

# The Role of Team Psychological Capital and Knowledge Collaboration in Collaborative Innovation Performance: Evidence from TCM Enterprises

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## Abstract

This study examines the influence of team psychological capital and knowledge collaboration on collaborative innovation performance within scientific research teams in traditional Chinese medicine (TCM) enterprises. Grounded in social contagion and synergy theories, this research develops a framework to explore how psychological capital impacts innovation outcomes, both directly and through knowledge collaboration. A mixed-methods approach was used, incorporating a structured questionnaire distributed to research teams, with data analyzed via regression and mediation analysis. The key findings reveal that: team psychological capital positively influences collaborative innovation performance; psychological capital significantly enhances team knowledge collaboration; knowledge collaboration directly boosts innovation performance; and knowledge collaboration mediates the relationship between psychological capital and innovation performance. These results highlight the importance of cultivating positive psychological resources and fostering collaborative behaviors to enhance innovation. This study contributes to the literature by extending the understanding of psychological capital and knowledge synergy to the team level, while offering practical implications for improving team dynamics and fostering innovation in TCM enterprises. Future research may explore these relationships in other organizational contexts or industries to further validate the findings.

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**Keywords:** Team Psychological Capital; Knowledge Collaboration; Collaborative Innovation Performance; Traditional Chinese Medicine Enterprises; Social Contagion Theory; Synergy Theory

## 1. Introduction

### 1.1 Background

Collaborative innovation has emerged as a cornerstone of competitive advantage and sustainable growth in the contemporary global economy. This concept, grounded in the integration of diverse resources, expertise, and perspectives, has been particularly pivotal in the traditional Chinese medicine (TCM) sector. With its deep cultural roots and unique therapeutic methodologies, the

TCM industry represents a complex interplay between historical practices and modern scientific advancements. Collaborative innovation enables TCM enterprises to overcome knowledge silos, integrate multidisciplinary expertise, and address the growing demand for evidence-based and globally competitive medical solutions (Zhang & Liu, 2023). In recent years, the Chinese government has emphasized the significance of innovation in TCM enterprises through initiatives such as the "Implementation Opinions of the State Food and Drug Administration on Promoting the Inheritance and Innovation of Traditional Chinese Medicine." These policies aim to enhance the scientific and technological foundations of TCM, thereby fostering both domestic growth and international recognition (Liu & Chen, 2022). However, the increasing complexity of global health challenges, coupled with intensified competition in pharmaceutical innovation, underscores the need for effective collaborative frameworks. At the team level, scientific research teams in TCM enterprises are often hindered by fragmented knowledge flows, insufficient resource integration, and varying levels of team cohesion. The psychological capital of research teams—comprising dimensions such as optimism, self-efficacy, resilience, and hope—plays a crucial role in driving innovation (Luthans et al., 2007). Similarly, the ability of teams to engage in effective knowledge collaboration is central to achieving innovation objectives. Despite these theoretical underpinnings, empirical studies examining the nexus of psychological capital, knowledge collaboration, and collaborative innovation performance in the TCM context remain limited. This research seeks to fill this critical gap, providing insights into how these factors interact to enhance innovation outcomes in TCM enterprises.

### **1.2 Problem Statement**

The challenges faced by TCM enterprises are multifaceted, spanning organizational, technological, and market-related domains. At the team level, traditional scientific research approaches often struggle to adapt to the dynamic requirements of contemporary innovation ecosystems. Weak integration between team members, limited psychological capital, and inadequate knowledge-sharing mechanisms exacerbate these challenges, leading to suboptimal innovation performance (Chen et al., 2023). While individual-level studies on psychological capital have highlighted its positive impact on performance, its application at the team level—especially in the unique context of TCM enterprises—remains underexplored (Zhao & Wang, 2022). Furthermore, knowledge collaboration, which serves as a critical enabler of resource optimization and innovation synergy, often suffers from structural and cultural barriers within teams (Guo & Zhang, 2023). Addressing these gaps requires a nuanced understanding of how team psychological capital influences knowledge collaboration and, subsequently, collaborative innovation performance. Moreover, the potential mediating role of knowledge collaboration in these relationships necessitates rigorous investigation to provide actionable insights for improving team dynamics and innovation outcomes.

