (e.g., unskilled, skilled/semi-skilled workers), the majority were nonmanual professionals (e.g., foremen, engineers, architects, safety officers/supervisors) who have substantial exposure to and are knowledgeable of the industry.

Table 1. Demographics of the respondents.

Category	Items	Valid Respondents (*N* = 292)	
		Frequency	Percentage (%)
Age	<20	0	0
	20–30	20	6.8%
	31–40	51	17.5%
	41–50	102	34.9%
	>50	119	40.8%
Education level	Below primary	1	0.3%
	Primary	5	1.7%
	Secondary	22	7.5%
	Certificate/diploma	17	5.8%
	College or higher	247	84.6%
Industry experience (years)	<3	10	3.4%
	3–10	29	9.9%
	11–15	36	12.3%
	16–20	39	13.4%
	>20	178	61.0%

Among those 2996 construction personnel, 865 could not be reached, because they had already moved to another company when the hardcopy questionnaire reached their former employer. Given these non-deliverables, the effective response rate was calculated as 13.7%, which was acceptable [57]. Those respondents who returned their questionnaires in the first month were categorized as early respondents, and the rest as late respondents. Non-response bias was approximately assessed by comparing early respondents with late respondents on all study variables using independent-samples *t*-tests [58]. No statistically significant differences were found, suggesting that non-response bias was not a serious concern.

3.2. Measures

In order to curb possible common method bias, the first section of the questionnaire assured prospective respondents of anonymity. Furthermore, the four constructs in the model were measured with Likert scales in different points (to be elaborated shortly). The measures were as follows.

Intellectual stimulation was measured by two items from Avolio et al.'s [59] Multifactor Leadership Questionnaire (MLQ). Avolio et al. [59] validated a six-factor structure of the leadership construct, with the first four factors/dimensions related to transformational leadership and the last two factors/dimensions to transactional leadership. The two items were "My immediate supervisor suggests new ways" and "My immediate supervisor suggests different angles". Although the MLQ includes additional items for the intellectual stimulation dimension, only these two items were adopted in the survey instrument to reduce respondent burden. Respondents were asked to rate them on a six-point Likert scale, where 1 = "To small extent" and 6 = "To large extent".

Safety-specific LMX was measured by seven adapted items from the Leader–Member Exchange 7 Questionnaire (LMX-7) [5]. An example item was "My immediate supervisor understands my job problems and need”. The items were rated on a six-point Likert scale, where 1 = “To small extent” and 6 = “To large extent”.

Safety-specific TMX was measured by ten adapted items from Tuuli [60]. An example item was “I often ask other peers for help with my work”. The items were rated on a six-point Likert scale, from 1 = “To small extent” to 6 = “To large extent”.

Psychological safety climate was measured by a 24-item scale developed by Fang and colleagues [61,62]. A sample item was “People here always work safely even when they are not being supervised”. The items were rated on a seven-point scale, from 1 = “To small extent” to 7 = “To large extent”.

3.3. Data Analysis

In social science, structural equation modeling (SEM) is a prominent statistical analysis technique to investigate latent phenomena (e.g., perceptions, attitudes, expectations, etc.), which are measured by observed variables (i.e., indicators) [63]. There are at least two categories of SEM, i.e., covariance-based SEM (CB-SEM) and partial least squares SEM (PLS-SEM) [64]. The former is often used to confirm theories, while the latter is usually adopted to develop theories. Because this study was exploratory in nature as it aimed to explore the association between one specific transformational leadership dimension and psychological safety climate, it employed PLS-SEM to analyze data. Specifically, the software of SmartPLS 3.0 was used in this study. In PLS-SEM, there are two types of variables, i.e., exogenous and endogenous variables. The former are explained by variables outside of the model, and the latter by the former [64]. A typical PLS path model consists of two elements, i.e., structural and measurement models. The former is also called the inner model, and displays the relationships among the constructs. The latter is also called the outer model, and displays the relationships between the constructs and their indicator variables [64]. Further, there are two different approaches to measure unobservable constructs. One approach is called reflective measurement, and the other is formative measurement. Reflective measurement models assume that the construct causes the covariation of the indicator variables. In the diagram of reflective measurement models, the directional arrows are pointing from the construct to the indicator variables. On the contrary, formative measurement models assume the indicator variables cause the construct, and hence the directional arrows are pointing from the indicator variables to the construct in the diagram [64]. This study adopted the reflective measurement model, as many other empirical studies. The bootstrapping procedure performs fairly robustly when data are non-normal [64,65]. Therefore, this study employed the bootstrapping procedure with 5000 samples to assess (in)direct effects and heterotrait–monotrait ratio (HTMT) of the correlations among constructs, and correspondingly reported two-tailed 95% confidence intervals.

