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Original Research

Does Psychological Capital Increase Emotional-Cognitive Readiness for Scientific Collaborations? A Case Study

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Abstract

This research aims to examine the influence of social capital on the emotional-cognitive readiness of faculty members for scientific collaborations using Structural Equation Modeling, considering the importance of social capital and its dimensions in social interactions. This study is applied research that was conducted in a survey method. The statistical population includes all faculty members (709) of two universities of medical sciences in Iran: Hamadan and Kurdistan universities of medical sciences. The sample size of this study was 250 people who were selected using stratified random sampling. Data were collected using two standard questionnaires. Spearman correlation and Structural equation modeling (SEM) were used to test the research hypotheses using SPSS version 25 and PLS 3. The results showed a positive and significant relationship between the dimensions of psychological capital (self-efficacy, optimism, resilience, and hope) and cognitive-emotional readiness for scientific collaboration. Also, the results obtained from Structural Equation Modeling indicated the relative compatibility of the experimental model with the conceptual model of the research, which indicates the effect of psychological capital on cognitive-emotional readiness for scientific collaboration. This research can give university administrators insight into increasing scientific collaboration among faculty members. The factors affecting it should be identified and planned to strengthen them.

Keywords: Scientific Collaborations, Psychological Capital, Faculty Members, Emotional Cognitive, Iran.

Introduction

Undoubtedly, the development of science is not done by individual activities alone. Science has a collective identity, and the growth and increase in the quantity and quality of science should be considered a result of scientific collaborations and communication between researchers and scientists (Davarpanah, 2007). Social studies of science indicate that science is not an abstract and individual phenomenon but is inherently a purely social epistemology that can be affected by various individual and social factors (Jalili, Zahedi, Ershad & Rabiee, 2016).

The structure of science refers to the association of scientific concepts with social structure, which is mainly exposed in relationships between scientists. In particular, the main part of the social structure of science is scientific collaborations among scientists (Ghelbash Ghraehbalaghi Inaloo, Kareshki & Ahanchian, 2017) because, in the face of the challenges of research activities, a change in the methodology of research is more necessary than a change in the concept of the purpose of research (Andrade, de Los Reyes Lopez & Martín, 2009). Scientific collaboration is an appropriate approach to the development of science. Nevertheless, due to the growth of co-authorship, the division of the scientific work, and the multidisciplinary nature of some research teams, scientific collaboration is becoming increasingly involved (Beaver, 2001). In scientific collaboration, two or more scientists share their resources and talents to create a scientific work or research (Amiri, Vakili Mofrad & Valinejad, 2011).

The basic approach of scientific collaboration is to create empathy, cooperation, consultation, and partnership between scientists and researchers to establish a direct, healthy, and constructive scientific relationship (Gazni & Thelwall, 2014). Nowadays, scientific collaboration and teamwork have been considered tools for knowledge integration, endeavors, and abilities for research processes (Andrade et al., 2009), and it needs to go beyond the organizational and geographical boundaries. Today, the ability of scientists to communicate scientifically beyond institutional and geographical boundaries has led to an increase in collaborative research activities and thus the development of science around the world. One of the main features of modern science and knowledge production is collaborative research (Hagedoorn, Link & Vonortas, 2000).

Investigating and paying attention to the factors affecting the increase of scientific collaboration can increase the quantity and quality of research. One factor is positive psychology (Hosseinpoor, Armandi & Valadi, 2017; Hu et al., 2018), which this research is considered.

Literature Review and Theoretical Framework

Scientific collaboration

Scientific collaboration is the process through which scientists and researchers work together to generate new scientific knowledge (Katz & Martin, 1997), which seems to be one of the important factors to increase publication quality in modern science (Ferligoj, Kronegger, Mali, Snijders & Doreian, 2015; Sun, Negishi & Nishizawa, 2007) and reduce the problems of multidisciplinary research (Amiri et al., 2011). Scientific collaboration contributes to progress research and is considered a mechanism to raise visibility and researchers' productivity (Andrade et al., 2009). Scientific collaboration, in addition to the development of technology and specialization in science, has led to greater communication among scientists around the world (Larivière, Gingras, Sugimoto & Tsou, 2015; Ribeiro, Rapini, Silva & Albuquerque, 2018; Wagner, Park & Leydesdorff, 2015) and so the tendency towards scientific collaboration

has also increased (Amiri et al., 2011).

