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Complete List of Authors:	Wu, Jijun; Deyang People's Hospital, Department of Cardiology Li, Yuxin; North Sichuan Medical College; Deyang People's Hospital, Nursing Department Lin, Qin; Zhejiang Shuren University Fan, Yuting; Deyang People's Hospital, Nursing Department Zhang, Jiquan; Deyang People's Hospital, Nursing Department Liu, Zhenfan; Dnyanganga College of Engineering and Research, Nursing Department Liu, Xiaoli; Deyang People's Hospital, Nursing Department Rong, Xian; Sichuan Nursing Vocational College Zhong, Xiaoli; Deyang People's Hospital, Nursing Department
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The relationship between transformational leadership and presenteeism among Chinese ICU nurses: navigating the chain-mediated role of perceived social support and occupational coping self-efficacy

Jijun Wu [1†], Yuxin Li [2†,3†], Qin Lin[4†], Yuting Fan[3,6], Jiquan Zhang[3], Zhenfan Liu[3], Xiaoli Liu[3], Xian Rong[5*], Xiaoli Zhong[3*]

[1]Department of Cardiology, Deyang People's Hospital, Sichuan, China, [2]School of Nursing, North Sichuan Medical College, Sichuan, China, [3]Nursing Department, Deyang People's Hospital, Sichuan, China, [4]Shulan International Medical College, Zhejiang Shuren University, Hangzhou, China, [5]School of Nursing, ChengDu College, Sichuan, China, [6]Sichuan Nursing Vocational College, Sichuan, China

Jijun Wu[1†] 、Yuxin Li[2†,3†] and Qin Lin[4†]: These authors contributed equally to this work and share first authorship

*** Correspondence:**

Xiaoli Zhong

Xian Rong

1165254226@qq.com

Abstract

Background: In the global shortage of human resources in health care, nurses are characterized by high intensity, high pressure, and high workload. They are at increased risk of presenteeism. Research on presenteeism among nurses in China is in its infancy, and there is a lack of research on the mechanisms influencing presenteeism among nurses from the perspectives of transformational leadership, social support, and self-efficacy.

Objective: Unlike explicit absenteeism, presenteeism is challenging to assess quantitatively, and the indirect productivity loss it causes cannot be ignored. This study aimed to investigate the relationship between transformational leadership and presenteeism among ICU nurses in a tertiary care hospital and further investigate the moderating role of navigational social support and occupational coping self-efficacy.

Methods: A cross-sectional survey was conducted from March to April 2023 at a tertiary hospital in Sichuan Province, China. The Transformational Leadership Scale, Perceived Social Support Scale, Occupational Coping Self-Efficacy Scale, and Stanford Presenteeism Scale were used to measure critical variables. Information on the demographic characteristics of ICU nurses was collected. Correlation and multivariate hierarchical regression analyses were used to explore the influencing factors of presenteeism. Chain mediation effects were verified by Model 6 in the PROCESS 4.1 macro program in SPSS.

Results: 635 ICU nurses participated in this survey, and the final results of 590 nurses were analyzed. The presenteeism score of ICU nurses was 15.46 ± 4.45 (Mean ± SD), with a high

presenteeism incidence of 53.90%. Correlation analysis showed that presenteeism was negatively correlated with transformational leadership, perceived social support, and occupational coping self-efficacy (r=-0.412 to -0.486). Structural equation modeling showed that transformational leadership had a direct negative effect on presenteeism, with an effect value of -0.231; perceptual social support and occupational coping self-efficacy partially moderated the relationship between transformational leadership and presenteeism, with effect values of -0.055 and -0.042, respectively; and there was a chained mediation effect between transformational leadership and presenteeism, with an effect value of -0.029.

Conclusion: Perceived social support and occupational coping self-efficacy were chain mediators between transformational leadership and presenteeism. Therefore, to reduce presenteeism among nurses, nursing managers should adopt targeted interventions based on the influencing factors to improve transformational leaders and enhance their social support and self-efficacy levels.

Keywords: intensive care unit; nurses; presenteeism; transformational leadership; perceived social support; occupational coping self-efficacy

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study determined the relationship between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism through chain-mediated effects analysis.
- This study was cross-sectional, and causal relationships between variables could not be inferred.
- This study only surveyed tertiary hospitals in Sichuan Province, China, and there were limitations in the sample.

Introduction

In recent years, the study of the relationship between the health status of occupational groups and the economy has increasingly become a hot spot of scholars' attention. Health, as one of the most essential human capital, not only affects individual labor performance but also influences a country's or region's economic growth dynamics. Presenteeism, also known as low health-related productivity, is prevalent among occupational groups, especially in the healthcare industry. There is no standardized concept of presenteeism, which was first proposed by Professor Copper in 1996, describing it as the phenomenon of working when one should take a break from work due to illness or extended working hours that cause a reduction in health-related productivity.[1]In 2005, Kivimäki et al. expanded the concept of presenteeism to include working when one is in an unhealthy state.[2] A systematic evaluation by Webster et al. showed that the reported prevalence of presenteeism in the occupational population ranged from 35% to 97%, influenced by organizational factors, job characteristics, and personal factors.[3]As a major force in health care, nurses are a high-risk, high-stress, and high-work-intensity population. In the global shortage of nursing human resources, nurses are at high risk of presenteeism, especially in developing countries or poor areas, due to heavy workloads, human resource constraints, shift work, complex interpersonal relationships, and inadequate remuneration packages.[4]

It has been reported that 85% of healthcare workers have had the experience of attending work with illness,[5] while the global rate of presenteeism reporting among nurses is about 49.2%,[6] with 65.0% in the United States,[7] 48.7% in New Zealand,[8] and a high rate of 94.25% of presenteeism

reporting among nurses in China.[9] The impact of presenteeism on individuals and organizations is often multifaceted; on the one hand, it affects personal health, resulting in decreased productivity, lower work efficiency, and increased burnout, which affects professional well-being. On the other hand, it affects patient safety by increasing the risk of medication errors, falls, and infections. In addition, presenteeism can have a series of negative impacts on organizational development, directly or indirectly increasing the economic loss of the organization. Studies have shown that due to differences in the level of economic growth, the financial loss caused by presenteeism of nurses varies slightly in different countries, from about US$4.38 billion per year in China,[9] US$3-12 billion per year in the United States,[10] and about US$3,055 per capita in Japan.[11] Therefore, considering the negative consequences of presenteeism on multiple domains, such as individuals, patients, and organizations, it is necessary to explore the mechanisms and pathways of its impact from various perspectives.

According to the 2020 State of Global Nursing Report, there is currently a shortfall of up to 5.9 million nurses worldwide, with a projected shortfall of 5.7 million by 2030, with the shortage of nurses in developing countries and poorer regions particularly prominent. Although the shortage of nurses in China has dramatically improved in recent years, there is still a gap from the global average. Whether the allocation of human resources is reasonable and whether the appropriate ratio directly affects the quality of nursing services, work efficiency, and healthcare costs, thus affecting the quality and safety of patient services.[12, 13]The intensive care unit (ICU), as a special ward for the centralized treatment, resuscitation, and monitoring of patients with acute, critical, and severe illnesses in medical institutions, is characterized by solid professionalism, heavy workload, modern equipment, and complex treatment, which makes nurses' workload challenging and stressful, leading to prominent chronic health problems such as chronic pain, fatigue, gastrointestinal disorders, and sleep disorders. Research shows that the average ICU bed-to-nurse ratio in China is 1:1.86, with 63.3% of the regions having a 1:1.5 to <2.0 ratio.[14] Therefore, the shortage of human resources for ICU nurses is still prominent in China. Presenteeism of ICU nurses is also notable due to the influence of factors such as dedication, health status, work pressure, remuneration, and poor job replacement. Therefore, it is essential to pay attention to the current situation of ICU nurses' presenteeism and its influence mechanism and to develop targeted interventions to improve nurses' health status and patient safety.

In organizations, leadership style is an essential source of employees' emotional and psychological experience, affecting their psychological well-being and job performance.[15] Transformational leadership refers to a leader's ability to guide employees to develop proper values, resilience, and a positive mindset by making them aware of their responsibilities, stimulating high-level needs, and building mutual trust. Transformational leadership has four dimensions: moral example, charisma, personalized care, and visionary inspiration. As a work resource, leadership style is an essential organizational contextual variable affecting employees. Transformational leadership style can improve employee performance and reduce impaired productivity by exuding leadership charisma, reinforcing leadership inspiration, and personalized care to stimulate employees' intellectual and higher-level needs.[16] The positive effects of transformational leadership have been widely studied and confirmed regarding nurses' resilience,[17] burnout,[18] job satisfaction,[19]and improved patient safety outcomes.[20] Research on transformational leadership's impact on presenteeism has not been reported. Based on this, we propose research hypothesis 1: Transformational leadership negatively affects presenteeism and can further reduce the occurrence of presenteeism through mediating variables.

Previous research on the factors influencing nurses' presenteeism has focused on demographic characteristics such as length of service and job title;[21] health conditions such as subfertility symptoms, chronic bodily pain, hypertension, and other chronic illnesses;[22, 23] and work-related factors such as pay and income, work environment, and occupational stress.[24] The synergistic effects of positive psychological work resources, such as social support and self-efficacy, are often overlooked.

Some studies have shown that social support directly predicts the mental health of healthcare workers and indirectly affects mental health through personal resilience, which directly or indirectly affects work efficiency. Perceived social support as a positive psychological resource is one of the essential protective resources for individuals, which helps to alleviate work pressure and negative emotions, maintain a healthy psychological state and a positive work state, and thus reduce the phenomenon of presenteeism. The social support buffer model also points out that navigational social support can inhibit or buffer the adverse effects of stressful events on individuals.[25] Some studies have shown that presenteeism is negatively related to marine social support and that high social support may improve presenteeism by reducing stress and increasing job satisfaction and performance.[26] In addition, leadership styles can improve employees' stress coping and handling abilities through support for employees, which can stimulate employees' motivation, work attitudes, and behaviors and enhance the level of perceived social support. Based on this, we propose the following research hypotheses:

Research Hypothesis 2: Transformational leadership can influence presenteeism among ICU nurses through the mediating role of perceived social support.

Occupational coping self-efficacy refers to an overarching self-efficacy of employees to effectively cope with and accomplish nursing care. Self-efficacy, as a positive psychological resource within an individual, is essential for enhancing occupational coping ability, reducing work stress and burnout, improving mental health, and enhancing work efficiency and work quality. Research shows that the lack of coping self-efficacy may directly or indirectly affect work engagement through stress and interpersonal relationships, making employees feel inefficient.[27]The Job Demands-Resources Model states that each occupation has specific risk factors associated with job stress and that when employees have high levels of job demands and job resources, it stimulates personal growth and development and helps to promote good organizational outcomes.[28] Transformational leadership, appreciative social support, and occupational coping self-efficacy are important to nurses in achieving organizational goals as overarching components of job demands and resources. Based on these analyses, we propose the following research hypotheses:

Research Hypothesis 3: Transformational leadership can influence presenteeism among ICU nurses through the mediating role of occupational coping self-efficacy.

Research Hypothesis 4: Transformational leaders can influence presenteeism among ICU nurses by mediating the chain of perceived social support and occupational coping self-efficacy.

Based on the above analysis, this study used the JD-R model as a theoretical guide to explore the influence mechanism of presenteeism of Chinese ICU nurses from multiple perspectives of job requirements (transformational leadership), job resources (perceived social support), and personal resources (occupational coping self-efficacy), and to establish a hypothetical model (Fig. 1) to provide a theoretical basis for the reduction of presenteeism of ICU nurses.

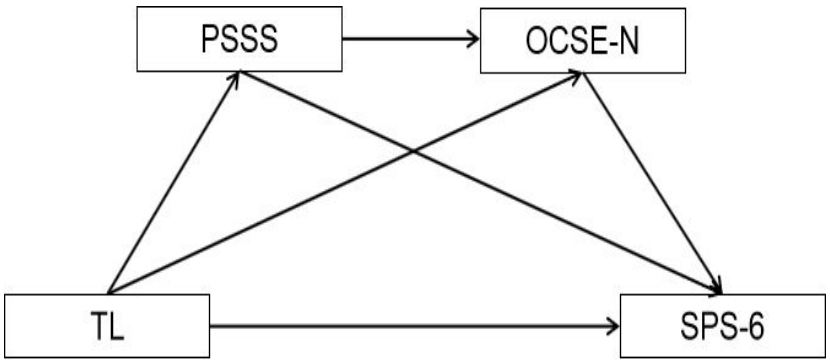

Figure 1: Hypothesized Model of the Relationship between Transformational Leadership（TL), Perceived Social Support(PSSS), Occupational Coping Self-Efficacy(OCSE-N) and Presenteeism（SPS-6）

Methods

Participants

In March-April 2023, 590 ICU nurses were recruited from 6 tertiary hospitals in 5 regions of Sichuan Province (North Sichuan, East Sichuan, West Sichuan, South Sichuan, and Chengdu) for the survey by using the whole cluster random sampling method. According to the Kendall sample size rough estimation method,[29] the variables in this study were 23. At least 5-10 times the number of variables were selected, and considering 20% of invalid questionnaires, the sample size ranged from 138 to 276 cases. A total of 635 ICU nurses participated in this survey, kicking out the apparent regularity of filling out (answering the same for six or more consecutive entries) or filling out questionnaires with contradictory demographic information characteristics (e.g., the length of service does not match the title). Finally, 590 ICU nurses were included in the analysis of the results, with an adequate participation rate of 94.70%. Sample inclusion criteria: holding a professional qualification certificate for nurses, more than one year of clinical work in ICU; no history of alcohol or drug addiction, no history of mental illness; no history of use of drugs related to mental illness; voluntary participation. Exclusion criteria: internship, further training nurses, those who are currently on sick leave, maternity leave, and other absenteeism.

Procedures

Use Questionnaire Star to create and distribute questionnaires. First, Sichuan Province was divided into five regions according to regional locations, and each regional tertiary hospital was identified, and one tertiary hospital was randomly selected for data collection. Uniformly trained study members provided on-site instructions. Before the survey, the precautions for filling out the survey were explained to the respondents, and any questionable information was presented on-site. All survey content was set as mandatory options in the electronic questionnaire to ensure the complete survey information responses. After the completion of the survey, the quality of the questionnaire filling was checked by two people, and questionnaires with obvious regular answers or contradictory demographic information characteristics were excluded.

Measures

Socio-demographic characteristics

Fourteen demographic variables were included in this study work, mainly gender, age, marital and childbearing status et al.

Transformational Leadership Scale，TL

A questionnaire developed by Li et al. was used.[30]The scale consists of four dimensions with 26 entries. A Likert 5-point scale was used, with a total score of 26 to 130, with a higher total score indicating a higher degree of perceived transformational leadership behavior. The Cronbach's alpha coefficient for the scale was 0.928.

Perceived Social Support Scale，PSSS

A questionnaire developed by Blumenthal et al. was used.[31]The scale consists of 3 dimensions with 12 entries. It was scored on a 7-point Likert scale with a total score of 12-84, with higher scores indicating a higher level of social support felt by the individual. The Cronbach's alpha coefficient of the scale was 0.912.

Occupational Coping Self Efficacy Scale，OCSE-N

A questionnaire developed by Pisanti et al. was used.[32] The scale consists of two dimensions with a total of 9 entries. A 5-point Likert scale was used, with higher scores indicating higher occupational coping self-efficacy. The scale Cronbach's alpha coefficient was 0.882.

Stanford Presenteeism Scale-6，SPS-6

The scale developed by Koopman et al. was used. [33]The scale consists of two dimensions with six entries. A 5-point Likert scale was used with a total score of 6 to 30, with higher SPS-6 scores indicating more significant impairment of health productivity due to an individual's presenteeism. The scale Cronbach's alpha coefficient was 0.860.

Statistical analysis

SPSS 23.0 was used for statistical analysis. Exploratory analysis showed that the measured variables conformed to a normal distribution. Differences between groups were analyzed using independent samples t-test or one-way ANOVA. Pearson correlation analysis was used to analyze the correlation between variables. Hierarchical regression was used to analyze the factors influencing presenteeism among nurses and the mediating role among variables. Based on the bias-corrected percentile bootstrap method, the Bootstrap method (5000 samples) yielded 95% confidence intervals for significance testing. The chained mediation effect was verified through Model 6 in the PROCESS 4.1 macro program, with presenteeism as the dependent variable, transformational leadership as the independent variable, and navigating social support and career coping self-efficacy as the mediating variables. Transformational leadership, navigational social support, career coping self-efficacy, and presenteeism scores were standardized before testing the model. Direct, mediated (paths a*y (Path 1), x*c (Path 2), a*b*c (Path 3)), and total effects were examined.

Ethical considerations

This study was approved by the Hospital Ethics Committee (2021-04-056-K01).

Results

General demographic characteristics

Of the 599 participants, 533 (or 90.34%) were female. Nearly 97.46% of the participants were <40 years old. Most nurses had a bachelor's degree (81.86%), 66.10% were married, 53.39% were mid-level, 86.27% were clinical nurses, and 84.75% were employed under labor contracts. The remaining sociodemographic characteristics (Table 1).

