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Original article

The Effect of Social Capital on Emotional-Cognitive Readiness for Scientific Collaboration: The Mediating Role of Psychological Capital

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Abstract

Introduction: The purpose of this study is to investigate the effect of social capital on the emotional-cognitive readiness of faculty members for scientific collaborations with the presence of a mediation of psychological capital.

Methods: This practical research was conducted in an analytic-survey method. The statistical population consisted of all faculty members of two medical universities in Iran (709 people), and the sample size is calculated to be 250 people. The stratified and random sampling method was used. All data for this study were collected using three standard questionnaires: (a) Nahapiet and Ghoshal's social capital questionnaire, (b) emotional-cognitive readiness questionnaire, and (c) Lathan's psychological capital questionnaire. The Kolmogorov–Smirnov test was used to check the normality of data distribution. Spearman correlation and Structural equation modelling (SEM) were used to analyze and test hypotheses using PLS 3 and SPSS version 25.

Results: The results showed that social capital and psychological capital and their dimensions affect cognitive-emotional readiness for scientific collaboration. Also, the findings indicate that the level or the degree at which social capital alone contributes to cognitive-emotional readiness is weaker than when it is mediated by psychological capital.

Conclusion: Through the creation and development of social and psychological capital, university administrators can gradually create a common language and, as a result, common insight among faculty members to provide the basis for more scientific collaboration.

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Introduction

The development of sciences is one of the criteria for developing countries, and undoubtedly it cannot result from individual activities alone. Science has a collective identity and the growth, and increase in the quantity and quality of science should be considered as a result of scientific collaborations and communication between researchers and scientists (1). In particular, the main part of the social structure of science is scientific collaborations among scientists (2, 3) because in the face of the challenges of research activities, a change in 'ways of doing research' is more necessary than a change in the concept of 'the research object' (4). Scientific collaboration is an appropriate approach to the development of science, and due to the growth of co-authorship, the division of the scientific work, and the multidisciplinary nature of some research, scientific collaboration has increasingly received attention (5). In scientific collaboration, two or more scientists share their resources and talents to create a scientific work or research (6). Scientific collaboration is the process of collaboration and interaction between scientists and

researchers to produce new knowledge (7), which seems to be one of the main factors in increasing publication quality in modern science (8, 9) and reducing the problems of multidisciplinary research (6). The basic approach of scientific collaboration is to create empathy, collaboration, consultation, and partnership between scientists and researchers to establish a direct, healthy, and constructive scientific relationship (10).

Today, the ability of scientists to communicate with each other around the world has increased collaboration in research activities (11). Thus, scientific collaboration is becoming one of the most significant features of scientific activities and the primary forms of knowledge production in modern academia (12). In addition to the development of technology and specialization in science, scientific collaboration has encouraged scientists from different universities, regions, and countries to communicate (13-15), so the tendency toward scientific collaboration has also increased (6). There are several factors involved in scientific collaboration, including:

a) Functional factors, including the contribution of participation in creating knowledge, participation in scientific communities and collaboration in the research process.

b) Attitudinal factors, including emotional-cognitive readiness and behavioral readiness (2).

Emotional-cognitive readiness is the individuals' feelings, interests, beliefs, and thoughts about scientific collaborations, and behavioral readiness that emphasizes behavior is the tendency of individuals to engage in collaborative activities (2).

In general, collaboration is a phenomenon influenced by various factors such as culture, mutual trust, and individual beliefs. However, it is not facilitated only by pure social laws. In the world of science, social relations between scientists are not explained only through pure laws of scientific methods, but the internal characteristics, norms, and values of the scientific community further determine these relationships (1, 16). Scientific collaboration is also a social interaction (17) in which different individual variables can affect its quantity and quality.