Scientific collaboration requires presuppositions and components. These presuppositions and components are (Ghelbash Ghraehbalaghi Inaloo et al., 2017):

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

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

Emotional-cognitive readiness is 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. In general, collaboration is a phenomenon that is influenced by various factors such as culture, mutual trust, individual beliefs, etc., and is not facilitated only by pure social laws. In science, social relations between scientists are not explained only through pure laws of scientific methods, but the scientific community's internal characteristics, norms, and values further determine these relationships (Davarpanah, 2007). Scientific collaboration is also a social interaction (Anderson & Kieliszewski, 2019) in which different individual variables can affect its quantity and quality. Given the importance and necessity of scientific collaboration, examining the individual factors affecting it, such as psychological capital, and providing conditions to facilitate it can be one of the scientific policies of any country.

Psychological capital and its dimensions

Human capital is considered the most valuable resource among the strategic resources (Ketchen Jr, Crook, Todd, Combs & Woehr, 2017). In scientific collaboration, which is the interaction between scientists to produce science, human capital is recognized as an important factor; Because scientific collaboration creates empathy, cooperation, consultation, and partnership between scientists and researchers as human capital, in order to establish a direct, healthy, and constructive scientific relationship between them, is important (Gazni & Thelwall, 2014). In order to provide an atmosphere of empathy and cooperation among researchers, various factors are involved. Psychological capital is one of the factors that researchers have considered because of its impact on human performance. (Ardichvili, 2011).

Psychological capital is described as the positive and developmental state of a person. It consists of four components: (1) Self-efficacy: having confidence to attain a specific goal in a specific situation; (2) Optimism: having psychological intention and expectation to hope the current and future success; (3) Hope: having target and the conviction to follow up that target and when necessary, redirecting pathways to target in order to succeed; and (4) Resilience: person's ability to come back to succeed when encompass by problems (Luthans, Avey, Avolio & Peterson, 2010). Psychological capital is an important capital that influences people's attitudes, job behaviors, and performance; Psychological capital, as a common core potential, is important to motivate cognitive processing, striving for success, and thus better performance (Hosseinpoor et al., 2017). Psychological capital can generally influence social interactions and collaborations (Gu, Tang, Wang & Zhou, 2019). 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 (Ghasemzadeh-Alishahi, Heydarizadeh, Moosavi & Hasani, 2015; Khalife Soltani, Valii & Sehat, 2014).

Many studies have investigated the role of psychological capital on social interactions.

Kerksieck, Bauer and Brauchli (2019) investigated the mutual associations between components of psychological capital (hope, self-efficacy, resilience, and optimism) and the social job resource of social support using structural equation modeling. They found that social support at work positively impressed the development of psychological capital. In their research, Ma, Topolansky Barbe and Zhang (2018) found that the psychological capital of the new migrant workers has a more considerable effect on their entrepreneurial opportunity identification and entrepreneurial environment perception than social capital. Hu et al. (2018) examine the mediating role of psychological capital between authentic leadership and the proactive behavior of subordinates and found that psychological capital as mediating variable plays a perfect role between authentic leadership and proactive behavior. Zhang, Zhang, Lin & Du (2017), Hosseinpoor et al. (2017), and Li and Sheu (2013) investigate the effect of psychological capital on knowledge sharing behavior and found that psychological capital has a profound impact on customers' enthusiasm to share knowledge.

The literature review indicates the positive role of psychological capital in many social activities. One of the social activities in the scientific community is a scientific collaboration among faculty members in universities. The emotional-cognitive readiness is one of the factors involved in scientific collaborations that psychological patterns may influence. Therefore, this article aims to investigate the effect of 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 research hypotheses are:

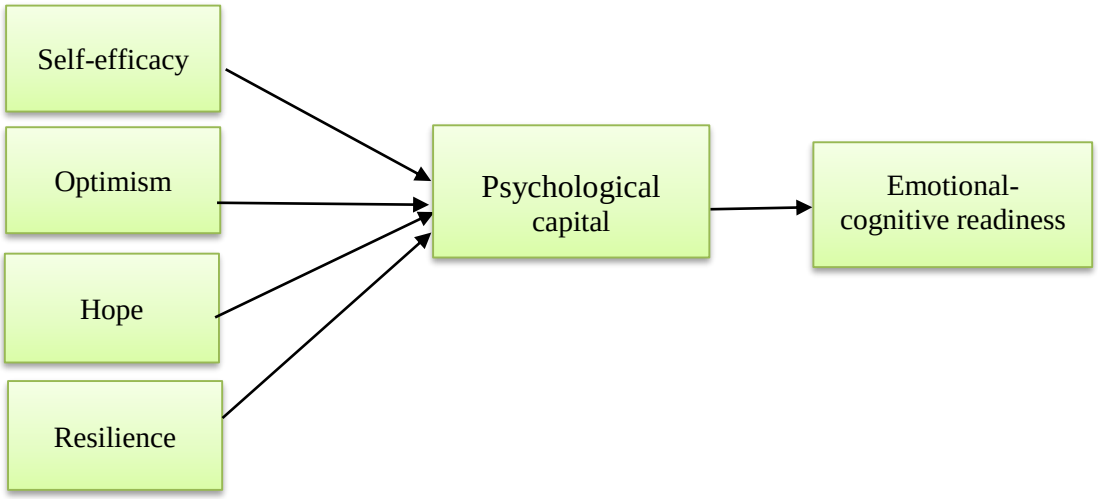

Figure 1: The Theoretical Framework of the Research

H_1. There is a relationship between dimensions of psychological capital and cognitive-emotional readiness for scientific collaboration.

H_2. The psychological capital variable affects the cognitive-emotional readiness for scientific collaboration.

Materials and Methods

Participants and procedures

This study is practical research conducted in an analytic-survey method. The study aims 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): Hamadan and Kurdistan universities of medical sciences. According to Cochran's formula, the sample size was calculated to be 250 people with a coefficient of 5%. The stratified and random sampling method was used. 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 Structural Equation Modeling (SEM) to test hypotheses and evaluate the conceptual model.

Research tools

All data for this study were collected using two standard questionnaires: (a) Luthans, Youssef & Avolio's (2007) psychological capital questionnaire (including 24 items). (b) emotional-cognitive readiness questionnaire (including 22 items) adapted from Ghelbash Ghraehbalaghi Inaloo et al. (2017) research. The measurement scale in both questionnaires 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 by using Cronbach's alpha, Composite Reliability (CR), and Spearman tests for all samples. As you can see in table 1, the calculated coefficients for both questionnaires and each of their dimensions were higher than 0.7, which confirms the reliability of the questionnaire.

Table 1

Cronbach's alpha, Composite Reliability (CR), and Spearman coefficients to measure the reliability of the research tools

Variable	Cronbach's alpha coefficient	Spearman coefficient	Composite Reliability coefficient
Emotional-cognitive readiness	0.948	0.962	0.954
hope	0.845	0.850	0.886
Resilience	0.726	0.730	0.749
Self-efficacy	0.863	0.867	0.898
Optimism	0.727	0.792	0.805

Analytical procedures

The normality of the data was evaluated using the Kolmogorov–Smirnov test. This test showed that data were not normal, so Spearman correlation was used to test the first hypothesis (H_1) using SPSS version 25. Structural equation modeling (SEM) was also used to test the second hypothesis (H_2) using PLS 3.

Results

Reliability and validity of measures

In order to evaluate the validity of research tools and measurement models, in addition to faced validity, construct validity was also examined using convergent validity and discriminant validity. Confirmatory factor analysis and Average Variance Extracted (AVE) evaluated Convergent Validity (Table 2). As shown in Tables 1 and 2, the reliability and validity of

measures were confirmed by the values of composite reliability (>0.70) and AVE (>0.50). As you can see in Table 2, the factor loadings of all questions are greater than 0.6, indicating that all questions in the questionnaire were confirmed and none of the questions were excluded from the measurement model.

Table 2
Standardized confirmatory factor analysis coefficients and construct reliabilities

variables	dimensions	questions	Factor loadings	AVE	Cross Validity Communality
psychological capital	Self-efficacy	1-6	> 0.6	0.595	0.369
	hope	7-12	> 0.6	0.564	
	Resilience	13-18	> 0.6	0.516	
	Optimism	19-24	> 0.6	0.515	
Emotional – cognitive readiness		1-22	> 0.6	.502	0.436

To assess discriminant validity Fornell & Larcker criterion was used. Results are shown in Table 3. As shown in Table 3, the values on the principal diameter, the square root of the AVE, are greater than the numbers in each row, so there is discriminant validity between each construct and other constructs.

Table 3
Discriminant validity assessment of constructs

	Emotional – cognitive readiness	hope	Resilience	Self-efficacy	Optimism	psychological capital
Emotional – cognitive readiness	0.709					
hope	0.396	0.751				
Resilience	0.294	0.702	0.715			
Self-efficacy	0.506	0.649	0.480	0.771		
Optimism	0.408	0.690	0.606	0.650	0.709	
psychological capital	0.485	0.904	0.775	0.848	0.861	0.928

Therefore, the measurement model in the standardized coefficient mode, which is drawn using PLS software, is shown in Figure 2.