Table 1: Relationship Between Demographic Characteristics and Transformational Leadership, Perceived Social Support, Occupational coping self-efficacy, and Presenteeism

Items	N	*Mean* ±*SD*			
		TL	PSSS	OCSE-N	SPS-6
Sex					
Male	57	106.91±18.74	64.35±12.33	31.77±8.21	15.25±5.10
Female	533	103.76±17.56	62.39±11.88	31.06±6.38	15.48±4.38
t		1.281	1.180	0.776	-0.378
P		0.201	0.238	0.438	0.706
Age					
< 30	267	103.93±18.11	63.50±11.63	31.42±6.89	15.39±4.32
30~ < 40	308	104.01±17.35	61.95±12.15	30.87±6.34	15.51±4.66
≥40	15	107.53±17.70	59.00±11.81	31.27±5.81	15.47±2.10
F		0.297	1.904	0.489	0.052
P		0.743	0.150	0.614	0.950
Marital status					

Unmarried	189	103.58±18.39	62.33±11.99	30.77±6.92	15.87±4.36
Married but not having children	73	104.11±15.18	63.52±11.15	31.16±6.66	15.55±4.14
Married and having children	317	104.24±17.92	62.49±11.96	31.27±6.32	15.15±4.58
Divorced or other	11	106.82±15.51	63.27±15.69	33.00±7.91	16.82±3.97
F		0.146	0.197	0.436	1.410
P		0.932	0.899	0.658	0.239
Highest degree					
College and below	93	106.76±19.66	64.20±11.39	31.43±7.60	15.31±4.54
Undergraduate	483	103.72±17.09	62.41±11.92	31.09±6.35	15.49±4.32
Master's degree or above	14	98.07±22.67	57.57±14.49	30.57±7.57	15.21±4.87
F		1.987	2.154	0.157	0.086
P		0.138	0.117	0.855	0.918
Professional title					
Junior level	102	104.91±19.78	62.59±12.54	30.96±7.90	15.36±4.67

Middle level	315	102.26±17.79	62.63±11.93	30.74±6.42	15.77±4.34
High level	173	106.84±15.80	62.48±11.61	31.94±5.94	14.94±4.50
F		3.917	0.009	1.894	1.971
P		0.020	0.991	0.151	0.140
Position					
Clinical nurse	509	103.53±17.78	62.47±12.16	30.96±6.60	15.58±4.44
Nursing team leader	68	105.97±17.45	63.74±10.51	32.03±6.81	14.78±4.64
Head nurse	13	114.77±10.57	60.85±9.56	32.85±3.65	14.23±3.47
F		3.026	0.478	1.240	1.476
P		0.049	0.620	0.290	0.229
Years of experience in ICU					
1~ < 5	252	104.38±18.20	63.71±12.24	31.62±6.69	15.07±4.36
5~ < 10	204	102.77±18.46	61.40±11.48	30.14±6.31	15.88±4.45
≥10	134	105.43±15.35	62.26±11.86	31.72±6.65	15.54±4.60
F		0.983	2.185	3.549	1.903

P		0.375	0.113	0.029	0.150
Average monthly income					
1~ < 6000	150	104.61±19.53	60.80±12.77	30.73±6.84	15.63±4.46
6000~ < 8000	268	102.03±17.40	62.12±11.77	30.91±6.09	15.75±4.49
8000~ < 10000	132	107.70±16.19	64.71±11.47	31.70±7.33	14.64±4.28
≥10000	40	103.65±15.43	65.33±9.84	32.15±6.09	15.53±4.57
F		3.139	3.404	0.934	1.945
P		0.025	0.017	0.424	0.121
Type of contract					
Professional preparation	90	106.64±14.40	63.88±9.75	30.87±6.19	14.91±3.96
Labor contract	500	103.60±18.19	62.35±12.27	31.18±6.65	15.56±4.53
t		1.769	1.315	-0.410	-1.266
P		0.079	0.191	0.682	0.206
Self-assessed health status					
Good	328	107.67±16.74	65.13±11.33	32.73±6.64	14.27±4.20

General	233	99.30±17.62	59.96±11.57	29.47±5.89	16.62±4.14
Worse	29	101.55±19.70	54.76±13.67	26.31±5.58	19.59±4.89
F		16.367	20.699	27.119	36.031
P		0.000	0.000	0.000	0.000
Whether or not you have a chronic disease					
No	87	103.18±17.59	59.51±12.18	29.78±6.22	16.16±4.39
Yes	503	104.21±17.71	63.11±11.81	31.36±6.62	15.34±4.46
t		-0.502	-2.617	-2.075	1.598
P		0.616	0.009	0.038	0.111
Perceived work stress					
Low	13	121.62±11.28	72.23±13.06	39.85±5.29	11.77±3.81
Middle	292	105.88±17.32	64.37±11.03	32.83±6.28	14.34±3.93
High	285	101.40±17.64	60.30±12.26	28.99±6.09	16.78±4.58
F		11.562	13.296	41.302	28.679
P		0.000	0.000	0.000	0.000

ICU human resources					
< 1:2.5~3	347	104.17±17.32	62.39±12.14	31.26±6.64	15.25±4.58
=1:2.5~3	143	105.15±18.51	62.89±11.77	31.89±6.47	15.45±4.27
>1:2.5~3	100	102.13±17.76	62.84±11.49	29.59±6.34	16.19±4.24
F		0.872	0.121	3.793	1.732
P		0.419	0.086	0.023	0.178
Exposure to workplace violence in the past year					
No	386	106.35±17.24	63.89±11.68	32.33±6.58	14.71±4.39
Yes	204	99.74±17.76	60.09±12.02	28.85±5.96	16.87±4.24
t		-4.387	-3.722	-6.308	5.763
P		0.000	0.000	0.000	0.000

Correlation analysis

Transformational leadership, navigational social support, and career coping self-efficacy were all negatively correlated with presenteeism, transformational leadership was positively associated with perceived social support and occupational coping self-efficacy, and perceived social support was positively correlated with occupational coping self-efficacy(Table 2).

Table 2：Correlations between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism

Variables	*Mean* ±*SD*	1	2	3	4

Transformational leadership(1)	104.06±17.68	1	-	-	-
Perceived social support(2)	62.58±11.92	0.515**	1	-	-
Occupational coping self-efficacy（3）	31.13±6.58	0.369**	0.417**	1	-
Presenteeism(4)	15.46±4.45	-0.445**	-0.412**	-0.486**	1

**P <0.05

Multiple stratified regression analysis

As shown in Table 3, a multivariate hierarchical regression analysis was conducted with presenteeism as the dependent variable. In the first step, the variables that made sense in the univariate analysis of presenteeism were added to the model as control variables. In the second step, after excluding the effects of the above control variables, transformational leadership was negatively associated with presenteeism, where transformational leadership had a significant effect on presenteeism, explaining 11.8% of the variance. In the third step, perceived social support was negatively related to presenteeism, and adding the mediating variable perceived social support to the model explained an additional 14.0% of the variance in presenteeism. The regression coefficient for transformational leadership decreased from -0.090 in the second step to -0.069 in the third step, which was still significant. In the fourth step, occupational coping self-efficacy was negatively correlated with presenteeism, and adding career coping self-efficacy to the model explained an additional 18.7% of the unnoticeable absenteeism variance. The regression coefficient for transformational leadership decreased from -0.069 in the third step to -0.058 in the fourth but remained significant. Statistical analyses initially showed that perceived social support and occupational coping self-efficacy mediated the relationship with presenteeism in the transformational leadership component of Chinese ICU nurses (see Table 3).

Table 3: Multiple stratified regression analysis of presenteeism of ICU nurses in China

	Step1	Step2	Step3	Step4
Step1				

Self-assessed health status	1.883**	1.475**	1.290**	1.057**
Perceived work stress	1.729**	1.392**	1.268**	0.803**
Exposure to workplace violence in the past year	-1.371**	-0.939**	-0.892**	-0.584
Step2				
Transformational leadership	—	-0.090**	-0.069**	-0.058**
Step3				
Perceived social support	—	—	-0.068**	-0.044**
Step4				
Occupational coping self-efficacy	—	—	—	-0.177**
F	42.575**	61.893**	55.090**	56.639**
R^2	0.179	0.297	0.320	0.368
Adjustment R^2	0.175	0.293	0.315	0.362

**P <0.01

Analysis of chain mediation effects

All variables were standardized with transformational leadership as the independent variable, presenteeism as the dependent variable, and perceived social support and occupational coping self-efficacy as the mediating variables. Based on the Bootstrap method, the chained mediation effect was tested according to the SPSS macro program PROCESS model 6 provided by Hayes. Bootstrap 5000 repeated sampling was used to estimate the 95% confidence intervals separately.

The results, as shown in Table 4 and Figure 1, show transformational leadership negatively predicted presenteeism, confirming research hypothesis 1. Positively predicted perceived social support and occupational coping self-efficacy. Perceived social support positively predicted occupational coping self-efficacy and negatively predicted presenteeism, and occupational coping self-efficacy, and occupational coping self-efficacy negatively predicted presenteeism. The impact of the pathway "Transformational Leadership→Perceived social support→Presenteeism" was -0.055, confirming hypothesis 2. The impact of the pathway "Transformational Leadership→Occupational coping self-efficacy→Presenteeism" was -0.055, confirming hypothesis 2. The impact of the path "Transformational Leadership → Perceived social support → Occupational coping self-efficacy → Presenteeism" was -0.042, confirming Hypothesis 3. The impact of the path "Transformational Leadership → Perceived Social Support → Occupational coping self-efficacy →Presenteeism" was -0.029, confirming hypothesis 4.

Table 4: Multiple mediation effect analysis between variables for ICU nurses in China

Effect types	Effect	Boot SE	Boot LLCI	Boot ULCI	Effect ratio
Total effect	-0.358	0.036	-0.428	-0.287	100%
Direct effect	-0.231	0.039	-0.308	-0.153	64.5%
Total indirect effect	-0.127	0.027	-0.181	-0.078	35.5%
Path 1	-0.055	0.023	-0.102	-0.012	15.4%
Path 2	-0.042	0.015	-0.074	-0.017	11.7%
Path 3	-0.029	0.008	-0.046	-0.016	8.1%
Comparsion1	-0.013	0.030	-0.070	0.046	-

Comparsion2	-0.026	0.025	-0.075	0.023	-
Comparsion3	-0.013	0.016	-0.045	0.017	-

Path 1Transformational leadership → Perceived Social Support → Presenteeism

Path 2 Transformational leadership → Occupational Coping Self Efficacy→ Presenteeism

Path 3 Transformational leadership → Perceived Social Support → Occupational Coping Self Efficacy →Presenteeism

Comparsion1：Ind1 minus Ind2

Comparsion2：Ind1 minus Ind3

Comparsion3：Ind2 minus Ind3

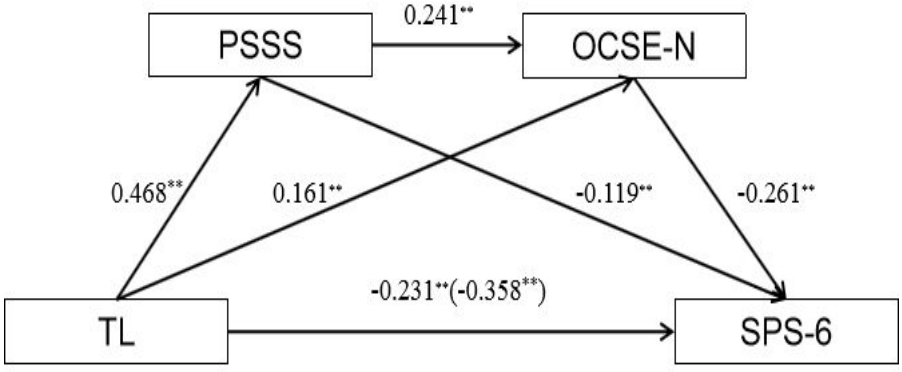

FIGURE 1
Chain mediating model. **p < 0.01.

Discussion

The results of this study showed that ICU nurses' presenteeism score was (15.46±4.45), of which high presenteeism accounted for 53.9%, which indicated that China's ICU nurses' presenteeism was at a high level, which was worth paying attention to. To analyze the reasons for this, (1) only 56% of ICU nurses in this study had good self-assessed health. Several studies have also confirmed that individual physical and mental health conditions are the root cause of presenteeism.[34, 35] When nurses feel unwell or suffer from chronic illnesses, they may experience an inability to concentrate and devote themselves entirely to their work, which leads to lower work efficiency, lower productivity levels, and presenteeism. (2) 48% of the ICU nurses in this study had a high level of perceived stress. ICU, as an essential area for the rescue and treatment of patients with acute and critical illnesses in healthcare institutions, has a complex working environment. ICU nurses must continuously monitor changes in patients' conditions and cope with various first-aid situations. The high-intensity workload and prolonged work pressure may increase the nurses' fatigue and psychological burden, which may

lead to presenteeism behaviors. (3) About 35% of ICU nurses in this study had suffered from workplace violence in the past. Workplace violence is a severe threat to the personal safety of nurses. It is a stressful event that can easily trigger anxiety and depression in nurses, negatively affect employee job satisfaction and loyalty, and increase concerns about the work environment and job security, leading to an inability to concentrate on work, thus resulting in presenteeism.[36]

The results of this study show that the transformational leadership score of ICU nurses is (104.06±17.68), which is at the medium-high level, similar to the results of foreign scholars.[16] In recent years, nursing managers' understanding of scientific management has gradually deepened, the leadership style of nursing team leaders has been continuously improved, and managers who have received higher education have higher qualities and conduct can play a corresponding exemplary role among nurses and can make wise decisions and guidance based on their professional knowledge when leading the team to make changes. Hence, the level of transformational leadership is higher.

The results of this study showed that ICU nurses perceived social support scores of (62.58±11.92), which was at a medium-high level, similar to the findings of Lu et al.[37] Social support, as a positive emotional experience in which an individual subjectively feels that they receive understanding and support from family, society, and friends, can reflect the degree to which an individual gets support in a stressful situation. Social support theory also states that a strengthened social support network helps to cope with external environmental challenges.[38] It may be related to the fact that the survey respondents in this study were mainly bachelor's degree holders (81.86%), and people with higher education tend to have more knowledge and skills, as well as better communication and expression skills and are more likely to establish and maintain good social relationships. The lower level of perceived social support among those with poor health, perceived high work stress may be related to the decline in participation in social activities and lack of time and energy to maintain interpersonal social relationships among this group.

The results of this study showed that ICU nurses' occupational coping self-efficacy score was (31.13 ± 6.58), which is at the medium level (median total score of 22.5), similar to the results of the study by Pisanti et al.[39] Self-efficacy is not confidence generated for a specific domain but can predict people's behavior in different situations. Studies have shown that individuals with high levels of self-efficacy favor using positive or problem-focused coping strategies, which help them effectively buffer the adverse effects of stress and contribute to maintaining high levels of physical and mental health.[40] It may be related to the fact that the working years of the respondents in this study were mainly 1-5 years, which accounted for about 40%. On the one hand, the ICU work environment is challenging, requiring the handling of critically ill patients and complex medical situations. Low-seniority nurses working in such a high-pressure environment may feel uneasy and anxious, which affects self-efficacy enhancement. On the other hand, newly recruited ICU nurses may lack confidence in their abilities and coping measures due to a lack of sufficient work experience and training, resulting in lower self-efficacy.

This study found that perceived social support mediates the relationship between transformational leadership and presenteeism among ICU nurses, with the mediating effect accounting for 15.4% of the total impact, i.e., transformational leadership not only acts directly on presenteeism but also indirectly through comprehension of social support. According to the theory of transformational leadership, transformational leadership is an upbeat leadership style that stimulates the intrinsic motivation of employees by motivating them so that they can maximize their potential to achieve the highest level of performance, promote their personal growth and career development, and thus improve team cohesion and work performance.[41] On the one hand, when nurse leaders have a

high transformational leadership style, they can provide the social support that nurses need. By motivating and stimulating nurses' potential, they feel valued and supported. They are willing to devote themselves to their work in a positive frame of mind, which contributes to the joint development of themselves and the organization and enhances nurses' job satisfaction, which helps to reduce presenteeism; on the other hand, it is based on the theory of social exchange. When individuals receive sufficient support in social exchange, they are more confident and motivated to face challenges at work, thus reducing presenteeism. When nurses perceive the care and support from leaders, colleagues, and organizations, this emotional support is not only conducive to regulating the negative emotions of nurses and reducing the negative impact of work pressure on them but also helps to enhance the nurses' commitment to and identification with the organization, so that they are more engaged in their work and reduce the possibility of presenteeism.[26]

The results of this study found that occupational coping self-efficacy mediates the relationship between transformational leadership and presenteeism among ICU nurses, and the mediating effect accounted for 11.7% of the total impact, which means that transformational leadership not only acts directly on presenteeism but also indirectly through occupational coping self-efficacy. Bandura's self-efficacy theory states that when individuals believe they are competent enough to accomplish a task, they are more motivated to engage in it and strive to achieve the desired goal.[42] Managers with a high level of transformational leadership style can motivate nurses through character appeal and vision sharing and stimulate positive emotions in nurses to show more energy, dedication, and focused attitudes to be more confident in dealing with challenges and pressures at work. Nurses with higher occupational coping self-efficacy are more confident and capable of dealing with difficulties and challenges at work. They are more willing to take the initiative to solve problems, improve work performance, and reduce presenteeism behavior.

The results of this study found that perceived social support and career coping self-efficacy acted as chain mediators between transformational leadership and presenteeism among ICU nurses, and the chain mediation effect accounted for 8.1% of the total impact, i.e., transformational leadership among nurses affects presenteeism through perceived social support and career coping self-efficacy. According to the JD-R model, job resources can buffer the negative consequences of presenteeism by stimulating employees' internal and external motivation to cope with demanding job tasks. Transformational leadership and perceived social support as an essential external resource and occupational coping self-efficacy as a vital internal resource, managers with a high level of transformational leadership style excel at stimulating nurses' autonomy and creativity by establishing good interpersonal relationships and a teamwork atmosphere, providing nurses with the necessary resources and support, and enhancing nurses' perceptions of social support.[20] When nurses feel the support and encouragement from their leaders, they will be more willing to seek and utilize help and support from external resources, such as colleagues, family, and friends. This social support helps meet nurses' needs at work, reduces work stress and fatigue, and increases job satisfaction and well-being, enhancing nurses' occupational coping self-efficacy. When possessing a higher level of self-efficacy, nurses are more confident that they can better cope with the challenges and pressures at work, which is conducive to maintaining good mental health and reducing the incidence of presenteeism.

Based on the results of this study, we put forward the following recommendations to improve the status of presenteeism among ICU nurses. First, cultivate and promote a transformational leadership style: leaders should pay attention to the needs and emotions of nurses and actively listen to their opinions and suggestions; stimulate nurses' enthusiasm and innovation through incentives and encouragement so that they can feel the meaning and value of their work; establish a positive, open

and inclusive work environment and encourage nurses to participate in decision-making to improve their sense of belonging and responsibility and reduce presenteeism. Second, enhance comprehension of social support: establish a good social support network; organizations should encourage supportive colleague relationships and teamwork and promote interactions and exchanges through regular team-building activities; nursing managers should strengthen communication with nurses, establish a good team communication mechanism, and encourage information exchange and emotional support among nurses; and provide resources for mental health support by providing resources such as psychological counseling services, guidance and training on work-life balance, to help nurses cope with work stress and emotional distress, promote nurses' physical and mental health, and reduce presenteeism. Third, to improve nurses' sense of self-efficacy in occupational coping, regular training and refresher courses are conducted to improve nurses' professional skills and knowledge and enhance their ability to cope with work challenges; work tasks and resources are reasonably allocated to reduce nurses' overload and stress; and appropriate incentives and recognition mechanisms are provided to stimulate nurses' motivation and self-efficacy and to reduce presenteeism.

Limitation

First, this study was a cross-sectional study, which could not dynamically assess the level of presenteeism and its influencing factors on ICU nurses in different periods and stages. It could not effectively reveal the dynamic changes among the four variables. In the future, we can analyze the presenteeism of ICU nurses and the changes of the related influencing factors in a multifaceted way through longitudinal studies; Second, this study only set ICU nurses from six tertiary hospitals in Sichuan Province, China, as the study population, and the sample is not representative enough, so the next step could be to launch a multicenter, large-sample survey to explore the presenteeism of ICU nurses in different regions and levels of hospitals.

Conclusions

In summary, China's ICU nurses' presenteeism is at a high level, and transformational leadership can not only directly affect ICU nurses' presenteeism but also indirectly affect ICU nurses' presenteeism by the chain mediating role of perceived social support and occupational coping self-efficacy. Nursing managers should pay attention to developing a transformational leadership style to enhance social support and improve ICU nurses' occupational coping efficacy, thus reducing ICU nurses' presenteeism behavior.

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Competing interests None declared.

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Patient consent for publication Not applicable.

