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Comparing the Psychosocial Safety Climate between Megaprojects and Non-Megaprojects: Evidence from China

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Abstract: Compared to non-megaprojects, megaprojects are often more complex and riskier, and construction employees are thus susceptible to a higher level of psychosocial hazards, which adversely affect their psychosocial health and safety performance. The psychosocial safety climate evaluates the employees' perceived level of psychosocial health and safety of the workplace and reveals the causes of psychosocial hazards that need to be addressed; it is, therefore, of great significance to determine whether the psychosocial safety climate (PSC) of megaprojects is different from that of non-megaprojects. A questionnaire survey is described involving 10 megaprojects and 143 non-megaprojects in China. The results show that, contrary to expectations, the psychosocial safety climate of megaprojects is significantly better than that of non-megaprojects. Compared with those of non-megaprojects, the employees of megaprojects have a higher common perception of the organization's emphasis on psychosocial health and safety-related policies, procedures, and behavioral practices in work processes. This research, for the first time, demonstrates and tests the use of the psychosocial safety climate scale (PSC-12) for measuring the construction industry's PSC, provides insights for understanding the psychosocial safety climate of megaprojects, and serves as a reference for organizational management to intervene in employees' psychosocial health and correct unsafe behaviors. It also contributes to theoretical research and the measurement standards of psychological safety in megaprojects.

Keywords: psychosocial safety climate; megaprojects; construction industry; psychological health; organizational climate; safety climate

1. Introduction

The world is witnessing a boom in the construction of megaprojects; the McKinsey Consulting Group predicts that investment in megaprojects will grow to USD 57 trillion by 2030 [1]. China's megaprojects are second to none in the world in terms of both the total amount of construction and individual scale and involve the world's leading technology and philosophy [2,3]. In the foreseeable future, China will continue to have more megaprojects in the engineering and construction sector [2].

Meanwhile, many accidents have occurred during the rapid development of megaprojects because they are characterized by multiple risk sources, great uncertainty, and high complexity [4,5]. Frequent accidents in megaprojects not only involve an irreparable loss of life and property to individuals directly affected but also the poor psychological health and safety of relatives and friends due to their remorse for the loss. They also create a great economic burden on companies and a negative image of the country. The long working cycle, high-risk working environment, difficult construction technologies,

high-intensity physical labor, numerous stakeholders, and the close attention of the media and society mean that megaproject construction workers experience greater psychological pressure and are more vulnerable to psychological injury than their non-megaproject counterparts [6–8]. Considering that the psychological problems of construction workers of megaprojects cause high economic and social costs, it is important to take measures to identify, assess, and control the possible psychosocial hazards involved [9].

Hall et al. [10] propose that psychosocial safety climate (PSC), an organizational factor, affects employees' psychological health. The PSC concept, first proposed by Dollard and Bakker [11], is defined as employees' shared perception of whether their organization values psychological health- and safety-related policies, procedures, and behavioral practices. Dollard and Neser [12] propose that PSC reflects the extent of management concern for the workers' psychological health and is critical in determining national health and productivity differences. As an active organizational resource in the workplace, PSC can help senior managers to provide employees with other working resources to alleviate pressures in the work environment and promote the level of work input, thus increasing the effectiveness of the project and reducing psychological harm in the organization [10,11,13].

Although PSC was proposed in the context of Western culture, its applicability has also been confirmed in countries with an Eastern cultural background, such as China, Malaysia, and Vietnam [11,14–16]. At present, research into PSC is aimed mostly at the education industry and the medical industry, with little attention paid to the construction industry and none at all to megaprojects. Considering the complexity, high risk, and sociality of megaprojects, it is possible that they have a worse PSC than non-megaprojects. To ascertain whether or not this is the case, a questionnaire survey is described involving 124 and 502 megaproject and non-megaproject construction personnel, respectively, to reveal the PSC of their organization, develop suggestions for improving PSC, and provide a reference for future studies. The PSC of megaprojects and non-megaprojects is also compared and analyzed to show that although the PSC is high for both types of projects, it is better for megaprojects, with the individual level of subjective initiative, pursuit of self-worth, organizational level of funding, and political orientation also effectively improving their PSC.

2. Literature Review

2.1. Megaprojects

Megaprojects refer to large-scale public projects with a large investment scale and high complexity and which have a significant impact on national politics, the economy, society, scientific and technological development, environmental protection, public health, and national security [17]. A megaproject is a complex giant system composed of multiple heterogeneous aspects driven by multi-dimensional construction goals, such as investment, benefit, and social responsibility, together with an organizational model, organizational culture, and other elements [18]. China's General Office of the State Council defines megaprojects as "fixed asset investment projects that have been approved in accordance with relevant government approvals and have direct, extensive, and important impacts on economic and social development and improvement of people's livelihood". Megaprojects are usually invested or commissioned by the government [19] and have far-reaching social impacts, from their design, construction, and completion to operation, and have an important national strategic significance. They can change the structure of society and have a multifaceted uniqueness and complexity in terms of the environment, program quality, and formation path [17]. Compared with more regular projects, megaprojects consume many social resources (such as materials, funds, and manpower) in the construction process, which has a significant impact on the public, environment, and government finance [20].

