Risk Management and Healthcare Policy

Dovepress
open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Relationships Between Perceived Organizational Support, Psychological Capital and Work Engagement Among Chinese Infection Control Nurses

Lingyun Tian[1,2], Anhua Wu[3], Wan Li[2], Xun Huang[3], Nan Ren[3], Xinyu Feng[4], Ying Zhang[2,3]

[1]Department of Nursing, the First Affiliated Hospital of USTC, Division of Life Sciences and Medicine, University of Science and Technology of China, Hefei, People's Republic of China; [2]Teaching and Research Section of Clinical Nursing, Xiangya Hospital, Central South University, Changsha, People's Republic of China; [3]Infection Control Center, Xiangya Hospital, Central South University, Changsha, People's Republic of China; [4]Xiangya School of Nursing, Central South University, Changsha, People's Republic of China

Correspondence: Ying Zhang, Tel +8613787263396, Email zhang_ying1013@hotmail.com

Background: Few studies have focused on the work engagement of infection control nurses (ICNs). The perceived organizational support (POS) and psychological capital (PsyCap) might be important factors influencing ICNs' work engagement. Moreover, PsyCap might play a mediating role in the relationship between POS and work engagement.

Objective: This study aims to clarify the relationships among POS, PsyCap and work engagement of Chinese ICNs.

Methods: A cross-sectional design was performed to collect data on 7382 ICNs from 20 provinces in China. Data collection was conducted by an online questionnaire, including questions about demographics, the Chinese version of the Utrecht work engagement scale (UWES), the Chinese version of the psychological capital questionnaire (PCQ) and the perceived organizational support scale for medical staff. Univariate analysis, the Spearman correlation method and the mediating effect test were conducted.

Results: The work engagement was at a relatively high level, with a total score of 80.87 ± 14.95. The total scores of POS and PsyCap scale were 41.45 ± 7.37 and 89.14 ± 9.06 respectively, both of which were at the upper-middle level. Work engagement was positively associated with both POS and PsyCap (both $P<0.01$). Furthermore, the mediating effect of PsyCap on the relationship between POS and work engagement was 0.394, the total effect was 0.443, and the ratio of mediating effect to total effect was 88.94%.

Conclusion: The findings suggest that both POS and PsyCap can directly increase the work engagement of the Chinese ICNs. Besides, POS can indirectly improve work engagement, partially through PsyCap. Therefore, enhancing POS and PsyCap could be effective in improving the work engagement of ICNs.

Keywords: infection control nurses, mediating effect test, perceived organizational support, psychological capital, work engagement

Introduction

Nosocomial infection is the most common adverse event in global health services. It is reported that hundreds of millions of patients worldwide become infected in hospitals each year, leading to high mortality and financial losses for health systems.[1] In China, there are about 5 million cases of nosocomial infections annually, and the economic loss is as high as 10–15 billion yuan.[2] With the progress in medical techniques, novel diagnoses, and treatments have been gradually employed, and traumatic and invasive interventions have been introduced in hospitals in recent years. As a result, the source, transmission path, and susceptible population of nosocomial infection have been thoroughly changed. Furthermore, the generation of multidrug-resistant bacteria has enhanced the rate of refractory infections.[3] To maximize the rational use of medical resources, medical institutions should attach importance to practical and effective measures for the prevention and control of nosocomial infection. Infection control nurses (ICNs), as an important part of hospital infection management, refer to registered nurses specialized in nosocomial infection control monitoring, supervision, guidance, training, and management. Clinically, ICNs are also responsible for monitoring risk factors associated with nosocomial infections in medical activities, implementing safety precautions (disinfection and isolation measures), and

Received: 3 November 2022
Accepted: 3 March 2023
Published: 3 April 2023

disposing and managing medical waste in medical institutions.[4,5] Besides, ICNs also propose scientific advice, support and guide the medical staff in the management of nosocomial infection.[6,7]

Work engagement refers to an active, fulfilling, affective-motivational state in the working, and it is symbolized by vitality, devotion, and concentration.[8] As a positive work attitude, work engagement is a vital assessment index of the individual work potential and work effect optimization.[9] Halbesleben and Wheeler have indicated that the higher the employee's engagement and energy level, the stronger the employee's sense of participation in work activities.[10] Conversely, the low work engagement of dominant practitioners results in a negative work attitude.[11] At present, ICNs are the main full-time personnel of hospital infection management in China, accounting for about 70%; the remaining 30% are professional staff with other backgrounds such as clinical medicine and laboratory medicine.[12] It can be seen that ICNs play a crucial role in Chinese hospital infection management, and the work engagement of ICNs determines the implementation and quality of nosocomial infection management in China to some extent.

In the previous study, the job demands-resources (JD-R) model was used to predict work engagement.[13] The health-impairment process and the motivational process are integrated with the JD-R theory.[14] Specifically, the health-impairment process is a response to the demands of the job, which can lead to negative outcomes such as burnout. When job and personal resources increase work engagement, the motivational process concerned in this study occurs.[14] Job resources are considered to be the most important predictors of work engagement, contributing to both daily and long-term work engagement.[15,16] Perceived organizational support (POS), is a type of job resource that reflects employees' perception of the organization's support and concern for their contributions, interests, or benefits.[17,18] The existing studies have shown that POS has a good predictive effect on work engagement.[19,20] As a personal resource, psychological capital (PsyCap) is a measurable and exploitable positive mental state formed by an individual in their growth and development. The PsyCap mainly includes four dimensions: self-efficacy, optimism, hope, and resiliency.[21] Individuals with higher PsyCap have higher work engagement as they are better equipped to deal with adverse factors and have a positive attitude towards work.[22,23]

The JD-R model suggests that both job resources and personal resources have important effects on work engagement. The conservation of resources (COR) theory claims that resources, or resource shortages, tend to exist in clusters, rather than in isolation. For instance, individuals with high self-esteem also have a greater sense of self-control ability and receive better social support.[24] Therefore, POS and PsyCap might have comprehensive influences, contributing to the work engagement of the individuals. Previous studies have confirmed that POS can indirectly affect nurses' work engagement through the intermediary role of PsyCap.[25,26]

However, to the best of our knowledge, the correlations among POS, PsyCap, and work engagement of ICNs have not yet been confirmed. Accordingly, based on the JD-R model and COR theory, job and personal resources were focused on, the status quo of the POS, PsyCap, and work engagement of Chinese ICNs was explored, and their correlations were analyzed, especially the mediating effect of PsyCap between POS and work engagement. In addition, the three hypotheses were proposed as follows (Figure 1): (1) POS is positively associated with work engagement; (2) PsyCap is positively associated with work engagement; (3) The effects of POS on work engagement are partially mediated by PsyCap.