Assessing PLS-SEM results involves evaluating measurement and structural models in sequence. Figure 2 illustrates assessment of a PLS-SEM model with a reflective measurement model.

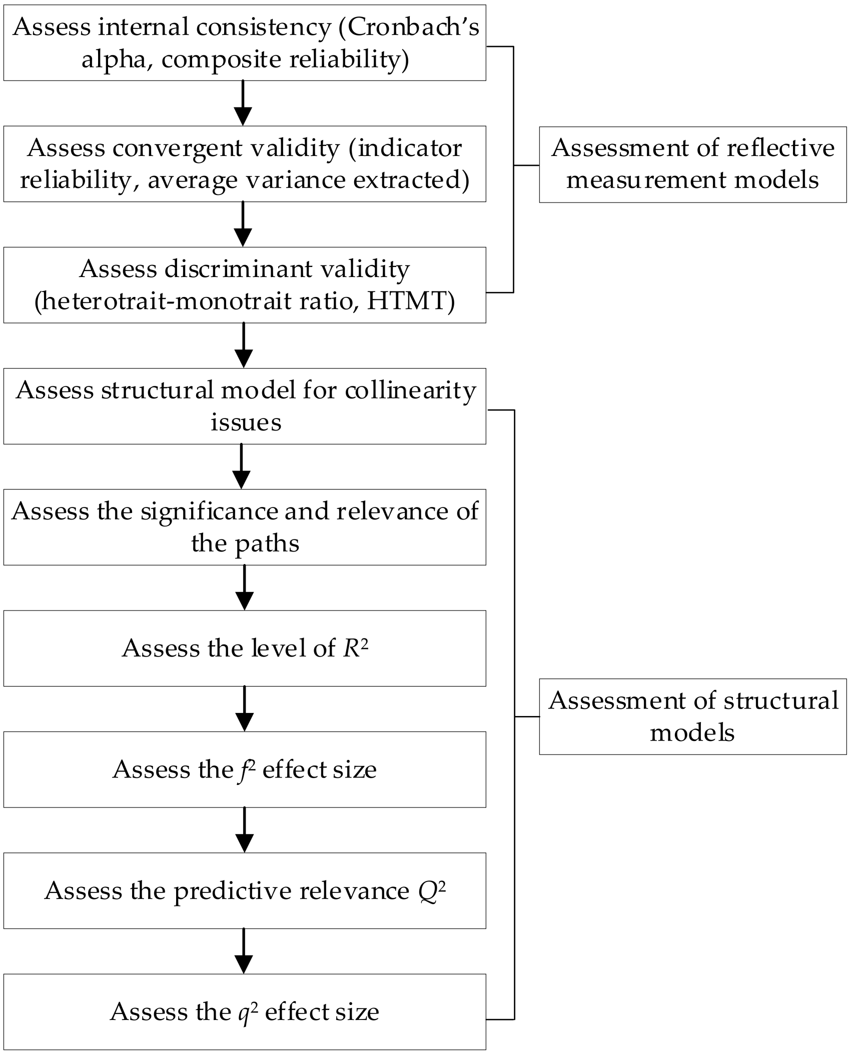

Figure 2. Assessing PLS-SEM results (adapted from Hair et al. (2017) [64]).

4. Results

4.1. Assessment of the Measurement Model

In this paper, the constructs were reflectively measured by indicators; i.e., the indicators are believed to be caused by the corresponding construct. Hence, the indicators are interchangeable with each other, and deletion of any indicator does not undermine the construct [66]. Assessment of reflective measurement models covers evaluating the measures' reliability (both at the indicator and construct levels) and two kinds of validity (i.e., convergent and discriminant validity) [64]. Following Hair et al.'s [64] recommendation, indicators with outer loadings below 0.7 were considered for deletion through iterative assessment. Three indicators of safety-specific LMX, seven of safety-specific TMX, and 19 of psychological safety climate were removed. The retained indicators for the four constructs (i.e., intellectual stimulation, safety-specific LMX, safety-specific TMX, and PSC) are shown in Table 2. It can be seen that although a substantial number of indicators have been removed, the key dimensions of the intended constructs were covered by the remaining indicators. While the reduced item sets may limit the breadth of construct coverage, the retained indicators achieved satisfactory reliability and validity.

Table 2. Constructs and the retained indicators.