In the field of construction engineering, megaprojects are mainly divided into two main categories [21] of infrastructure engineering and urban complexes. The former may consist of a single major project, such as the English Channel Tunnel, or several sub-projects that mainly serve the

main infrastructure works, such as the civil works of bridges, tunnels, highways, and ports associated with the Hong Kong–Zhuhai–Macao Bridge project. The latter, on the other hand, is usually planned and deployed by the government or investors and may involve roads, housing, education, finance, entertainment, and other aspects, such as the Qianhai Development Zone and Shanghai World Expo. Both kinds of megaproject have three main functions: (1) to meet people's living needs; (2) to improve the social image of a location (e.g., a city); and (3) to meet the needs of major international events [22,23].

Due to the technical difficulty of engineering construction, a long cycle, a large number of stakeholders, and lack of experience, megaprojects involve increased uncertainties and risks in their construction process [7,8]. As a result, they contain many hidden hazards, and accidents occur frequently. Take infrastructure engineering as an example; a total of 122 cases of bridge damage and collapse occurred between 2000 and 2012 [24] and a total of nine fatal accidents occurred during the construction of the Hong Kong–Zhuhai–Macao Bridge in Hong Kong from 2012 to the first half of 2017 [25]. Similar cases show that megaprojects are essentially high-risk tasks. Furthermore, accidents at a megaproject construction site not only delay the project, causing huge economic and social losses, but also lead to negative social repercussions and a potential decline in the country's international image [26]. The occurrence of the accident often arouses widespread concern and reflection from all sectors of society [27].

In summary, while megaprojects can create huge economic and social benefits, they also have great production safety risks. Human factors are the major cause of construction accidents. Of these, 58% of accidents are caused by the poor psychological state of construction workers [28]. For a better understanding of the situation, this paper introduces the concept and measurement method of PSC and analyzes the PSC of megaprojects from the organizational factors that affect the psychological health of construction workers.

2.2. Organizational Climate Perspectives and PSC

Organizational climate refers to employees' common perception of organizational policies, practices, and procedures [29]—reflecting the characteristics of an organization's or group's understanding of the employees' workplace experience. It is also a crucial element promoting occupational health and safety [30].

Safety climate and PSC both belong to the organizational climate concept and are an organizational resource. Safety climate is defined as a shared perception of the commitment and performance of employees, regarding safety policies, procedures, and practices [31]. Similar to the PSC, safety climate can also provide signals for employees' safety behaviors. Safety climate emphasizes physical health and safety, while PSC emphasizes mental health and safety [10]. PSC, which emphasizes psychological health and safety, has a greater impact on workers than just the safety climate [32].

PSC is a specific concept in organizational climate, describing the specific psychological health and safety climate. It is similar to the concepts of psychological safety and team psychological safety climates [10] in that it refers to a climate of freedom from psychological harm caused by workplace problems [11]. Dollard and Bakker [11] believe PSC to be a specific aspect of the organizational climate in referring to the common view concerning "policies, practices and procedures to protect the psychological health and safety of workers". Psychological health refers to the state of maintaining good communication and cooperation. The ideal state of psychological health is to maintain a normal personality, intelligence, emotion, and behavior, with a positive attitude. Hall et al. view psychological health at work as an important occupational health and safety issue [10]. In many countries, legislation is in place to protect employees' psychological health and prevent the psychosocial hazards that cause workplace psychological injury. The PSC concept is viewed from the perspective of senior managers, focusing on the commitment, attitude, support, and behavioral practices of senior managers towards ensuring employees' psychological health and safety goals and avoiding harm caused by excessive work demands.

PSC comprises four aspects [10,33,34]: firstly, senior managers providing support and commitment to the mental health and safety of employees [9], which reflects whether they can take relevant measures to prevent, stop, and solve mental health injuries to employees; secondly, when the organization's production goals conflict with the employees' mental health goals, senior managers prioritize employees' mental health and safety issues, which reflects the senior managers attaching high importance to the employees' psychological health and safety issues [35,36]; thirdly, the top–bottom transmission and the bottom–top feedback of psychological health and safety issues are smooth and effective [9,35]; fourthly, managers and employees at all levels can participate in the prevention and relief of work stress and job burnout as well as the cognition and solution of psychological health and safety problems [37–40]. From the perspective of employees, the working environment, working conditions, management system, salary level, interpersonal relationships, occupational equity, communication channels, and work requirements provided by the organization are important factors affecting PSC. Previous studies showed that aggregating employees' knowledge of PSC to the team or organizational level can predict job design and psychological health, even when the PSC is estimated solely from the perceptions of other workers in the group [41].