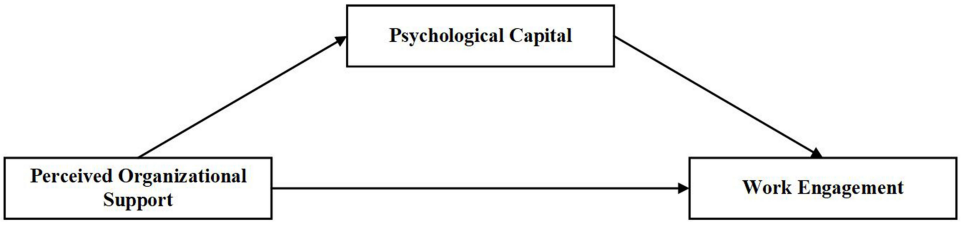

Figure 1 Theoretical model of the mediating role of PsyCap on the association between POS and work engagement.

Method

Participants and Sampling

A national cross-sectional survey was conducted by convenient sampling. The ICNs (> 18 years old) in China were taken as the research subjects. The criteria for inclusion of ICNs were as follows: (1) Registered nurse; (2) Full-time staff of the infection control department in the hospitals; (3) Voluntarily participated in the survey with informed consent. These ICNs who were not on the job for sick leave, maternity leave, or other reasons were not included. Finally, a total of 7479 ICNs from 3144 hospitals in 20 provinces were involved in the survey, and a total of 7382 (98.70%) valid questionnaires were obtained. When all answers in the questionnaire were identical, or the response time of the whole questionnaire was less than 3 minutes, this questionnaire was invalid and eliminated.

Measurements

Demographic data were collected. Data included age, gender, marital status, highest education, post category, years of working in the department, work part-time in other departments, average working hours per week, average monthly income, the number of beds in a hospital, hospital level, hospital nature, and hospital location (the specific economic region).

Work engagement was assessed by the Chinese version of the Utrecht Work Engagement Scale (UWES), which was developed by Schaufeli et al and adapted by Li et al. The version was composed of 16 items and 3 dimensions, namely vigor, dedication, and absorption.[27,28] A 6-point Likert scale was assigned to each item, and the total score range was 16–96 points; the higher total score suggested a higher degree of work engagement. This scale has been verified by Chinese medical staff with good reliability, and its overall and various dimensions Cronbach's α range from 0.890 to 0.957.[29] In our research, the Cronbach's α of the total scale and three dimensions (vigor, absorption, and dedication) were 0.943, 0.851, 0.917 and 0.883, respectively.

The psychological capital questionnaire (PCQ) was developed by Luthans to evaluate psychological capital in 2007.[30] In the Chinese version of the PCQ, there were 4 dimensions (ie, self-efficacy, hope, optimism, and resilience) and 24 items.[31] The Likert 5-point scoring was assigned to each item of the scale, and the total score ranged from 24–120 points; a higher total score indicated a higher level of PsyCap. Research has shown that Cronbach's α of the total scale is 0.879, and the range of Cronbach's α of the dimensions is 0.768–0.814, which has good reliability among medical staff.[31] In our research, Cronbach's α of the total scale and four dimensions (self-efficacy, hope, optimism, and resilience) were 0.903, 0.874, 0.607, 0.865, and 0.685, respectively.

The 24-item perceived organizational support scale developed by Ling et al was used to measure the POS of employees.[32] Meng modified the original scale to obtain the perceived organizational support scale for medical staff, which contained 12 items and 3 dimensions, namely support for work, concerns for interests, and value identity.[31] The Likert 5-point scoring was assigned to each item of the scale, and the total score ranged from 12 to 60 points; the higher the total score, the higher level of POS. The previous study has shown that this scale was suitable for the Chinese medical staff with excellent reliability (Cronbach's α ranging from 0.828 to 0.951).[31] In our research, the overall Cronbach's α for the scale was 0.923, and the Cronbach's α was 0.879 in support for work, 0.869 in concern for interests, and 0.688 in value identity.

Data Collection

The electronic questionnaire was published on the "Questionnaire Star" online survey platform which is a professional questionnaire survey tool in China. The purpose, content, significance, filling instructions, and confidentiality of the survey were clearly stated. With the assistance of the National Hospital Infection Monitoring and Management Training Base and the Platform of the Hospital Infection Control Branch of the Chinese Preventive Medicine Association, the network link of questionnaires was delivered to the directors of hospital infection control departments, and then distributed to ICNs from March 27, 2020 to April 8, 2020. The ICNs answered the questions online by using a computer or mobile phone and submitted the questionnaires only if they completed all the options. To prevent repeated filling, the same IP address, computer or mobile phone was allowed to submit the questionnaire once.

Ethical Considerations

The study was authorized by the Ethic Committee of the Xiangya Hospital of Central South University (Certificate: IRB202002011). Meanwhile, the information on confidentiality was attached to the electronic questionnaire on the homepage of the questionnaire. Before filling out the questionnaire, the respondent was provided with an electronic informed consent form with two choices (yes/no). Respondents who selected "yes" can start to answer the questionnaire, and they can exit and give up answering at any time during the survey period. All procedures complied with the Declaration of Helsinki.