One of the social factors that are effective in many collaborations is social capital. Social capital refers to features of social organization such as networks, norms, and social trust that facilitate coordination and collaboration for mutual benefit (18). As one of the values enclosed in the social relations of individuals or groups, social capital increases the level of collaboration of the members of a society and reduces the costs of communications (19) and opportunistic motives (18). Social capital is a network of relationships based on interpersonal and intergroup social trust and the interaction of individuals between institutions, organizations, and social groups, which leads to solidarity, social cohesion, and the enjoyment of social support for individuals and groups and creates the energy needed to facilitate actions to achieve individual and collective goals (20, 21). Nahapiet & Ghoshal provide a useful framework for understanding social capital with an organizational approach. They identified three highly interrelated dimensions of social capital: structural, relational, and cognitive (22). The structural dimension encapsulates a series of connections (as a matter of resources) individuals or organizations have with others (23). It focuses on the patterns and ties that strengthen or curb the flow of information. The relational dimension describes a type of personal relationship that people establish with each other because of their interaction history, which improves social collaboration by building trust between collaborators (24). The cognitive dimension targets resources such as shared interests or understanding the network members develop, which provides the ground for the development of knowledge transfer by creating a mutual understanding among collaborators (25).

Many studies show the impact of social capital on some social collaborations. Ganguly et al., in their research found that relational and cognitive social capital significantly improves the quality of shared knowledge among the employees (26). Steinmo and Rasmussen found that experienced firms establish external collaborations based on cognitive and social capital, but this basis is reinforced by relational social capital over time (27). Li, Ye, and Sheu, in their study, found that relational and cognitive capital have significant positive influences on information sharing, and structural capital has no direct positive impact on information sharing. However, it displays indirect effects through the other two social capital dimensions (28). Mooghali and Bahmanyari showed a positive and significant relationship between social capital and the dimensions of knowledge management (29). Hassanzadeh and Sadeghi, in their research, found that social capital, especially the cognitive dimension, plays an essential role in increasing knowledge sharing (30).

Another crucial factor affecting social interactions is psychological capital. Internal features of individuals can affect social behaviors and interactions (31). Accordingly, psychological capital, as essential internal features and personal resources, is a person's positive and developmental state. Four components characterize it: (1) Self-efficacy: having the confidence to achieve a specific goal in a specific situation; (2) Optimism: making a positive attribution about succeeding now and in the future; (3) Hope: persevering toward targets and, when necessary, redirecting pathways to targets in order to succeed; and (4) Resilience: a positive way of coping with problems or distress (31).

Psychological capital is a significant capital that influences people's attitudes, job behaviors, and performance; psychological capital, as a common core potential, is vital to motivate, cognitive processing, striving for success, and thus better performance (32). In general, psychological capital can influence social interactions and collaborations (33). In other words, psychological capital can affect the indicators of self-confidence, sacrifice, ability, and trust of individuals through the accumulation of internal values and ultimately lead to their motivation and participation in group activities (12, 19).

Many studies indicate the role of psychological capital in social interactions. Kerksieck et al. investigated the mutual relations between the personal resource of psychological capital (hope, self-efficacy, resilience, and optimism) and the social job resource of social support and found that social support at work positively impressed the development of psychological capital, supporting and extending the enabling hypothesis of self-efficacy (34). According to Ma et al. psychological capital is found to exert a more considerable effect on entrepreneurial opportunity identification and entrepreneurial environment perception than social capital (35). Hu et al. examinethe effect of authentic leadership on the proactive behavior of subordinates, in particular the mediating effect of psychological capital and the moderating effect of compassion at work. The results reveal that psychological capital plays a perfect mediating role between authentic leadership and proactive behavior (36). Zhang et al. (37), Hosseinpoor (38), and Liand Sheu (28) found that psychological capital has a profound impact on customers' enthusiasm to share knowledge.

Emotional-cognitive readiness is an attitudinal factor

influencing the tendency to scientific collaboration; so, due to its importance for scientific collaboration, the study of the factors affecting it can help direct scientific collaboration.