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Table 1: Relationship Between Demographic Characteristics and Transformational Leadership, Perceived Social Support, Occupational coping self-efficacy, and Presenteeism

Items	N	*Mean ±SD*			
		TL	PSSS	OCSE-N	SPS-6
Sex					
Male	57	106.91±18.74	64.35±12.33	31.77±8.21	15.25±5.10
Female	533	103.76±17.56	62.39±11.88	31.06±6.38	15.48±4.38
t		1.281	1.180	0.776	-0.378
P		0.201	0.238	0.438	0.706
Age					
< 30	267	103.93±18.11	63.50±11.63	31.42±6.89	15.39±4.32
30~ < 40	308	104.01±17.35	61.95±12.15	30.87±6.34	15.51±4.66
≥40	15	107.53±17.70	59.00±11.81	31.27±5.81	15.47±2.10
F		0.297	1.904	0.489	0.052
P		0.743	0.150	0.614	0.950
Marital status					
Unmarried	189	103.58±18.39	62.33±11.99	30.77±6.92	15.87±4.36

Married but not having children	73	104.11±15.18	63.52±11.15	31.16±6.66	15.55±4.14
Married and having children	317	104.24±17.92	62.49±11.96	31.27±6.32	15.15±4.58
Divorced or other	11	106.82±15.51	63.27±15.69	33.00±7.91	16.82±3.97
F		0.146	0.197	0.436	1.410
P		0.932	0.899	0.658	0.239
Highest degree					
College and below	93	106.76±19.66	64.20±11.39	31.43±7.60	15.31±4.54
Undergraduate	483	103.72±17.09	62.41±11.92	31.09±6.35	15.49±4.32
Master's degree or above	14	98.07±22.67	57.57±14.49	30.57±7.57	15.21±4.87
F		1.987	2.154	0.157	0.086
P		0.138	0.117	0.855	0.918
Professional title					
Junior level	102	104.91±19.78	62.59±12.54	30.96±7.90	15.36±4.67

Middle level	315	102.26±17.79	62.63±11.93	30.74±6.42	15.77±4.34
High level	173	106.84±15.80	62.48±11.61	31.94±5.94	14.94±4.50
F		3.917	0.009	1.894	1.971
P		0.020	0.991	0.151	0.140
Position					
Clinical nurse	509	103.53±17.78	62.47±12.16	30.96±6.60	15.58±4.44
Nursing team leader	68	105.97±17.45	63.74±10.51	32.03±6.81	14.78±4.64
Head nurse	13	114.77±10.57	60.85±9.56	32.85±3.65	14.23±3.47
F		3.026	0.478	1.240	1.476
P		0.049	0.620	0.290	0.229
Years of experience in ICU					
1~ < 5	252	104.38±18.20	63.71±12.24	31.62±6.69	15.07±4.36
5~ < 10	204	102.77±18.46	61.40±11.48	30.14±6.31	15.88±4.45
≥10	134	105.43±15.35	62.26±11.86	31.72±6.65	15.54±4.60

F		0.983	2.185	3.549	1.903
P		0.375	0.113	0.029	0.150
Average monthly income					
1~ < 6000	150	104.61±19.53	60.80±12.77	30.73±6.84	15.63±4.46
6000~ < 8000	268	102.03±17.40	62.12±11.77	30.91±6.09	15.75±4.49
8000~ < 10000	132	107.70±16.19	64.71±11.47	31.70±7.33	14.64±4.28
≥10000	40	103.65±15.43	65.33±9.84	32.15±6.09	15.53±4.57
F		3.139	3.404	0.934	1.945
P		0.025	0.017	0.424	0.121
Type of contract					
Professional preparation	90	106.64±14.40	63.88±9.75	30.87±6.19	14.91±3.96
Labor contract	500	103.60±18.19	62.35±12.27	31.18±6.65	15.56±4.53
t		1.769	1.315	-0.410	-1.266
P		0.079	0.191	0.682	0.206

Self-assessed health status					
Good	328	107.67±16.74	65.13±11.33	32.73±6.64	14.27±4.20
General	233	99.30±17.62	59.96±11.57	29.47±5.89	16.62±4.14
Worse	29	101.55±19.70	54.76±13.67	26.31±5.58	19.59±4.89
F		16.367	20.699	27.119	36.031
P		0.000	0.000	0.000	0.000
Whether or not you have a chronic disease					
No	87	103.18±17.59	59.51±12.18	29.78±6.22	16.16±4.39
Yes	503	104.21±17.71	63.11±11.81	31.36±6.62	15.34±4.46
t		-0.502	-2.617	-2.075	1.598
P		0.616	0.009	0.038	0.111
Perceived work stress					
Low	13	121.62±11.28	72.23±13.06	39.85±5.29	11.77±3.81
Middle	292	105.88±17.32	64.37±11.03	32.83±6.28	14.34±3.93

High	285	101.40±17.64	60.30±12.26	28.99±6.09	16.78±4.58
F		11.562	13.296	41.302	28.679
P		0.000	0.000	0.000	0.000
ICU human resources					
< 1:2.5~3	347	104.17±17.32	62.39±12.14	31.26±6.64	15.25±4.58
=1:2.5~3	143	105.15±18.51	62.89±11.77	31.89±6.47	15.45±4.27
>1:2.5~3	100	102.13±17.76	62.84±11.49	29.59±6.34	16.19±4.24
F		0.872	0.121	3.793	1.732
P		0.419	0.086	0.023	0.178
Exposure to workplace violence in the past year					
No	386	106.35±17.24	63.89±11.68	32.33±6.58	14.71±4.39
Yes	204	99.74±17.76	60.09±12.02	28.85±5.96	16.87±4.24
t		-4.387	-3.722	-6.308	5.763
P		0.000	0.000	0.000	0.000

Table 2：Correlations between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism

Variables	*Mean* ±*SD*	1	2	3	4
Transformational leadership(1)	104.06±17.68	1	-	-	-
Perceived social support(2)	62.58±11.92	0.515**	1	-	-
Occupational coping self-efficacy（3）	31.13±6.58	0.369**	0.417**	1	-
Presenteeism(4)	15.46±4.45	-0.445**	-0.412**	-0.486**	1

Table 3: Multiple stratified regression analysis of presenteeism of ICU nurses in China

	Step1	Step2	Step3	Step4
Step1				
Self-assessed health status	1.883**	1.475**	1.290**	1.057**
Perceived work stress	1.729**	1.392**	1.268**	0.803**
Exposure to workplace violence in the past year	-1.371**	-0.939**	-0.892**	-0.584
Step2				

Transformational leadership	—	-0.090**	-0.069**	-0.058**
Step3				
Perceived social support	—	—	-0.068**	-0.044**
Step4				
Occupational coping self-efficacy	—	—	—	-0.177**
F	42.575**	61.893**	55.090**	56.639**
R^2	0.179	0.297	0.320	0.368
Adjustment R^2	0.175	0.293	0.315	0.362

Table 4: Multiple mediation effect analysis between variables for ICU nurses in China

Effect types	Effect	Boot SE	Boot LLCI	Boot ULCI	Effect ratio
Total effect	-0.358	0.036	-0.428	-0.287	100%
Direct effect	-0.231	0.039	-0.308	-0.153	64.5%
Total indirect effect	-0.127	0.027	-0.181	-0.078	35.5%

Path 1	-0.055	0.023	-0.102	-0.012	15.4%
Path 2	-0.042	0.015	-0.074	-0.017	11.7%
Path 3	-0.029	0.008	-0.046	-0.016	8.1%
Comparsion1	-0.013	0.030	-0.070	0.046	-
Comparsion2	-0.026	0.025	-0.075	0.023	-
Comparsion3	-0.013	0.016	-0.045	0.017	-

Path 1Transformational leadership → Perceived Social Support → Presenteeism

Path 2 Transformational leadership → Occupational Coping Self Efficacy→ Presenteeism

Path 3 Transformational leadership → Perceived Social Support → Occupational Coping Self Efficacy →Presenteeism

Comparsion1：Ind1 minus Ind2

Comparsion2：Ind1 minus Ind3

Comparsion3：Ind2 minus Ind3

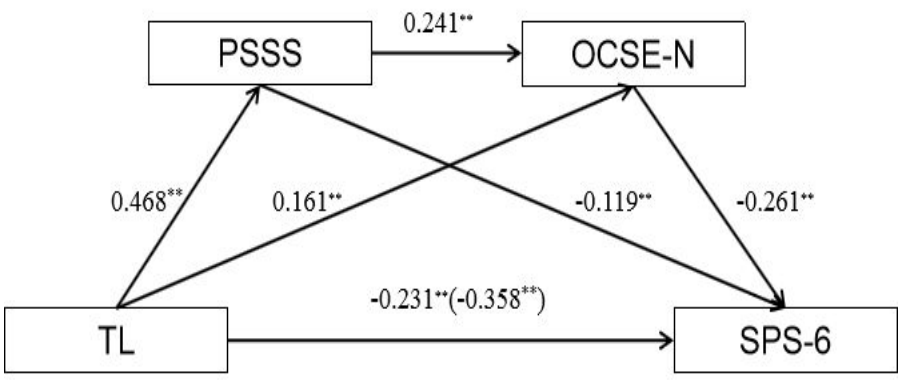

FIGURE 1
Chain mediating model. **p < 0.01.

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Relationships between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among Chinese ICU nurses: a cross-sectional study

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Relationships between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among Chinese ICU nurses: a cross-sectional study

Jijun Wu [1†], Yuxin Li [2†,3†], Qin Lin[4†], Yuting Fan[3,6], Jiquan Zhang[3], Zhenfan Liu[3], Xiaoli Liu[3], Xian Rong[5*], Xiaoli Zhong[3*]

[1]Department of Cardiology, Deyang People's Hospital, Sichuan, China，[2]School of Nursing, North Sichuan Medical College, Sichuan, China，[3]Nursing Department, Deyang People's Hospital, Sichuan, China，[4]Shulan International Medical College, Zhejiang Shuren University, Hangzhou, China, [5]School of Nursing, ChengDu College, Sichuan, China，[6]Sichuan Nursing Vocational College, Sichuan, China

Jijun Wu[1†] 、Yuxin Li[2†,3†] and Qin Lin[4†]：These authors contributed equally to this work and share first authorship

*** Correspondence:**

Xiaoli Zhong

Xian Rong

1165254226@qq.com

Abstract

Objective: This study aimed to investigate the relationship between transformational leadership and presenteeism among ICU nurses in tertiary hospitals and further investigate the chain-mediated role of perceived social support and occupational coping self-efficacy.

Design： This is a cross-sectional survey study.

Setting: 6 tertiary hospitals in Sichuan Province, China.

Participants: 590 ICU nurses were recruited from 6 tertiary hospitals in China for the survey.

Primary and secondary outcome measures: Presenteeism of ICU nurses was the primary outcome indicator. Transformational leadership, perceived social support, and occupational coping self-efficacy were secondary outcome indicators. The transformational leadership scale, perceived social support, occupational coping self-efficacy, and stanford presenteeism scale were used to investigate ICU nurses through convenience sampling.

Results: The presenteeism score of ICU nurses was 15.46±4.45 (Mean±SD), in which the incidence of high presenteeism was 53.90%. Correlation analysis showed that presenteeism was negatively correlated with transformational leadership, perceived social support, and occupational coping self-efficacy (r= -0.412 to -0.486; P<0.05). Perceived social support partially mediated the relationship between transformational leadership and presenteeism, with an effect value of 0.055 (95%CI:-0.102,-0.012; P<0.001);occupational coping self-efficacy partially mediated the relationship between transformational leadership and presenteeism, with an effect value of 0.042 (95% CI:

-0.074,-0.017; *P*<0.001); perceived social support and occupational coping self-efficacy chain-mediated between transformational leadership and presenteeism, with an effect value of 0.029 (95% CI: -0.046,-0.016; *P*<0.001).

Conclusion: ICU nurses' perceived social support and occupational coping self-efficacy are chain-mediated between transformational leadership and presenteeism. Therefore, to reduce nurses' presenteeism, nursing managers should adopt targeted interventions based on the factors influencing them to improve transformational leadership and enhance their perceived social support and occupational coping self-efficacy.

Keywords: intensive care unit; nurses; presenteeism; transformational leadership; perceived social support; occupational coping self-efficacy

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study included transformational leadership, perceived social support, and occupational coping self-efficacy in the analysis of presenteeism among ICU nurses, providing a new perspective on the relationship between transformational leadership and presenteeism.
- This study was cross-sectional, and causal relationships between variables could not be inferred.
- This study only surveyed 6 tertiary hospitals in Sichuan Province, China, and there were limitations in the sample.

Introduction

In recent years, the study of the relationship between the health status of occupational groups and the economy has increasingly become a hot spot of scholars' attention. Health, as one of the most essential human capital, not only affects individual labor performance but also influences a country's or region's economic growth dynamics. Presenteeism, also known as low health-related productivity, is prevalent among occupational groups, especially in the healthcare industry. There is no standardized concept of presenteeism, which was first proposed by Professor Copper in 1996, describing it as the phenomenon of working when one should take a break from work due to illness or extended working hours that cause a reduction in health-related productivity.[1]In 2005, Kivimäki et al. expanded the concept of presenteeism to include working when one is in an unhealthy state.[2] A systematic evaluation by Webster et al. showed that the reported prevalence of presenteeism in the occupational population ranged from 35% to 97%, influenced by organizational factors, job characteristics, and personal factors.[3]As a major force in health care, nurses are a high-risk, high-stress, and high-work-intensity population. In the global shortage of nursing human resources, nurses are at high risk of presenteeism, especially in developing countries or poor areas, due to heavy workloads, human resource constraints, shift work, complex interpersonal relationships, and inadequate remuneration packages.[4]

It has been reported that 85% of healthcare workers have had the experience of attending work with illness,[5] while the global rate of presenteeism reporting among nurses is about 49.2%,[6] with 65.0% in the United States,[7] 48.7% in New Zealand,[8] and a high rate of 94.25% of presenteeism reporting among nurses in China.[9] The impact of presenteeism on individuals and organizations is

often multifaceted; on the one hand, it affects personal health, resulting in decreased productivity, lower work efficiency, and increased burnout, which affects professional well-being. On the other hand, it affects patient safety by increasing the risk of medication errors, falls, and infections. In addition, presenteeism can have a series of negative impacts on organizational development, directly or indirectly increasing the economic loss of the organization. Studies have shown that due to differences in the level of economic growth, the financial loss caused by presenteeism of nurses varies slightly in different countries, from about US$4.38 billion per year in China,[9] US$3-12 billion per year in the United States,[10] and about US$3,055 per capita in Japan.[11] Therefore, considering the negative consequences of presenteeism on multiple domains, such as individuals, patients, and organizations, it is necessary to explore the mechanisms and pathways of its impact from various perspectives.

According to the 2020 State of Global Nursing Report, there is currently a shortfall of up to 5.9 million nurses worldwide, with a projected shortfall of 5.7 million by 2030, with the shortage of nurses in developing countries and poorer regions particularly prominent. Although the shortage of nurses in China has dramatically improved in recent years, there is still a gap from the global average. Whether the allocation of human resources is reasonable and whether the appropriate ratio directly affects the quality of nursing services, work efficiency, and healthcare costs, thus affecting the quality and safety of patient services.[12, 13]The intensive care unit (ICU), as a special ward for the centralized treatment, resuscitation, and monitoring of patients with acute, critical, and severe illnesses in medical institutions, is characterized by solid professionalism, heavy workload, modern equipment, and complex treatment, which makes nurses' workload challenging and stressful, leading to prominent chronic health problems such as chronic pain, fatigue, gastrointestinal disorders, and sleep disorders. Research shows that the average ICU bed-to-nurse ratio in China is 1:1.86, with 63.3% of the regions having a 1:1.5 to <2.0 ratio.[14] Therefore, the shortage of human resources for ICU nurses is still prominent in China. Presenteeism of ICU nurses is also notable due to the influence of factors such as dedication, health status, work pressure, remuneration, and poor job replacement. Therefore, it is essential to pay attention to the current situation of ICU nurses' presenteeism and its influence mechanism and to develop targeted interventions to improve nurses' health status and patient safety.

In organizations, leadership style is an essential source of employees' emotional and psychological experience, affecting their psychological well-being and job performance.[15] Transformational leadership refers to a leader's ability to guide employees to develop proper values, resilience, and a positive mindset by making them aware of their responsibilities, stimulating high-level needs, and building mutual trust. Transformational leadership has four dimensions: moral example, charisma, personalized care, and visionary inspiration. As a work resource, leadership style is an essential organizational contextual variable affecting employees. Transformational leadership style can improve employee performance and reduce impaired productivity by exuding leadership charisma, reinforcing leadership inspiration, and personalized care to stimulate employees' intellectual and higher-level needs.[16] The positive effects of transformational leadership have been widely studied and confirmed regarding nurses' resilience,[17] burnout,[18] job satisfaction,[19]and improved patient safety outcomes.[20] Research on transformational leadership's impact on presenteeism has not been reported. Based on this, we propose research hypothesis 1: Transformational leadership negatively affects presenteeism and can further reduce the occurrence of presenteeism through mediating variables.

Previous research on the factors influencing nurses' presenteeism has focused on demographic characteristics such as length of service and job title;[21] health conditions such as subfertility

symptoms, chronic bodily pain, hypertension, and other chronic illnesses;[22, 23] and work-related factors such as pay and income, work environment, and occupational stress.[24] The synergistic effects of positive psychological work resources, such as social support and self-efficacy, are often overlooked.

Some studies have shown that social support directly predicts the mental health of healthcare workers and indirectly affects mental health through personal resilience, which directly or indirectly affects work efficiency. Perceived social support refers to an individual's emotional experience and degree of satisfaction in feeling respected, supported, and understood. It consists of three main components: family support, friend support, and material or other spiritual support from the community.Perceived social support as a positive psychological resource is one of the essential protective resources for individuals, which helps to alleviate work pressure and negative emotions, maintain a healthy psychological state and a positive work state, and thus reduce the phenomenon of presenteeism. The social support buffer model also points out that perceived social support can inhibit or buffer the adverse effects of stressful events on individuals.[25] Some studies have shown that presenteeism is negatively related to marine social support and that high social support may improve presenteeism by reducing stress and increasing job satisfaction and performance.[26] In addition, leadership styles can improve employees' stress coping and handling abilities through support for employees, which can stimulate employees' motivation, work attitudes, and behaviors and enhance the level of perceived social support. Based on this, we propose the following research hypotheses:

Research Hypothesis 2: Transformational leadership can influence presenteeism among ICU nurses through the mediating role of perceived social support.

Occupational coping self-efficacy refers to an overarching self-efficacy of employees to effectively cope with and accomplish nursing care. Self-efficacy, as a positive psychological resource within an individual, is essential for enhancing occupational coping ability, reducing work stress and burnout, improving mental health, and enhancing work efficiency and work quality. Research shows that the lack of coping self-efficacy may directly or indirectly affect work engagement through stress and interpersonal relationships, making employees feel inefficient.[27]The Job Demands-Resources Model states that each occupation has specific risk factors associated with job stress and that when employees have high levels of job demands and job resources, it stimulates personal growth and development and helps to promote good organizational outcomes.[28] Transformational leadership, perceived social support, and occupational coping self-efficacy are important to nurses in achieving organizational goals as overarching components of job demands and resources. Currently, there is evidence regarding the influential relationship between transformational leadership, perceived social support and self-efficacy. However, it is not yet known whether occupational coping self-efficacy mediates the relationship between transformational leadership and presenteeism, and whether there is a chain of mediation between perceived social support and occupational coping self-efficacy between transformational leadership and presenteeism. Based on these analyses, we propose the following research hypotheses:

Research Hypothesis 3: Transformational leadership can influence presenteeism among ICU nurses through the mediating role of occupational coping self-efficacy.

Research Hypothesis 4: Transformational leaders can influence presenteeism among ICU nurses by mediating the chain of perceived social support and occupational coping self-efficacy.

Based on the above analysis, this study used the JD-R model as a theoretical guide to explore the influence mechanism of presenteeism of Chinese ICU nurses from multiple perspectives of job requirements (transformational leadership), job resources (perceived social support), and personal resources (occupational coping self-efficacy), and to establish a hypothetical model (Fig. 1) to provide a theoretical basis for the reduction of presenteeism of ICU nurses.

Figure 1: Hypothesized Model of the Relationship between Transformational Leadership（TL), Perceived Social Support(PSSS), Occupational Coping Self-Efficacy(OCSE-N) and Presenteeism（SPS-6）

Methods

Participants

In March-April 2023, the cluster random sampling method was used to divide Sichuan Province into five regions: north Sichuan, east Sichuan, west Sichuan, south Sichuan and Chengdu City. One tertiary hospital was randomly selected from each region of north Sichuan, east Sichuan, west Sichuan, and south Sichuan. Two tertiary hospitals were randomly selected from Chengdu City, and finally, the ICU nurses in these six tertiary hospitals were surveyed. Inclusion criteria: holders of professional qualification certificate for nurses, engaged in ICU clinical work for more than one year; no history of alcohol or drug addiction, no history of mental illness; no history of psychiatric disease-related drugs; informed consent and voluntary participation. Exclusion criteria: internship, regulation training, and advanced training nurses; those currently on sick leave, maternity leave, and other absenteeism. According to the Kendall sample size rough estimation method, the variables in this study were 24 (14 general demographic information + four dimensions of the Transformational Leadership Scale + 3 dimensions of the Perceived Social Support Scale + 2 dimensions of the Occupational Coping Self-Efficacy + 1 dimension of Stanford Presenteeism Scale). At least 5-10 times the number of variables were selected, considering 20% of invalid questionnaires, and the sample size ranged from 150 to 300 cases. A total of 635 questionnaires were recovered in this study; 45 invalid questionnaires with regular filling and logical errors were excluded, and 590 valid questionnaires were finally recovered, with an effective recovery rate of 92.9%.