Statistical Analysis

All statistical analysis was performed by the SPSS 20.0 and Amos 22.0 statistical software. And the P-P plot and Q-Q plot were employed to reveal the data distribution. The continuous variables were represented by means (standard deviations) or medians (P25, P75), and the counting variables were represented by frequency (percentage). In the univariate analysis of work engagement of ICNs, for dichotomous data, a *t*-test was used if the variance was homogeneous, and the Mann–Whitney *U*-test was used if the variance was heterogeneous; for multiple classified data, ANOVA was used if the variance was homogeneous, and Kruskal–Wallis *H*-test was used if the variance was heterogeneous. Multiple comparisons were completed using the Bonferroni corrections if a relevant test result was significant. Pearson or Spearman correlation was performed to analyze the correlation among POS, PsyCap and work engagement. The mediating effect test proposed by Baron and Kenny was used to analyze whether PsyCap can mediate the correlation between POS and work engagement of ICNs.[33] To further verify the mediating effect, AMOS 22.0 was used to establish a structural equation model; POS, PsyCap and work engagement were taken as the independent variable, mediating variable, and dependent variable, respectively; the maximum likelihood method was used to test the mediating effect. In this study, two-tailed $P < 0.05$ was considered statistically significant.

Results

Demographic Information

The majority of respondents were female (99.38%) and married (92.51%). Most had a bachelor's degree (61.31%) and were in professional and technical posts (55.08%). In terms of work experience, the largest group (41.57%) had worked for 1–5 years, and over half (51.44%) worked part-time in other departments. The average working time per week for the majority of respondents (57.14%) was 35–45 hours, and over half (54.50%) had an average monthly income of 3000–6000 yuan. Table 1 presents the basic information of 7382 ICNs in this study.

Statistical Description of POS, PsyCap, and Work Engagement

The scores of ICNs' work engagement, POS, and PsyCap were approximately normal distribution. As shown in Table 2, the total scores of work engagement, POS and PsyCap were 80.87 ± 14.95, 41.45 ± 7.37, and 89.14 ± 9.06, and their items' average scores were 5.05 ± 0.93, 3.45 ± 0.61 and 3.71 ± 0.38, respectively.

Univariate Analysis on Work Engagement of ICNs

According to the results of the univariate analysis on work engagement of ICNs, the differences in age, highest education, average monthly income, post category, years of working in the department, average working hours per week, hospital nature, hospital level, hospital location (the specific economic region) and the number of beds in the hospital were compared between groups and were statistically significant ($P < 0.05$) (Table 1).

Correlation Analysis

The Pearson correlation analysis revealed significant correlations between POS, PsyCap, and work engagement. Specifically, the POS and its dimensions were positively correlated with work engagement and its dimensions (r=0.218–0.403, $P<0.01$), as well as PsyCap and its dimensions (r=0.297–0.520, $P<0.01$). The PsyCap and its dimensions were also positively correlated with work engagement and its dimensions (r=0.301–0.604, $P<0.01$), as shown in Table 3.

Table 1 Basic Information and Distribution of Work Engagement on ICNs (N=7382)

Demographics	All (n=7382)	Mean (SD)	Statistical values	*P*	Bonferroni' s Multiple Comparison (*P*<0.05)
Age (y)			122.910[a]	<0.001	19–35 vs 51–64; 19–35 vs ≥65; 36–50 vs 51–64; 36–50 vs ≥65; 51–64 vs ≥65
19–35	1605 (21.74%)	80.09 (16.06)			
36–50	4539 (61.49%)	80.06 (14.52)			
51–64	1218 (16.50%)	84.75 (14.36)			
≥65	20 (0.27%)	92.35 (10.97)			
Gender			−0.281[b]	0.778	NA
Male	46 (0.62%)	81.93 (18.12)			
Female	7336 (99.38%)	80.87 (14.93)			
Marital status			2.646[a]	0.266	NA
Unmarried	314 (4.25%)	80.08 (17.38)			
Married	6829 (92.51%)	80.91 (14.82)			
Divorce or bereavement	239 (3.24%)	80.76 (15.28)			
Highest education			12.865[a]	0.005	Bachelor degree vs College degree or below
College degree or below	2795 (37.86%)	81.63 (15.47)			
Bachelor degree	4526 (61.31%)	80.38 (14.60)			
Master degree	59 (0.80%)	82.76 (15.28)			
Doctoral degree	2 (0.03%)	82.00 (5.66)			
Post category			27.437[c]	<0.001	Professional and technical posts vs Management post; Professional and technical posts vs Work skill post; Management post vs Work skill post
Professional and technical posts	4066 (55.08%)	80.08 (15.06)			
Management post	3221 (43.63%)	82.08 (14.63)			
Work skill post	95 (1.29%)	73.68 (16.68)			
Years of working in department			75.640[a]	<0.001	1–5 year vs 10–15 year; 1–5 year vs 15–20 year; 1–5 year vs More than 20 year; Less than 1 year vs 15–20 year; Less than 1 year vs More than 20 year; 5–10 year vs 10–15 year; 5–10 year vs 15–20 year; 5–10 year vs More than 20 year
Less than 1 year	1345 (18.22%)	81.14 (15.83)			
1–5 year (including 5 year)	3069 (41.57%)	79.72 (14.66)			
5–10 year (including 10 year)	1861 (25.21%)	80.81 (14.75)			
10–15 year (including 15 year)	691 (9.36%)	82.94 (14.53)			
15–20 year (including 20 year)	244 (3.31%)	84.81 (14.67)			
More than 20 year	172 (2.33%)	86.08 (14.25)			
Work part-time in other department			−0.717[d]	0.473	NA
No	3797 (51.44%)	80.75 (15.21)			
Yes	3585 (48.56%)	81.00 (14.67)			
Average working hours per week			27.135[a]	<0.001	Less than 35 hours vs 61–80 hours; 35–45 hours vs 61–80 hours
Less than 35 hours	308 (4.17%)	80.70 (15.48)			
35–45 hours	4218 (57.14%)	80.22 (15.03)			
46–60 hours	2457 (33.28%)	81.58 (14.54)			
61–80 hours	321 (4.35%)	83.45 (14.73)			

(*Continued*)

Table 1 (Continued).