The literature review indicates the positive role of social and psychological capital in many social activities. One of the social activities in the scientific community is a scientific collaboration among faculty members in universities. Therefore, this article aims to investigate effecting social and psychological capital on cognitive-emotional readiness as one of the essential components for scientific collaboration among faculty members. Hence based on the literature review, the theoretical framework (Figure 1) and the total hypotheses are:

H1: Social capital positively affects emotional-cognitive readiness in scientific collaboration.

H2: Social capital positively affects psychological capital.

H3: Psychological capital positively affects emotional-cognitive readiness in scientific collaboration.

H4: Psychological capital mediates the effect of social capital on emotional-cognitive readiness of scientific collaboration.

Given the lack of systematic understanding of factors that make collaboration sustainable (12), investigating and paying attention to the factors affecting the increase of scientific collaboration can increase the quantity and quality of research. Social and psychological capitals are the influential factors in social and group activities. Since scientific collaboration is a group activity, examining the impact of social capital and psychological capital on scientific collaboration can help planning to improve it. This research examines the effect of social capital on the emotional-cognitive readiness of faculty members in scientific collaboration mediated by psychological capital.

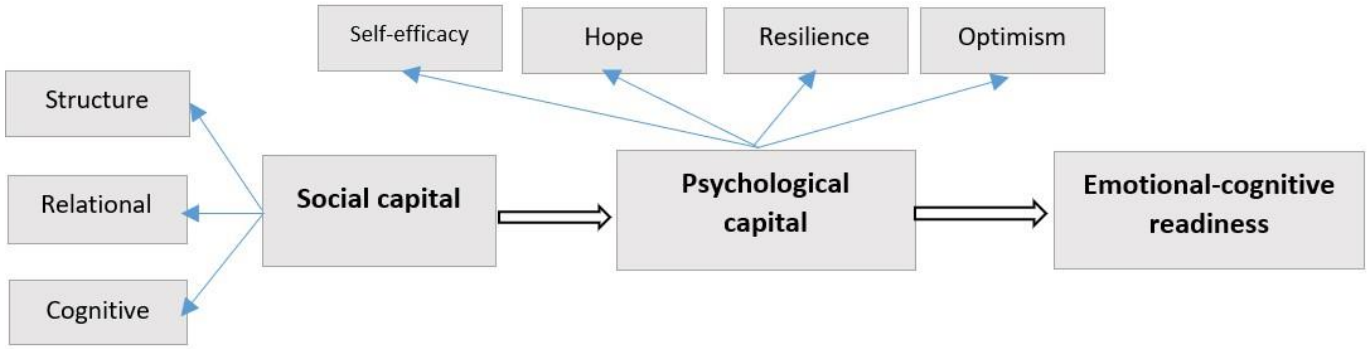

Figure 1. Theoretical framework of the research

Methods

This study is practical research conducted in an analytic-survey method. The present study aimed to examine the effect of psychological capital dimensions on the emotional-cognitive readiness of scientific collaboration among faculty members of universities. The statistical population includes all faculty members of two medical universities in Iran (709 people). According to Cochran's formula, the sample size was calculated to be 250 people with a coefficient of 5%. Since the study's statistical population included three different universities, to select the appropriate samples, the stratified and random sampling method was used to select the appropriate sample. For this purpose, the sample size for each university was calculated in proportion to the number of faculty members of that university. In this research, the theoretical framework of the subject was first examined using the library and exploratory studies, and then hypotheses and the theoretical framework of the research were developed. Finally, collected data were analyzed using Spearman correlation and Structural Equation Modeling (SEM) to test hypotheses and evaluate the conceptual model.