Research into PSC has been scarce to date in China, although there has been some localized PSC-related theoretical research. Xie's [42] research into the dimensions and mechanism of the psychological and social security atmosphere, for instance, investigated the internal nursing teams of several hospitals in three Chinese cities; Li et al. [15] investigated coal mining companies and found that a high PSC had a significant incentive effect on safety behavior; meanwhile, Liu (2016) found that employees in high-PSC organizations are very willing to adopt the 'appeal' approach to face, suppress, alleviate, or even eliminate bullying. However, employees in low-PSC organizations tend to adopt an 'ignore', 'acquiesce', and then 'quit' reaction to bullying, leading to the bullying problem not being effectively solved or even accelerated. However, no research examines the PSC of construction megaprojects.

3. Research Methods

Megaprojects are temporary organizations [43] where, to achieve common construction goals, each participating organization forms a temporary institutional work field through material exchange, information exchange, and task cooperation. Within the organization's field, management and employees follow certain rules, regulations, and codes of conduct. They influence, depend on, and constrain each other. This study takes two different organizations, i.e., megaprojects and non-megaprojects, as the research focus, using a questionnaire survey to explore the differences in PSC levels.

3.1. Questionnaire

Early studies screened and reorganized the items in the safety climate scale into a scale to measure PSC. This contains 26 questions covering the relevant PSC dimensions. Hall et al. [10] combined the literature relating to stress prevention intervention theory and safety research and divided PSC into four dimensions of management support, management priority, organizational communication, and organizational participation (e.g., Flin and Mearns [36]; Cheyne [35]; Cox and Cheyne [9]; Neal et al. [37]; Gershon et al. [44]; Pronovost et al. [45]; Clarke [40]; Hahn and Murphy [39]; see Table 1) to develop and adopt the the psychosocial safety climate scale (PSC-12) [10] scale based on 26 questions. This tool is a Likert 5-point scoring method from 1 (strongly disagree) to 5 (strongly agree). The score range of each item is, therefore, 1–5 points, with a range for each dimension of 3–15 points, making a total PSC score range of 12–60 points. As indicated in Table 2, PSC scores of 41 and over are taken to indicate that the perceived PSC level is high (low risk), belonging to an organization that is performing well. Hall et al.'s [10] empirical work indicates that the PSC-12 scale has good reliability and validity with a 0.88 management commitment reliability, 0.90 management priority

reliability, 0.77 organizational communication reliability, 0.80 organization participation reliability, and a 0.95 overall reliability score.

Table 1. Psychosocial safety climate (PSC) dimensions.

Dimension Name	Dimension Description
Management priority	Senior management can clearly provide support and commitment to prevent stress, ease burnout, and address mental health issues.
Management commitment	When the achievement of the organization's productivity goals conflict with the employee's mental health goals, senior managers give priority to the employees' mental health, reflecting that senior managers attach great importance to employee mental health.
Organizational communication	The organization forms a safe and good working atmosphere. For the mental health and safety of employees, senior managers provide listening time, communicate seriously, and resolve decisively.
Organizational participation	Staff at all levels and departments within the organization actively participate in the process of maintaining employees' mental health and safety. The prevention of work stress and maintenance of employees' mental health involve all aspects of the organization.

Table 2. The different risk categories of PSC-12 according to the PSC risk benchmarks (source: Centre for Workplace Excellence, 2019).

PSC Standards	Range 12–90	Prognosis
Low-risk PSC (high PSC)	≥41	Performing well, improvements in PSC levels might be noted; increased leader performance in PSC
Medium-risk PSC	41< and ≥37	Steady state, need more enacting of PSC principles
High-risk PSC	37< and ≥26	Increasing PSC levels could reduce depression by 16% and job strain by 14%
Very high-risk PSC (very low PSC)	26<	Urgent action is required to prevent further dramatic increases in depressive periods and worsening conditions (e.g., increased bullying)

The scale's extensive use in related research also justifies its good reliability and validity [10]. It has been widely used worldwide and is suitable for a variety of organizations and industries. The design of the questions is very simple and clear, which facilitates the ease of understanding of respondents. It can be used directly. Pien et al. [15] developed a Chinese version of the PSC-12 scale and conducted an empirical test with 405 nurses as samples, confirming that the PSC-12 scale is also applicable in domestic studies in China. Therefore, no further validity analysis of the scale is needed.