Procedures

The data for this study were collected anonymously using an electronic questionnaire called "Questionnaire Star". After obtaining the consent of the relevant person in charge of each hospital, a researcher was identified in each hospital, and uniform training was provided to all researchers to clarify the purpose, significance, and method of filling out the questionnaires in this study. After the training, the survey researcher distributed the questionnaire to the hospital ICU nurses' WeChat group, and the first page of the questionnaire was set up with a unified filling instruction, explaining the purpose of this study and the precautions for filling in the method. This study followed the

principles of informed consent and voluntariness, and the investigators could withdraw from this study at any time in the middle. All survey contents were set as mandatory options in the electronic questionnaire to ensure the complete survey information responses.

Measures

Socio-demographic characteristics

Fourteen demographic variables were included in this study work, mainly gender, age, marital and childbearing status et al.

Transformational Leadership Scale，TL

A questionnaire developed by Li et al. was used.[30]The scale consists of four dimensions with 26 entries. A Likert 5-point scale was used, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with a total score of 26 to 130. Higher scores indicated a higher degree of perceived transformational leadership behaviour. The Cronbach's alpha coefficient of the scale was 0.912. In this study, the Cronbach's alpha coefficient was 0.906.

Perceived Social Support Scale，PSSS

A questionnaire developed by Blumenthal et al. was used.[31]The scale consists of 3 dimensions with 12 entries. A Likert 7-point scale was used for scoring, ranging from 1 (strongly disagree) to 7 (strongly agree), with a total score of 12-84. Higher scores indicated a higher level of social support felt by the individual. The Cronbach's alpha coefficient of the scale was 0.912. In this study, the Cronbach's alpha coefficient for this scale was 0.910.

Occupational Coping Self Efficacy Scale，OCSE-N

A questionnaire developed by Pisanti et al. was used.[32] The scale consists of two dimensions with a total of 9 entries. A Likert 5-point scale was used, ranging from 1 (very non-compliant) to 5 (very compliant), with a total score ranging from 9 to 45, with higher scores indicating higher occupational coping self-efficacy. The Cronbach's alpha coefficient for the scale was 0.882. In this study, the Cronbach's alpha coefficient for the scale was 0.899.

Stanford Presenteeism Scale-6，SPS-6

The scale developed by Koopman et al. was used. [33]The scale consists of two dimensions with six entries. A 5-point Likert scale was used, ranging from 1 (strongly disagree) to 5 (strongly agree), with entries 5 and 6 content being reverse scored, for a total score of 6 to 30, with higher SPS-6 scores indicating greater impairment of health productivity due to an individual's presenteeism. The median score of the scale was used as a boundary to categorize low and high presenteeism. The Cronbach's alpha coefficient for the scale was 0.860. In this study, the Cronbach's alpha coefficient for the scale was 0.896.

Statistical analysis

SPSS 23.0 was used for statistical analysis. Exploratory analysis showed that the measured variables conformed to a normal distribution. Differences between groups were analyzed using independent samples t-test or one-way ANOVA. Pearson correlation analysis was used to analyze the correlation

between variables. Hierarchical regression was used to analyze the factors influencing presenteeism among nurses and the mediating role among variables. Based on the bias-corrected percentile bootstrap method, the Bootstrap method (5000 samples) yielded 95% confidence intervals for significance testing. The chained mediation effect was verified through Model 6 in the PROCESS 4.1 macro program, with presenteeism as the dependent variable, transformational leadership as the independent variable, and perceived social support and occupational coping self-efficacy as the mediating variables. Transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism scores were standardized before testing the model. Direct, mediated (paths a*y (Path 1), x*c (Path 2), a*b*c (Path 3)), and total effects were examined.

Ethical considerations

Ethical review approval for this study was obtained from the Medical Ethics Review Committee of Deyang People's Hospital (No. 2021-04-056-K01). The Declaration of Helsinki conducted all study procedures. Before the survey, the researcher obtained access permission from the hospital administration after providing information about the purpose, methodology, and significance of the survey to the investigating organization. At the beginning of the anonymous survey, an informed consent form was included on the cover of the online questionnaire, and completion and submission of the questionnaire was considered as informed consent and voluntary participation in this survey. All participants consciously and voluntarily agreed to participate in this survey. During the survey, participants were fully informed of their right to withdraw and terminate the survey at any stage without any negative consequences. The researcher ensured that all data collected from the participants were anonymous and confidential to protect their privacy.

Results

General demographic characteristics

Of the 590 participants, 533 (or 90.34%) were female. Nearly 97.46% of the participants were <40 years old. Most nurses had a bachelor's degree (81.86%), 66.10% were married, 53.39% were mid-level, 86.27% were clinical nurses, and 84.75% were employed under labor contracts. The remaining sociodemographic characteristics (Supplemental Table 1).

Descriptive and correlation analysis of the scales

In this study, ICU nurses' transformational leadership scores were 104.06±17.68, perceived social support scores were 62.58±11.92, occupational coping self-efficacy scores were 31.13±6.58, and presenteeism scores were 15.46±4.45.Transformational leadership, perceived social support, and occupational coping self-efficacy were all negatively correlated with presenteeism, transformational leadership was positively associated with perceived social support and occupational coping self-efficacy, and perceived social support was positively correlated with occupational coping self-efficacy(Supplemental Table 2).

Multiple stratified regression analysis

As shown in Supplemental Table 3, a multivariate hierarchical regression analysis was conducted with presenteeism as the dependent variable. In the first step, the variables that made sense in the univariate analysis of presenteeism were added to the model as control variables. In the second step, after excluding the effects of the above control variables, transformational leadership was negatively associated with presenteeism（β=-0.090, P<0.001）, where transformational leadership had a

significant effect on presenteeism, explaining 11.8% of the variance. In the third step, perceived social support was negatively related to presenteeism（β=-0.068, P<0.05）, and adding the mediating variable perceived social support to the model explained an additional 14.0% of the variance in presenteeism. The regression coefficient for transformational leadership decreased from -0.090 in the second step to -0.069 in the third step, which was still significant. In the fourth step, occupational coping self-efficacy was negatively correlated with presenteeism（β=-0.044, P<0.05）, and adding career coping self-efficacy to the model explained an additional 18.7% of the unnoticeable absenteeism variance. The regression coefficient for transformational leadership decreased from -0.069 in the third step to -0.058 in the fourth but remained significant. Statistical analyses initially showed that perceived social support and occupational coping self-efficacy mediated the relationship with presenteeism in the transformational leadership component of Chinese ICU nurses (see Supplemental Table 3).

Analysis of chain mediation effects

All variables were standardized, with transformational leadership as the independent variable, presenteeism as the dependent variable, perceived social support and occupational coping self-efficacy as the mediating variables, and self-assessed physical health, perceived job stress, and whether or not one has suffered from workplace violence in the past year as control variables, and mediation effects were analyzed using Model 6 in PROCESS.

The results of the chain mediation modelling of the role of perceived social support, occupational coping self-efficacy in transformational leadership and presenteeism showed that the total effect of transformational leadership on presenteeism was -0.358 (95%CI: -0.428, -0.287; P<0.001). The coefficients of the indirect paths transformational leadership on perceived social support, perceived social support on occupational coping self-efficacy, transformational leadership on occupational coping self-efficacy, perceived social support on presenteeism, and occupational coping self-efficacy on presenteeism were 0.468 (95%CI: 0.397, 0.538; P<0.001), 0.241 (95%CI: 0.160, 0.322; P<0.001), 0.161 (95%CI: 0.081, 0.241; P<0.001), -0.119 (95%CI: -0.198, -0.039; P= 0.003), -0.261 (95%CI: -0.339, -0.184; P<0.001), with an indirect effect of -0.029 (95%CI: -0.046, -0.016; P<0.001), and the 95%CI did not contain zero, indicating that the model of perceived social support and occupational coping self-efficacy as chain mediators was valid. See Supplemental Table 4, Supplemental Table 5 and Figure 2.

Figure 2: Schematic diagram of the chain-mediated effects of perceived social support, occupational coping self-efficacy between transformational leadership and presenteeism

Discussion

This study explored the relationship between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among ICU nurses. The results found a direct effect of transformational leadership on presenteeism among ICU nurses. They confirmed that

perceived social support and occupational coping self-efficacy were chain mediators between transformational leadership and presenteeism. This provides a new perspective for studying the relationship between transformational leadership and presenteeism among ICU nurses.

The results of this study showed that ICU nurses' presenteeism score was (15.46±4.45), of which high presenteeism accounted for 53.9%, which indicated that China's ICU nurses' presenteeism was at a high level, which was worth paying attention to. To analyze the reasons for this, (1) only 56% of ICU nurses in this study had good self-assessed health. Several studies have also confirmed that individual physical and mental health conditions are the root cause of presenteeism.[34, 35] When nurses feel unwell or suffer from chronic illnesses, they may experience an inability to concentrate and devote themselves entirely to their work, which leads to lower work efficiency, lower productivity levels, and presenteeism. (2) 48% of the ICU nurses in this study had a high level of perceived stress. ICU, as an essential area for the rescue and treatment of patients with acute and critical illnesses in healthcare institutions, has a complex working environment. ICU nurses must continuously monitor changes in patients' conditions and cope with various first-aid situations. The high-intensity workload and prolonged work pressure may increase the nurses' fatigue and psychological burden, which may lead to presenteeism behaviors. (3) About 35% of ICU nurses in this study had suffered from workplace violence in the past. Workplace violence is a severe threat to the personal safety of nurses. It is a stressful event that can easily trigger anxiety and depression in nurses, negatively affect employee job satisfaction and loyalty, and increase concerns about the work environment and job security, leading to an inability to concentrate on work, thus resulting in presenteeism.[36]

The results of this study show that the transformational leadership score of ICU nurses is (104.06±17.68), which is at the medium-high level, similar to the results of foreign scholars.[16] In recent years, nursing managers' understanding of scientific management has gradually deepened, the leadership style of nursing team leaders has been continuously improved, and managers who have received higher education have higher qualities and conduct can play a corresponding exemplary role among nurses and can make wise decisions and guidance based on their professional knowledge when leading the team to make changes. Hence, the level of transformational leadership is higher.

The results of this study showed that ICU nurses perceived social support scores of (62.58±11.92), which was at a medium-high level, similar to the findings of Lu et al.[37] Social support, as a positive emotional experience in which an individual subjectively feels that they receive understanding and support from family, society, and friends, can reflect the degree to which an individual gets support in a stressful situation. Social support theory also states that a strengthened social support network helps to cope with external environmental challenges.[38] It may be related to the fact that the survey respondents in this study were mainly bachelor's degree holders (81.86%), and people with higher education tend to have more knowledge and skills, as well as better communication and expression skills and are more likely to establish and maintain good social relationships. The lower level of perceived social support among those with poor health, perceived high work stress may be related to the decline in participation in social activities and lack of time and energy to maintain interpersonal social relationships among this group.

The results of this study showed that ICU nurses' occupational coping self-efficacy score was (31.13 ± 6.58), which is at the medium level (median total score of 22.5), similar to the results of the study by Pisanti et al.[39] Self-efficacy is not confidence generated for a specific domain but can predict people's behavior in different situations. Studies have shown that individuals with high levels of self-efficacy favor using positive or problem-focused coping strategies, which help them effectively

buffer the adverse effects of stress and contribute to maintaining high levels of physical and mental health.[40] It may be related to the fact that the working years of the respondents in this study were mainly 1-5 years, which accounted for about 40%. On the one hand, the ICU work environment is challenging, requiring the handling of critically ill patients and complex medical situations. Low-seniority nurses working in such a high-pressure environment may feel uneasy and anxious, which affects self-efficacy enhancement. On the other hand, newly recruited ICU nurses may lack confidence in their abilities and coping measures due to a lack of sufficient work experience and training, resulting in lower self-efficacy.

This study found that perceived social support mediates the relationship between transformational leadership and presenteeism among ICU nurses, i.e., transformational leadership not only acts directly on presenteeism but also indirectly through perceived social support. According to the theory of transformational leadership, transformational leadership is an upbeat leadership style that stimulates the intrinsic motivation of employees by motivating them so that they can maximize their potential to achieve the highest level of performance, promote their personal growth and career development, and thus improve team cohesion and work performance.[41] On the one hand, when nurse leaders have a high transformational leadership style, they can provide the social support that nurses need. By motivating and stimulating nurses' potential, they feel valued and supported. They are willing to devote themselves to their work in a positive frame of mind, which contributes to the joint development of themselves and the organization and enhances nurses' job satisfaction, which helps to reduce presenteeism; on the other hand, it is based on the theory of social exchange. When individuals receive sufficient support in social exchange, they are more confident and motivated to face challenges at work, thus reducing presenteeism. When nurses perceive the care and support from leaders, colleagues, and organizations, this emotional support is not only conducive to regulating the negative emotions of nurses and reducing the negative impact of work pressure on them but also helps to enhance the nurses' commitment to and identification with the organization, so that they are more engaged in their work and reduce the possibility of presenteeism.[26]

The results of this study found that occupational coping self-efficacy mediates the relationship between transformational leadership and presenteeism among ICU nurses, which means that transformational leadership not only acts directly on presenteeism but also indirectly through occupational coping self-efficacy. Bandura's self-efficacy theory states that when individuals believe they are competent enough to accomplish a task, they are more motivated to engage in it and strive to achieve the desired goal.[42] Managers with a high level of transformational leadership style can motivate nurses through character appeal and vision sharing and stimulate positive emotions in nurses to show more energy, dedication, and focused attitudes to be more confident in dealing with challenges and pressures at work. Nurses with higher occupational coping self-efficacy are more confident and capable of dealing with difficulties and challenges at work. They are more willing to take the initiative to solve problems, improve work performance, and reduce presenteeism behavior.

The results of this study found that perceived social support and occupational coping self-efficacy acted as chain mediators between transformational leadership and presenteeism among ICU nurses, i.e., transformational leadership among nurses affects presenteeism through perceived social support and occupational coping self-efficacy. According to the JD-R model, job resources can buffer the negative consequences of presenteeism by stimulating employees' internal and external motivation to cope with demanding job tasks. Transformational leadership and perceived social support as an essential external resource and occupational coping self-efficacy as a vital internal resource, managers with a high level of transformational leadership style excel at stimulating nurses' autonomy and creativity by establishing good interpersonal relationships and a teamwork

atmosphere, providing nurses with the necessary resources and support, and enhancing nurses' perceptions of social support.[20] When nurses feel the support and encouragement from their leaders, they will be more willing to seek and utilize help and support from external resources, such as colleagues, family, and friends. This social support helps meet nurses' needs at work, reduces work stress and fatigue, and increases job satisfaction and well-being, enhancing nurses' occupational coping self-efficacy. When possessing a higher level of self-efficacy, nurses are more confident that they can better cope with the challenges and pressures at work, which is conducive to maintaining good mental health and reducing the incidence of presenteeism.

Based on the results of this study, we put forward the following recommendations to improve the status of presenteeism among ICU nurses. First, cultivate and promote a transformational leadership style: leaders should pay attention to the needs and emotions of nurses and actively listen to their opinions and suggestions; stimulate nurses' enthusiasm and innovation through incentives and encouragement so that they can feel the meaning and value of their work; establish a positive, open and inclusive work environment and encourage nurses to participate in decision-making to improve their sense of belonging and responsibility and reduce presenteeism. Second, enhance perceived social support: establish a good social support network; organizations should encourage supportive colleague relationships and teamwork and promote interactions and exchanges through regular team-building activities; nursing managers should strengthen communication with nurses, establish a good team communication mechanism, and encourage information exchange and emotional support among nurses; and provide resources for mental health support by providing resources such as psychological counseling services, guidance and training on work-life balance, to help nurses cope with work stress and emotional distress, promote nurses' physical and mental health, and reduce presenteeism. Third, to improve nurses' sense of self-efficacy in occupational coping, regular training and refresher courses are conducted to improve nurses' professional skills and knowledge and enhance their ability to cope with work challenges; work tasks and resources are reasonably allocated to reduce nurses' overload and stress; and appropriate incentives and recognition mechanisms are provided to stimulate nurses' motivation and self-efficacy and to reduce presenteeism.

Limitation

First, this study was a cross-sectional study, which could not dynamically assess the level of presenteeism and its influencing factors on ICU nurses in different periods and stages. It could not effectively reveal the dynamic changes among the four variables. In the future, we can analyze the presenteeism of ICU nurses and the changes of the related influencing factors in a multifaceted way through longitudinal studies; Second, this study only set ICU nurses from six tertiary hospitals in Sichuan Province, China, as the study population, and the sample is not representative enough, so the next step could be to launch a multicenter, large-sample survey to explore the presenteeism of ICU nurses in different regions and levels of hospitals.

Conclusions

In summary, China's ICU nurses' presenteeism is at a high level, and transformational leadership can not only directly affect ICU nurses' presenteeism but also indirectly affect ICU nurses' presenteeism by the chain mediating role of perceived social support and occupational coping self-efficacy. Nursing managers should pay attention to developing a transformational leadership style to enhance social support and improve ICU nurses' occupational coping efficacy, thus reducing ICU nurses' presenteeism behavior.