All data for this study were collected using three standard questionnaires: (a) Nahapiet and Ghoshal social capital questionnaire (including 11 items) (22); (b) Luthans psychological capital questionnaire (including 24 items) (39); and (c) emotional-cognitive readiness questionnaire (including 22 items) adapted from Ghalbash research (2). The measurement scale was based on a five-point Likert scale (strongly disagree=1, disagree=2, neutral=3, agree=4, strongly agree=5). The reliability of the research questionnaires was measured using Cronbach's alpha (Cronbach's $\alpha = 0.93$) for all samples.

Analytical Procedures

The Kolmogorov–Smirnov test was used to evaluate the normality of the data. This test is applied to determine whether the data is normal or not by choose parametric or nonparametric tests. The results of this test showed that data were not normal, so Structural equation modeling (SEM) was used to test the hypothesis (H1, H2, H3, H4) using Smart PLS 2; because one of the reasons for using PLS is that the data distribution of all variables in the research model is not normal (40). Also, Spearman correlation, a nonparametric test, was used to evaluate the relationship between social and psychological capital dimensions and emotional-cognitive readiness.

Results

Description of Demographic Data

Table 1 indicates the respondents' demographic features by gender and academic rank. Of 250 250 respondents, 63.6% were male, and 36.4% were female. In terms of academic rank, most of the respondents were "assistant professors" (38.8%), and the least respondents were professors (15.6%).

Table 1. Demographic features of the respondents

Variable		Frequency	%
Gender	Female	91	36. 4
	Male	159	63.6
	Total	250	100
Academic rank	professor	39	15.6
	associate professor	61	24.4
	assistant professor	97	38.8
	Instructor	53	21.2
	Total	245	100

Correlation Analyses

The Spearman correlation test tested the relationship between social and psychological capital dimensions and emotional- cognitive readiness. The results are shown in Tables 2. The significance level obtained from the Spearman correlation test for structural and relational dimensions is less than 0.01, which indicates that there is a significant relationship between "emotional-cognitive readiness" and two "structural" and "relational" dimensions with a 99% confidence level; and there is a significant relationship between "emotional-cognitive readiness" and "cognitive" dimension with 95% confidence level (sig. value = 0.15 <0.05). Also, the positive correlation coefficient indicates that the higher the level of social capital dimensions, the higher the level of cognitive-emotional readiness of scientific cooperation among faculty members. Therefore, it can be said that there is a positive relationship between the dimensions of social capital and cognitive-emotional readiness of scientific cooperation among faculty members.

Also, the significance value obtained from the Spearman correlation test for all dimensions of psychological capital (self-efficacy, Hope, Resilience, and Optimism) is less than 0.01, which indicates a significant relationship between "emotional-cognitive readiness" and dimensions of psychological capital with 99% confidence level. The positive correlation coefficient indicates that the higher the level of psychological capital dimensions, the higher the level of cognitive-emotional readiness for scientific collaboration among faculty members. Therefore, it can be concluded that there is a positive relationship between the dimensions of psychological capital and cognitive-emotional readiness for scientific collaboration among faculty members.

Table 2. Spearman correlation test results

Independent variable \ Dependent variable		Emotional-cognitive readiness	
Social capital	Structural	Correlation coefficient	0.286
		Sig. (2-tailed)*	0.000
	Cognitive	Correlation coefficient	0.153
		Sig. (2-tailed)**	0.015
	Relational	Correlation coefficient	0.177
		Sig. (2-tailed)*	0.005
Psychological capital	Self-efficacy	Correlation coefficient	0.516
		Sig. (2-tailed)**	0.001
	Hope	Correlation coefficient	0.372
		Sig. (2-tailed) **	0.001
	Resilience	Correlation coefficient	0.178
		Sig. (2-tailed) **	0.005
	Optimism	Correlation coefficient	0.443
		Sig. (2-tailed) **	0.001

* Sig. values lower than .05 were considered to be statistically significant
** Sig. values lower than .01 were considered to be statistically significant