Constructs [1]	Code	Indicators
IS	J3	My immediate supervisor suggests new ways.
	J4	My immediate supervisor suggests different angles.
SLMX	H2	My immediate supervisor understands my job problems and needs.
	H3	My immediate supervisor recognizes my potential.
	H6	I have confidence in my immediate supervisor that I would defend and justify his/her decision if he/she were not present to do so.
	H7	My working relationship with my immediate supervisor is very good.
STMX	I4	I am flexible about switching tasks with peers.
	I5	I am willing to finish work assigned to other peers.
	I7	My peers are willing to finish work assigned to me.
PSC	M1	Accidents and incidents which happen here are always reported.
	M18	The project really cares about the safety of the people who work here.
	M20	Sufficient resources are available for safety here.
	M21	The project shows interest in my views on safety.
	M23	All the people who work in my team are fully committed to safety.

[1] Note: IS = intellectual stimulation; SLMX = safety-specific leader–member exchange; STMX = safety-specific team member exchange; PSC = psychological safety climate.

With the retained indicators, Figure 3 features the path model in SmartPLS 3.0.

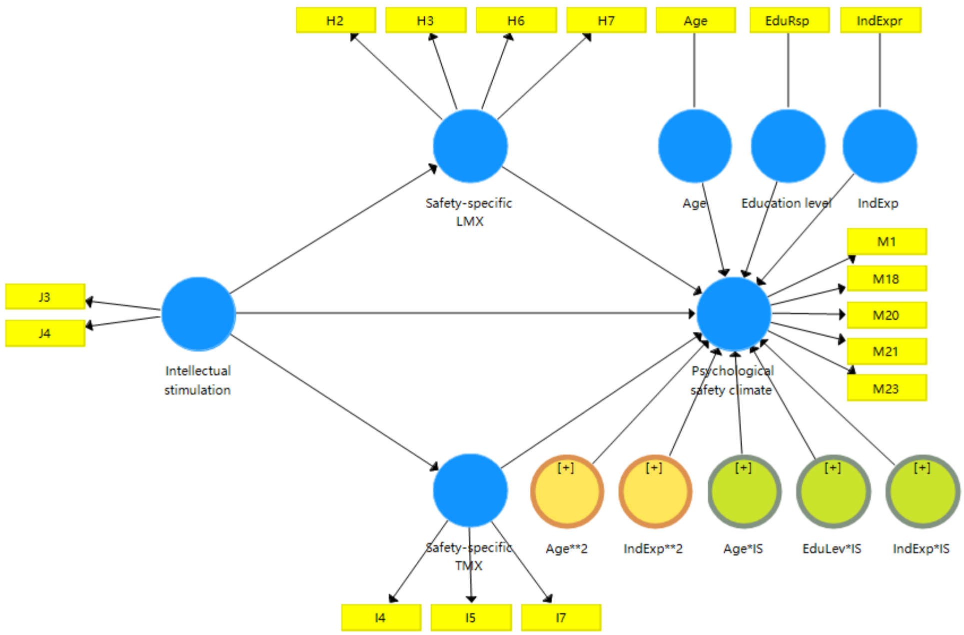

Figure 3. Path model in SmartPLS 3.0.

As suggested by Hair et al. [64], reliability ρ_A is used to assess the reliability of a measure for a latent variable. Average variance extracted (AVE) is to measure the degree to which a latent variable explains the variance of its indicators (i.e., the convergent validity of the measure). After deleting those unsatisfactory indicators (i.e., three indicators of safety-specific LMX, seven indicators of safety-specific TMX, and 19 indicators of psychological safety climate), outer loadings, reliability ρ_A, and AVEs are shown in Table 3. Outer loadings are all above 0.7, indicating that all indicators are reliable. Reliability ρ_A of each measure is above 0.7, suggesting that all measures are reliable. All AVEs are above 0.5, supporting convergent validity of each measure.

Table 3. Measurement model validation.

Latent Variables [1]	Indicators	Outer Loadings	Reliability ρ_A	AVE
IS			0.818	0.840
	J3	0.907		
	J4	0.926		
SLMX			0.833	0.655
	H2	0.772		
	H3	0.816		
	H6	0.791		
	H7	0.855		
STMX			0.759	0.650
	I4	0.834		
	I5	0.809		
	I7	0.775		
PSC			0.839	0.599
	M1	0.739		
	M18	0.740		
	M20	0.784		
	M21	0.805		
	M23	0.800		

[1] Note: IS = intellectual stimulation; SLMX = safety-specific leader–member exchange; STMX = safety-specific team member exchange; PSC = psychological safety climate; AVE = average variance extracted.

HTMT estimates the true correlation between two constructs if they were perfectly measured, and hence is a measure of discriminant validity [66]. If the HTMT between two measures is below 0.85, then the two measures (and hence constructs) achieve discriminant validity [64]. As shown in Table 4, the HTMT for all pairs of constructs are under 0.85, and hence discriminant validity of all the measures is ensured.