The questionnaire used is based on PSC-12, with statements scored on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). This includes four demographic questions concerning the position, age, gender, and marital status of construction employees added to form the 'Questionnaire on Psychosocial Safety Climate of Construction Industry' (see Appendix A).

3.2. Data Collection

The questionnaires were sent to the construction sites of a large sample of construction engineering projects in Guangzhou and Shenzhen, two major cities in China's Guangdong province, selected by the stratified sampling method, as this method is suitable for a complicated overall situation with a large number of units and differences between units and is used to increase the commonality of units in various types, extract representative survey samples, and reduce sampling errors. The overall unit was divided into several types according to their attributes, and then, sample units were randomly selected from different types. According to the list of projects provided by the Guangzhou Municipal Bureau of Housing and Urban-Rural Development and the Shenzhen Municipal Bureau of Housing and

Urban-Rural Development, 95 megaprojects in Shenzhen and 1429 non-megaprojects in Guangzhou were obtained after excluding non-construction engineering projects. The number of engineering projects to be inspected in each area was determined according to the sampling proportion of 10%, with each selected engineering project determined by reference to a random number table—resulting in 10 and 143 projects in Shenzhen and Guangzhou, respectively. Finally, 5–15 people were randomly selected from each project. For megaprojects, 150 questionnaires were issued and 124 valid questionnaires were returned, with a response rate of 82.7%; for non-megaprojects, 715 questionnaires were issued and 502 valid questionnaires were returned, with a response rate of 70.2%.

The data collection was conducted anonymously when distributing questionnaires on site to reduce sampling errors, improve sampling accuracy, and maximize the objectivity and recovery rate of the questionnaire. Guangzhou and Shenzhen have the highest construction industry contribution rates and with construction companies that have a solid foundation, mature development, and strong overall strength. The statistical yearbook of Statistics Bureau of Guangdong Province reports that from 2000 to the present, the construction industry contribution rates of the two cities are the highest in the province. Guangzhou is the provincial capital and central city and is a developed city that has an important influence in southern China that radiates to the entire country (Hu et al., 2010). Shenzhen is a special economic zone, a national economic center, and an international city determined by General Office of the State Council (The Overall Urban Planning of Shenzhen was approved by the State Council 2010).

3.3. Data Analysis

For the analysis, the 12 items in the PSC scale were divided into four dimensions, namely: management commitment, management priority, organizational communication, and organizational participation. Each of the four dimensions contains three items. The range of scores is 1 to 5 for each item, and 3 to 15 for each dimension. The PSC level of megaprojects and non-megaprojects was determined by the mean scores and a one-way ANOVA, with Fisher's least significant difference (LSD) method used to evaluate the differences in each dimension.

Descriptive analysis, reliability analysis, *t*-test, and least significant difference (LSD) test were all performed using SPSS 22.0 software. Before the formal analysis of the data, we first conducted a descriptive analysis on the sample and tested the reliability of the questionnaire. The descriptive analysis was conducted to describe the distribution of samples with the data obtained from the data collection. We grouped two different organizations, megaprojects and non-megaprojects, and different population characteristics (position, age, gender, and marital status) and used tables, classifications, and calculations to describe the samples. The questionnaire is an attitude and opinion model, so we adopted the most applicable and most commonly used reliability analysis method—Cronbach's α reliability coefficient method—to test the sample. Since Hall et al. [10] have tested the reliability of the questionnaire, we will only test it briefly.

For the collected data, we used an independent sample *t*-test and the one-way analysis of variance test. The independent sample *t*-test was to determine whether there is a significant difference in the means of the two groups. The one-way analysis of variance test was to compare multiple groups (the number of groups is more than 2) and determine whether there are significant differences in their mean values. The two methods analyze the significant differences of the entire sample. If the sample does not have a significant difference, we can end the test. However, if the samples are significantly different, we need to further discover which groups are significantly different, so we used the most commonly used least significant difference (LSD) test for post hoc analysis.

4. Results and Analysis

4.1. Sample Descriptive Analysis

Table 3 provides the specific project information of the megaprojects sampled. The types of non-megaprojects include residential buildings, commercial buildings, office building projects, and expansion projects, with an average investment of approximately USD 58 million.

Table 3. Megaprojects information.