Measurement Model Results

In order to evaluate the validity of research tools and measurement models, in addition to faced validity, construct validity was also examined using three approaches content validity, convergent validity, and discriminant validity. Content validity was done by interviewing senior system users and pilot-testing the instrument. The convergent validity was validated by examining Cronbach's α, composite reliability, and Average Variance Extracted (AVE) from the measures. As shown in Table 3, the Cronbach's α of every subscale range from 0.66 to 0.95 was above the acceptability value of 0.7, except for two resilience and optimism dimensions of psychological capital. Moreover, the composite reliability values, which ranged from 0.75 to 0.95, and the AVE by our measures, which ranged from 0.36 to 0.72, are all within the commonly accepted range greater than 0.5, except for two resilience and optimism dimensions of psychological capital and psychological capital variable. Therefore, the convergent validities of many constructs are confirmed.

Table 3. Reliability and validity of constructs

Construct	Cronbach's α	Composite Reliability	AVE
Emotional – cognitive readiness	0.948	0.954	0.512
Social capital	0.889	0.909	0.501
Psychological capital	0.879	0.897	0.468
Structural	0.746	0.839	0.567
Relational	0.869	0.912	0.722
Cognitive	0.768	0.866	0.683
Self-efficacy	0.863	0.898	0.595
Hope	0.845	0.885	0.564
Resilience	0.661	0.750	0.357
Optimism	0.694	0.805	0.491

To assess discriminant validity Fornell & Larcker criterion was used. Results are shown in Table 4. As can be seen, the values on the principal diameter, which are the square root of the AVE, are more significant than the numbers in each row.

In all cases and regardless resilience and optimism dimension of psychological capital, the AVE for each construct is larger than the squared correlation of that construct with all other constructs in the model. Therefore, the results confirm that the discriminant validity of constructs in the study is appropriate.

Table 4. Comparison of squared correlation and average variance

	Emotional cognitive	Social capital	Psychological capital	Structural	Relational	Cognitive	Self-efficacy	Hope	Resilience	Optimism
Emotional cognitive	0.716									
Social capital	0.356	0.708								
Psychological capital	0.626	0.284	0.598							
Structural	0.428	0.784	0.373	0.753						
Relational	0.257	0.899	0.165	0.284	0.850					
Cognitive	0.239	0.672	0.213	0.543	0.718	0.826				
Self-efficacy	0.595	0.265	0.537	0.351	0.182	0.156	0.771			
Hope	0.503	0.249	0.589	0.312	0.138	0.211	0.647	0.751		
Resilience	0.447	0.179	0.800	0.285	0.082	0.115	0.479	0.703	0.597	
Optimism	0.499	0.201	0.858	0.264	0.098	0.176	0.648	0.690	0.505	0.701

Hypotheses Testing

The results for the structural model with the estimated standardized path coefficients and path significance among the constructs are presented in Figures 2 and 3 and Table 5. As shown in Fig. 2, the estimated standardized path coefficients indicate the positive effect of social capital on emotional cognition. The R square value was 0.43, which suggests that the model variable can explain 43% of the variance of the dependent variable (social capital and psychological capital), which is substantial (R^2=0426). As predicted, almost all of the proposed hypotheses are supported.