Table 4. Heterotrait–monotrait ratio (HTMT) with 5000 bootstrap subsamples.

Pairs of Constructs [1]	Original Sample	Sample Mean	95% Confidence Interval
IS $\leftrightarrow$ SLMX	0.564	0.565	(0.394, 0.715)
IS $\leftrightarrow$ STMX	0.259	0.261	(0.124, 0.406)
IS $\leftrightarrow$ PSC	0.317	0.319	(0.162, 0.477)
SLMX $\leftrightarrow$ STMX	0.390	0.394	(0.258, 0.534)
SLMX $\leftrightarrow$ PSC	0.569	0.569	(0.440, 0.679)
STMX $\leftrightarrow$ PSC	0.360	0.359	(0.185, 0.529)
IS $\leftrightarrow$ SLMX	0.564	0.565	(0.394, 0.715)

[1] Note: IS = intellectual stimulation; SLMX = safety-specific leader–member exchange; STMX = safety-specific team member exchange; PSC = psychological safety climate.

4.2. Assessment of the Structural Model

After securing reliable and valid construct measures, the structural model embodying the relationships among constructs requires assessment. Hair et al. [64] present a six-step procedure to assess the structural model, as shown in Figure 2. The first step is to examine possible collinearity among predictor variables of an endogenous variable. The second step is to assess the significance of the path coefficients, which measure the impact of a predictor variable on an endogenous variable. The third step is to assess the model's in-sample predictive power, which is measured by coefficient of determination (i.e., the level of R^2 value). The fourth step is to assess the relative impact of a predictor variable on the endogenous variable, which is measured by the f^2 effect size. The fifth step is to assess the model's out-of-sample predictive relevance regarding endogenous variables as measured by Stone–Geisser's Q^2 value. And the sixth step is to measure relative out-of-sample predictive relevance, which is measured by the q^2 effect size. Predictive power as measured by the level of R^2 value is different from predictive relevance as measured by Stone–Geisser's Q^2 value. The former measures the model's ability to explain variance in endogenous variables within the current sample (i.e., in-sample predictive power), while the latter measures the model's capability to predict the endogenous variables in other samples (i.e., out-of-sample predictive relevance) [64]. In a more recent version, Hair et al. [67] advocate using the $PLS_{predict}$ procedure, instead of Stone–Geisser's Q^2 value, to assess the model's predictive power.

The statistic of variance inflation factor (VIF) is used to measure the severity of collinearity between predictor variables in a structural model [66]. If the VIF is below 3.0, collinearity is not a concern [66]. Table 5 shows the VIF values of all predictors in the structural model, and suggests that multicollinearity is not an issue in this study.

Table 5. Variance inflation factors among exogenous and endogenous variables.

Exogenous Variables [1]	Endogenous Variables		
	SLMX	STMX	PSC
IS	1.000	1.000	1.392
SLMX			1.430
STMX			1.147

[1] Note: IS = intellectual stimulation; SLMX = safety-specific leader–member exchange; STMX = safety-specific team member exchange; PSC = psychological safety climate.

The path coefficients and related significance test results are shown in Table 6. Seven hypotheses (i.e., H1–4, H6–7, H11) are supported, and six (i.e., H5, H8–10, H12–13) are not supported. The results showed that intellectual stimulation is significantly associated with safety-specific LMX and safety-specific TMX, although it is not significantly associated with psychological safety climate. Psychological safety climate is significantly associated with safety-specific LMX, safety-specific TMX, and the interaction term between age and intellectual stimulation (i.e., age * intellectual stimulation). The mediation effects of safety-specific LMX (i.e., IS → SLMX → PSC) and safety-specific TMX (i.e., IS → STMX → PSC) are supported. However, psychological safety climate is not significantly associated with the quadratic effects of age (i.e., age ** 2) and industrial experience (i.e., IE ** 2), education level, the interaction term between intellectual stimulation and education level (i.e., EduLev * IS) and that between intellectual and industrial experience (i.e., IE * IS).

Table 6. Significance test of path coefficients in the structural model (5000 bootstrap subsamples).