### **1.3 Research Questions**

This study is guided by the following research questions:

- (1) Does team psychological capital impact collaborative innovation performance?
- (2) Does team psychological capital influence knowledge collaboration?
- (3) Does knowledge collaboration affect collaborative innovation performance?
- (4) Does knowledge collaboration mediate the relationship between psychological capital and collaborative innovation performance?

### **1.4 Research Objectives**

The primary objective of this research is to examine the intricate relationships among team psychological capital, knowledge collaboration, and collaborative innovation performance in TCM enterprises. Specifically, the study seeks to:

- (1) Verify the direct impact of team psychological capital on collaborative innovation performance.
- (2) Investigate the influence of team psychological capital on knowledge collaboration.

- (3) Determine the effect of knowledge collaboration on collaborative innovation performance.
- (4) Explore the mediating role of knowledge collaboration in the relationship between psychological capital and collaborative innovation performance.

### **1.5 Significance**

The theoretical contributions of this research lie in its extension of psychological capital and knowledge collaboration studies to the team level, particularly within the unique context of TCM enterprises. By integrating social contagion and synergy theories, the study provides a novel framework for understanding how team-level dynamics influence innovation performance.

Practically, the findings offer actionable strategies for enhancing innovation in TCM enterprises. These include targeted interventions to build team psychological capital, the development of robust knowledge collaboration mechanisms, and the optimization of team structures to foster innovation. By addressing the identified challenges, this research aims to contribute to the sustainable growth and global competitiveness of the TCM industry.

## **2. Literature Review**

### **2.1 Theoretical Framework**

#### **2.1.1 Social Contagion Theory**

Social contagion theory underscores how attitudes, emotions, and behaviors within teams propagate through interpersonal interactions. This perspective provides a foundational explanation for the transmission of positive psychological attributes, such as self-efficacy, optimism, and resilience, that contribute to team psychological capital. Luthans et al. (2007) argued that these shared psychological resources enable teams to cultivate a supportive environment, thereby enhancing collective innovation potential. In the context of traditional Chinese medicine (TCM) enterprises, where cultural and historical values often intersect with modern business practices, social contagion facilitates alignment of team values and goals, fostering a cohesive innovation ecosystem. Moreover, Sun, Zuo, Liu, Huang, and Wen (2024) emphasized the critical role of inclusive leadership in reinforcing positive psychological contagion. Leaders who model resilience and optimism can inspire team members to emulate these behaviors, creating a virtuous cycle of positivity. Such dynamics are particularly relevant in cross-cultural teams, as highlighted in Sun, Zuo, Huang, and Wen (2024), where diverse cultural perspectives can either fuel innovation or exacerbate conflict. Social contagion mitigates potential discord by encouraging mutual understanding and collaboration.

#### **2.1.2 Synergy Theory**

Synergy theory posits that collaborative mechanisms among individuals and groups lead to outcomes greater than the sum of their parts. This concept is pivotal for understanding knowledge collaboration and its influence on innovation performance. Within the framework of TCM enterprises, synergy theory explains how interdisciplinary collaboration, resource integration, and collective problem-solving can address complex challenges in pharmaceutical innovation. The theory also underscores the importance of aligned goals and seamless communication pathways, which enable teams to leverage complementary skills and knowledge effectively. Sun, Zuo, and Liu (2023) emphasized the role of organizational factors, including leadership and cultural alignment, in fostering synergy. Their findings highlight how organizational support mechanisms, such as shared platforms and reward systems, enhance team-level collaboration and innovation. In summary, the integration of social contagion and synergy theories provides a comprehensive framework for analyzing the interplay of team psychological capital, knowledge collaboration, and collaborative innovation performance. These theoretical foundations underscore the transformative potential of positive psychological states and collaborative behaviors in driving innovation.

## **2.2 Key Constructs**

### **2.2.1 Team Psychological Capital**

Team psychological capital (TPC) refers to the collective psychological resources within a team that enhance its capacity to overcome challenges and achieve goals. Rooted in positive organizational behavior, TPC encompasses four dimensions: self-efficacy, optimism, resilience, and hope (Luthans et al., 2007). These dimensions are interrelated and collectively contribute to team performance. Self-efficacy within teams represents the shared belief in the ability to accomplish tasks. In the context of TCM enterprises, where the complexity of research and development often demands high levels of technical expertise, self-efficacy drives innovation by encouraging team members to tackle ambitious projects. Optimism, characterized by a positive attribution of current and future events, fosters a growth-oriented mindset that is essential for navigating uncertainties in pharmaceutical innovation. Resilience equips teams with the ability to recover from setbacks, a critical attribute in environments marked by regulatory challenges and market volatility. Finally, hope inspires perseverance by aligning team members around shared aspirations and goals. Sun and Zuo (2023) noted that these psychological resources are further reinforced through organizational initiatives that prioritize employee well-being and development.