Demographics	All (n=7382)	Mean (SD)	Statistical values	*P*	Bonferroni' s Multiple Comparison (*P*<0.05)
More than 80 hours	78 (1.06%)	83.58 (19.10)			
Average monthly income (yuan)			25.784[a]	<0.001	Less than 3000 vs More than 12,000; 3000–6000 vs More than 12,000; 6001–9000 vs More than 12,000
Less than 3000	447 (6.06%)	80.00 (18.04)			
3000–6000	4023 (54.50%)	80.49 (15.05)			
6001–9000	2023 (27.40%)	81.13 (14.18)			
9001–12,000	639 (8.66%)	81.64 (14.44)			
More than 12,000	250 (3.39%)	84.61 (13.95)			
Number of beds in hospital			23.396[a]	<0.001	100–499 vs Less than 100; 100–499 vs 500–1000; 100–499 vs 1001–2000
Less than 100	2172 (29.42%)	81.96 (15.64)			
100–499	2935 (39.76%)	79.89 (14.73)			
500–1000	1594 (21.59%)	80.81 (14.32)			
1001–2000	508 (6.88%)	81.93 (15.16)			
2001–3000	105 (1.42%)	80.61 (14.04)			
More than 3000	68 (0.92%)	82.66 (13.17)			
Hospital level			16.300[a]	0.001	Second-class hospital vs Third-class hospital
Unranked	679 (9.20%)	82.23 (15.37)			
First-class hospital	1272 (17.23%)	81.99 (15.55)			
Second-class hospital	3853 (52.19%)	80.18 (14.82)			
Third-class hospital	1578 (21.38%)	81.08 (14.49)			
Hospital nature			−6.702[b]	<0.001	NA
Private hospital	1293 (17.52%)	83.45 (15.05)			
Public hospital	6089 (82.48%)	80.32 (14.87)			
Hospital location			25.530[a]	<0.001	Central economic region vs Northeast economic region; Western economic region vs Northeast economic region
Eastern economic region	2538 (34.38%)	81.12 (15.10)			
Central economic region	2331 (31.58%)	80.15 (14.58)			
Western economic region	1936 (26.23%)	80.47 (14.41)			
Northeast economic region	577 (7.82%)	84.07 (16.97)			

Note: [a]H value obtained using Kruskal–Wallis-*H* test; [b]Z value obtained using Mann–Whitney *U*-test; [c]F value obtained using variance test; [d]t value obtained using *t*-test.
Abbreviations: SD, standard deviation; NA, None.

Mediating Effect Analysis

The correlations of POS, PsyCap and work engagement of ICNs satisfied the premise of the mediating effect analysis, and the results of mediating effect analysis were obtained, as shown in Table 4. On the premise of controlling for the influence of demographic data with statistically significant differences in univariate analysis, the following steps were performed: (1) Regression analysis was carried out with the work engagement as a dependent variable and the POS as an independent variable. The results showed that the POS had a positive predictive effect on the work engagement of ICNs (β'=0.402, P<0.05). (2) Regression analysis was conducted with PsyCap as a dependent variable and POS as an independent variable. The results showed that POS had a positive predictive effect on the PsyCap of ICNs (β'=0.529, P<0.05). (3) Regression analysis was carried out with work engagement as a dependent variable, POS and PsyCap as independent variables. The results showed that the predictive effect of POS on work engagement of ICNs decreased from 0.402 to 0.118. Therefore, PsyCap plays a certain mediating effect between POS and work engagement of ICNs.

Table 2 Total Score and Items' Average Score of the Main Variables (N=7382)

Variables	Total Score (Mean±SD)	Average Score of Items (Mean±SD)
Work engagement	80.87±14.95	5.05±0.93
Vigour	29.39±5.70	4.90±0.95
Dedication	25.0±25.84	5.00±1.17
Absorption	26.46±5.01	5.29±1.00
POS	41.45±7.37	3.45±0.61
Support for work	17.71±3.36	3.54±0.67
Concerns for interests	12.75±3.10	3.19±0.77
Value identity	10.99±1.76	3.66±0.59
PsyCap	89.14±9.06	3.71±0.38
Self-efficacy	23.80±2.62	3.97±0.44
Hope	21.52±2.70	3.59±0.45
Resilience	21.57±2.58	3.60±0.43
Optimism	22.25±3.13	3.71±0.52

Abbreviations: POS, perceived organizational support; PsyCap, psychological capital; SD, standard deviation.

To further verify the mediating effect, AMOS 22.0 statistical software was used to establish a structural equation model, in which POS, PsyCap and work engagement were taken as the independent variable, mediating variable and dependent variable, respectively. The mediating effect test was carried out by the maximum likelihood method. The model-fitting results showed that $\chi 2$ / df = 40.572, RMSEA = 0.073, GFI = 0.966, AGFI = 0.942, NFI = 0.969, CFI = 0.970, IFI = 0.970, as shown in Figure 2. The direct effect of POS on work engagement was 0.049. The mediating effect of PsyCap on the correlation between POS and work engagement was 0.394, the total effect was 0.443, and the ratio of mediating effect to the total effect was 88.94% (Table 5).