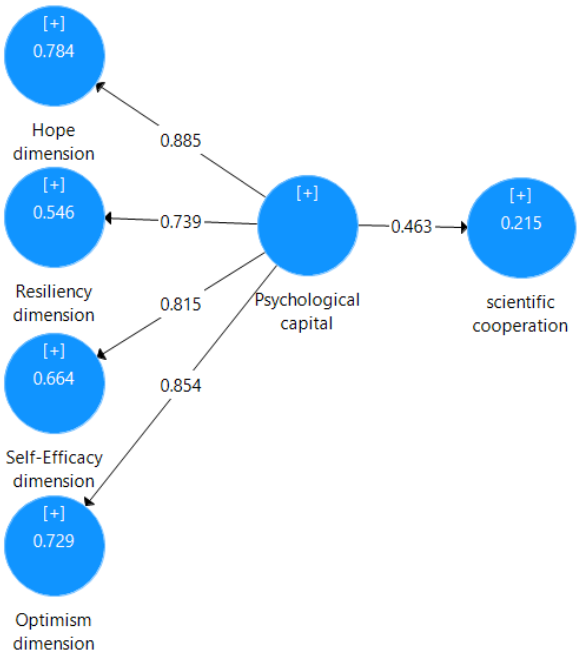

Figure 2: Measurement Model in the Standardized Coefficient Mode

The Cross Validity Communality test was used to assess the measurement model quality. As shown in Table 2, the values of the Cross Validity Communality show that the measurement model quality for the variables of "social capital" (= 0.369) and "cognitive-emotional readiness" (= 0.436) has been evaluated as "*very strong*". Because the measurement model quality is based on values close to 0.02 (poor measurement model quality), 0.15 (medium measurement model quality), and 0.35 (strong measurement model quality) are evaluated (Kline, 2015).

Description of demographic data

Table 4 shows the demographic features of respondents by gender and academic rank. As you can see, of 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 a least respondents were professors (15.6%).

Table 4
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

First hypothesis testing

H_1. There is a relationship between dimensions of psychological capital and cognitive-emotional readiness for scientific collaboration.

Spearman correlation test is used to test this hypothesis. The reason for using this test is that the association between the two variables is to be examined, and secondly, the research variables have a non-normal distribution. The results are shown in Table 5.

Table 5

Spearman correlation test results to evaluate H_1

dependent variable / independent variable	Emotional-cognitive readiness	
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 .01 were considered to be statistically significant

As you can see in table 5, 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 that there is a significant relationship between "emotional-cognitive readiness" and dimensions of psychological capital with 99% confidence level. Also, 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. Based on the value of the correlation coefficient, "self-efficacy" (0.516) and "resilience" (0.178) have the highest and lowest positive correlation with "emotional-cognitive readiness", respectively.

Second hypothesis and model

H_2. The social capital variable affects the cognitive-emotional readiness for scientific collaboration.

Structural equation analysis is used to test the model and investigate the effect of psychological capital on the cognitive-emotional readiness of scientific collaboration. According to the results of the Kolmogorov-Smirnov test, indicating the non-normality of data distribution, PLS 3 software was used to test the hypothesis and model; because one of the reasons for using PLS is that the data distribution of all variables in the research model is not normal (Henseler, Ringle & Sinkovics, 2009). The results of structural equation analysis to investigate the effect of psychological capital on cognitive-emotional readiness of scientific collaboration are shown in table 6. Since the t-value for the relationship between psychological capital and cognitive-emotional readiness is outside the range of 1.96 and -1.96. So we can conclude that this relationship with the 95% confidence level is significant. On the other hand, from the β coefficients, it can be concluded that psychological capital affects the cognitive-emotional readiness of scientific collaboration by 45%. Therefore, the second hypothesis was

confirmed.

Table 6
The effects of psychological capital on cognitive-emotional readiness score

Hypothesis	(standard β)	Standard deviation	t-value	P. Value	supported
psychological capital ➡ cognitive-emotional readiness	0.452	0.066	8.114	0.001	yes

Discussion

Scientific collaboration is one of the important processes in promoting and improving the scientific performance of scientific centers and researchers. Scientific collaboration seems to be a key factor in increasing scientific products and their quality. Today, the major role of scientific participation and collaboration in the economic, industrial, and cultural fields in industrial societies is felt significantly. Psychological capital is an important human capital that affects individuals' various activities. Psychological capital refers to an individual's psychological developmental condition that consists of four constructs: self-efficacy, optimism, resilience, and hope (Luthans et al., 2010).