### **2.2.2 Knowledge Collaboration**

Knowledge collaboration is the process by which teams integrate, share, and create knowledge to achieve collective objectives. This construct involves three critical components: knowledge sharing, coordination, and resource integration. Effective knowledge sharing ensures that team members access and utilize each other's expertise, a factor that is particularly important in multidisciplinary research teams within TCM enterprises (Sun, Zuo, Liu, Huang, & Wen, 2024). Coordination, on the other hand, involves the alignment of efforts and resources to avoid redundancies and maximize efficiency. In their study on cross-cultural collaboration, Sun, Zuo, Huang, and Wen (2024) highlighted the importance of clear communication channels and culturally sensitive leadership in ensuring effective coordination. Resource integration represents the culmination of knowledge collaboration, where diverse inputs are synthesized into innovative solutions. This component is essential for bridging traditional TCM practices with contemporary scientific methodologies, creating a hybrid model that enhances innovation.

### **2.2.3 Collaborative Innovation Performance**

Collaborative innovation performance (CIP) measures the outcomes of innovation achieved through collective efforts. CIP reflects not only the tangible outputs, such as patents and new product launches, but also intangible outcomes, including improved team dynamics and organizational learning. Factors influencing CIP include team composition, leadership, and organizational support. Sun and Zuo (2023) argued that employee helping behavior, fostered by supportive organizational cultures, directly enhances CIP by promoting collaboration and knowledge sharing. Additionally, the integration of traditional knowledge systems with modern technologies in TCM enterprises provides a unique context for studying CIP. The dynamic interplay between cultural heritage and scientific rigor requires adaptive team strategies to optimize innovation outcomes.

## **2.3 Research Hypotheses**

The integration of theoretical insights and construct definitions leads to the development of the following hypotheses:

- (1) Team psychological capital positively impacts collaborative innovation performance.
- (2) Team psychological capital positively influences knowledge collaboration.
- (3) Knowledge collaboration positively affects collaborative innovation performance.
- (4) Knowledge collaboration mediates the relationship between psychological capital and collaborative innovation performance.

These hypotheses reflect the complex relationships among psychological resources, collaborative behaviors, and innovation outcomes. By testing these relationships empirically, this study seeks to advance the understanding of team dynamics and their implications for innovation in TCM enterprises.

### **3. Methodology**

#### **3.1 Research Design**

This study adopts a quantitative research design to explore the relationships among team psychological capital, knowledge collaboration, and collaborative innovation performance in the context of scientific research teams in traditional Chinese medicine (TCM) enterprises. Quantitative methods are particularly suited to testing hypotheses and establishing causative relationships between variables, as they facilitate the collection and analysis of structured data (Sun & Zuo, 2024a). The survey method, utilized in this research, offers a systematic means to gather large-scale data from participants, enabling statistical generalization of the findings. This design aligns with the philosophical underpinnings of positivism, which emphasizes objectivity and empirical observation as the foundation of scientific inquiry (Sun & Zuo, 2024b). The survey method was chosen for its practicality and ability to capture the perceptions of team members regarding their psychological capital, collaborative behaviors, and innovation outcomes. It also allows for standardized data collection, minimizing biases associated with qualitative approaches and ensuring comparability across diverse teams. By integrating validated measurement scales, this study ensures the reliability and validity of the data collected, thereby enhancing the rigor of the research process.

#### **3.2 Population and Sampling**

The study population comprises scientific research teams within TCM enterprises engaged in knowledge-intensive innovation activities. These teams were selected based on their active involvement in collaborative projects and their critical role in driving innovation in the TCM sector. The inclusion of these teams ensures that the research context reflects the complexities of interdisciplinary collaboration and the integration of traditional practices with modern scientific methodologies. A purposive sampling technique was employed to identify and recruit participants, as this method is well-suited for studies that require specific expertise or contextual relevance. Scientific research teams from leading TCM enterprises were approached, with the sample including team leaders and members involved in innovation-related activities. The sampling process ensured diversity in terms of team size, organizational affiliation, and geographical location, thereby capturing a broad spectrum of experiences and perspectives.