Discussion

Through the cross-sectional survey on the current status of work engagement of ICNs in China, we found that the ICNs' work engagement is at a relatively high level, which is higher than that of other nurse groups.[34,35] In other words, most Chinese ICNs are energetic, enthusiastic and willing to contribute to work, and they can persevere in the face of

Table 3 Correlations (r) of the Main Variables (N=7382)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Vigour	1												
2. Dedication	0.739*	1											
3. Absorption	0.691*	0.732*	1										
4. Work engagement	0.902*	0.918*	0.885*	1									
5. Support for work	0.370*	0.403*	0.258*	0.385*	1								
6. Concerns for interests	0.323*	0.336*	0.218*	0.327*	0.784*	1							
7. Value identity	0.302*	0.312*	0.248*	0.321*	0.605*	0.633*	1						
8. POS	0.377*	0.399*	0.268*	0.390*	0.930*	0.928*	0.780*	1					
9. Self-efficacy	0.445*	0.452*	0.433*	0.492*	0.369*	0.316*	0.366*	0.388*	1				
10. Hope	0.387*	0.392*	0.301*	0.402*	0.409*	0.405*	0.373*	0.446*	0.431*	1			
11. Resilience	0.475*	0.429*	0.396*	0.482*	0.345*	0.313*	0.297*	0.360*	0.531*	0.528*	1		
12. Optimism	0.584*	0.564*	0.451*	0.595*	0.489*	0.433*	0.395*	0.499*	0.627*	0.577*	0.677*	1	
13. PsyCap	0.581*	0.564*	0.483*	0.604*	0.496*	0.450*	0.438*	0.520*	0.785*	0.772*	0.829*	0.891*	1

Note: *P<0.01.
Abbreviations: POS, perceived organizational support; PsyCap, psychological capital.

Table 4 Mediating Effect Analysis in the POS-PsyCap-Work Engagement Relationships on ICNs (N=7382)

Step	Regression Equation	Adjusted R^2	β	SE	β'	95% CI	*P*
Step 1	Y=0.402X	0.179	0.815	0.022	0.402	0.773–0.858	<0.001
Step 2	M=0.529X	0.290	0.650	0.012	0.529	0.626–0.674	<0.001
Step 3	Y=0.118X	0.383	0.239	0.022	0.118	0.196–0.283	<0.001
	+0.537M		0.885	0.018	0.537	0.850–0.920	<0.001

Note: X=POS; Y=work engagement; M=PsyCap.
Abbreviations: POS, perceived organizational support; PsyCap, psychological capital.

difficulties. The reasons are explained as follows. Firstly, the status of ICNs is significant among specialist nursing in our country.[12] Since the ICNs' professional duty meets the clinical needs for nosocomial infection prevention and control, the importance of ICNs is gradually emphasized by hospital administrators.[36] As a result, the ICNs' professional identity is enhanced, and their work engagement is increased. Secondly, the effective implementation of the scientific performance appraisal and salary distribution policies formulated at the national level in recent years has mobilized the enthusiasm of the ICNs. Finally, our data collection was performed during the domestic COVID-19 outbreak, and ICNs have received much attention during this period. The Chinese government has strengthened the prevention and control of hospital infections and raised the management of nosocomial infections to an unprecedented height. In other words, in the context of the COVID-19 outbreak and the national call, the ICNs are more fully engaged in this anti-epidemic work as the core force to ensure the smooth and efficient implementation and completion of hospital infection management.

As hypothesized, there is a significant positive correlation between POS and work engagement, and it has a direct predictive effect on the work engagement of ICNs. Namely, ICNs with a higher POS have a higher level of work engagement, which is consistent with the research results of other nurse groups.[25,35,37,38] Based on the JD-R model, adequate job resources (such as organizational support) stimulate the workers' motivation and leads to engagement.[15]

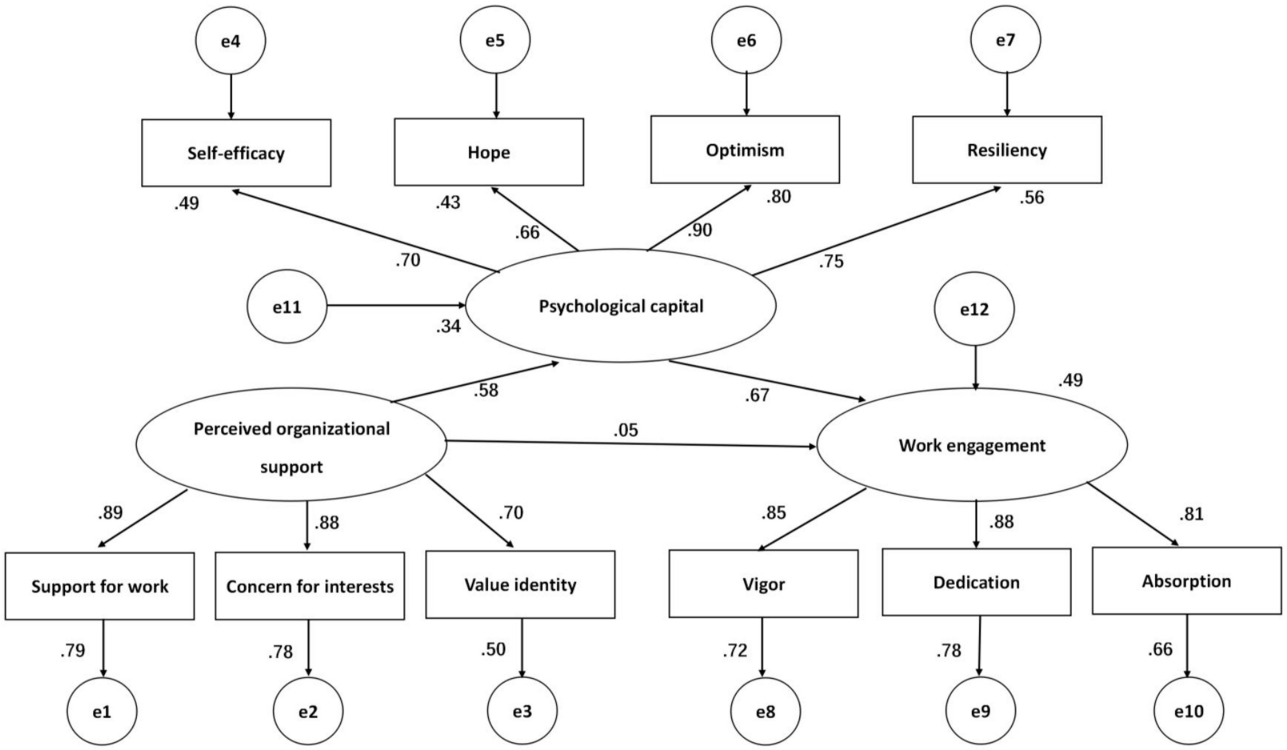

Figure 2 Model of the mediating effect of PsyCap on the association between POS and work engagement on ICNs.