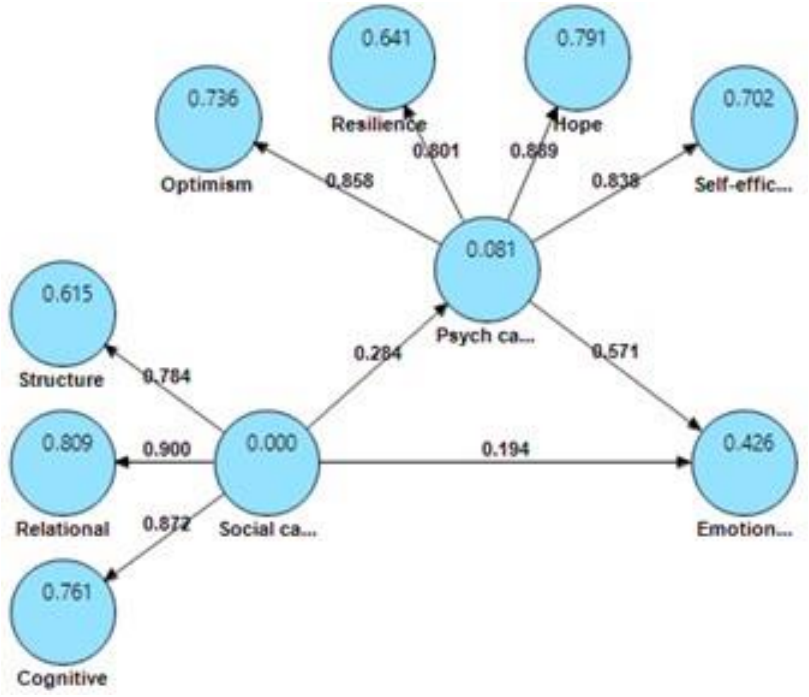

Figure 2. Measurement model in the standardized coefficient model

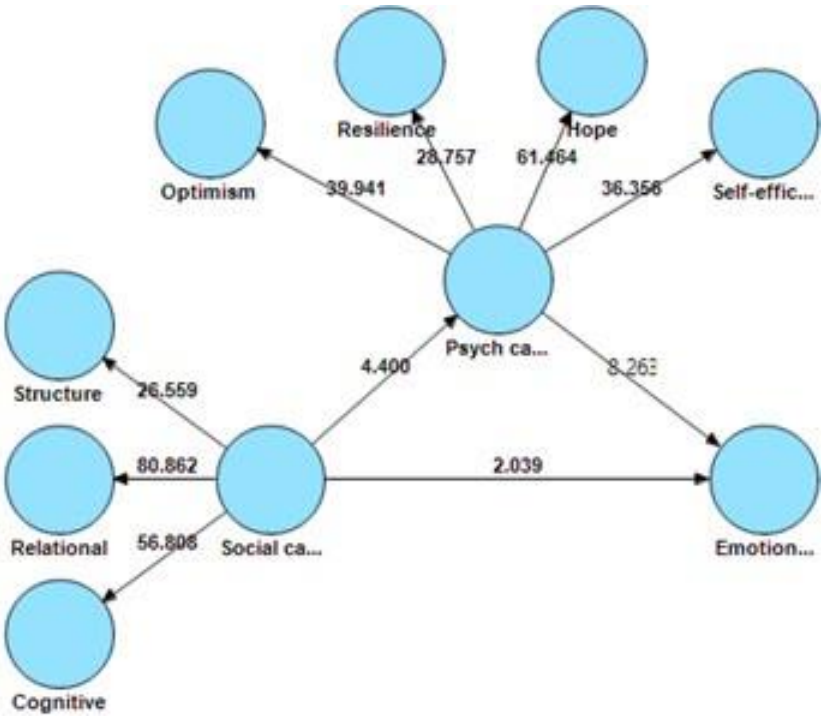

Figure 3. Measurement model in the T-Statistics model

As shown in Figures 2 and 3, social capital (β = 0.194, t= 2.039) and psychological capital (β = 0.571, t= 8.263) both significantly affected emotional–cognitive readiness. Similarly, the effect of social capital on psychological capital is also significant (β = 0.284, t= 4.4). This means that the hypotheses H1, H2, and H3 are supported because the T-Statistics greater than 1.96, equally psychological capital mediates the relationship between social capital and emotional–cognitive readiness (β = 0.378; t=7.845); thus, H4 is accepted. Table 5 summarizes the results of the hypotheses.