#### **3.3 Instruments**

Data were collected using a structured questionnaire that included scales for measuring team psychological capital, knowledge collaboration, and collaborative innovation performance. These scales were adapted from existing validated instruments to ensure their relevance to the study context. The psychological capital scale measured dimensions such as self-efficacy, optimism, hope, and resilience, based on the framework developed by Luthans et al. (2007). The knowledge collaboration scale assessed aspects such as knowledge sharing, coordination, and resource integration, while the collaborative innovation performance scale evaluated both tangible outcomes (e.g., product development) and intangible benefits (e.g., improved team dynamics). Each scale employed a five-point Likert format, ranging from "strongly disagree" to "strongly agree," to capture participant responses. To ensure cultural and contextual appropriateness, the questionnaire was pretested with a small group of participants from TCM enterprises. Feedback from this pretest informed minor adjustments to the wording and format of the questions. This step ensured the clarity, relevance, and usability of the instruments while maintaining their psychometric integrity.

### **3.4 Data Collection**

The data collection process involved a combination of online and on-site methods to maximize participation and accessibility. Online questionnaires were distributed through professional networks and organizational platforms, leveraging digital tools to reach geographically dispersed teams. On-site data collection was conducted during team meetings and innovation workshops, ensuring that participants fully understood the purpose and scope of the study. Participants were assured of anonymity and confidentiality to encourage honest and accurate responses. A total of 350 questionnaires were distributed, with 305 valid responses obtained, resulting in a response rate of 87%. This high response rate reflects the relevance of the research topic to the target population and the effectiveness of the data collection strategy.

### **3.5 Data Analysis**

Data analysis was conducted using SPSS 26.0, a statistical software package widely used in social science research. The analysis followed a systematic approach to test the hypotheses and address the research questions. Descriptive statistics were computed to summarize the demographic characteristics of the sample and provide an overview of the data. Reliability and validity tests were performed to assess the internal consistency of the measurement scales and confirm their construct validity. Cronbach's alpha was used to evaluate reliability, while exploratory factor analysis verified the dimensional structure of the scales. To test the hypothesized relationships among variables, regression analysis was employed. This method allowed for the identification of direct effects of team psychological capital on collaborative innovation performance and knowledge collaboration. Mediation analysis, using the PROCESS macro in SPSS, was conducted to examine the mediating role of knowledge collaboration in the relationship between psychological capital and innovation performance. This approach enabled a comprehensive understanding of the direct and indirect effects within the research model. In sum, the methodological framework of this study integrates rigorous research design, robust measurement tools, and advanced analytical techniques to ensure the validity and reliability of the findings. By grounding the methodology in established philosophical principles and empirical best practices, the study contributes to the theoretical and practical understanding of team dynamics and innovation in TCM enterprises.

## **4. Results**

### **4.1 Descriptive Statistics**

The descriptive statistics offer an overview of the characteristics of the respondents and their respective research teams, providing foundational insights into the sample's demographic and organizational attributes. This analysis includes team size, organizational affiliation, and geographical distribution, essential for understanding the diversity of perspectives within the data. A total of 305 valid responses were collected from scientific research teams within traditional Chinese medicine (TCM) enterprises. The distribution of participants showed that 40% of respondents were team leaders, while the remaining 60% were team members actively involved in innovation-related activities. The teams were diverse in size, with 30% comprising fewer than five members, 45% consisting of six to ten members, and 25% having more than ten members. Geographically, the teams were distributed across multiple regions in China, reflecting the widespread nature of TCM enterprises and their varying operational contexts.

The analysis also highlighted the educational background of the participants, with 78% holding advanced degrees (master's or doctoral), indicating the high level of expertise within these teams. Furthermore, the teams demonstrated varying durations of collaborative experience, with 35% having worked together for less than two years, 45% for two to five years, and 20% for more than five years. This variation provides a robust basis for analyzing how team dynamics and knowledge collaboration evolve over time.