Path [1]	Original Sample	Sample Mean	95% Confidence Intervals	Remark
IS → SLMX	0.464	0.468	(0.317, 0.576)	H1 supported
SLMX → PSC	0.407	0.399	(0.283, 0.527)	H2 supported
IS → STMX	0.206	0.212	(0.083, 0.317)	H3 supported
STMX → PSC	0.155	0.153	(0.016, 0.287)	H4 supported
IS → PSC	0.077	0.086	(−0.052, 0.208)	H5 not supported
IS → SLMX → PSC	0.189	0.187	(0.122, 0.272)	H6 supported
IS → STMX → PSC	0.032	0.032	(0.006, 0.070)	H7 supported
Age ** 2 → PSC	0.011	0.009	(−0.097, 0.118)	H8 not supported
EduLev → PSC	0.002	0.004	(−0.096, 0.090)	H9 not supported
IE ** 2 → PSC	0.014	0.018	(−0.115, 0.139)	H10 not supported
Age * IS → PSC	−0.187	−0.184	(−0.369, −0.032)	H11 supported
EduLev * IS → PSC	−0.053	−0.061	(−0.158, 0.045)	H12 not supported
IE * IS → PSC	0.107	0.108	(−0.049, 0.257)	H13 not supported

[1] Note: IS = intellectual stimulation; SLMX = safety-specific leader–member exchange; STMX = safety-specific team member exchange; PSC = psychological safety climate; EduLev = education level; IE = industry experience.

As the three demographic variables (i.e., age, education level, and industrial experience) have five response categories, they can be treated as continuous variables [68]. In order to reduce collinearity, they were standardized in creating the interaction terms in testing their moderation effects. The moderation effect of age on the positive association between intellectual stimulation and psychological safety climate was supported. Specifically, the path coefficient for Age * IS → PSC was −0.187, and the 95% confidence interval with 5000 bootstrap subsamples was (−0.369, −0.032), excluding 0. Figure 4 features the moderation effect of age on the association between intellectual stimulation and psychological safety climate. In particular, the slope for the younger construction personnel (i.e., those younger than one standard deviation below the mean) was 0.481 ($p < 0.001$), and that for their senior counterparts (i.e., those older than one standard deviation above the mean) was 0.195 ($p = 0.029$).

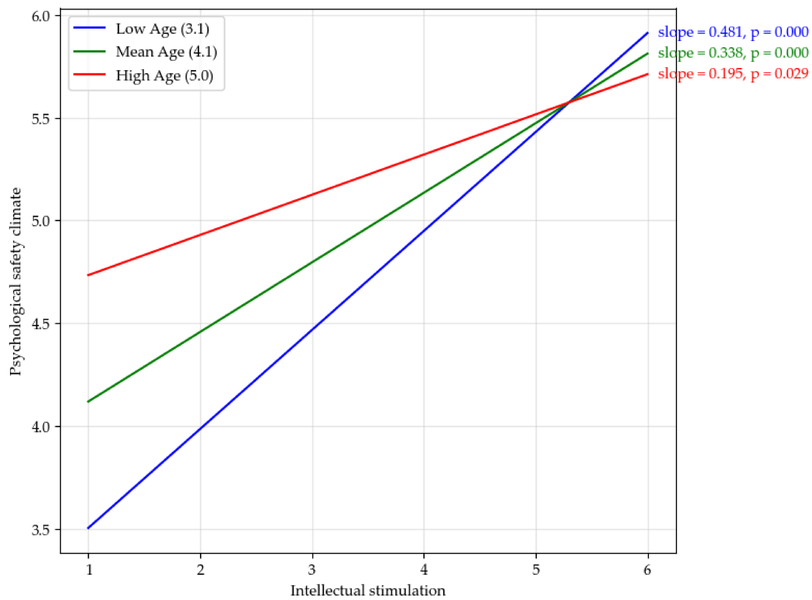

Figure 4. Interactive effects of age and intellectual stimulation on construction personnel's psychological safety climate perceptions.

Coefficients of determination (i.e., R^2 values) are shown in Table 7. In behavioral science, an R^2 value of above 0.2 is considered as high [64]. Hence, the structural model has high in-sample predictive power for safety-specific LMX and psychological safety climate, but weak for safety-specific TMX.

Table 7. Coefficient of determination (5000 bootstrap subsamples).

Endogenous Variables [1]	Original Sample	Sample Mean	95% Confidence Intervals
SLMX	0.213	0.221	(0.097, 0.329)
STMX	0.039	0.045	(0.003, 0.094)
PSC	0.250	0.280	(0.128, 0.323)

[1] Note: SLMX = safety-specific leader–member exchange; STMX = safety-specific team member exchange; PSC = psychological safety climate.

Relative impact of a predictor on an endogenous construct as measured by the f^2 effect size is presented in Table 8. According to Hair et al. [64], the f^2 effect size values of 0.02, 0.15, and 0.35 represent small, medium, and large effects. Intellectual stimulation has medium relative impact on safety-specific LMX, and so does safety-specific LMX on psychological safety climate. Intellectual stimulation has small relative impact on safety-specific TMX, and so does safety-specific TMX on psychological safety climate.