Table 5. Hypothesis testing

Hypothesis	standard β	Standard error	t-value	supported
Direct effects				
H1: social capital ⟶ emotional- cognitive readiness	0.194	0. 095	2.039	Yes
H1: social capital ⟶ psychological capital	0.284[a]	0.065	4.4	Yes
H3: psychological capital ⟶ emotional- cognitive readiness	0.571[b]	0.069	8.263	Yes
Indirect effect				
H4: social capital ⟶ psychological capital ⟶ emotional-cognitive readiness	0.162	0.042	3.857	Yes

For mediation effect, a mediation test is conducted to discover if a mediator construct can significantly carry the ability of an independent variable to a dependent variable. Similarly, the mediation test determines the indirect effect of the independent variable on the dependent variable through a mediator variable —newer approaches that consist of distribution of the production method and re-sampling approaches such as bootstrapping. In addition, mediation is measured by multiplying the direct path coefficients “a” and “b” and then dividing the obtained value by the standard error of the paths (Cepeda-Carrion et al., 2018). Table 5 and Figure 4 summarize these results.

Discussion

Scientific collaboration is one of the essential processes in promoting and improving the scientific performance of scientific centers and researchers. Scientific collaboration seems to be a critical factor in increasing scientific products’ quality. Today, the prominent role of scientific collaboration in the economic, industrial, and cultural fields has become significantly important. Considering the role of social and psychological capital on social interactions, this study examined the effect of social capital on the emotional-cognitive readiness of faculty members for scientific collaboration mediated by psychological capital.

Because one of the factors affecting scientific collaboration is the emotional-cognitive readiness of colleagues, recognizing the factors affecting this component can help in planning to strengthen the scientific collaboration among faculty members of universities. Four hypotheses were developed after reviewing the literature, and a conceptual model was designed in line with these goals. Using Spearman correlation tests and structural equation modeling, hypotheses and model were tested. The results of these tests confirmed the research hypotheses. In other words, the results show that social capital and its dimensions (structural, cognitive, and relational) and psychological capital and its dimensions (self-efficacy, optimism, resilience, and hope) affect cognitive-emotional readiness for scientific collaboration. Also, the results obtained from Structural Equation Modeling indicate that psychological capital has a mediating role in the relationship between social capital and cognitive-emotional readiness for scientific collaboration, and this role is a partial mediator.

Social capital is one of the most critical human capitals in developing relationships between individuals, which significantly affects many group activities through a network of relationships based on interpersonal and intergroup social trust between them. The current study results showed that social capital and its dimensions (structural, cognitive, and relational) could affect emotional-cognitive readiness as one of the components of scientific collaboration. It means that as social capital increases, so does cognitive-emotional readiness for scientific collaboration among faculty members. The results of this research are consistent with the results of many studies (23, 26, 30, 32, 41-45) that indicate the effect of social capital on the sharing and transfer of knowledge and information. In explaining this result, it can be said that the social capital through group cohesion and personalization of the group (46) and by affecting the amount of communication or access capabilities of network members (structural dimension), causes flexibility and ease of information exchange and thus increases the level of cognitive-emotional readiness for scientific collaboration among faculty members.

Social capital (by cognitive dimension) creates a common insight of goals and values and a common language among collaborators, providing the basis for their optimal activity in a variety of collaboration networks such as academic collaborations (25, 27), knowledge sharing, and emotional-cognitive readiness for scientific collaboration that in this study was confirmed. Admittedly, the relational dimension of social capital, with trust and confidence among faculty members, leads to effective communication so that they are more likely to share information and improve scientific collaboration. Faculty members psychologically tend to trust people with whom they share a similar mindset and vision in achieving their goals, and this in itself can be an influential factor in increasing scientific collaboration and knowledge sharing. In general, with the increase in effective communication and connections between faculty members, a kind of exchange of ideas and comprehensive trust is created, which accelerates the process of

scientific collaboration in universities.