Table 5 Mediating Effect of PsyCap on the Association Between POS and Work Engagement on ICNs (N=7382)

Path	Direct Effect	Indirect Effect	Total Effect
POS→PsyCap	0.585*		0.585*
POS→PsyCap→work engagement	0.049*	0.394*	0.443*
PsyCap→work engagement	0.673*		0.673*

Note: *P<0.001.
Abbreviations: POS, perceived organizational support; PsyCap, psychological capital.

The results of this study are consistent with the predictions of the COR theory. Specifically, organizations can inspire employees to be motivated and keep good working conditions, to decrease the physical and mental drain of employees on resources and burnout at work. In this way, workers are more concentrated on their tasks and concentrated and strive for their goals. Moreover, the social exchange theory has pointed out that when employees perceive the organization's support for themselves, employees will have a sense of obligation to pay for the organization, so employees are willing to work hard and contribute their strength to achieve organizational goals.[39] The ICNs who feel the support of the organization will feel that they are valuable, affirmed and accepted, and thus will be more enthusiastic about their work. It is reminded that nursing managers can take active measures to intervene in the POS to influence and improve the work engagement of ICNs. Rohades reported that organizational fairness, superior support, rewards from the organization and good working conditions are important variables that affect the POS.[18] In addition, the results of semi-structured in-depth interviews show that the POS of clinical nurses is mainly reflected in four themes, namely personal value, welfare benefits, career development and work-related support.[40] The above research results suggest that nursing managers need to pay attention to their personal growth and provide more emotional support while providing material support to the ICNs to improve the POS.

PsyCap is the driving force for nurses to work efficiently and can keep nurses with a lasting enthusiasm for work.[41] In this study, it is found that PsyCap is positively correlated with work engagement, and PsyCap is significantly positively predicted work engagement, indicating that the higher the PsyCap, the higher the level of work engagement of ICNs, which is consistent with the research results of other nurse groups.[25] Based on the correlation between PsyCap and work engagement, the following speculations are made for the ICNs: (1) ICNs with a high sense of self-efficacy believe that they can achieve their work goals after investing a certain amount of time and effort. Therefore, they will be energetic in their work and perseverant in the face of difficulties; (2) Hopeful ICNs have a positive expectation for their work. This motivation for success will motivate them to devote themselves to the work; (3) Resilience can help ICNs actively cope with difficulties and not give up easily; (4) Optimism can protect ICNs' physical and mental health in coping with stress. For instance, when a positive event occurs, optimistic ICNs attribute it to their own, persistent and universal reasons, which is a good self-motivation for themselves; when a negative event occurs, they attribute it to external, temporary and situation-related reasons and are less likely to feel pessimistic and helpless.

Furthermore, PsyCap has a partial mediating effect on the impact of POS on ICNs' work engagement, that is, personal resources can strengthen the positive role between job resources and work engagement. This finding is consistent with the results of other nurse and medical staff groups.[25,42] PsyCap can be effective in helping the ICNs deal with negative emotions resulting from inadequate organizational support. Therefore, when the ICNs with a high level of PsyCap perceive the low organizational support for their work, their emotional regulation ability can buffer (or reduce) the impact of organizational support on job engagement. Conversely, even if the ICNs believe that the organization provides strong support for their work, the work engagement can be reduced by their poor PsyCap. Considering the direct predictive effect of PsyCap on work engagement and the mediating effect of PsyCap between POS and work engagement, nursing managers should pay more attention to developing the PsyCap of ICNs, so as to encourage individuals to work more intently. Based on PsyCap intervention theory,[43] the following methods can be used,

including the short-term Vipassana therapy,[44] focused solution mode,[45] mindfulness reduction,[46] the introduction of employee assistance program,[47] Satya transformational group therapy.[48]

Therefore, nursing managers should take a series of measures to improve the work engagement of ICNs. For instance, nursing managers can provide organizational support for ICNs from different aspects (such as humanistic environment, working system and process, salary and welfare) and create a relatively comfortable and convenient working environment to ensure that ICNs can devote themselves to their work. At the same time, nursing managers should also strengthen ICNs psychological assessment, psychological training and other measures to improve their psychological capital. In this way, the confidence to complete the work and the psychological resilience in the face of work pressure of ICNs will be stimulated, and positive emotions of hope and optimism are also mobilized, thus generating a higher level of work engagement.

Study Limitations

Although these findings are notable, there are still several limitations. Firstly, the cross-sectional research is designed to explore the mechanism of ICNs' work engagement based on the JD-R model and COR theory, however, it is not clear whether there is a causal relationship between POS, PsyCap and work engagement of ICNs. The relationship between different variables (in Figure 2) is not a direct causal relationship, but an association with a certain causal sequence, which needs to be confirmed in future longitudinal studies. Secondly, a convenient sampling method is adopted in the study, leading to the uneven distribution of demographic variables. For gender variables, male ICNs only account for 0.62%, which affects the sample representativeness of the study population. In future research, a variety of demographic variables and random probability sampling methods should be used, and the scope of research objects should be enlarged to improve the applicability and reliability of research results. Besides, although a comprehensive statistical data analysis method is used to increase the reliability of research results, the data collected by self-report and self-assessment of the research subjects may be exaggerated or reduced, resulting in inaccurate results. Finally, our data are collected during the fight against COVID-19 in China. As an individual characteristic of a state type, PsyCap has a large degree of malleability and changes under different circumstances, varying with the change of the work situation.[49] Hence, it is reasonable to wonder whether PsyCap levels in China's ICNs have changed in response to COVID-19 compared to other non-challenging environments. If so, does the PsyCap level further affect their work engagement during the epidemic prevention period? Due to the impact of special circumstances, we have to consider the current situation of the POS, PsyCap and work engagement of ICNs in other situations. In the future, research on the group of ICNs under other situations should be conducted.