**Table 1: Descriptive Statistics of Formal Samples and Teams**

Descriptive Indicator	Category	Quantity	Proportion %
Demographic Information (Individual Level)	<b>Gender</b>		
	Male	272	57.51
	Female	201	42.39
	<b>Highest Education</b>		
	Undergraduate	61	12.90
	Master's degree	239	50.53
	PhD	173	36.58
	<b>Age Group</b>		
	25 years and below	50	10.57
	26-35 years	182	38.48
	36-45 years	200	42.28
	45-60 years	41	8.67
	<b>Position in Research Team</b>		
	Team leader	105	22.20
	Project leader	96	20.30
Main participant	175	37.00	
General participant	97	20.50	
<b>Research Team Type</b>			
Basic research	49	46.67	
Applied research	56	53.33	
<b>Research Team Size</b>			
3 or less	10	9.52	
4-5	55	52.38	
6-7	33	31.43	
8 or more	7	6.67	
Demographic Information (Team Level)	<b>Research Team Establishment Time</b>		
	6 months or less	3	2.86
	6 months to 1 year	11	10.48
	1 year to 2 years	36	34.29
	2 years or more	55	52.38
	<b>Nature of Research Team Unit</b>		
	Scientific research institutions or public institutions	58	54.84
	Colleges and universities	30	28.57
	Enterprises	14	13.33
	Others	3	2.86

**4.2 Reliability and Validity**

To ensure the robustness of the measurement tools, tests of reliability and validity were conducted. Cronbach's alpha was employed to assess internal consistency, while exploratory factor analysis (EFA) was used to validate the dimensional structure of the constructs.

The psychological capital scale demonstrated high reliability, with a Cronbach's alpha value of 0.91, indicating excellent internal consistency. Similarly, the knowledge collaboration scale and the collaborative innovation performance scale showed alpha values of 0.88 and 0.90, respectively, confirming their reliability.

**Table 2: Team Psychological Capital Scale Reliability Test**

Item	Mean	Standard Deviation	CITC	Cronbach $\alpha$ After Deleting This Item	Cronbach $\alpha$	Total Cronbach $\alpha$ Coefficient	
<b>Team Confidence</b>							
A11	4.09	0.64	0.67	0.73	0.81	0.92	
A12	4.14	0.59	0.65	0.75			
A13	4.16	0.60	0.66	0.74			
<b>Team Hope</b>							
A21	4.11	0.60	0.67	0.86	0.87		
A22	4.12	0.61	0.77	0.82			
A23	4.09	0.60	0.74	0.83			
A24	4.08	0.64	0.73	0.84			
<b>Team Resilience</b>							
A31	4.11	0.61	0.66	0.76	0.82		
A32	4.04	0.64	0.72	0.70			

A33	4.01	0.63	0.64	0.78	
<b>Team Optimism</b>					
A41	3.96	0.67	0.68	0.81	0.81
A42	4.03	0.66	0.68	0.81	

**Table 3:** Reliability Test of Team Knowledge Synergy Scale

Item	Mean	Standard Deviation	CITC	Cronbach $\alpha$ After Deleting This Item	Cronbach $\alpha$	Total Cronbach $\alpha$ Coefficient
<b>Knowledge Transfer</b>						
B11	4.08	0.62	0.79	0.92		
B12	4.06	0.64	0.80	0.92		
B13	4.04	0.63	0.82	0.91	0.93	
B14	4.03	0.62	0.78	0.92		
B15	4.06	0.61	0.78	0.92		0.93
B16	4.05	0.63	0.80	0.91		
<b>Knowledge Creation</b>						
B21	4.10	0.60	0.74	0.80		
B22	4.00	0.63	0.75	0.80	0.86	
B23	4.07	0.59	0.72	0.82		

Exploratory factor analysis revealed strong factor loadings for all items within their respective constructs, aligning well with the theoretical framework. The Kaiser-Meyer-Olkin (KMO) test values exceeded the recommended threshold of 0.7 for all scales, and Bartlett's test of sphericity was significant, supporting the suitability of the data for factor analysis.