Number	Types	Investment Amount (USD Million)	Project Description
P1	Municipal Engineering	3400	Subway hub project covering an area of 120,000 m^2, with a capacity of 1.278 million m^2 of building area
P2	Municipal Engineering	195	Underground traffic lanes, 1.5 km away
P3	Municipal Engineering	178	Covers an area of 520,000 m^2
P4	Housing Construction Project	1477	Covers an area of 49,000 m^2, capacity-calculated building area of approx. 320,000 m^2
P5	Housing Construction Project	927	Covers an area of 18,000 m^2, capacity-calculated building area of approx. 170,000 m^2
P6	Housing Construction Project	724	Covers an area of 12,000 m^2, capacity-calculated building area of approx. 120,000 m^2
P7	Housing Construction Project	864	Covers an area of 11,000 m^2, capacity-calculated building area of approx. 187,000 m^2
P8	Housing Construction Project	560	Covers an area of 10,000 m^2, capacity-calculated building area of approx. 110,000 m^2
P9	Housing Construction Project	521	Covers an area of 7000 m^2, capacity-calculated building area of approx. 66,000 m^2
P10	Housing Construction Project	500	Covers an area of 30,000 m^2, capacity-calculated building area of approx. 205,000 m^2

Table 4 provides descriptive statistics of the respondents in the two locations. As can be seen, the percentages of respondents in each location are very similar, which indicates they are a good representation of the population of construction personnel as a whole.

Table 4. Descriptive statistics of the respondents.

Respondents Characteristic	Megaprojects		Non-Megaprojects	
	N	%	N	%
Position				
Construction Worker	46	37	175	35
Junior Manager	56	45	234	47
Intermediate Manager	22	18	93	18
Age				
18–25	35	28	129	26
26–35	47	38	188	37
35–50	35	28	149	30
Above 50	7	6	36	7
Gender				
Male	113	91	467	93
Female	11	9	35	7
Marital status				
Single	53	43	180	36
Married	67	54	296	59
Other	4	3	26	5

4.2. Reliability Analysis

A reliability analysis was conducted to determine whether the data are reliable and whether the respondents truthfully answered the questions. This was carried out on 12 items of the four dimensions of the PSC scale (see Table 5). The corrected item-total correlation (CITC) of the corrected items is greater than 0.5. Cronbach's α being greater than 0.70 for each dimension and 0.938 overall indicates that the reliability of the questionnaire is high. In addition, when any item was deleted, Cronbach's α was lower than the original value, indicating that none of the 12 items should be deleted and the questionnaire data have high stability.

Table 5. PSC-12 reliability analysis.

	M after Deleting the Term	SD after Deleting the Term	CITC	Cronbach's α after Deleting the Term	Cronbach's α
Management Commitment MC1	6.400	2.091	0.618	0.809	
Management Commitment MC2	6.250	2.206	0.674	0.752	0.819
Management Commitment MC3	6.317	1.983	0.732	0.689	
Management Priority MP1	5.950	2.603	0.529	0.755	
Management Priority MP2	5.867	2.352	0.575	0.708	0.764
Management Priority MP3	6.000	2.185	0.691	0.572	
Organizational Communication OC1	6.042	2.259	0.742	0.728	
Organizational Communication OC2	6.092	2.403	0.720	0.752	0.836
Organizational Communication OC3	6.083	2.581	0.636	0.832	
Organizational Participation OP1	6.175	2.280	0.674	0.767	
Organizational Participation OP2	6.133	2.234	0.688	0.752	0.825
Organizational Participation OP3	6.308	2.181	0.683	0.758	

4.3. PSC Level Analysis and Evaluation

The descriptive statistics in Table 6 reflect that the PSC of non-megaprojects in Guangzhou is high, with an average score of 43.54 (SD = 9.47) (slightly higher than the median of 36) and the average scores for the four dimensions are all within the range of 10–11 (slightly higher than the median of 9).

Table 6. Descriptive statistical results of the PSC scale.

	Megaprojects		Non-Megaprojects		t	p
	Mean	SD	Mean	SD		
Management commitment	12.69	1.96	10.93	2.90	8.23	<0.001
Management priority	12.56	2.15	10.76	2.83	7.62	<0.001
Organizational communication	11.87	2.62	10.91	2.56	3.73	<0.001
Organizational participation	12.13	2.51	10.94	2.53	4.70	<0.001
PSC	49.25	8.19	43.54	9.47	6.12	<0.001

According to the prior study proposed by Bailey (2015), when the PSC of an organization is higher than 41 points, the organization is deemed to be at low risk, whereas a score lower than 41 points is deemed to be high-risk. Therefore, we define 41 points as the reference value of PSC, which is used to judge whether the organization is at high risk. The PSC of megaprojects is much higher, with an average score of 49.25 (SD = 8.19), while the averages for the four dimensions are all higher than the equivalent Guangzhou results. The results, therefore, demonstrate that the PSC of the all the projects is above 41, indicating that the organization is at low risk.

The independent sample t-test indicates the mean scores of all dimensions and PSC to be significantly higher for the megaprojects than the non-megaprojects.