Conclusion

In summary, the work engagement of Chinese ICNs is at a relatively high level, and the POS and PsyCap are at the upper-middle level. The POS and PsyCap are positively correlated with work engagement, and both directly affect work engagement. PsyCap can mediate the correlation between POS and work engagement to a certain extent. Therefore, nursing managers should take a series of measures to make ICNs perceive that the organization attaches importance to their work. The higher the POS value, the higher the level of organizational care, recognition and attention experienced by the ICNs. Finally, the ICNs will have a strong sense of professional self-identity and self-worth, and be more loyal to the organization, and be more active, devoted and energetic to work. Moreover, nursing managers should also help enhance ICNs' PsyCap, which can inhibit the negative influence of adverse factors on individuals, and the individual's attitude and investment in work are changed.

Acknowledgments

We thank all frontline ICNs of this study for their time and dedication. We would also like to thank the hospitals. The authors acknowledge the feedback from Minhui Liu, PhD, RN, on our earlier draft of this manuscript.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This work was supported by the Surface Project of the Natural Science Fund of Hunan Province [grant number 2019JJ40403] and the Health Commission of Hunan Province [grant number 202215024619].

Disclosure

The authors have no conflict of interest to declare in this work.

References

1. World Health Organization. *Global Report on Infection Prevention and Control*. World Health Organization; 2022.
2. Cai M, Liu JY. New progress in best clinical practice of nosocomial infection prevention and control. *Chin Clin Dr*. 2016;44(4):1–6. doi:10.3969/j.issn.2095-8552.2016.04.001
3. Sun B. Nosocomial infection in China: management status and solutions. *Am J Infect Control*. 2016;44(7):851–852. doi:10.1016/j.ajic.2016.01.039
4. Murphy DM, Hanchett M, Olmsted RN, et al. Competency in infection prevention: a conceptual approach to guide current and future practice. *Am J Infect Control*. 2012;40(4):296–303. doi:10.1016/j.ajic.2012.03.002
5. Henman LJ, Corrigan R, Carrico R, et al. Identifying changes in the role of the infection preventionist through the 2014 practice analysis study conducted by the Certification Board of Infection Control and Epidemiology, Inc. *Am J Infect Control*. 2015;43(7):664–668. doi:10.1016/j.ajic.2015.02.026
6. Choi JS, Kim KM. Crisis prevention and management by infection control nurses during the Middle East respiratory coronavirus outbreak in Korea. *Am J Infect Control*. 2016;44(4):480–481. doi:10.1016/j.ajic.2015.10.032
7. Oh HS. Knowledge, perception, performance, and attitude regarding hand hygiene and related factors among infection control nurses in South Korea: a cross-sectional study. *Am J Infect Control*. 2019;47(3):258–263. doi:10.1016/j.ajic.2018.09.006
8. Bakker AB, Schaufeli WB, Leiter MP, et al. Work engagement: an emerging concept in occupational health psychology. *Work Stress*. 2008;22(3):187–200. doi:10.1080/02678370802393649
9. Salanova M, Agut S, Peiró JM. Linking organizational resources and work engagement to employee performance and customer loyalty: the mediation of service climate. *J Appl Psychol*. 2005;90(6):1217–1227. doi:10.1037/0021-9010.90.6.1217
10. Halbesleben JRB, Wheeler AR. The relative roles of engagement and embeddedness in predicting job performance and intention to leave. *Work Stress*. 2008;22(3):242–256. doi:10.1080/02678370802383962
11. Denton DA, Newton JT, Bower EJ. Occupational burnout and work engagement: a national survey of dentists in the United Kingdom. *Br Dent J*. 2008;205(7):E13–E383. doi:10.1038/sj.bdj.2008.654
12. Li LY, Guo YH, Zhao YC, et al. National investigation of professional system of nosocomial infection control and management. *Chin J Nosocomiol*. 2005;15(03):78–80. doi:10.3321/j.issn:1005-4529.2005.03.025
13. Lan T, Chen M, Zeng X, Liu T. The influence of job and individual resources on work engagement among Chinese police officers: a moderated mediation model. *Front Psychol*. 2020;11:497. doi:10.3389/fpsyg.2020.00497
14. Bakker AB, Demerouti E. Job demands-resources theory: taking stock and looking forward. *J Occup Health Psychol*. 2017;22(3):273–285. doi:10.1037/ocp0000056
15. Bakker AB, Demerouti E, Sanz-Vergel AI. Burnout and work engagement: the JD–R approach. *Annu Rev Public Health*. 2014;1(1):389–411. doi:10.1146/annurev-orgpsych-031413-091235
16. Christian MS, Garza AS, Slaughter JE. Work engagement: a quantitative review and test of its relations with task and contextual performance. *Pers Psychol*. 2011;64(1):89–136. doi:10.1111/j.1744-6570.2010.01203.x
17. Battistelli A, Galletta M, Vandenberghe C, et al. Perceived organisational support, organisational commitment and self-competence among nurses: a study in two Italian hospitals. *J Nurs Manag*. 2016;24(1):E44–E53. doi:10.1111/jonm.12287
18. Rhoades L, Eisenberger R. Perceived organizational support: a review of the literature. *J Appl Psychol*. 2002;87(4):698–714. doi:10.1037/0021-9010.87.4.698
19. Xu D, Zhang N, Bu X, et al. The effect of perceived organizational support on the work engagement of Chinese nurses during the COVID-19: the mediating role of psychological safety. *Psychol Health Med*. 2022;27(2):481–487. doi:10.1080/13548506.2021.1946107
20. Yang S, Huang H, Qiu T, et al. Psychological capital mediates the association between perceived organizational support and work engagement among Chinese doctors. *Front Public Health*. 2020;8:149. doi:10.3389/fpubh.2020.00149
21. Luthans F, Youssef-Morgan CM. Psychological capital: an evidence-based positive approach. *Annu Rev Public Health*. 2017;4:339–366.
22. Wan PY, Xu MJ, Huang XN, et al. Correlation between work-family conflict and job involvement of hotel frontline staffs: psychological capital's mediating role and gender's modulating role. *Modern Prev Med*. 2016;43:3543–3546.
23. Zhang M, Chen H, Wang N, et al. The mediating role of job satisfaction between psychological capital and work engagement among Chinese nurses during COVID-19 outbreak: a comparative study between nurse specialists and general nurses. *Front Psychiatry*. 2023;13:990216. doi:10.3389/fpsyt.2022.990216
24. Rini CK, Dunkel-Schetter C, Wadhwa PD, et al. Psychological adaptation and birth outcomes: the role of personal resources, stress, and sociocultural context in pregnancy. *Health Psychol*. 1999;18(4):333–345.