Table 8. The f^2 effect size.

Pairs of Variables [1]	Original Sample	Sample Mean	95% Confidence Intervals
IS → SLMX	0.275	0.470	(0.147, 0.227)
SLMX → PSC	0.160	0.400	(0.165, 0.165)
IS → STMX	0.044	0.212	(−0.053, −0.053)
STMX → PSC	0.029	0.154	(−0.110, 0.040)
IS → PSC	0.006	0.087	(−0.138, 0.053)
Age ** 2 → PSC	0.000	0.011	(−0.122, 0.093)
EduLev → PSC	0.000	0.005	(−0.103, 0.087)
IE ** 2 → PSC	0.000	0.017	(−0.144, 0.133)
Age * IS → PSC	0.016	−0.185	(0.060, 0.103)
EduLev * IS → PSC	0.004	−0.061	(−0.023, 0.107)
IE * IS → PSC	0.005	0.110	(−0.193, 0.053)

[1] Note: IS = intellectual stimulation; SLMX = safety-specific leader–member exchange; STMX = safety-specific team member exchange; PSC = psychological safety climate; EduLev = education level; IE = industry experience.

In PLS-SEM, if an endogenous construct's Stone–Geisser's Q^2 value is larger than 0, the model is considered to have predictive relevance for the endogenous construct [64]. In the structural model, there are three endogenous constructs, i.e., safety-specific LMX, safety-specific TMX, and psychological safety climate. The Q^2 values for the three endogenous constructs were 0.139, 0.024, and 0.150 respectively, suggesting the model was predictively relevant for all of them. The $\text{PLS}_{\text{predict}}$ procedure was performed with 10-fold cross-validation and 10 repetitions. The results showed that all indictors' root mean square error (RMSE) values were lower than their linear regression model (LM) benchmark values. This suggested that the model has predictive power [67].

The q^2 effect size measures the relative impact of an exogenous construct's predictive relevance to an endogenous construct. At present it is not available in SmartPLS 3.0. Therefore, the research team had to calculate it manually using the equation given by [64] (p.207). According to Hair et al. [64], the q^2 values of 0.02, 0.15, and 0.35 suggest a small, medium, or large predictive relevance respectively for an exogenous construct on an endogenous construct. As shown in Table 9, intellectual stimulation has medium predictive relevance for safety-specific LMX. Safety-specific LMX in turn has small predictive relevance for psychological safety climate. Intellectual stimulation has small predictive relevance for safety-specific TMX.

Table 9. The q^2 effect size.

Pairs of Variables [1]	Original Sample
IS → SLMX	0.161
SLMX → PSC	0.079
IS → STMX	0.025
STMX → PSC	0.012
IS → PSC	0.006
Age ** 2 → PSC	0
EduLev → PSC	0
IE ** 2 → PSC	0
Age * IS → PSC	0.006
EduLev * IS → PSC	0.001
IE * IS → PSC	0.001

[1] Note: IS = intellectual stimulation; SLMX = safety-specific leader–member exchange; STMX = safety-specific team member exchange; PSC = psychological safety climate; EduLev = education level; IE = industry experience.

5. Discussions

Leadership creates climate [13], and this claim has been supported by empirical evidence. However, previous research almost unanimously treated leadership as a broad aggregate construct. This is far from enough, given the multidimensional nature of the leadership construct. Different dimensions of leadership are supposed to have different effects on safety climate [17]. Hence, uncovering mechanisms underlying the association between different dimensions of leadership and individual safety climate perception (i.e., psychological safety climate) can not only spur theoretical development, but more importantly also help devise targeted interventions. Furthermore, this study is also responding to Hu et al.'s [69] call for more research endeavors to investigate the interaction effect of individual- and organizational-level factors contributing to safety climate. With this motivation, this paper investigated the association between one dimension of leadership—intellectual stimulation—and psychological safety climate. Findings, implications, limitations, and future research directions are reported as follows.

5.1. Findings

Representing the social organizational context, organizational climate is the most studied concept as antecedent, outcome, or boundary conditions in the organizational sciences [70]. Given its broad scope and hence possibly no substantial meaning, scholars turned to domain-specific organizational climate. Safety climate is one such domain-specific organizational climate, i.e., organizational climate for safety [10]. Because still comparatively little is known about the formation of safety climate [29], recent years have seen more research efforts investigating the antecedents of safety climate (e.g., [15,58,71]). From the beginning of organizational climate, scholars consented that leadership creates climate [13]. The transactional–transformational leadership paradigm is broad enough to capture the concept of leadership [3]. Within projects which are characterized by a limited duration, transactional leadership seems more effective and prevalent [20,40]. However, as agents of change for the permanent organization, projects have to rely on transformational leadership to accommodate changes and uncertainty [20]. Transformational leadership is also too broad, covering four dimensions/components. Hence, there is a need to examine specific leader behaviors and their unique association with safety outcomes [2]. To fill up this knowledge gap, this study specifically investigates the association between one transformational leadership dimension—intellectual stimulation (IS)—and psychological safety climate, and has the following findings.