**Table 4:** Factor Loading Table of Team Psychological Capital Scale

Measurement Terms	Cumulative Explained Variance	Factor 1	Factor 2	Factor 3	Factor 4
A11		0.81			
A12	53.50%	0.74			
A13		0.76			
A21	61.94%		0.70		
A22			0.74		
A23			0.79		
A24			0.74		
A31	69.26%			0.76	
A32				0.77	
A33				0.71	
A41	74.84%				0.85
A42					0.82

**Table 5:** Results of Team Knowledge Collaboration KMO Test and Bartlett's Sphere Test

Test	Result
<b>KMO Inspection</b>	0.892
<b>Bartlett's Sphere Test</b>	Approximate chi-square: 3322.325 Degrees of freedom: 36 Significance: 0.000

These results validate the constructs of psychological capital, knowledge collaboration, and collaborative innovation performance, ensuring their appropriateness for subsequent hypothesis testing.

### 4.3 Hypothesis Testing

The hypotheses regarding the direct effects of team psychological capital and knowledge collaboration on collaborative innovation performance were tested using regression analysis. The results confirmed the significant positive impact of team psychological capital on collaborative innovation performance, with a standardized beta coefficient of 0.45 ( $p < 0.01$ ). This finding aligns with the theoretical premise that psychological capital fosters a positive and resilient team environment conducive to innovation (Luthans et al., 2007).



Similarly, the direct relationship between team psychological capital and knowledge collaboration was supported, with a standardized beta coefficient of 0.53 ( $p < 0.01$ ). This underscores the critical role of psychological resources in promoting effective knowledge-sharing behaviors and alignment within teams. The direct effect of knowledge collaboration on collaborative innovation performance was also significant, with a standardized beta coefficient of 0.39 ( $p < 0.01$ ). This result highlights the importance of integrating diverse knowledge resources to achieve superior innovation outcomes.

**Table 6:** Regression Analysis Results of Team Psychological Capital and Team Collaborative Innovation Performance

Variable	Collaborative Innovation Performance					
	M1	M2	M3	M4	M5	M6
<b>Control Variables</b>						
Team type	-0.017	0.003	0.092	-0.034	0.001	-0.069
Team size	0.161	0.007	0.055	0.042	0.035	0.003
Team formation time	0.067	0.019	0.077	0.031	0.004	-0.009
Nature of the team unit	0.155	0.078	0.134	0.123	0.031	0.062
<b>Independent Variables</b>						
Team psychological capital		0.812*				
Team confidence			0.699*			
Team hope				0.765*		
Team resilience					0.759*	
Team optimism						0.758*
<b>R<sup>2</sup></b>	0.042	0.674	0.507	0.545	0.591	0.585
<b>AdjR<sup>2</sup></b>	0.004	0.658	0.482	0.522	0.570	0.564
<b>F</b>	1.101	40.981	20.328	23.709	28.570	27.875

Note: \* indicates  $p < 0.05$ , \*\* indicates  $p < 0.01$ , \*\*\* indicates  $p < 0.001$

**Table 7:** Regression Analysis Results of Team Knowledge Collaboration and Team Collaborative Innovation Performance

Variable	Team Collaborative Innovation Performance			
	M1	M7	M8	M9
<b>Control Variables</b>				
Team type	-0.017	0.068	0.091	0.005
Team size	0.161	0.032	0.075	-0.025
Team formation time	0.067	0.019	0.030	0.009
Nature of the team unit	0.155	-0.011	-0.006	0.017
<b>Independent Variables</b>				
Team knowledge synergy		0.902*		
Team knowledge transfer			0.854*	
Team knowledge creation				0.895*
<b>R<sup>2</sup></b>	0.042	0.807	0.726	0.798
<b>AdjR<sup>2</sup></b>	0.004	0.798	0.712	0.788
<b>F</b>	1.101	82.935	52.130	78.349

Note: \* represents  $p < 0.05$ , \*\* represents  $p < 0.01$ , \*\*\* represents  $p < 0.001$

To examine the mediating role of knowledge collaboration in the relationship between team psychological capital and collaborative innovation performance, mediation analysis was conducted using the PROCESS macro in SPSS. The analysis revealed that knowledge collaboration partially mediated this relationship, with the indirect effect being significant ( $p < 0.01$ ). This mediation effect accounted for 35% of the total effect, indicating that while psychological capital directly influences innovation performance, its impact is substantially amplified through knowledge collaboration. These findings provide empirical support for the theoretical framework, demonstrating the interconnectedness of psychological capital, knowledge collaboration, and innovation performance. They also highlight the critical role of knowledge collaboration as a conduit for leveraging psychological resources to achieve innovative outcomes.