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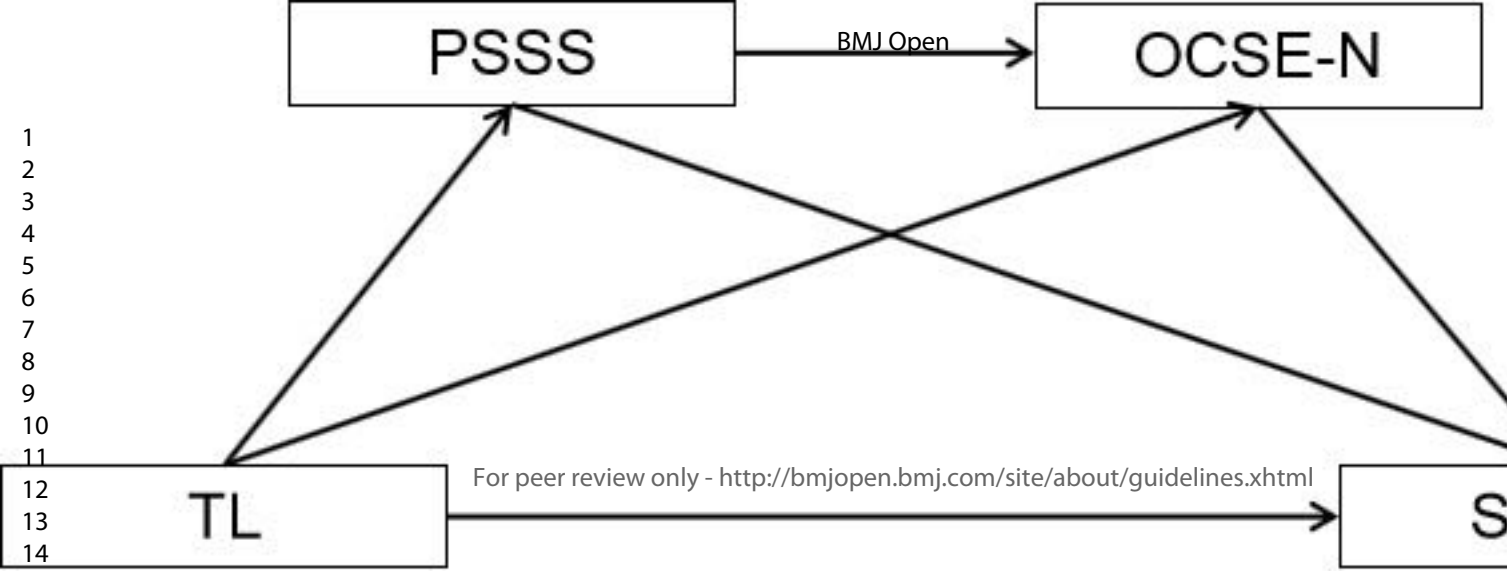

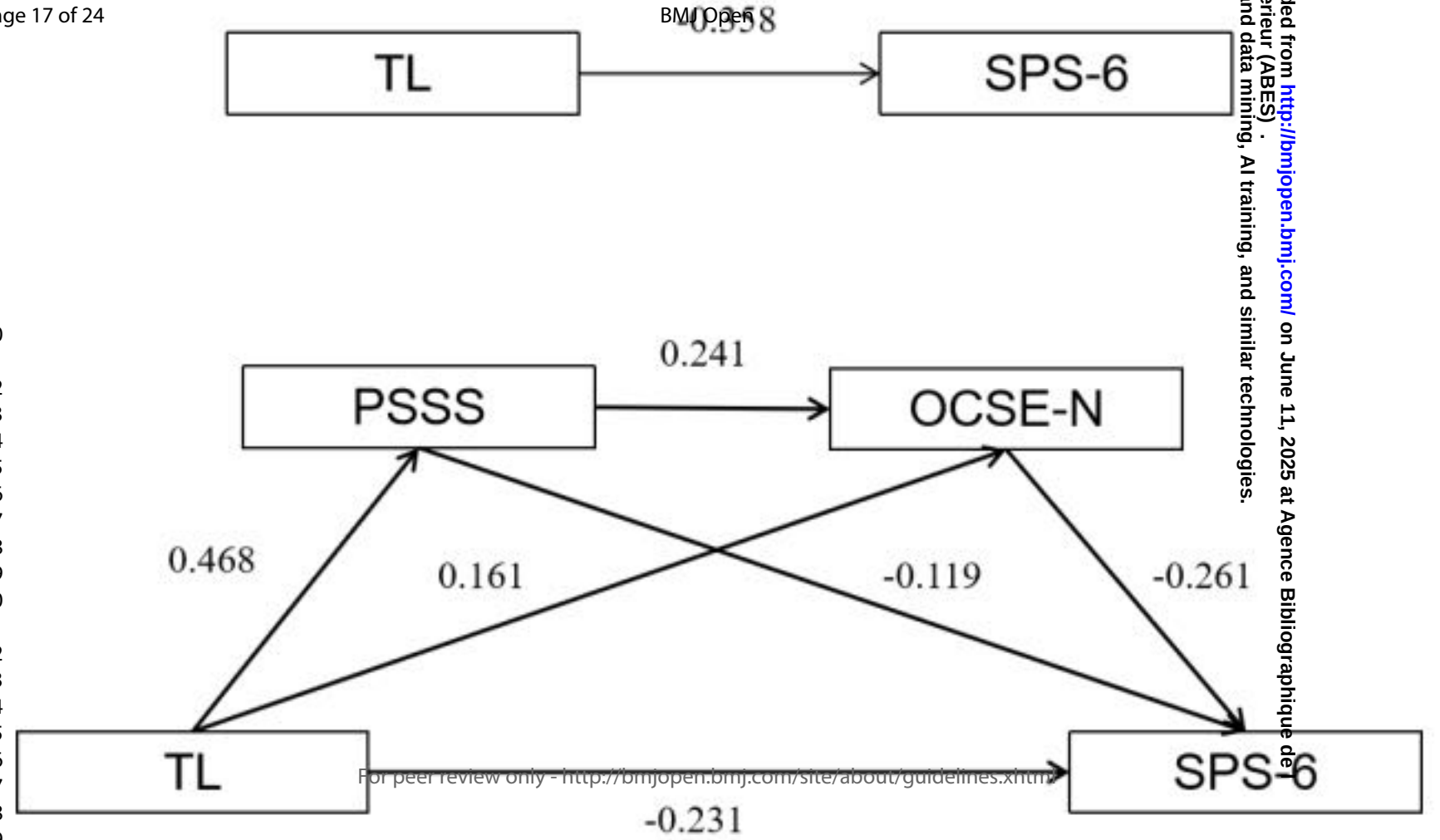

Results

Table 1: Relationship between demographic characteristics of ICU nurses and presenteeism

Items	N	SPS-6 Mean ±SD	*t/F*	*P*
Sex			-0.378	0.706
male	57	15.25±5.10		
female	533	15.48±4.38		
Age			0.052	0.950
< 30	267	15.39±4.32		
30~ < 40	308	15.51±4.66		
≥40	15	15.47±2.10		
Marital status			1.410	0.239
unmarried	189	15.87±4.36		
married but not having children	73	15.55±4.14		
married and having children	317	15.15±4.58		
Divorced or other	11	16.82±3.97		

Highest degree				
College and below	93	15.31±4.54	0.086	0.918
undergraduate	483	15.49±4.32		
Master's degree or above	14	15.21±4.87		
Professional title			1.971	0.140
junior level	102	15.36±4.67		
middle level	315	15.77±4.34		
high level	173	14.94±4.50		
Position			1.476	0.229
clinical nurse	509	15.58±4.44		
nursing team leader	68	14.78±4.64		
head nurse	13	14.23±3.47		
Years of experience in ICU			1.903	0.150
1~ < 5	252	15.07±4.36		
5~ < 10	204	15.88±4.45		
≥10	134	15.54±4.60		

Average monthly income			1.945	0.121
1~ < 6000	150	15.63±4.46		
6000~ < 8000	268	15.75±4.49		
8000~ < 10000	132	14.64±4.28		
≥10000	40	15.53±4.57		
Type of contract			-1.266	0.206
professional preparation	90	14.91±3.96		
labor contract	500	15.56±4.53		
Self-assessed health status			36.031	＜0.001
good	328	14.27±4.20		
general	233	16.62±4.14		
worse	29	19.59±4.89		
Whether or not you have a chronic disease			1.598	0.111
No	87	16.16±4.39		
Yes	503	15.34±4.46		
Perceived work stress			28.679	＜0.001

lower	13	11.77±3.81		
middle	292	14.34±3.93		
high	285	16.78±4.58		
ICU human resources			1.732	0.178
< 1:2.5~3	347	15.25±4.58		
=1:2.5~3	143	15.45±4.27		
>1:2.5~3	100	16.19±4.24		
Exposure to workplace violence in the past year			5.763	＜0.001
No	386	14.71±4.39		
Yes	204	16.87±4.24		

Table 2：Correlations between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism

Variables	*Mean* ±*SD*	1	2	3	4
Transformational leadership(1)	104.06±17.68	1	-	-	-
Perceived social support(2)	62.58±11.92	0.515**	1	-	-
Occupational	31.13±6.58	0.369**	0.417**	1	-

coping self-efficacy（3）					
Presenteeism(4)	15.46±4.45	-0.445**	-0.412**	-0.486**	1

**P <0.05

Table 3: Multiple stratified regression analysis of presenteeism of ICU nurses in China

	Step1	Step2	Step3	Step4
Step1				
Self-assessed health status	1.883**	1.475**	1.290**	1.057**
Perceived work stress	1.729**	1.392**	1.268**	0.803**
Exposure to workplace violence in the past year	-1.371**	-0.939**	-0.892**	-0.584
Step2				
Transformational leadership	—	-0.090**	-0.069**	-0.058**
Step3				
Perceived social support	—	—	-0.068**	-0.044**

Step4				
Occupational coping self-efficacy	—	—	—	-0.177**
F	42.575**	61.893**	55.090**	56.639**
R^2	0.179	0.297	0.320	0.368
Adjustment R^2	0.175	0.293	0.315	0.362

**P <0.01

Table 4: Paths of indirect mediating effects of perceived social support, occupational coping self-efficacy between transformational leadership and presenteeism

Path	Coeff	95%CI	
		LLCI	ULCI
Transformational leadership→Perceived Social Support →Presenteeism	-0.055	-0.104	-0.012
Transformational leadership→Occupational Coping Self Efficacy→Presenteeism	-0.042	-0.076	-0.017
Transformational leadership→Perceived Social Support →Occupational Coping Self Efficacy→Presenteeism	-0.029	-0.046	-0.016

Table 5 : Analysis of the chain-mediated effects of perceived social support, occupational coping self-efficacy on the relationship between transformational leadership and presenteeism

	R^2	F	Coeff	SE	*t*	*P*	LLCI	ULCI
Outcome	0.297	61.700						
Perceived Social Support								
Transformational leadership			0.468	0.036	12.980	＜0.001	0.397	0.538
Outcome	0.300	50.176						
Occupational Coping Self Efficacy								
Transformational leadership			0.161	0.041	3.941	＜0.001	0.081	0.241
Perceived Social Support			0.241	0.041	5.830	＜0.001	0.160	0.322
outcome	0.368	56.639						
Presenteeism								
Transformational leadership			-0.231	0.039	-5.865	＜0.001	-0.308	-0.153
Perceived Social Support			-0.119	0.040	-2.935	0.003	-0.198	-0.039

Occupational Coping Self Efficacy			-0.261	0.039	-6.638	＜0.001	-0.339	-0.184
Outcome	0.297	61.893						
Presenteeism								
Transformational leadership			-0.358	0.036	-9.929	＜0.001	-0.428	-0.287
Total effect			-0.358	0.036	-9.929	＜0.001	-0.428	-0.287
Direct effect			-0.231	0.039	-5.865	＜0.001	-0.308	-0.153
Total indirect effect			-0.127	0.027	-	-	-0.184	-0.080

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Relationships between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among Chinese ICU nurses: a cross-sectional study

Jijun Wu [1†], Yuxin Li [2†,3†], Qin Lin[4†], Yuting Fan[3,6], Jiquan Zhang[3], Zhenfan Liu[3], Xiaoli Liu[3], Xian Rong[5*], Xiaoli Zhong[3*]

[1]Department of Cardiology, Deyang People's Hospital, Sichuan, China，[2]School of Nursing, North Sichuan Medical College, Sichuan, China，[3]Nursing Department, Deyang People's Hospital, Sichuan, China，[4]Shulan International Medical College, Zhejiang Shuren University, Hangzhou, China, [5]School of Nursing, ChengDu College, Sichuan, China，[6]Sichuan Nursing Vocational College, Sichuan, China

Jijun Wu[1†] 、Yuxin Li[2†,3†] and Qin Lin[4†]：These authors contributed equally to this work and share first authorship

*** Correspondence:**

Xiaoli Zhong

Xian Rong

1165254226@qq.com

Abstract

Objective: This study aimed to investigate the relationship between transformational leadership and presenteeism among ICU nurses in tertiary hospitals and further investigate the chain-mediated role of perceived social support and occupational coping self-efficacy.

Design： This is a cross-sectional survey study.

Setting: 6 tertiary hospitals in Sichuan Province, China.

Participants: 590 ICU nurses were recruited from 6 tertiary hospitals in China for the survey.

Primary and secondary outcome measures: Presenteeism of ICU nurses was the primary outcome indicator. Transformational leadership, perceived social support, and occupational coping self-efficacy were secondary outcome indicators. The transformational leadership scale, perceived social support, occupational coping self-efficacy, and stanford presenteeism scale were used to investigate ICU nurses through convenience sampling.

Results: The presenteeism score of ICU nurses was 15.46±4.45 (Mean±SD), in which the incidence of high presenteeism was 53.90%. Correlation analysis showed that presenteeism was negatively correlated with transformational leadership, perceived social support, and occupational coping self-efficacy (r= -0.412 to -0.486; P<0.05). Perceived social support partially mediated the relationship between transformational leadership and presenteeism, with an effect value of 0.055 (95%CI:-0.102,-0.012; P<0.001);occupational coping self-efficacy partially mediated the relationship between transformational leadership and presenteeism, with an effect value of 0.042 (95% CI:

-0.074,-0.017; P<0.001); perceived social support and occupational coping self-efficacy chain-mediated between transformational leadership and presenteeism, with an effect value of 0.029 (95% CI: -0.046,-0.016; P<0.001).

Conclusion: ICU nurses' perceived social support and occupational coping self-efficacy are chain-mediated between transformational leadership and presenteeism. Therefore, to reduce nurses' presenteeism, nursing managers should adopt targeted interventions based on the factors influencing them to improve transformational leadership and enhance their perceived social support and occupational coping self-efficacy.

Keywords: intensive care unit; nurses; presenteeism; transformational leadership; perceived social support; occupational coping self-efficacy

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study included transformational leadership, perceived social support, and occupational coping self-efficacy in the analysis of presenteeism among ICU nurses, providing a new perspective on the relationship between transformational leadership and presenteeism.
- This study was cross-sectional, and causal relationships between variables could not be inferred.
- This study only surveyed 6 tertiary hospitals in Sichuan Province, China, and there were limitations in the sample.

Introduction

In recent years, the study of the relationship between the health status of occupational groups and the economy has increasingly become a hot spot of scholars' attention. Health, as one of the most essential human capital, not only affects individual labor performance but also influences a country's or region's economic growth dynamics. Presenteeism, also known as low health-related productivity, is prevalent among occupational groups, especially in the healthcare industry. There is no standardized concept of presenteeism, which was first proposed by Professor Copper in 1996, describing it as the phenomenon of working when one should take a break from work due to illness or extended working hours that cause a reduction in health-related productivity.[1]In 2005, Kivimäki et al. expanded the concept of presenteeism to include working when one is in an unhealthy state.[2] A systematic evaluation by Webster et al. showed that the reported prevalence of presenteeism in the occupational population ranged from 35% to 97%, influenced by organizational factors, job characteristics, and personal factors.[3]As a major force in health care, nurses are a high-risk, high-stress, and high-work-intensity population. In the global shortage of nursing human resources, nurses are at high risk of presenteeism, especially in developing countries or poor areas, due to heavy workloads, human resource constraints, shift work, complex interpersonal relationships, and inadequate remuneration packages.[4]

It has been reported that 85% of healthcare workers have had the experience of attending work with illness,[5] while the global rate of presenteeism reporting among nurses is about 49.2%,[6] with 65.0% in the United States,[7] 48.7% in New Zealand,[8] and a high rate of 94.25% of presenteeism reporting among nurses in China.[9] The impact of presenteeism on individuals and organizations is

often multifaceted; on the one hand, it affects personal health, resulting in decreased productivity, lower work efficiency, and increased burnout, which affects professional well-being. On the other hand, it affects patient safety by increasing the risk of medication errors, falls, and infections. In addition, presenteeism can have a series of negative impacts on organizational development, directly or indirectly increasing the economic loss of the organization. Studies have shown that due to differences in the level of economic growth, the financial loss caused by presenteeism of nurses varies slightly in different countries, from about US$4.38 billion per year in China,[9] US$3-12 billion per year in the United States,[10] and about US$3,055 per capita in Japan.[11] Therefore, considering the negative consequences of presenteeism on multiple domains, such as individuals, patients, and organizations, it is necessary to explore the mechanisms and pathways of its impact from various perspectives.

According to the 2020 State of Global Nursing Report, there is currently a shortfall of up to 5.9 million nurses worldwide, with a projected shortfall of 5.7 million by 2030, with the shortage of nurses in developing countries and poorer regions particularly prominent. Although the shortage of nurses in China has dramatically improved in recent years, there is still a gap from the global average. Whether the allocation of human resources is reasonable and whether the appropriate ratio directly affects the quality of nursing services, work efficiency, and healthcare costs, thus affecting the quality and safety of patient services.[12, 13]The intensive care unit (ICU), as a special ward for the centralized treatment, resuscitation, and monitoring of patients with acute, critical, and severe illnesses in medical institutions, is characterized by solid professionalism, heavy workload, modern equipment, and complex treatment, which makes nurses' workload challenging and stressful, leading to prominent chronic health problems such as chronic pain, fatigue, gastrointestinal disorders, and sleep disorders. Research shows that the average ICU bed-to-nurse ratio in China is 1:1.86, with 63.3% of the regions having a 1:1.5 to <2.0 ratio.[14] Therefore, the shortage of human resources for ICU nurses is still prominent in China. Presenteeism of ICU nurses is also notable due to the influence of factors such as dedication, health status, work pressure, remuneration, and poor job replacement. Therefore, it is essential to pay attention to the current situation of ICU nurses' presenteeism and its influence mechanism and to develop targeted interventions to improve nurses' health status and patient safety.

In organizations, leadership style is an essential source of employees' emotional and psychological experience, affecting their psychological well-being and job performance.[15] Transformational leadership refers to a leader's ability to guide employees to develop proper values, resilience, and a positive mindset by making them aware of their responsibilities, stimulating high-level needs, and building mutual trust. Transformational leadership has four dimensions: moral example, charisma, personalized care, and visionary inspiration. As a work resource, leadership style is an essential organizational contextual variable affecting employees. Transformational leadership style can improve employee performance and reduce impaired productivity by exuding leadership charisma, reinforcing leadership inspiration, and personalized care to stimulate employees' intellectual and higher-level needs.[16] The positive effects of transformational leadership have been widely studied and confirmed regarding nurses' resilience,[17] burnout,[18] job satisfaction,[19]and improved patient safety outcomes.[20] Research on transformational leadership's impact on presenteeism has not been reported. Based on this, we propose research hypothesis 1: Transformational leadership negatively affects presenteeism and can further reduce the occurrence of presenteeism through mediating variables.

Previous research on the factors influencing nurses' presenteeism has focused on demographic characteristics such as length of service and job title;[21] health conditions such as subfertility

symptoms, chronic bodily pain, hypertension, and other chronic illnesses;[22, 23] and work-related factors such as pay and income, work environment, and occupational stress.[24] The synergistic effects of positive psychological work resources, such as social support and self-efficacy, are often overlooked.

Some studies have shown that social support directly predicts the mental health of healthcare workers and indirectly affects mental health through personal resilience, which directly or indirectly affects work efficiency. Perceived social support refers to an individual's emotional experience and degree of satisfaction in feeling respected, supported, and understood. It consists of three main components: family support, friend support, and material or other spiritual support from the community.Perceived social support as a positive psychological resource is one of the essential protective resources for individuals, which helps to alleviate work pressure and negative emotions, maintain a healthy psychological state and a positive work state, and thus reduce the phenomenon of presenteeism. The social support buffer model also points out that perceived social support can inhibit or buffer the adverse effects of stressful events on individuals.[25] Some studies have shown that presenteeism is negatively related to marine social support and that high social support may improve presenteeism by reducing stress and increasing job satisfaction and performance.[26] In addition, leadership styles can improve employees' stress coping and handling abilities through support for employees, which can stimulate employees' motivation, work attitudes, and behaviors and enhance the level of perceived social support. Based on this, we propose the following research hypotheses:

Research Hypothesis 2: Transformational leadership can influence presenteeism among ICU nurses through the mediating role of perceived social support.

Occupational coping self-efficacy refers to an overarching self-efficacy of employees to effectively cope with and accomplish nursing care. Self-efficacy, as a positive psychological resource within an individual, is essential for enhancing occupational coping ability, reducing work stress and burnout, improving mental health, and enhancing work efficiency and work quality. Research shows that the lack of coping self-efficacy may directly or indirectly affect work engagement through stress and interpersonal relationships, making employees feel inefficient.[27]The Job Demands-Resources Model states that each occupation has specific risk factors associated with job stress and that when employees have high levels of job demands and job resources, it stimulates personal growth and development and helps to promote good organizational outcomes.[28] Transformational leadership, perceived social support, and occupational coping self-efficacy are important to nurses in achieving organizational goals as overarching components of job demands and resources. Currently, there is evidence regarding the influential relationship between transformational leadership, perceived social support and self-efficacy. However, it is not yet known whether occupational coping self-efficacy mediates the relationship between transformational leadership and presenteeism, and whether there is a chain of mediation between perceived social support and occupational coping self-efficacy between transformational leadership and presenteeism. Based on these analyses, we propose the following research hypotheses:

Research Hypothesis 3: Transformational leadership can influence presenteeism among ICU nurses through the mediating role of occupational coping self-efficacy.