This study revealed that psychological capital and its dimensions (self-efficacy, optimism, resilience, and hope) could affect emotional-cognitive readiness as one of the components of scientific collaboration. “Hope” has an impact on life satisfaction (47), work satisfaction and performance (43), and motivation to deal with stressful events (48). People who have more hope have more commitment and interest in group activities such as scientific collaboration. This study’s result showed that hope could provide the ground for increasing and improving cognitive-emotional readiness among faculty members for scientific collaboration. Resilient people look at things creatively and flexibly, which, in turn, increases their readiness for individual and social activities. One of the goals of scientific collaboration is to use different opinions and perspectives in order to increase the quality of scientific productions. Therefore, as the results of this study have shown, “resilience” can be recognized as a potential factor affecting the cognitive-emotional readiness of scientific collaboration. “Optimism” positively affects peoples to make their life easier and relieve stress (48). Optimistic people can more easily trust their colleagues and have a positive sense of knowledge sharing (32). The results of this study also indicate the effect of “optimism” on cognitive-emotional readiness for scientific collaboration among faculty members. “Self-efficacy” indicates the general belief of individuals while they exhibit their performances. Research by Stajkovic et al. showed an effective and positive relationship between self-efficacy and performance (49). There is also a positive relationship between self-efficacy and job satisfaction (50). The results of this study also indicate the effect of “self-efficacy” on cognitive-emotional readiness for scientific collaboration among faculty members. This means that when people are confident in their abilities and talents in performing tasks, they are motivated to exchange information and share knowledge (32, 37), increasing cognitive-emotional readiness for scientific collaborations. These results are consistent with the results of studies by Ziyae et al. (31), Zhang et al. (37), and Hosseinpoor et al. (38) that all indicate the relationship between psychological capital and their dimensions (self-efficacy, optimism, resilience, and hope) and some social activities such as organizational performance, job satisfaction, and knowledge sharing.

Psychological capital, which is known as positive thinking, by empowering the way of thinking and motivating people, and increasing their flexibility in different situations, can prepare people for social communication such as scientific collaboration. The present study results also indicate that with increasing the amount of psychological capital in individuals, the level of cognitive-emotional readiness of faculty members also increases. Finally, the study established a mediation effect (H4) in which psychological capital mediated the effect of social capital on cognitive-emotional readiness for scientific collaboration. While social capital alone can lead to cognitive-emotional readiness for scientific collaboration among faculty members, tests indicated that the level or degree at which social capital contributes to cognitive-emotional readiness is weaker than when mediated by psychological capital.

Conclusion

In this study, the effect of social capital on cognitive-emotional readiness to increase scientific collaboration was investigated for the first time, and therefore the result can be significant. The specialized and multidisciplinary nature of many topics in different sciences has made the necessity of scientific collaboration and participation in scientific research inevitable. Therefore, paying attention to the factors that facilitate scientific collaboration has become crucial for scientific policymakers and managers. The findings of this study indicate that social capital and psychological capital are essential factors in increasing the emotional cognitive readiness of faculty members as one of the components of scientific collaboration. Through the creation and development of social capital (such as the formation of various research groups), university administrators can gradually create a common language and, as a result, common insight among faculty members to provide the ground for more scientific collaboration. Managers can also create a sense of confidence by holding workshops on improving self-efficacy, resilience, hope, and optimism for faculty members so that the cognitive-emotional readiness for scientific collaboration among members increases.

Declarations

Acknowledgement

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Conflicts of Interests

The authors declare no conflict of interest.

Ethical statement

The study has been approved by the Ethics Committee of Hamadan University of Medical Sciences (Ethical code: IR.UMSHA.REC.1398.110).

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Authors’ contributions

Saed Mocheshi, S. (First Author) jointly led on the design of the study, led the primary data collection, and jointly the drafting of the article; Amiri, M.R. (Second and corresponding Author), jointly led on the design of the study, Statistical analyst jointly the drafting of the article; Vakilimofrad, H. (Third Author), Statistical analyst and jointly the drafting of the article.

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