Table 7 summarizes the results in terms of position, age, gender, and marital status, indicating the megaproject mean PSC scores to be higher than those for the non-megaprojects for every characteristic measured, with 7 of the 12 being highly significant.

Table 7. Descriptive statistical results of PSC scale.

Respondents Characteristic	Megaprojects		Non-Megaprojects		*p*
	Mean	SD	Mean	SD	
Position					
Construction Workers	51.59	9.17	40.26	9.45	<0.001
Junior Managers	47.43	7.83	45.12	9.34	0.089
Intermediate Managers	48.95	5.58	45.69	8.19	0.079
Age					
18–25	49.40	7.86	42.44	10.30	<0.001
26–35	48.00	7.20	44.32	9.65	<0.001
35–50	51.03	7.42	43.98	8.43	<0.001
Above 50	47.86	16.45	41.5	9.21	0.153
Gender					
Male	49.92	7.46	43.68	9.42	<0.001
Female	42.27	12.00	41.62	10.05	0.860
Marital status					
Single	47.91	8.68	42.34	10.68	<0.001
Married	50.46	7.74	44.16	8.77	<0.001
Other	46.50	7.33	44.73	7.51	0.664

The fact that there is no significant difference between junior managers and intermediate managers suggests that construction workers may be more concerned about whether the organization pays attention to their psychological health and takes relevant measures than employees in other positions. In megaprojects, construction workers have a higher common perception of the organization's concern about employees' psychological health and the PSC level is significantly higher than that of non-megaprojects. The fact that employees under the age of 50 and male employees have a higher PSC level in megaprojects may be because young employees lack social experience and great life pressure and hope to be cared for and protected by senior managers for their psychological health in their work. Therefore, their perception varies greatly in different organizational environments. Older employees may tend to be lazy and less enthusiastic about their work because of their experience and long hours and less likely to care whether senior managers are concerned about their psychological health. Many female employees may be focusing more on their families than work and pay less attention to workplace communication and management's policy commitment: therefore, in different organizational environments, they can have a low common perception of senior managers' emphasis on their psychological health.

Table 8 shows the results of the one-way ANOVA tests on the within-group means for the three characteristic groups of position, age, and marital status, and independent sample *t*-test for the gender, indicating the within-group respondents to be significantly different only for position and gender for both megaprojects and non-megaprojects. Levene's test indicates that the within-group variances are all sufficiently homogeneous for the ANOVA to be applied.

Table 9 shows the results of Fisher's least significant difference (LSD) test on the impact of position on PSC, indicating that the PSC of construction workers is significantly different from that of junior managers for megaprojects and of construction workers and both junior and intermediate managers for non-megaprojects. Of interest is that construction workers have a higher PSC level than the junior managers in megaprojects, but lower than both types of managers in non-megaprojects.

Table 8. Test of homogeneity of variance.

	Megaprojects				Non-Megaprojects			
	Levene Statistic	***p***	**ANOVA/*t*-Test**	***p***	**Levene Statistic**	***p***	**ANOVA/*t*-Test**	***p***
Position	2.115	0.125	3.40	0.037	0.932	0.394	17.19	0.001
Age	1.617	0.189	0.00	0.400	1.453	0.227	1.67	0.170
Marital Status	0.019	0.981	1.69	0.190	3.497	0.102	2.29	0.100
Gender	2.627	0.108	3.05	<0.01	0.079	0.779	1.34	<0.01

Table 9. Post hoc analysis.

	Position	**Position**	**Mean Difference**	**Sig.**
Megaprojects	Construction worker	Junior manager	4.158	0.010
		Intermediate managers	2.632	0.209
	Junior manager	Construction worker	−4.158	0.010
		Intermediate managers	−1.526	0.452
	Intermediate managers	Junior manager	−2.632	0.209
		Construction worker	1.526	0.452
Non-megaprojects	Construction worker	Junior manager	−4.8611	0.000
		Intermediate managers	−5.4253	0.000
	Junior manager	Construction worker	4.8611	0.000
		Intermediate managers	−0.5642	0.616
	Intermediate managers	Junior manager	5.4253	0.616
		Construction worker	0.5642	0.000

5. Discussion

When the PSC of an organization is higher than 41 points, the organization is deemed to be at low risk and it indicates that the perceived PSC level is good, belonging to a high-PSC-level organization [10,46]. Compared with the benchmark PSC, it was found that the mean PSC scores of non-megaprojects in Guangzhou (43.54) and megaprojects in Shenzhen (49.25) are higher than the benchmark level; the scores of all dimensions are higher than the median level and are in a low-risk area. This shows that the organization is at low risk, the PSC of employees in the construction industry is at a medium-high level, and they have a high common perception of the organization's emphasis on its employees' psychological health and safety-related policies, regulations, and behavioral practices. The mean PSC score of megaprojects is much higher than the benchmark and significantly higher than non-megaprojects, and the scores in all dimensions are significantly higher than non-megaprojects.