Research Hypothesis 4: Transformational leaders can influence presenteeism among ICU nurses by mediating the chain of perceived social support and occupational coping self-efficacy.

Based on the above analysis, this study used the JD-R model as a theoretical guide to explore the influence mechanism of presenteeism of Chinese ICU nurses from multiple perspectives of job requirements (transformational leadership), job resources (perceived social support), and personal resources (occupational coping self-efficacy), and to establish a hypothetical model (Fig. 1) to provide a theoretical basis for the reduction of presenteeism of ICU nurses.

Figure 1: Hypothesized Model of the Relationship between Transformational Leadership（TL), Perceived Social Support(PSSS), Occupational Coping Self-Efficacy(OCSE-N) and Presenteeism（SPS-6）

Methods

Participants

In March-April 2023, the cluster random sampling method was used to divide Sichuan Province into five regions: north Sichuan, east Sichuan, west Sichuan, south Sichuan and Chengdu City. One tertiary hospital was randomly selected from each region of north Sichuan, east Sichuan, west Sichuan, and south Sichuan. Two tertiary hospitals were randomly selected from Chengdu City, and finally, the ICU nurses in these six tertiary hospitals were surveyed. Inclusion criteria: holders of professional qualification certificate for nurses, engaged in ICU clinical work for more than one year; no history of alcohol or drug addiction, no history of mental illness; no history of psychiatric disease-related drugs; informed consent and voluntary participation. Exclusion criteria: internship, regulation training, and advanced training nurses; those currently on sick leave, maternity leave, and other absenteeism. According to the Kendall sample size rough estimation method, the variables in this study were 24 (14 general demographic information + four dimensions of the Transformational Leadership Scale + 3 dimensions of the Perceived Social Support Scale + 2 dimensions of the Occupational Coping Self-Efficacy + 1 dimension of Stanford Presenteeism Scale). At least 5-10 times the number of variables were selected, considering 20% of invalid questionnaires, and the sample size ranged from 150 to 300 cases. A total of 635 questionnaires were recovered in this study; 45 invalid questionnaires with regular filling and logical errors were excluded, and 590 valid questionnaires were finally recovered, with an effective recovery rate of 92.9%.

Procedures

The data for this study were collected anonymously using an electronic questionnaire called "Questionnaire Star". After obtaining the consent of the relevant person in charge of each hospital, a researcher was identified in each hospital, and uniform training was provided to all researchers to clarify the purpose, significance, and method of filling out the questionnaires in this study. After the training, the survey researcher distributed the questionnaire to the hospital ICU nurses' WeChat group, and the first page of the questionnaire was set up with a unified filling instruction, explaining the purpose of this study and the precautions for filling in the method. This study followed the

principles of informed consent and voluntariness, and the investigators could withdraw from this study at any time in the middle. All survey contents were set as mandatory options in the electronic questionnaire to ensure the complete survey information responses.

Measures

Socio-demographic characteristics

Fourteen demographic variables were included in this study work, mainly gender, age, marital and childbearing status et al.

Transformational Leadership Scale，TL

A questionnaire developed by Li et al. was used.[30]The scale consists of four dimensions with 26 entries. A Likert 5-point scale was used, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with a total score of 26 to 130. Higher scores indicated a higher degree of perceived transformational leadership behaviour. The scale has good reliability and validity and the Omega index of the scale in this study was 0.971.

Perceived Social Support Scale，PSSS

A questionnaire developed by Blumenthal et al. was used.[31]The scale consists of 3 dimensions with 12 entries. A Likert 7-point scale was used for scoring, ranging from 1 (strongly disagree) to 7 (strongly agree), with a total score of 12-84. Higher scores indicated a higher level of social support felt by the individual. The scale has good reliability and validity and the Omega index of the scale in this study was 0.956.

Occupational Coping Self Efficacy Scale，OCSE-N

A questionnaire developed by Pisanti et al. was used.[32] The scale consists of two dimensions with a total of 9 entries. A Likert 5-point scale was used, ranging from 1 (very non-compliant) to 5 (very compliant), with a total score ranging from 9 to 45, with higher scores indicating higher occupational coping self-efficacy. The scale has good reliability and validity and the Omega index of the scale in this study was 0.907.

Stanford Presenteeism Scale-6，SPS-6

The scale developed by Koopman et al. was used. [33]The scale consists of two dimensions with six entries. A 5-point Likert scale was used, ranging from 1 (strongly disagree) to 5 (strongly agree), with entries 5 and 6 content being reverse scored, for a total score of 6 to 30, with higher SPS-6 scores indicating greater impairment of health productivity due to an individual's presenteeism. The median score of the scale was used as a boundary to categorize low and high presenteeism. The scale has good reliability and validity and the Omega index of the scale in this study was 0.787.

Statistical analysis

SPSS 23.0 was used for statistical analysis. Data that exhibited a normal distribution were described using means and standard deviations. Count data were described using frequencies and constituent ratios. To assess differences between groups, independent t-tests or one-way analysis of variance (ANOVA) were employed. Pearson correlation analysis was used to analyze the correlation between

variables. Hierarchical regression was used to analyze the factors influencing presenteeism among nurses and the mediating role among variables. Based on the bias-corrected percentile bootstrap method, the Bootstrap method (5000 samples) yielded 95% confidence intervals for significance testing. The chained mediation effect was verified through Model 6 in the PROCESS 4.1 macro program, with presenteeism as the dependent variable, transformational leadership as the independent variable, and perceived social support and occupational coping self-efficacy as the mediating variables. Transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism scores were standardized before testing the model. Direct, mediated (paths a*y (Path 1), x*c (Path 2), a*b*c (Path 3)), and total effects were examined.

Ethical considerations

Ethical review approval for this study was obtained from the Medical Ethics Review Committee of Deyang People's Hospital (No. 2021-04-056-K01). The Declaration of Helsinki conducted all study procedures. Before the survey, the researcher obtained access permission from the hospital administration after providing information about the purpose, methodology, and significance of the survey to the investigating organization. At the beginning of the anonymous survey, an informed consent form was included on the cover of the online questionnaire, and completion and submission of the questionnaire was considered as informed consent and voluntary participation in this survey. All participants consciously and voluntarily agreed to participate in this survey. During the survey, participants were fully informed of their right to withdraw and terminate the survey at any stage without any negative consequences. The researcher ensured that all data collected from the participants were anonymous and confidential to protect their privacy.

Results

General demographic characteristics

Of the 590 participants, 533 (or 90.34%) were female. Nearly 97.46% of the participants were <40 years old. Most nurses had a bachelor's degree (81.86%), 66.10% were married, 53.39% were mid-level, 86.27% were clinical nurses, and 84.75% were employed under labor contracts. The remaining sociodemographic characteristics (Supplemental Table 1).

Descriptive and correlation analysis of the scales

In this study, ICU nurses' transformational leadership scores were 104.06±17.68, perceived social support scores were 62.58±11.92, occupational coping self-efficacy scores were 31.13±6.58, and presenteeism scores were 15.46±4.45.The results of this study showed that transformational leadership, perceived social support, and occupational coping self-efficacy were all significantly related to presenteeism. Transformational leadership, perceived social support, and occupational coping self-efficacy were all negatively correlated with presenteeism, transformational leadership was positively associated with perceived social support and occupational coping self-efficacy, and perceived social support was positively correlated with occupational coping self-efficacy(Supplemental Table 2).

Multiple stratified regression analysis

As shown in Supplemental Table 3, a multivariate hierarchical regression analysis was conducted with presenteeism as the dependent variable. In the first step, the variables that made sense in the univariate analysis of presenteeism were added to the model as control variables. In the second step,

after excluding the effects of the above control variables, transformational leadership was negatively associated with presenteeism（β=-0.090, P<0.001）, where transformational leadership had a significant effect on presenteeism, explaining 11.8% of the variance. In the third step, perceived social support was negatively related to presenteeism（β=-0.068, P<0.05）, and adding the mediating variable perceived social support to the model explained an additional 14.0% of the variance in presenteeism. The regression coefficient for transformational leadership decreased from -0.090 in the second step to -0.069 in the third step, which was still significant. In the fourth step, occupational coping self-efficacy was negatively correlated with presenteeism（β=-0.044, P<0.05）, and adding career coping self-efficacy to the model explained an additional 18.7% of the unnoticeable absenteeism variance. The regression coefficient for transformational leadership decreased from -0.069 in the third step to -0.058 in the fourth but remained significant. Statistical analyses initially showed that perceived social support and occupational coping self-efficacy mediated the relationship with presenteeism in the transformational leadership component of Chinese ICU nurses (see Supplemental Table 3).

Analysis of chain mediation effects

All variables were standardized, with transformational leadership as the independent variable, presenteeism as the dependent variable, perceived social support and occupational coping self-efficacy as the mediating variables, and self-assessed physical health, perceived job stress, and whether or not one has suffered from workplace violence in the past year as control variables, and mediation effects were analyzed using Model 6 in PROCESS.

The results of the chain mediation modelling of the role of perceived social support, occupational coping self-efficacy in transformational leadership and presenteeism showed that the total effect of transformational leadership on presenteeism was -0.358 (95%CI: -0.428, -0.287; P<0.001). The coefficients of the indirect paths transformational leadership on perceived social support, perceived social support on occupational coping self-efficacy, transformational leadership on occupational coping self-efficacy, perceived social support on presenteeism, and occupational coping self-efficacy on presenteeism were 0.468 (95%CI: 0.397, 0.538; P<0.001), 0.241 (95%CI: 0.160, 0.322; P<0.001), 0.161 (95%CI: 0.081, 0.241; P<0.001), -0.119 (95%CI: -0.198, -0.039; P= 0.003), -0.261 (95%CI: -0.339, -0.184; P<0.001), with an indirect effect of -0.029 (95%CI: -0.046, -0.016; P<0.001), and the 95%CI did not contain zero, indicating that the model of perceived social support and occupational coping self-efficacy as chain mediators was valid. See Supplemental Table 4, Supplemental Table 5 and Figure 2.

Figure 2: Schematic diagram of the chain-mediated effects of perceived social support, occupational coping self-efficacy between transformational leadership and presenteeism

Discussion

This study explored the relationship between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among ICU nurses. The results found a direct effect of transformational leadership on presenteeism among ICU nurses. They confirmed that perceived social support and occupational coping self-efficacy were chain mediators between transformational leadership and presenteeism. This provides a new perspective for studying the relationship between transformational leadership and presenteeism among ICU nurses.

The results of this study showed that ICU nurses' presenteeism score was (15.46±4.45), of which high presenteeism accounted for 53.9%, which indicated that China's ICU nurses' presenteeism was at a high level, which was worth paying attention to. To analyze the reasons for this, (1) only 56% of ICU nurses in this study had good self-assessed health. Several studies have also confirmed that individual physical and mental health conditions are the root cause of presenteeism.[34, 35] When nurses feel unwell or suffer from chronic illnesses, they may experience an inability to concentrate and devote themselves entirely to their work, which leads to lower work efficiency, lower productivity levels, and presenteeism. (2) 48% of the ICU nurses in this study had a high level of perceived stress. ICU, as an essential area for the rescue and treatment of patients with acute and critical illnesses in healthcare institutions, has a complex working environment. ICU nurses must continuously monitor changes in patients' conditions and cope with various first-aid situations. The high-intensity workload and prolonged work pressure may increase the nurses' fatigue and psychological burden, which may lead to presenteeism behaviors. (3) About 35% of ICU nurses in this study had suffered from workplace violence in the past. Workplace violence is a severe threat to the personal safety of nurses. It is a stressful event that can easily trigger anxiety and depression in nurses, negatively affect employee job satisfaction and loyalty, and increase concerns about the work environment and job security, leading to an inability to concentrate on work, thus resulting in presenteeism.[36]

The results of this study show that the transformational leadership score of ICU nurses is (104.06±17.68), which is at the medium-high level, similar to the results of foreign scholars.[16] In recent years, nursing managers' understanding of scientific management has gradually deepened, the leadership style of nursing team leaders has been continuously improved, and managers who have received higher education have higher qualities and conduct can play a corresponding exemplary role among nurses and can make wise decisions and guidance based on their professional knowledge when leading the team to make changes. Hence, the level of transformational leadership is higher.

The results of this study showed that ICU nurses perceived social support scores of (62.58±11.92), which was at a medium-high level, similar to the findings of Lu et al.[37] Social support, as a positive emotional experience in which an individual subjectively feels that they receive understanding and support from family, society, and friends, can reflect the degree to which an individual gets support in a stressful situation. Social support theory also states that a strengthened social support network helps to cope with external environmental challenges.[38] It may be related to the fact that the survey respondents in this study were mainly bachelor's degree holders (81.86%), and people with higher education tend to have more knowledge and skills, as well as better communication and expression skills and are more likely to establish and maintain good social relationships. The lower level of perceived social support among those with poor health, perceived high work stress may be related to the decline in participation in social activities and lack of time and energy to maintain interpersonal social relationships among this group.

The results of this study showed that ICU nurses' occupational coping self-efficacy score was (31.13 ± 6.58), which is at the medium level (median total score of 22.5), similar to the results of the

study by Pisanti et al.[39] Self-efficacy is not confidence generated for a specific domain but can predict people's behavior in different situations. Studies have shown that individuals with high levels of self-efficacy favor using positive or problem-focused coping strategies, which help them effectively buffer the adverse effects of stress and contribute to maintaining high levels of physical and mental health.[40] It may be related to the fact that the working years of the respondents in this study were mainly 1-5 years, which accounted for about 40%. On the one hand, the ICU work environment is challenging, requiring the handling of critically ill patients and complex medical situations. Low-seniority nurses working in such a high-pressure environment may feel uneasy and anxious, which affects self-efficacy enhancement. On the other hand, newly recruited ICU nurses may lack confidence in their abilities and coping measures due to a lack of sufficient work experience and training, resulting in lower self-efficacy.

This study found that perceived social support mediates the relationship between transformational leadership and presenteeism among ICU nurses, i.e., transformational leadership not only acts directly on presenteeism but also indirectly through perceived social support. According to the theory of transformational leadership, transformational leadership is an upbeat leadership style that stimulates the intrinsic motivation of employees by motivating them so that they can maximize their potential to achieve the highest level of performance, promote their personal growth and career development, and thus improve team cohesion and work performance.[41] On the one hand, when nurse leaders have a high transformational leadership style, they can provide the social support that nurses need. By motivating and stimulating nurses' potential, they feel valued and supported. They are willing to devote themselves to their work in a positive frame of mind, which contributes to the joint development of themselves and the organization and enhances nurses' job satisfaction, which helps to reduce presenteeism; on the other hand, it is based on the theory of social exchange. When individuals receive sufficient support in social exchange, they are more confident and motivated to face challenges at work, thus reducing presenteeism. When nurses perceive the care and support from leaders, colleagues, and organizations, this emotional support is not only conducive to regulating the negative emotions of nurses and reducing the negative impact of work pressure on them but also helps to enhance the nurses' commitment to and identification with the organization, so that they are more engaged in their work and reduce the possibility of presenteeism.[26]

The results of this study found that occupational coping self-efficacy mediates the relationship between transformational leadership and presenteeism among ICU nurses, which means that transformational leadership not only acts directly on presenteeism but also indirectly through occupational coping self-efficacy. Bandura's self-efficacy theory states that when individuals believe they are competent enough to accomplish a task, they are more motivated to engage in it and strive to achieve the desired goal.[42] Managers with a high level of transformational leadership style can motivate nurses through character appeal and vision sharing and stimulate positive emotions in nurses to show more energy, dedication, and focused attitudes to be more confident in dealing with challenges and pressures at work. Nurses with higher occupational coping self-efficacy are more confident and capable of dealing with difficulties and challenges at work. They are more willing to take the initiative to solve problems, improve work performance, and reduce presenteeism behavior.

The results of this study found that perceived social support and occupational coping self-efficacy acted as chain mediators between transformational leadership and presenteeism among ICU nurses, i.e., transformational leadership among nurses affects presenteeism through perceived social support and occupational coping self-efficacy. According to the JD-R model, job resources can buffer the negative consequences of presenteeism by stimulating employees' internal and external motivation to cope with demanding job tasks. Transformational leadership and perceived social

support as an essential external resource and occupational coping self-efficacy as a vital internal resource, managers with a high level of transformational leadership style excel at stimulating nurses' autonomy and creativity by establishing good interpersonal relationships and a teamwork atmosphere, providing nurses with the necessary resources and support, and enhancing nurses' perceptions of social support.[20] When nurses feel the support and encouragement from their leaders, they will be more willing to seek and utilize help and support from external resources, such as colleagues, family, and friends. This social support helps meet nurses' needs at work, reduces work stress and fatigue, and increases job satisfaction and well-being, enhancing nurses' occupational coping self-efficacy. When possessing a higher level of self-efficacy, nurses are more confident that they can better cope with the challenges and pressures at work, which is conducive to maintaining good mental health and reducing the incidence of presenteeism.

Based on the results of this study, we put forward the following recommendations to improve the status of presenteeism among ICU nurses. First, cultivate and promote a transformational leadership style: leaders should pay attention to the needs and emotions of nurses and actively listen to their opinions and suggestions; stimulate nurses' enthusiasm and innovation through incentives and encouragement so that they can feel the meaning and value of their work; establish a positive, open and inclusive work environment and encourage nurses to participate in decision-making to improve their sense of belonging and responsibility and reduce presenteeism. Second, enhance perceived social support: establish a good social support network; organizations should encourage supportive colleague relationships and teamwork and promote interactions and exchanges through regular team-building activities; nursing managers should strengthen communication with nurses, establish a good team communication mechanism, and encourage information exchange and emotional support among nurses; and provide resources for mental health support by providing resources such as psychological counseling services, guidance and training on work-life balance, to help nurses cope with work stress and emotional distress, promote nurses' physical and mental health, and reduce presenteeism. Third, to improve nurses' sense of self-efficacy in occupational coping, regular training and refresher courses are conducted to improve nurses' professional skills and knowledge and enhance their ability to cope with work challenges; work tasks and resources are reasonably allocated to reduce nurses' overload and stress; and appropriate incentives and recognition mechanisms are provided to stimulate nurses' motivation and self-efficacy and to reduce presenteeism.

Limitation and prospect

First, this study only selected ICU nurses from six tertiary hospitals in Sichuan Province, China, for the survey. As a result, the representativeness of the sample size and the generalizability of the findings are limited. In the future, multi-center and large-sample survey studies can be conducted to explore the presenteeism of ICU nurses in different regions and different levels of hospitals. Secondly, this study was a cross-sectional study and therefore unable to assess the longitudinal trajectory of change in transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among ICU nurses. The changes in presenteeism and related influencing factors among ICU nurses can be analysed in depth from multiple perspectives in the future through longitudinal studies.

Conclusions

In summary, China's ICU nurses' presenteeism is at a high level, and transformational leadership can not only directly affect ICU nurses' presenteeism but also indirectly affect ICU nurses' presenteeism by the chain mediating role of perceived social support and occupational coping self-efficacy.

Nursing managers should pay attention to developing a transformational leadership style to enhance social support and improve ICU nurses' occupational coping efficacy, thus reducing ICU nurses' presenteeism behavior.

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Patient consent for publication Not applicable.