Leader–member exchange often mediates relationships under study [27,47]. This paper once again supports this claim and finds that safety-specific LMX mediates the relationship between IS and psychological safety climate. More safety communication between foremen and workers leads to a higher level of safety climate [46]. Enhancing LMX is one key driver of trucking safety climate [43]. Toolbox meetings are a popular method of communication in construction. However, production issues and deadlines usually occupy toolbox meetings [72]. Safety topics should be given priority in toolbox meetings to promote both psychological and collective safety climate. Interestingly, the direct association between intellectual stimulation and psychological safety climate was not significant in this study (i.e., H5 not supported). However, a full mediation effect of social exchange—both vertically (LMX) and laterally (TMX)—in the association was found. This finding is consistent with the social information processing perspective [73], which posits that individuals form their climate perceptions through social interactions rather than through direct exposure to leaders' behaviors. In other words, intellectual stimulation does not automatically enhance followers' safety climate perceptions; rather, it must be channeled through high-quality social exchange to exert its influence. This underscores the indispensable role of social exchange mechanisms as the transmission channel between leadership behaviors and climate perceptions.

Notably, the indirect effect through safety-specific LMX (0.189) was substantially larger than that through safety-specific TMX (0.032), suggesting that vertical exchange between leaders and followers plays a more prominent role than horizontal exchange among peers in associating intellectual stimulation with psychological safety climate. This finding is particularly relevant in the construction industry, where workers typically operate in crews and rely heavily on supervisors' instructions and orders for day-to-day safety management. It implies a more effective way for intellectually stimulating project managers to raise construction personnel's safety awareness is through high-quality leader–follower interactions regarding safety within crews.

Last but not least, age was found to moderate the relationship between IS and psychological safety climate. Project team leaders' intellectual stimulation is significantly and positively associated with construction personnel's psychological safety climate, but this positive association differs between junior and senior construction personnel. Specifically, the positive association is stronger for junior construction personnel than their senior counterparts. This suggests that when working with novices, intellectually stimulating project team leaders are more likely to cultivate a high-level psychological safety climate in their followers.

In contrast to some prior studies (e.g., [49,51]), age, education level, and industry experience were not directly associated with psychological safety climate in this sample. This discrepancy may be attributable to the limited variability in our sample: 76% of respondents were above 40 years old, 84.6% held college or higher degrees, and 87.7% had over 10 years of industry experience. With such homogeneous demographics, detecting significant direct effects of these variables becomes statistically challenging. Furthermore, Hong Kong's stringent construction safety regulations and mandatory safety training may have leveled demographic differences in safety climate perceptions. Similarly, education level (H12) and industry experience (H13) did not moderate the IS–psychological safety climate relationship. This may be due to the high collinearity among the three demographic variables, which could have diluted their individual moderating effects. The finding that only age emerged as a significant moderator suggests that it may capture a broader set of experiential and cognitive differences than education level or industry experience alone.

5.2. Implications

This study makes three theoretical contributions. First, it extends the leadership–climate linkage literature by identifying the specific social exchange pathways through which intellectual stimulation might be associated with psychological safety climate. The finding that safety-specific LMX exerts a stronger mediating effect than safety-specific TMX underscores the importance of vertical social exchange processes in forming individual safety climate perception. Second, the identification of age as a significant moderator enriches our understanding of the boundary conditions of leadership effectiveness, suggesting that demographic characteristics may differentiate how followers respond to the same leadership behaviors. Third, the full mediation of the IS–PSC relationship challenges the simplistic assumption that leadership behaviors directly shape climate perceptions, instead highlighting the indispensable role of social exchange as a transmission mechanism.

Several actionable recommendations emerge from the findings. First, intellectual stimulation training should be incorporated into project leaders' professional development programs. Specifically, leaders should be trained to (a) pose open-ended safety questions during toolbox meetings (e.g., "What could go differently here?"), (b) encourage team members to propose alternative safety approaches, and (c) publicly recognize innovative safety suggestions. Second, given the stronger mediating effect of safety-specific LMX, project leaders should be encouraged to foster high-quality relationships with followers regarding safety. Project leaders should pay heed to followers' voice, listen to their concerns, elicit their suggestions, and provide timely feedback to their performance. Third, TMX also mediates the association between IS and PSC, despite the small effect size. This suggests that project management team should encourage peer safety exchange—such as safety buddy systems, peer observation programs, and team-based safety problem-solving sessions. Fourth, the moderating role of age suggests that safety interventions should be tailored to experience levels. For novice or less experienced workers, leaders should adopt more guided and explicit intellectual stimulation. For experienced workers, however, leveraging their expertise through reverse mentoring and collaborative safety innovation may be more effective.