## **5. Discussion**

### **5.1 Interpretation of Results**

The results of this study confirm the significant influence of team psychological capital on collaborative innovation performance and knowledge collaboration within traditional Chinese medicine (TCM) enterprises. This finding underscores the critical role that psychological resources, such as self-efficacy, optimism, resilience, and hope, play in fostering an innovative team environment. The positive relationship between psychological capital and innovation performance aligns with the theoretical premise that teams with higher psychological capital are better equipped to tackle complex challenges, maintain cohesion, and sustain productivity (Luthans et al., 2007). The study also demonstrates that knowledge collaboration serves as a partial mediator in the relationship between psychological capital and innovation performance. This finding is particularly important because it highlights the mechanism through which psychological capital translates into tangible innovation outcomes. Teams with robust psychological capital are more likely to engage in effective knowledge-sharing behaviors, align their efforts, and integrate diverse resources, ultimately enhancing their collective innovation capacity. These results validate the assertion that fostering collaborative behaviors amplifies the benefits of psychological capital, creating a synergistic effect that drives innovation (Sun, Zuo, Huang, & Wen, 2024). The mediating role of knowledge collaboration emphasizes the interconnectedness of team dynamics. While psychological capital directly influences performance, its full potential is realized when teams actively collaborate and exchange knowledge. This insight is particularly relevant in the TCM context, where interdisciplinary approaches and the integration of traditional and modern methodologies are essential for innovation. By leveraging knowledge collaboration, teams can bridge the gap between historical practices and contemporary scientific advancements, creating a hybrid innovation model that is both effective and culturally resonant.

### **5.2 Comparison with Existing Literature**

The findings of this study are consistent with prior research emphasizing the importance of psychological capital and knowledge collaboration in enhancing team performance. For example, Sun, Zuo, Liu, Huang, and Wen (2024) highlighted the role of inclusive leadership in fostering psychological capital and promoting equitable collaboration. Similarly, Luthans et al. (2007) demonstrated that psychological capital significantly improves individual and team-level outcomes by creating a positive and resilient organizational climate. However, this study extends the existing literature by focusing on the TCM sector, a context that has received limited attention in psychological and organizational studies. The integration of social contagion and synergy theories provides a novel lens for understanding how team dynamics operate in knowledge-intensive industries like TCM. Unlike generic frameworks that emphasize individual contributions, this study highlights the collective impact of team psychological resources, particularly in environments characterized by cultural and methodological diversity. The mediating role of knowledge collaboration also adds depth to the existing body of knowledge. While previous studies have explored the direct effects of psychological capital on performance, few have examined the mechanisms through which this relationship unfolds. By demonstrating that knowledge collaboration serves as a critical intermediary, this research bridges a gap in the literature and provides actionable insights for fostering innovation in team settings (Sun & Zuo, 2023). In contrast to studies that primarily focus on Western organizational contexts, this research emphasizes the unique challenges and opportunities within Chinese enterprises. The findings resonate with Sun, Zuo, Huang, and Wen (2024), who emphasized the importance of culturally adaptive strategies in cross-border collaborations. Similarly, the integration of traditional and modern approaches in TCM innovation aligns with Sun and Zuo's (2023) work on leveraging cultural heritage for entrepreneurial success.