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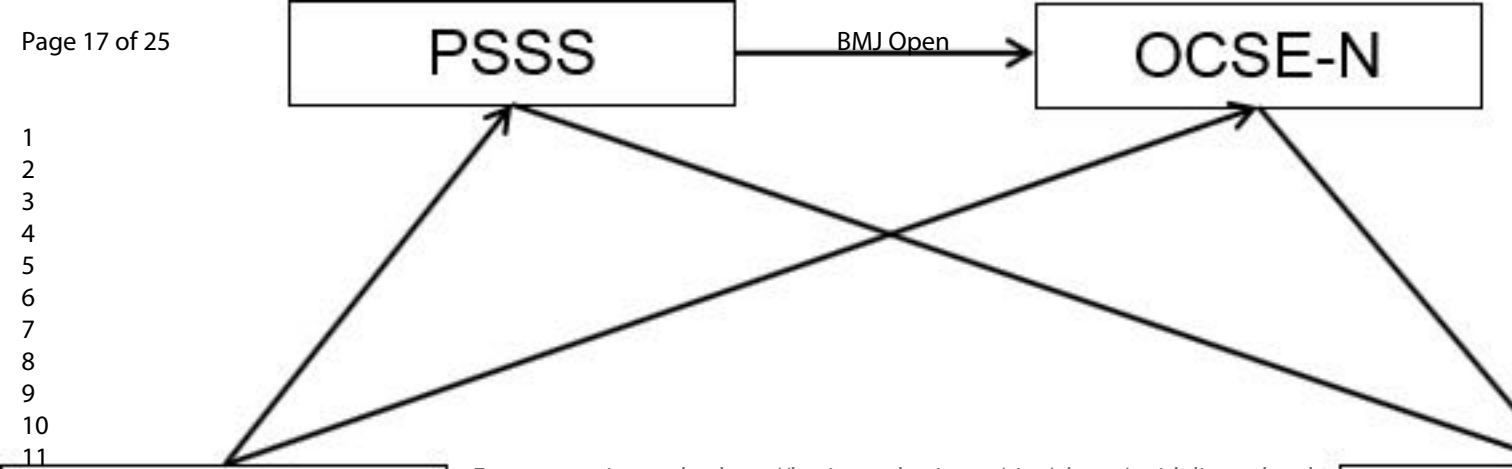
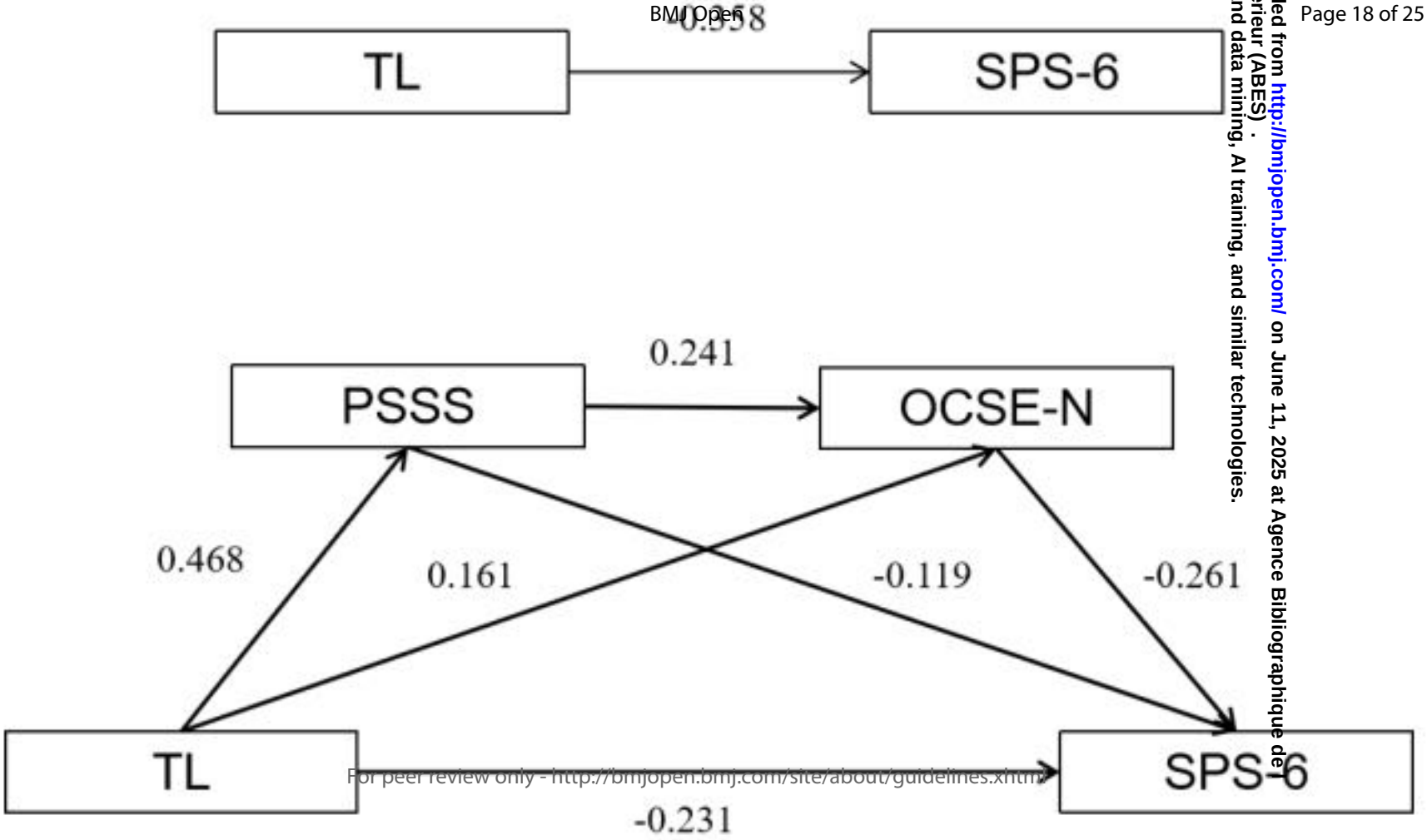
Figure 1: Hypothesized Model of the Relationship between Transformational Leadership（TL), Perceived Social Support(PSSS), Occupational Coping Self-Efficacy(OCSE-N) and Presenteeism（SPS-6）

Figure 2: Schematic diagram of the chain-mediated effects of perceived social support, occupational coping self-efficacy between transformational leadership and presenteeism





Results

Table 1: Relationship between demographic characteristics of ICU nurses and presenteeism

Items	N	SPS-6 Mean ±SD	*t/F*	*P*	Multiple comparisons
Sex			-0.378	0.706	/
male	57	15.25±5.10			
female	533	15.48±4.38			
Age			0.052	0.950	/
< 30	267	15.39±4.32			
30~ < 40	308	15.51±4.66			
≥40	15	15.47±2.10			
Marital status			1.410	0.239	/
unmarried	189	15.87±4.36			
married but not having children	73	15.55±4.14			
married and having children	317	15.15±4.58			
Divorced or other	11	16.82±3.97			

Highest degree					
College and below	93	15.31±4.54	0.086	0.918	/
undergraduate	483	15.49±4.32			
Master's degree or above	14	15.21±4.87			
Professional title			1.971	0.140	/
junior level	102	15.36±4.67			
middle level	315	15.77±4.34			
high level	173	14.94±4.50			
Position			1.476	0.229	/
clinical nurse	509	15.58±4.44			
nursing team leader	68	14.78±4.64			
head nurse	13	14.23±3.47			
Years of experience in ICU			1.903	0.150	/
1~ < 5	252	15.07±4.36			
5~ < 10	204	15.88±4.45			
≥10	134	15.54±4.60			

Average monthly income			1.945	0.121	/
1~ < 6000	150	15.63±4.46			
6000~ < 8000	268	15.75±4.49			
8000~ < 10000	132	14.64±4.28			
≥10000	40	15.53±4.57			
Type of contract			-1.266	0.206	/
professional preparation	90	14.91±3.96			
labor contract	500	15.56±4.53			
Self-assessed health status			36.031	＜0.001	①＜②＜③
good	328	14.27±4.20			
general	233	16.62±4.14			
worse	29	19.59±4.89			
Whether or not you have a chronic disease			1.598	0.111	/
No	87	16.16±4.39			
Yes	503	15.34±4.46			

Perceived work stress			28.679	＜0.001	④＜⑤＜⑥
lower	13	11.77±3.81			
middle	292	14.34±3.93			
high	285	16.78±4.58			
ICU human resources			1.732	0.178	/
< 1:2.5~3	347	15.25±4.58			
=1:2.5~3	143	15.45±4.27			
>1:2.5~3	100	16.19±4.24			
Exposure to workplace violence in the past year			5.763	＜0.001	/
No	386	14.71±4.39			
Yes	204	16.87±4.24			

Note:①good；②general；③worse；④lower；⑤middle；⑥high

Table 2：Correlations between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism

Variables	*Mean* ±*SD*	1	2	3	4
Transformational leadership(1)	104.06±17.68	1	-	-	-

Perceived social support(2)	62.58±11.92	0.515**	1	-	-
Occupational coping self-efficacy（3）	31.13±6.58	0.369**	0.417**	1	-
Presenteeism(4)	15.46±4.45	-0.445**	-0.412**	-0.486**	1

**P <0.05

Table 3: Multiple stratified regression analysis of presenteeism of ICU nurses in China

	Step1	Step2	Step3	Step4
Step1				
Self-assessed health status	1.883**	1.475**	1.290**	1.057**
Perceived work stress	1.729**	1.392**	1.268**	0.803**
Exposure to workplace violence in the past year	-1.371**	-0.939**	-0.892**	-0.584
Step2				
Transformational leadership	—	-0.090**	-0.069**	-0.058**

Step3				
Perceived social support	—	—	-0.068**	-0.044**
Step4				
Occupational coping self-efficacy	—	—	—	-0.177**
F	42.575**	61.893**	55.090**	56.639**
R^2	0.179	0.297	0.320	0.368
Adjustment R^2	0.175	0.293	0.315	0.362

**P <0.01

Table 4: Paths of indirect mediating effects of perceived social support, occupational coping self-efficacy between transformational leadership and presenteeism

Path	Coeff	95%CI	
		LLCI	ULCI
Transformational leadership→Perceived Social Support →Presenteeism	-0.055	-0.104	-0.012
Transformational leadership→Occupational Coping Self Efficacy→Presenteeism	-0.042	-0.076	-0.017

Transformational leadership→Perceived Social Support →Occupational Coping Self Efficacy→Presenteeism	-0.029	-0.046	-0.016

Table 5 : Analysis of the chain-mediated effects of perceived social support, occupational coping self-efficacy on the relationship between transformational leadership and presenteeism

	R^2	F	Coeff	SE	*t*	*P*	LLCI	ULCI
Outcome	0.297	61.700						
Perceived Social Support								
Transformational leadership			0.468	0.036	12.980	＜0.001	0.397	0.538
Outcome	0.300	50.176						
Occupational Coping Self Efficacy								
Transformational leadership			0.161	0.041	3.941	＜0.001	0.081	0.241
Perceived Social Support			0.241	0.041	5.830	＜0.001	0.160	0.322
outcome	0.368	56.639						
Presenteeism								

Transformational leadership			-0.231	0.039	-5.865	＜0.001	-0.308	-0.153
Perceived Social Support			-0.119	0.040	-2.935	0.003	-0.198	-0.039
Occupational Coping Self Efficacy			-0.261	0.039	-6.638	＜0.001	-0.339	-0.184
Outcome	0.297	61.893						
Presenteeism								
Transformational leadership			-0.358	0.036	-9.929	＜0.001	-0.428	-0.287
Total effect			-0.358	0.036	-9.929	＜0.001	-0.428	-0.287
Direct effect			-0.231	0.039	-5.865	＜0.001	-0.308	-0.153
Total indirect effect			-0.127	0.027	-	-	-0.184	-0.080

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Relationships between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among Chinese ICU nurses: a cross-sectional study

Jijun Wu [1†], Yuxin Li [2†,3†], Qin Lin[4†], Yuting Fan[3,6], Jiquan Zhang[3], Zhenfan Liu[3], Xiaoli Liu[3], Xian Rong[5*], Xiaoli Zhong[3*]

[1]Department of Cardiology, Deyang People's Hospital, Sichuan, China，[2]School of Nursing, North Sichuan Medical College, Sichuan, China，[3]Nursing Department, Deyang People's Hospital, Sichuan, China，[4]Shulan International Medical College, Zhejiang Shuren University, Hangzhou, China, [5]School of Nursing, ChengDu College, Sichuan, China，[6]Sichuan Nursing Vocational College, Sichuan, China

Jijun Wu[1†] 、Yuxin Li[2†,3†] and Qin Lin[4†]：These authors contributed equally to this work and share first authorship

*** Correspondence:**

Xiaoli Zhong

Xian Rong

1165254226@qq.com

Abstract

Objective: This study aimed to investigate the relationship between transformational leadership and presenteeism among ICU nurses in tertiary hospitals and further investigate the chain-mediated role of perceived social support and occupational coping self-efficacy.

Design： This is a cross-sectional survey study.

Setting: 6 tertiary hospitals in Sichuan Province, China.

Participants: 590 ICU nurses were recruited from 6 tertiary hospitals in China for the survey.

Primary and secondary outcome measures: Presenteeism of ICU nurses was the primary outcome indicator. Transformational leadership, perceived social support, and occupational coping self-efficacy were secondary outcome indicators. The transformational leadership scale, perceived social support, occupational coping self-efficacy, and stanford presenteeism scale were used to investigate ICU nurses through convenience sampling.

Results: The presenteeism score of ICU nurses was 15.46±4.45 (Mean±SD), in which the incidence of high presenteeism was 53.90%. Correlation analysis showed that presenteeism was negatively correlated with transformational leadership, perceived social support, and occupational coping self-efficacy (r= -0.412 to -0.486; P<0.05). Perceived social support partially mediated the relationship between transformational leadership and presenteeism, with an effect value of 0.055 (95%CI:-0.102,-0.012; P<0.001);occupational coping self-efficacy partially mediated the relationship between transformational leadership and presenteeism, with an effect value of 0.042 (95% CI:

-0.074,-0.017; P<0.001); perceived social support and occupational coping self-efficacy chain-mediated between transformational leadership and presenteeism, with an effect value of 0.029 (95% CI: -0.046,-0.016; P<0.001).

Conclusion: ICU nurses' perceived social support and occupational coping self-efficacy are chain-mediated between transformational leadership and presenteeism. Therefore, to reduce nurses' presenteeism, nursing managers should adopt targeted interventions based on the factors influencing them to improve transformational leadership and enhance their perceived social support and occupational coping self-efficacy.

Keywords: intensive care unit; nurses; presenteeism; transformational leadership; perceived social support; occupational coping self-efficacy

STRENGTHS AND LIMITATIONS OF THIS STUDY

- This study included transformational leadership, perceived social support, and occupational coping self-efficacy in the analysis of presenteeism among ICU nurses, providing a new perspective on the relationship between transformational leadership and presenteeism.
- This study was cross-sectional, and causal relationships between variables could not be inferred.
- This study only surveyed 6 tertiary hospitals in Sichuan Province, China, and there were limitations in the sample.

Introduction

In recent years, the study of the relationship between the health status of occupational groups and the economy has increasingly become a hot spot of scholars' attention. Health, as one of the most essential human capital, not only affects individual labor performance but also influences a country's or region's economic growth dynamics. Presenteeism, also known as low health-related productivity, is prevalent among occupational groups, especially in the healthcare industry. There is no standardized concept of presenteeism, which was first proposed by Professor Copper in 1996, describing it as the phenomenon of working when one should take a break from work due to illness or extended working hours that cause a reduction in health-related productivity.[1]In 2005, Kivimäki et al. expanded the concept of presenteeism to include working when one is in an unhealthy state.[2] A systematic evaluation by Webster et al. showed that the reported prevalence of presenteeism in the occupational population ranged from 35% to 97%, influenced by organizational factors, job characteristics, and personal factors.[3]As a major force in health care, nurses are a high-risk, high-stress, and high-work-intensity population. In the global shortage of nursing human resources, nurses are at high risk of presenteeism, especially in developing countries or poor areas, due to heavy workloads, human resource constraints, shift work, complex interpersonal relationships, and inadequate remuneration packages.[4]

It has been reported that 85% of healthcare workers have had the experience of attending work with illness,[5] while the global rate of presenteeism reporting among nurses is about 49.2%,[6] with 65.0% in the United States,[7] 48.7% in New Zealand,[8] and a high rate of 94.25% of presenteeism reporting among nurses in China.[9] The impact of presenteeism on individuals and organizations is

often multifaceted; on the one hand, it affects personal health, resulting in decreased productivity, lower work efficiency, and increased burnout, which affects professional well-being. On the other hand, it affects patient safety by increasing the risk of medication errors, falls, and infections. In addition, presenteeism can have a series of negative impacts on organizational development, directly or indirectly increasing the economic loss of the organization. Studies have shown that due to differences in the level of economic growth, the financial loss caused by presenteeism of nurses varies slightly in different countries, from about US$4.38 billion per year in China,[9] US$3-12 billion per year in the United States,[10] and about US$3,055 per capita in Japan.[11] Therefore, considering the negative consequences of presenteeism on multiple domains, such as individuals, patients, and organizations, it is necessary to explore the mechanisms and pathways of its impact from various perspectives.

According to the 2020 State of Global Nursing Report, there is currently a shortfall of up to 5.9 million nurses worldwide, with a projected shortfall of 5.7 million by 2030, with the shortage of nurses in developing countries and poorer regions particularly prominent. Although the shortage of nurses in China has dramatically improved in recent years, there is still a gap from the global average. Whether the allocation of human resources is reasonable and whether the appropriate ratio directly affects the quality of nursing services, work efficiency, and healthcare costs, thus affecting the quality and safety of patient services.[12, 13]The intensive care unit (ICU), as a special ward for the centralized treatment, resuscitation, and monitoring of patients with acute, critical, and severe illnesses in medical institutions, is characterized by solid professionalism, heavy workload, modern equipment, and complex treatment, which makes nurses' workload challenging and stressful, leading to prominent chronic health problems such as chronic pain, fatigue, gastrointestinal disorders, and sleep disorders. Research shows that the average ICU bed-to-nurse ratio in China is 1:1.86, with 63.3% of the regions having a 1:1.5 to <2.0 ratio.[14] Therefore, the shortage of human resources for ICU nurses is still prominent in China. Presenteeism of ICU nurses is also notable due to the influence of factors such as dedication, health status, work pressure, remuneration, and poor job replacement. Therefore, it is essential to pay attention to the current situation of ICU nurses' presenteeism and its influence mechanism and to develop targeted interventions to improve nurses' health status and patient safety.

In organizations, leadership style is an essential source of employees' emotional and psychological experience, affecting their psychological well-being and job performance.[15] Transformational leadership refers to a leader's ability to guide employees to develop proper values, resilience, and a positive mindset by making them aware of their responsibilities, stimulating high-level needs, and building mutual trust. Transformational leadership has four dimensions: moral example, charisma, personalized care, and visionary inspiration. As a work resource, leadership style is an essential organizational contextual variable affecting employees. Transformational leadership style can improve employee performance and reduce impaired productivity by exuding leadership charisma, reinforcing leadership inspiration, and personalized care to stimulate employees' intellectual and higher-level needs.[16] The positive effects of transformational leadership have been widely studied and confirmed regarding nurses' resilience,[17] burnout,[18] job satisfaction,[19]and improved patient safety outcomes.[20] Research on transformational leadership's impact on presenteeism has not been reported. Based on this, we propose research hypothesis 1: Transformational leadership negatively affects presenteeism and can further reduce the occurrence of presenteeism through mediating variables.

Previous research on the factors influencing nurses' presenteeism has focused on demographic characteristics such as length of service and job title;[21] health conditions such as subfertility

symptoms, chronic bodily pain, hypertension, and other chronic illnesses;[22, 23] and work-related factors such as pay and income, work environment, and occupational stress.[24] The synergistic effects of positive psychological work resources, such as social support and self-efficacy, are often overlooked.