Due to the complexity, high risk, and sociality of megaprojects, their construction workers are more likely to suffer psychological harm. However, after field investigation and data analysis, we found that the PSC level of megaprojects is significantly higher than that of non-megaprojects, and the average scores of the four dimensions are significantly higher than those of non-megaprojects. This seems to indicate that the senior managers of megaprojects attach great importance to the psychological health of employees. This article provides a reference for the reasons why megaprojects have high PSC levels from the perspective of government, companies, and individuals.

Megaprojects are often initiated by the government, with strong government intervention [27]. The government performs only regulatory functions with non-megaprojects, which belong to their external stakeholders [47]. As a form of public project, megaprojects are important carriers for the government to provide social services and have an important significance for regional and even national development [48]. Therefore, the attribute and strategic significance of public goods determine that the government no longer plays the role of a simple external regulator but becomes involved in megaprojects and plays the core role in investment, management, and coordination [19,49]. The construction of

megaprojects is used by the government to increase employment, stimulate consumption, and expand production platforms [3].

In addition, megaprojects carry social interest and represent the needs of the public [3]. External stakeholders represented by non-governmental organizations are paying increasing attention to, and meeting the requirements for, project construction [50]. The government needs to control and invest in megaprojects to ensure project construction progress and production safety and improve their social and community influence [27]. In China, a quasi-governmental organization called the Construction Headquarter is widely used in megaprojects, such as the Shanghai Hongqiao Transportation Hub, the Shanghai World Expo Pavilion, and the South-to-North Water Diversion Project. The headquarter members are from government departments. They represent the will of the government and directly manage projects through administrative interventions such as policies and instructions [51]. This shows that the involvement of government administrative forces in China's megaprojects is universal and powerful, and government officials concurrently serving as key persons in the management system of megaprojects have played a positive role in creating a good psychological safety climate.

Contractors for megaprojects and the government have industry, talent, rule of law, open construction cooperation, etc. To support megaproject construction, the state has promulgated a series of policies that are beneficial to megaprojects, with fiscal and tax support, funding channels, talent introduction, talent service, management mechanisms, and other innovative approaches. With the policy support of the government, megaprojects have introduced a large amount of senior management talent to hold leadership and management positions in organizations [52]. Construction companies gained the support and leadership of the State Council, the National Development and Reform Commission, and the Land Resources Committee under the influence of the government's resource allocation role and political factors, such as a cost-oriented construction period. Accordingly, the owners, construction units, design units, and the construction companies, etc., have effectively improved the perceived PSC level of employees and promoted employees' attention to the organization's psychological health and safety concerns through capital investment and political orientation. Moreover, they have induced a common perception of policies, procedures, and behavioral practices [48]. With non-megaprojects, contractors rarely cooperate with the government. Since non-megaprojects do not have an extensive social impact, the government rarely provides policy support and financial help.

As megaprojects have the characteristics of huge investment, high economic benefits, good sustainability, and wide social influence, they are of great political and symbolic significance, of which the participating parties are proud [53]. In China, such pride is often associated with national confidence [27], which inspires the participants' sense of mission and responsibility and forms a high degree of unity of collective and individual value. While pursuing the economic benefits of megaprojects, the government emphasizes that megaprojects should make contributions to the country and society as well as safety in the construction process [3]. In addition, the altruistic behavior of construction workers beyond their role is manifested in a strong sense of collective honor, subjective initiative, dedication, and pursuit of self-worth, which have also contributed to the improved PSC levels [54,55].

With China's megaprojects, most of the companies that participate in the their construction are state-owned companies with abundant capital and great achievements, and the projects are usually undertaken by large contractors [56]. State-owned companies and large contractors tend to pursue long-term benefits and the improvement of employee benefits. They have sound health and safety standards and training systems and good communication and feedback mechanisms to create a safe working atmosphere for construction workers. Small- and medium-sized contractors are mostly responsible for non-megaprojects and survival is their primary goal. Companies tend to pay more attention to short-term economic benefits and pursuing maximum profits than to employees [57]. They have established fewer health and safety standards and lack training systems and communication

and feedback mechanisms. In response, we provide some suggestions concerning how to improve the PSC level for non-megaprojects.