5.3. Limitations and Future Research Directions

This study has several limitations. First, intellectual stimulation was measured using only two items. The best practice to obtain reliable measures is to use multiple-item questionnaires, instead of single-item tests. However, multiple-item questionnaires may frighten away prospective respondents as they are always time-consuming. In this case, two-item measures were often administered [74]. This study, accordingly, adopted the two items with the highest factor loadings from Avolio et al. [59] to measure intellectual stimulation. Furthermore, the two-item measure demonstrated acceptable reliability (ρ_A = 0.818) and both convergent and discriminant validity. Although more items were more preferable, the current two-item measure sufficed. Second, a substantial number of indicators were removed during the measurement model assessment, and the reduced item sets may not fully represent the original constructs. Third, the sample as mentioned earlier was primarily composed of non-manual construction professionals, and hence the practical implications may not necessarily extend to all segments of the broader construction workforce. Fourth, this study adopted a cross-sectional research design, and hence causal inference cannot be made from the findings. Fifth, all data were self-reported and collected from a single source, raising concerns about common method bias. Although common method bias does not necessarily undermine validity [75], and procedural remedies (e.g., different Likert scales and anonymity assurance) have been taken, common method bias still constitutes a significant methodological limitation. Sixth, the data was collected in Hong Kong 15 years ago. Although the theoretical implications may be relevant nowadays, the practical implications only apply to the Hong Kong construction sector when the data was collected.

Several directions for future research emerge. First, longitudinal panel studies would allow examination of the temporal dynamics of the IS $\rightarrow$ LMX/TMX $\rightarrow$ PSC pathway and establish causal ordering. Second, multilevel analysis aggregating individual perceptions to team and organizational levels would extend the findings beyond the individual level. Third, replicating this study with more demographically diverse samples would strengthen generalizability and external validity of the findings. For example, Chan et al. [76] found that construction workers have different safety climate perceptions than managers/supervisors. Therefore, comparing the difference in the leadership–safety climate link between workers and management might bring forth more interesting findings and interventions. Fourth, as artificial intelligence (AI) agents increasingly join construction project teams, understanding how intellectual stimulation functions in human–AI collaborative environments presents a novel and timely research question. Fifth, the association between other dimensions of leadership (e.g., individualized consideration, idealized influence, contingent reward) is also worthy of investigation.

6. Conclusions

Different dimensions of transformational leadership have different impacts on safety climate perceptions. This study explored the mechanism underlying the association between one dimension of transformational leadership (i.e., intellectual stimulation) and construction personnel's individual safety climate perceptions (i.e., psychological safety climate). It found that safety-specific leader–member exchange and team member exchange fully mediate the association between intellectual stimulation and psychological safety climate, and age moderates the association. Although this study has several limitations (e.g., aggressive removal of unqualified indicators for some constructs), it makes a potentially valuable contribution to the literature by isolating one dimension of transformational leadership instead of treating transformational leadership as an aggregate construct. In practice, this study once again highlights the importance of vertical safety communication in project teams.

Author Contributions: Conceptualization, Y.S., C.H. and C.K.H.H.; methodology, Y.S. and C.K.H.H.; software, C.H.; validation, H.D., C.H. and Z.X.; formal analysis, Z.X.; investigation, Y.S.; data curation, Z.X.; writing—original draft preparation, Y.S., Z.H. and C.H.; writing—review and editing, C.K.H.H. and H.D.; visualization, S.Y.; project administration, Z.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the National Natural Science Foundation of China, grant number 72274034.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of Human Research Ethics Committee for Non-clinical Faculties, the University of Hong Kong (approval code: EA011011, 6 October 2011).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Acknowledgments: We acknowledge assistance from Steve Rowlinson, Tas Yong Koh, Yunyan Jia, and Rita Peihua Zhang.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

PLS-SEM	Partial least squares structural equation modeling
AVE	Average variance extracted
LMX	Leader–member exchange
TMX	Team member exchange
IS	Intellectual stimulation
SLMX	Safety-specific leader–member exchange
STMX	Safety-specific team member exchange
PSC	Psychological safety climate
IE	Industry experience
EduLev	Education level

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