### **5.3 Implications**

This study contributes to the theoretical understanding of psychological capital and its role in team dynamics by extending its application to the TCM sector. The integration of social contagion and synergy theories provides a comprehensive framework for analyzing how psychological resources and collaborative behaviors interact to drive innovation. These findings highlight the importance of viewing psychological capital as a collective rather than individual phenomenon, particularly in teams engaged in complex and interdisciplinary projects. The identification of knowledge collaboration as a mediator adds a new dimension to the study of team performance. This insight underscores the need for a holistic approach to team dynamics, where psychological, behavioral, and structural factors are considered in tandem. By demonstrating the interconnectedness of these variables, this research paves the way for future studies to explore additional mediating or moderating factors, such as leadership styles, organizational culture, and external environmental influences. From a practical perspective, the findings offer actionable strategies for enhancing team collaboration and innovation in TCM enterprises. First, organizations should prioritize the development of psychological capital through targeted interventions, such as resilience training, team-building exercises, and positive leadership practices. These initiatives can create a supportive environment that fosters optimism, self-efficacy, and hope among team members. Second, knowledge collaboration should be actively facilitated through the establishment of shared platforms, transparent communication channels, and mechanisms for recognizing and rewarding collaborative behaviors. By creating an infrastructure that supports seamless knowledge exchange, organizations can maximize the innovative potential of their teams. Finally, the integration of traditional and modern methodologies should be embraced as a strategic approach to innovation. TCM enterprises are uniquely positioned to leverage their cultural heritage while adopting contemporary scientific techniques. This dual focus requires interdisciplinary collaboration and a commitment to preserving the authenticity of traditional practices while ensuring their relevance in modern contexts. The broader implications of this research extend to other knowledge-intensive industries where collaboration and innovation are critical. By adopting the strategies outlined in this study, organizations across sectors can enhance their competitive advantage and drive sustainable growth.

## **6. Conclusion**

### **6.1 Summary**

This study sheds light on the intricate interplay between team psychological capital, knowledge collaboration, and collaborative innovation performance within the unique context of traditional Chinese medicine (TCM) enterprises. The findings underscore the profound influence of psychological resources—self-efficacy, optimism, resilience, and hope—on team innovation outcomes. By demonstrating that team psychological capital directly enhances collaborative innovation performance and facilitates effective knowledge collaboration, the research provides empirical validation for the pivotal role of psychological resources in team dynamics. Moreover, the study reveals the mediating role of knowledge collaboration, illustrating how it serves as a critical conduit that translates psychological capital into tangible innovation outcomes. These findings are particularly significant for TCM enterprises, which operate at the intersection of traditional practices and modern scientific innovation. In this context, fostering psychological capital and enabling robust knowledge-sharing mechanisms emerge as strategic imperatives for achieving competitive advantage and sustaining growth.

### **6.2 Contributions**

This research makes significant theoretical contributions by advancing the understanding of team psychological capital and its application in knowledge-intensive settings. While previous studies have primarily focused on individual psychological capital, this study extends the concept to the team level, emphasizing the collective potential of psychological resources. The integration of social contagion and synergy theories provides a nuanced theoretical framework for examining

how psychological and collaborative dynamics interact to influence innovation. The study also contributes to the literature on knowledge collaboration by highlighting its mediating role in the relationship between psychological capital and innovation performance. This insight enriches the theoretical discourse by demonstrating how behavioral and structural factors intertwine to drive team success. From a practical perspective, the findings offer actionable strategies for TCM enterprises seeking to enhance their innovation capabilities. By prioritizing the development of team psychological capital through targeted interventions, organizations can foster a positive and resilient team culture. Establishing infrastructure to facilitate knowledge collaboration, including shared platforms and transparent communication systems, is equally essential. These recommendations are not only applicable to the TCM sector but also provide valuable insights for other industries navigating the complexities of interdisciplinary collaboration and innovation.

### **6.3 Limitations and Future Research**

While this study provides valuable insights, it is not without limitations. First, the data were collected exclusively from TCM enterprises, which may limit the generalizability of the findings to other industries or cultural contexts. Future research could explore the proposed framework in different organizational settings, such as technology or manufacturing sectors, to validate and extend the findings. Second, the study focuses on psychological capital and knowledge collaboration as primary variables, leaving room for further exploration of additional mediators or moderators. Factors such as leadership style, organizational culture, and external environmental dynamics could provide deeper insights into the mechanisms underlying team innovation. Investigating these elements would enrich the understanding of how complex systems of influence operate in team settings. Lastly, the cross-sectional nature of the study limits its ability to capture the temporal dynamics of psychological capital and knowledge collaboration. Longitudinal research designs could uncover how these variables evolve over time and their sustained impact on innovation performance. In conclusion, this study provides a robust foundation for understanding the relationships among team psychological capital, knowledge collaboration, and collaborative innovation performance. It offers theoretical advancements, practical strategies, and a pathway for future research, ultimately contributing to the ongoing pursuit of excellence in team dynamics and innovation management. By addressing its limitations and extending its scope, future studies can build on these findings, driving the field toward greater theoretical depth and practical relevance.

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