With the increase in citizens' income, social awareness, and welfare, people are paying more attention to quality of life and health [58]. Compared with their remuneration level and welfare, the employees hope that their psychological health will be valued by senior managers and can be nurtured by the organization—appropriately alleviating and releasing any psychological pressures. Therefore, for senior managers of non-megaprojects, firstly, from the dimension of management priority, they should establish the importance and awareness of employees' psychological health, give play to a people-oriented enterprise orientation, pay attention to the employees' working mood and psychological health, improve working conditions, and support organizational care. Secondly, from the perspective of commitment, senior managers are expected to provide preventive programs and effective guarantees to minimize employees' psychological health problems. Employees need to access necessary psychological counselling and career planning training along with adequate rich and diverse work resources. Employees need guidance to deal with psychological health problems with a positive attitude while stimulating work enthusiasm, stabilizing work mood, and improving psychological health. Thirdly, organizational participation and communication are important dimensions of PSC [10], and senior managers need to build an effective communication channel between themselves and the employees and improve communication methods, communication efficiency, and the information communication mechanism. They also need to fully mobilize and coordinate the various departments involved at all employee levels and effectively participate in mental health and security.

6. Conclusions

According to the survey data, while the mean PSC score of megaprojects (49.25) and non-megaprojects (43.54) is high (meaning the organizations are in a state of low risk), that of the former is significantly higher, and the mean PSC scores of the four dimensions are all significantly higher for megaprojects than non-megaprojects. In megaprojects, the mean PSC scores of construction workers, employees under 50, and male employees are significantly higher than those of non-megaproject workers. In megaprojects and non-megaprojects, the mean PSC scores are significantly different for employees in different positions. In megaprojects, the mean PSC score of construction workers is significantly higher than that of junior managers, while it is lower than that of managers in non-megaprojects. This finding indicates that the megaproject construction personnel have a higher common perception of the policies, regulations, and actions and that the senior management of the organization attach great importance to, and protect, the mental health and safety of the workers. These results highlight the vital role played by organizational factors.

That the PSC level of megaprojects is significantly higher than that of non-megaprojects may be due to Chinese megaprojects being supported by national and government policies and funds to promote the healthy growth of companies. In addition, the company has complete safety and health standards, a mature training system, and a high-efficiency and high-quality communication and feedback mechanism. Senior managers in the organization can pay attention to the psychological health of employees and prevent employees' psychological health problems by formulating rules and regulations and issuing policies. These have contributed to the high PSC of megaprojects.

This paper has conducted a pioneering study of the PSC of the Chinese construction industry. Comparing the PSC level of those involved in megaprojects and non-megaprojects helps in understanding the psychological health and safety of employees in domestic construction companies. It is limited, at this stage, to the two developed cities of Shenzhen and Guangzhou, with Shenzhen's megaprojects selected as a regional representative of the entire country. However, there are large differences in economic, social, scientific, technological, and ecological environments between developed and developing cities in China, and the development of construction companies in each city is unbalanced. Extra extensive attention therefore needs to be paid to construction companies

in other Chinese provinces/cities and beyond in order to provide a reference for improving their PSC for the benefit of both workers and projects.

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Appendix A

Questionnaire of the Psychosocial Safety Climate in Construction Industry

Dear Madam/Sir,

Thank you for your support and participation! This questionnaire will take you 5–10 min to complete. Your responses will be completely anonymous and no personal information will be collected. There is no right or wrong answer to any of the questions. Please answer according to your real feelings and experiences. Do not leave out any item, as an incomplete questionnaire will make your response lose research value. Thank you.

The first part: basic information

Please select the option that best fits your situation in the following questions.

1. What is your current job title at your company?

   ○ Construction worker
   ○ Junior manager
   ○ Middle manager

2. What is your age?

   ○ 18–25
   ○ 26–35
   ○ 35–50
   ○ Above 50

3. What is your gender?

   ○ Male
   ○ Female

4. What is your marital status?

   ○ Unmarried
   ○ Married
   ○ Other

The second part: psychosocial security status scale

The following statements relate to the psychological health and safety of your workplace. Please select the option that best fits your situation.

Table A1. The Psychosocial Safety Climate (PSC-12) Scale.

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1. In my workplace senior management acts quickly to correct problems/issues that affect employees' psychological health					
2. Senior management acts decisively when a concern of an employees' psychological status is raised					
3. Senior management show support for stress prevention through involvement and commitment					
4. The psychological well-being of staff is a priority for this organization					
5. Senior management clearly considers psychological health of employees to be of great importance					
6. Senior management clearly considers psychological health to be as important as productivity					
7. There is good communication here about psychological safety issues that affect me					
8. Information about workplace psychological well-being is always brought to my attention by my manager/supervisor					
9. My contribution to resolving occupational health and safety concerns in the organization are listened to					
10. Participation and consultation in psychological health and safety occurs with employees, unions, and health and safety					
11. Employees are encouraged to become involved in psychological safety and health matters					
12. In my organization, the prevention of stress involves all levels of the organization					

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