25. Liu J, Yang YJ, Zhu HY, et al. Mediating effect of psychological capital of nurses between perceived organizational support and work engagement. *Chin J Public Health*. 2019;35(04):475–477. doi:10.11847/zgggws.1121234
26. Wang J, Liu WC, Mi J, et al. Status and correlation analysis of perceived organizational support, psychological capital and work engagement among frontline nurses fighting against COVID-19 in Chongqing. *Chin Nurs Res*. 2020;34(17):3068–3073.
27. Schaufeli WB, Salanova M, González-Romá V, et al. The measurement of engagement and burnout: a two sample confirmatory factor analytic approach. *J Happiness Stud*. 2002;3(1):71–92.
28. Li JB, Xu BH, Chen JM. A study on the organizational factors influencing employees' work engagement. *Chin J Appl Psych*. 2006;12 (02):176–181. doi:10.3969/j.issn.1006-6020.2006.02.012
29. Chen X. *Research on the Relationship Between Medical Staff Doctor-Patient Relationship, Perceived Organizational Support and Work Engagement*. Guangxi Univ; 2016.
30. Luthans F, Youssef CM, Avolio BJ. *Psychological Capital: Developing the Human Competitive Edge*. Oxford: Oxford university press; 2007.
31. Meng XM. *Study on Relationship Between Perceived Organizational Support, Psychological Capital and Job Stress Among Medical Staff*. Yanshan Univ; 2016.
32. Ling WQ, Yang HJ, Fang LL. Organizational support of enterprise employees. *Acta Psychol Sinica*. 2006;38(02):281–287.
33. Baron RM, Kenny DA. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol*. 1986;51(6):1173.
34. Havens DS, Gittell JH, Vasey J. Impact of relational coordination on nurse job satisfaction, work engagement and burnout: achieving the quadruple AIM. *J Nurs Adm*. 2018;48(3):132–140. doi:10.1097/NNA.0000000000000587
35. Wang X, Liu L, Zou F, et al. Associations of occupational stressors, perceived organizational support, and psychological capital with work engagement among Chinese female nurses. *Biomed Res Int*. 2017;2017:5284628. doi:10.1155/2017/5284628
36. Li QW. *Research on the Construction of Index System of Training Mode for Infection Control Nurse specialist*. Shanxi Med Univ; 2018.
37. Ding JJ, Qian GQ, Li R, et al. Study on the relationship among role stress, perceived organizational support and work engagement of nurses. *Chin Gen Pract Nurs*. 2015;13(16):1477–1480. doi:10.3969/j.issn.1672-1888.2015.16.002
38. Pan JJ. *Research on the Relationship Among ICU Nurse's Psychological Resilience, Perceived Organizational Support, Professional Quality of Life and Work Engagement*. Qingdao Univ; 2019.
39. Eisenberger R, Huntington R, Hutchison S, et al. Perceived organizational support. *J Appl Psychol*. 1986;71(3):500–507. doi:10.1037/0021-9010.71.3.500
40. Wang HC, Bao L, Zhang YQ. Qualitative study on perceived organizational support of nurses in Shanghai. *J Shanghai Jiaotong Univ Med Sci*. 2013;33(5):579–583. doi:10.3969/j.issn.1674-8115.2013.05
41. Liu CY, Song LP, Shang LP. The effect of psychological capital on work engagement among nurses. *Chin Nurs Manag*. 2013;13(03):39–42. doi:10.3969/j.issn.1672-1756.2013.03.011
42. Shu QY. *The Association Among Organizational Support, Work Engagement, and Job Satisfaction of Medical Staff: The Intermediary Role of Psychological Capital*. Shenyang: Chin Med Univ; 2018.
43. Song R, Sun N, Song X. The efficacy of Psychological Capital Intervention (PCI) for depression from the perspective of positive psychology: a pilot study. *Front Psychol*. 2019;10:1816. doi:10.3389/fpsyg.2019.01816
44. Li H, Chen JH, Liu ZQ. Influencing of short-course Naikan therapy on learning burnout and psychological capital: a longitudinal study. *Chin J Health Psychol*. 2020;28(02):274–278.
45. Jiang HL, Dai J, Mai Y, et al. Effect of solution focused collective intervention on psychological capital of operating room nurses. *J Qilu Nurs*. 2018;24(16):33–36. doi:10.3969/j.issn.1006-7256.2018.16.011
46. Peng JY, Hu YL, Fan XF, et al. Effect of mindfulness decompression on psychological capital and work engagement of nurses. *Chin Remed Clin*. 2019;19(14):2484–2485.
47. Shen DR. Using EAP to intervene the crisis of organization. *Hum Resour Health*. 2019;7:100–102. doi:10.3969/j.issn.1672-1632.2019.07.029
48. Li L. A study on the intervention of Satya group in improving the psychological capital of College Students. *J Hubei Normal Univ Philos Soc Sci*. 2019;39(05):89–93. doi:10.3969/j.issn.2096-3130.2019.05.020
49. Zhao MH, Shang LP. Application of psychological capital in nurse group in China. *Chin Gen Pract Nurs*. 2014;12(14):1315–1316. doi:10.3969/j.issn.1674-4748.2014.14.044