This study examined the association between psychological capital dimensions and its effect on the emotional-cognitive readiness of faculty members for scientific collaboration considering the role of psychological capital and its dimensions on social interactions. Because one of the factors affecting scientific collaboration is the emotional-cognitive readiness of colleagues that recognizing the factors affecting this component can help in planning to strengthen psychological capital among faculty members of universities. After reviewing the literature, two hypotheses were developed, 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 of this study showed a positive and significant association between the psychological capital dimensions (self-efficacy, optimism, resilience, and hope) and cognitive-emotional readiness for scientific collaboration. Also, the results obtained from Structural Equation Modeling indicated the relative compatibility of the experimental model with the conceptual model of the research, which indicates the effect of psychological capital on cognitive-emotional readiness for scientific collaboration.

Based on the results, there is a positive and significant association between the "hope" dimension of psychological capital and the emotional-cognitive readiness of faculty members for scientific collaboration that as the level of the "hope" dimension of psychological capital increases, the level of cognitive-emotional readiness for scientific collaboration among faculty members increases. Hope motivates people when doing work (Çavuş & Gökçen, 2015). Studies also indicate that hope has an impact on life satisfaction (Valle, Huebner & Suldo, 2004), work satisfaction and performance (Luthans & Youssef, 2004), and motivation to deal with stressful events (Çavuş & Gökçen, 2015). People with more hope have more commitment and interest in group activities such as scientific collaboration. This study showed that hope could provide the ground for increasing and improving cognitive-emotional readiness among faculty members for scientific collaboration.

Resiliency allows people to see intolerable situations optimistically, and due to its reactive nature, it causes people to deal with all kinds of life situations (Çavuş & Gökçen, 2015). Resilient people look at things creatively and flexibly, which increases their readiness for individual and social activities. One of the goals of scientific collaboration is to use different opinions and perspectives 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 is a psychological intention to hope for the best positive outcome. It can positively affect people to make their life easier and relieve stress (Çavuş & Gökçen, 2015). Optimistic people can more easily trust their colleagues and have a positive sense of knowledge sharing (Hosseinpoor et al., 2017). This study also indicates 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. Stajkovic & Luthans (1998) showed a strong and positive relationship between self-efficacy and performance. There is also a positive relationship between self-efficacy and job satisfaction. (Judge, Thoresen, Bono & Patton, 2001). This study also indicates the effect of "self-efficacy" on cognitive-emotional readiness for scientific collaboration among faculty members. On the other hand, the results of the Spearman correlation test show that this dimension of psychological capital has a greater impact on "cognitive-emotional readiness" than other dimensions. This means that when people are confident in their abilities and talents in performing tasks, they are motivated to exchange information and share knowledge (Hosseinpoor et al., 2017; Zhang et al., 2017), which can increase the level of cognitive-emotional readiness for scientific collaborations.

In general, psychological capital, known as positive thinking, can prepare people for social communication such as scientific collaboration by empowering their way of thinking, motivating people, and increasing their flexibility in different situations. 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.

This result is in line with the studies of Ziyae, Mobaraki, & Saeediyoun (2015), Zhang et al. (2017), Hosseinpoor et al. (2017), which all indicate the relationship between psychological capital and its dimensions (self-efficacy, optimism, resilience, and hope) and some social activities such as organizational performance, job satisfaction, and knowledge sharing.

One of the dimensions of scientific collaboration is the attitude and level of emotional-cognitive readiness of researchers towards this issue. Emotional-cognitive readiness refers to individuals' feelings, interests, beliefs, and thoughts about scientific collaborations (Ghelbash Ghraehbalaghi Inaloo et al., 2017). The results showed that the factor of psychological capital could affect the emotional-cognitive readiness of faculty members for scientific collaboration, and up to 45% can be considered a predictor of it. This provides the ground for increasing emotional-cognitive readiness for scientific collaboration.

Conclusion

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 very important for scientific policymakers and managers. The findings of this study give university administrators the insight to increase scientific collaboration among faculty members. The factors affecting it should be identified and planned to strengthen them. This study indicates that psychological capital is an important factor in increasing the emotional cognitive readiness of faculty members as one component of scientific collaboration. So, managers can 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 faculty members increases.

Limitations and future research

This study confirmed the effect of psychological capital and its dimensions on the emotional cognitive readiness of faculty members for scientific collaboration as one of the components of scientific cooperation. This study was conducted on faculty members of Hamadan and Kurdistan universities of medical sciences, and this was a limitation for the study and this was a limitation for study, so it is suggested that a study be conducted on the wider population. Also, since various factors are influential in scientific collaboration, this study examined only one of the attitudinal factors, namely emotional-cognitive readiness, but other factors were not examined due to the extent of these factors. Therefore, it is suggested that research be conducted on the effect of psychological capital on the functional and behavioral factors of scientific collaboration.

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Ethical Statement

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

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest concerning this article's research, authorship, and publication.

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