Some studies have shown that social support directly predicts the mental health of healthcare workers and indirectly affects mental health through personal resilience, which directly or indirectly affects work efficiency. Perceived social support refers to an individual's emotional experience and degree of satisfaction in feeling respected, supported, and understood. It consists of three main components: family support, friend support, and material or other spiritual support from the community.Perceived social support as a positive psychological resource is one of the essential protective resources for individuals, which helps to alleviate work pressure and negative emotions, maintain a healthy psychological state and a positive work state, and thus reduce the phenomenon of presenteeism. The social support buffer model also points out that perceived social support can inhibit or buffer the adverse effects of stressful events on individuals.[25] Some studies have shown that presenteeism is negatively related to marine social support and that high social support may improve presenteeism by reducing stress and increasing job satisfaction and performance.[26] In addition, leadership styles can improve employees' stress coping and handling abilities through support for employees, which can stimulate employees' motivation, work attitudes, and behaviors and enhance the level of perceived social support. Based on this, we propose the following research hypotheses:

Research Hypothesis 2: Transformational leadership can influence presenteeism among ICU nurses through the mediating role of perceived social support.

Occupational coping self-efficacy refers to an overarching self-efficacy of employees to effectively cope with and accomplish nursing care. Self-efficacy, as a positive psychological resource within an individual, is essential for enhancing occupational coping ability, reducing work stress and burnout, improving mental health, and enhancing work efficiency and work quality. Research shows that the lack of coping self-efficacy may directly or indirectly affect work engagement through stress and interpersonal relationships, making employees feel inefficient.[27]The Job Demands-Resources Model states that each occupation has specific risk factors associated with job stress and that when employees have high levels of job demands and job resources, it stimulates personal growth and development and helps to promote good organizational outcomes.[28] Transformational leadership, perceived social support, and occupational coping self-efficacy are important to nurses in achieving organizational goals as overarching components of job demands and resources. Currently, there is evidence regarding the influential relationship between transformational leadership, perceived social support and self-efficacy. However, it is not yet known whether occupational coping self-efficacy mediates the relationship between transformational leadership and presenteeism, and whether there is a chain of mediation between perceived social support and occupational coping self-efficacy between transformational leadership and presenteeism. Based on these analyses, we propose the following research hypotheses:

Research Hypothesis 3: Transformational leadership can influence presenteeism among ICU nurses through the mediating role of occupational coping self-efficacy.

Research Hypothesis 4: Transformational leaders can influence presenteeism among ICU nurses by mediating the chain of perceived social support and occupational coping self-efficacy.

Based on the above analysis, this study used the JD-R model as a theoretical guide to explore the influence mechanism of presenteeism of Chinese ICU nurses from multiple perspectives of job requirements (transformational leadership), job resources (perceived social support), and personal resources (occupational coping self-efficacy), and to establish a hypothetical model (Fig. 1) to provide a theoretical basis for the reduction of presenteeism of ICU nurses.

Figure 1: Hypothesized Model of the Relationship between Transformational Leadership（TL), Perceived Social Support(PSSS), Occupational Coping Self-Efficacy(OCSE-N) and Presenteeism（SPS-6）

Methods

Participants

In March-April 2023, the cluster random sampling method was used to divide Sichuan Province into five regions: north Sichuan, east Sichuan, west Sichuan, south Sichuan and Chengdu City. One tertiary hospital was randomly selected from each region of north Sichuan, east Sichuan, west Sichuan, and south Sichuan. Two tertiary hospitals were randomly selected from Chengdu City, and finally, the ICU nurses in these six tertiary hospitals were surveyed.（Including Deyang People's Hospital, Sichuan Provincial People's Hospital, Suining Central Hospital, Yibin First People's Hospital, Affiliated Hospital of Sichuan North Medical College, Leshan People's Hospital）Inclusion criteria: holders of professional qualification certificate for nurses, engaged in ICU clinical work for more than one year; no history of alcohol or drug addiction, no history of mental illness; no history of psychiatric disease-related drugs; informed consent and voluntary participation. Exclusion criteria: internship, regulation training, and advanced training nurses; those currently on sick leave, maternity leave, and other absenteeism. According to the Kendall sample size rough estimation method, the variables in this study were 24 (14 general demographic information + four dimensions of the Transformational Leadership Scale + 3 dimensions of the Perceived Social Support Scale + 2 dimensions of the Occupational Coping Self-Efficacy + 1 dimension of Stanford Presenteeism Scale). At least 5-10 times the number of variables were selected, considering 20% of invalid questionnaires, and the sample size ranged from 150 to 300 cases. A total of 635 questionnaires were recovered in this study; 45 invalid questionnaires with regular filling and logical errors were excluded, and 590 valid questionnaires were finally recovered, with an effective recovery rate of 92.9%.

Procedures

The data for this study were collected anonymously using an electronic questionnaire called "Questionnaire Star". After obtaining the consent of the relevant person in charge of each hospital, a researcher was identified in each hospital, and uniform training was provided to all researchers to

clarify the purpose, significance, and method of filling out the questionnaires in this study. After the training, the survey researcher distributed the questionnaire to the hospital ICU nurses' WeChat group, and the first page of the questionnaire was set up with a unified filling instruction, explaining the purpose of this study and the precautions for filling in the method. This study followed the principles of informed consent and voluntariness, and the investigators could withdraw from this study at any time in the middle. All survey contents were set as mandatory options in the electronic questionnaire to ensure the complete survey information responses.

Measures

Socio-demographic characteristics

Fourteen demographic variables were included in this study work, mainly gender, age, marital and childbearing status et al.

Transformational Leadership Scale，TL

A questionnaire developed by Li et al. was used.[30]The scale consists of four dimensions with 26 entries. A Likert 5-point scale was used, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with a total score of 26 to 130. Higher scores indicated a higher degree of perceived transformational leadership behaviour. The scale has good reliability and validity and the Omega index of the scale in this study was 0.971.

Perceived Social Support Scale，PSSS

A questionnaire developed by Blumenthal et al. was used.[31]The scale consists of 3 dimensions with 12 entries. A Likert 7-point scale was used for scoring, ranging from 1 (strongly disagree) to 7 (strongly agree), with a total score of 12-84. Higher scores indicated a higher level of social support felt by the individual. The scale has good reliability and validity and the Omega index of the scale in this study was 0.956.

Occupational Coping Self Efficacy Scale，OCSE-N

A questionnaire developed by Pisanti et al. was used.[32] The scale consists of two dimensions with a total of 9 entries. A Likert 5-point scale was used, ranging from 1 (very non-compliant) to 5 (very compliant), with a total score ranging from 9 to 45, with higher scores indicating higher occupational coping self-efficacy. The scale has good reliability and validity and the Omega index of the scale in this study was 0.907.

Stanford Presenteeism Scale-6，SPS-6

The scale developed by Koopman et al. was used. [33]The scale consists of two dimensions with six entries. A 5-point Likert scale was used, ranging from 1 (strongly disagree) to 5 (strongly agree), with entries 5 and 6 content being reverse scored, for a total score of 6 to 30, with higher SPS-6 scores indicating greater impairment of health productivity due to an individual's presenteeism. The median score of the scale was used as a boundary to categorize low and high presenteeism. The scale has good reliability and validity and the Omega index of the scale in this study was 0.787.

Statistical analysis

SPSS 23.0 was used for statistical analysis. Data that exhibited a normal distribution were described using means and standard deviations. Count data were described using frequencies and constituent ratios. To assess differences between groups, independent t-tests or one-way analysis of variance (ANOVA) were employed. Pearson correlation analysis was used to analyze the correlation between variables. Hierarchical regression was used to analyze the factors influencing presenteeism among nurses and the mediating role among variables. Based on the bias-corrected percentile bootstrap method, the Bootstrap method (5000 samples) yielded 95% confidence intervals for significance testing. The chained mediation effect was verified through Model 6 in the PROCESS 4.1 macro program, with presenteeism as the dependent variable, transformational leadership as the independent variable, and perceived social support and occupational coping self-efficacy as the mediating variables. Transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism scores were standardized before testing the model. Direct, mediated (paths a*y (Path 1), x*c (Path 2), a*b*c (Path 3)), and total effects were examined.

Ethical considerations

Ethical review approval for this study was obtained from the Medical Ethics Review Committee of Deyang People's Hospital (No. 2021-04-056-K01). The Declaration of Helsinki conducted all study procedures. Before the survey, the researcher obtained access permission from the hospital administration after providing information about the purpose, methodology, and significance of the survey to the investigating organization. At the beginning of the anonymous survey, an informed consent form was included on the cover of the online questionnaire, and completion and submission of the questionnaire was considered as informed consent and voluntary participation in this survey. All participants consciously and voluntarily agreed to participate in this survey. During the survey, participants were fully informed of their right to withdraw and terminate the survey at any stage without any negative consequences. The researcher ensured that all data collected from the participants were anonymous and confidential to protect their privacy.

Results

General demographic characteristics

Of the 590 participants, 533 (or 90.34%) were female. Nearly 97.46% of the participants were <40 years old. Most nurses had a bachelor's degree (81.86%), 66.10% were married, 53.39% were mid-level, 86.27% were clinical nurses, and 84.75% were employed under labor contracts. The remaining sociodemographic characteristics (Supplemental Table 1).

Descriptive and correlation analysis of the scales

In this study, ICU nurses' transformational leadership scores were 104.06±17.68, perceived social support scores were 62.58±11.92, occupational coping self-efficacy scores were 31.13±6.58, and presenteeism scores were 15.46±4.45.The results of this study showed that transformational leadership, perceived social support, and occupational coping self-efficacy were negatively correlated with presenteeism (r=-0.445, -0.412, and -0.486, P<0.05), with correlations of moderate strength; transformational leadership was positively correlated with perceived social support and occupational coping self-efficacy (r=0.515, 0.369, P<0.05), and the correlations were weak and moderate strength

respectively; perceived social support was positively correlated with occupational coping self-efficacy (r=0.417, P<0.05) and the correlation was moderate strength.(Supplemental Table 2).

Multiple stratified regression analysis

As shown in Supplemental Table 3, a multivariate hierarchical regression analysis was conducted with presenteeism as the dependent variable. In the first step, the variables that made sense in the univariate analysis of presenteeism were added to the model as control variables. In the second step, after excluding the effects of the above control variables, transformational leadership was negatively associated with presenteeism（β=-0.090, P<0.001）, where transformational leadership had a significant effect on presenteeism, explaining 11.8% of the variance. In the third step, perceived social support was negatively related to presenteeism（β=-0.068, P<0.05）, and adding the mediating variable perceived social support to the model explained an additional 14.0% of the variance in presenteeism. The regression coefficient for transformational leadership decreased from -0.090 in the second step to -0.069 in the third step, which was still significant. In the fourth step, occupational coping self-efficacy was negatively correlated with presenteeism（β=-0.044, P<0.05）, and adding career coping self-efficacy to the model explained an additional 18.7% of the unnoticeable absenteeism variance. The regression coefficient for transformational leadership decreased from -0.069 in the third step to -0.058 in the fourth but remained significant. Statistical analyses initially showed that perceived social support and occupational coping self-efficacy mediated the relationship with presenteeism in the transformational leadership component of Chinese ICU nurses (see Supplemental Table 3).

Analysis of chain mediation effects

All variables were standardized, with transformational leadership as the independent variable, presenteeism as the dependent variable, perceived social support and occupational coping self-efficacy as the mediating variables, and self-assessed physical health, perceived job stress, and whether or not one has suffered from workplace violence in the past year as control variables, and mediation effects were analyzed using Model 6 in PROCESS.

The results of the chain mediation modelling of the role of perceived social support, occupational coping self-efficacy in transformational leadership and presenteeism showed that the total effect of transformational leadership on presenteeism was -0.358 (95%CI: -0.428, -0.287; P<0.001). The coefficients of the indirect paths transformational leadership on perceived social support, perceived social support on occupational coping self-efficacy, transformational leadership on occupational coping self-efficacy, perceived social support on presenteeism, and occupational coping self-efficacy on presenteeism were 0.468 (95%CI: 0.397, 0.538; P<0.001), 0.241 (95%CI: 0.160, 0.322; P<0.001), 0.161 (95%CI: 0.081, 0.241; P<0.001), -0.119 (95%CI: -0.198, -0.039; P= 0.003), -0.261 (95%CI: -0.339, -0.184; P<0.001), with an indirect effect of -0.029 (95%CI: -0.046, -0.016; P<0.001), and the 95%CI did not contain zero, indicating that the model of perceived social

support and occupational coping self-efficacy as chain mediators was valid. See Supplemental Table 4, Supplemental Table 5 and Figure 2.

Figure 2: Schematic diagram of the chain-mediated effects of perceived social support, occupational coping self-efficacy between transformational leadership and presenteeism

Discussion

This study explored the relationship between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among ICU nurses. The results found a direct effect of transformational leadership on presenteeism among ICU nurses. They confirmed that perceived social support and occupational coping self-efficacy were chain mediators between transformational leadership and presenteeism. This provides a new perspective for studying the relationship between transformational leadership and presenteeism among ICU nurses.

The results of this study showed that ICU nurses' presenteeism score was (15.46±4.45), of which high presenteeism accounted for 53.9%, which indicated that China's ICU nurses' presenteeism was at a high level, which was worth paying attention to. To analyze the reasons for this, (1) only 56% of ICU nurses in this study had good self-assessed health. Several studies have also confirmed that individual physical and mental health conditions are the root cause of presenteeism.[34, 35] When nurses feel unwell or suffer from chronic illnesses, they may experience an inability to concentrate and devote themselves entirely to their work, which leads to lower work efficiency, lower productivity levels, and presenteeism. (2) 48% of the ICU nurses in this study had a high level of perceived stress. ICU, as an essential area for the rescue and treatment of patients with acute and critical illnesses in healthcare institutions, has a complex working environment. ICU nurses must continuously monitor changes in patients' conditions and cope with various first-aid situations. The high-intensity workload and prolonged work pressure may increase the nurses' fatigue and psychological burden, which may lead to presenteeism behaviors. (3) About 35% of ICU nurses in this study had suffered from workplace violence in the past. Workplace violence is a severe threat to the personal safety of nurses. It is a stressful event that can easily trigger anxiety and depression in nurses, negatively affect employee job satisfaction and loyalty, and increase concerns about the work environment and job security, leading to an inability to concentrate on work, thus resulting in presenteeism.[36]

The results of this study show that the transformational leadership score of ICU nurses is (104.06±17.68), which is at the medium-high level, similar to the results of foreign scholars.[16] In recent years, nursing managers' understanding of scientific management has gradually deepened, the leadership style of nursing team leaders has been continuously improved, and managers who have received higher education have higher qualities and conduct can play a corresponding exemplary role among nurses and can make wise decisions and guidance based on their professional knowledge when leading the team to make changes. Hence, the level of transformational leadership is higher.

The results of this study showed that ICU nurses perceived social support scores of (62.58±11.92), which was at a medium-high level, similar to the findings of Lu et al.[37] Social support, as a positive emotional experience in which an individual subjectively feels that they receive understanding and support from family, society, and friends, can reflect the degree to which an individual gets support in a stressful situation. Social support theory also states that a strengthened

social support network helps to cope with external environmental challenges.[38] It may be related to the fact that the survey respondents in this study were mainly bachelor's degree holders (81.86%), and people with higher education tend to have more knowledge and skills, as well as better communication and expression skills and are more likely to establish and maintain good social relationships. The lower level of perceived social support among those with poor health, perceived high work stress may be related to the decline in participation in social activities and lack of time and energy to maintain interpersonal social relationships among this group.

The results of this study showed that ICU nurses' occupational coping self-efficacy score was (31.13 ± 6.58), which is at the medium level (median total score of 22.5), similar to the results of the study by Pisanti et al.[39] Self-efficacy is not confidence generated for a specific domain but can predict people's behavior in different situations. Studies have shown that individuals with high levels of self-efficacy favor using positive or problem-focused coping strategies, which help them effectively buffer the adverse effects of stress and contribute to maintaining high levels of physical and mental health.[40] It may be related to the fact that the working years of the respondents in this study were mainly 1-5 years, which accounted for about 40%. On the one hand, the ICU work environment is challenging, requiring the handling of critically ill patients and complex medical situations. Low-seniority nurses working in such a high-pressure environment may feel uneasy and anxious, which affects self-efficacy enhancement. On the other hand, newly recruited ICU nurses may lack confidence in their abilities and coping measures due to a lack of sufficient work experience and training, resulting in lower self-efficacy.

This study found that perceived social support mediates the relationship between transformational leadership and presenteeism among ICU nurses, i.e., transformational leadership not only acts directly on presenteeism but also indirectly through perceived social support. According to the theory of transformational leadership, transformational leadership is an upbeat leadership style that stimulates the intrinsic motivation of employees by motivating them so that they can maximize their potential to achieve the highest level of performance, promote their personal growth and career development, and thus improve team cohesion and work performance.[41] On the one hand, when nurse leaders have a high transformational leadership style, they can provide the social support that nurses need. By motivating and stimulating nurses' potential, they feel valued and supported. They are willing to devote themselves to their work in a positive frame of mind, which contributes to the joint development of themselves and the organization and enhances nurses' job satisfaction, which helps to reduce presenteeism; on the other hand, it is based on the theory of social exchange. When individuals receive sufficient support in social exchange, they are more confident and motivated to face challenges at work, thus reducing presenteeism. When nurses perceive the care and support from leaders, colleagues, and organizations, this emotional support is not only conducive to regulating the negative emotions of nurses and reducing the negative impact of work pressure on them but also helps to enhance the nurses' commitment to and identification with the organization, so that they are more engaged in their work and reduce the possibility of presenteeism.[26]

The results of this study found that occupational coping self-efficacy mediates the relationship between transformational leadership and presenteeism among ICU nurses, which means that transformational leadership not only acts directly on presenteeism but also indirectly through occupational coping self-efficacy. Bandura's self-efficacy theory states that when individuals believe they are competent enough to accomplish a task, they are more motivated to engage in it and strive to achieve the desired goal.[42] Managers with a high level of transformational leadership style can motivate nurses through character appeal and vision sharing and stimulate positive emotions in nurses to show more energy, dedication, and focused attitudes to be more confident in dealing with

challenges and pressures at work. Nurses with higher occupational coping self-efficacy are more confident and capable of dealing with difficulties and challenges at work. They are more willing to take the initiative to solve problems, improve work performance, and reduce presenteeism behavior.

The results of this study found that perceived social support and occupational coping self-efficacy acted as chain mediators between transformational leadership and presenteeism among ICU nurses, i.e., transformational leadership among nurses affects presenteeism through perceived social support and occupational coping self-efficacy. According to the JD-R model, job resources can buffer the negative consequences of presenteeism by stimulating employees' internal and external motivation to cope with demanding job tasks. Transformational leadership and perceived social support as an essential external resource and occupational coping self-efficacy as a vital internal resource, managers with a high level of transformational leadership style excel at stimulating nurses' autonomy and creativity by establishing good interpersonal relationships and a teamwork atmosphere, providing nurses with the necessary resources and support, and enhancing nurses' perceptions of social support.[20] When nurses feel the support and encouragement from their leaders, they will be more willing to seek and utilize help and support from external resources, such as colleagues, family, and friends. This social support helps meet nurses' needs at work, reduces work stress and fatigue, and increases job satisfaction and well-being, enhancing nurses' occupational coping self-efficacy. When possessing a higher level of self-efficacy, nurses are more confident that they can better cope with the challenges and pressures at work, which is conducive to maintaining good mental health and reducing the incidence of presenteeism.

Based on the results of this study, we put forward the following recommendations to improve the status of presenteeism among ICU nurses. First, cultivate and promote a transformational leadership style: leaders should pay attention to the needs and emotions of nurses and actively listen to their opinions and suggestions; stimulate nurses' enthusiasm and innovation through incentives and encouragement so that they can feel the meaning and value of their work; establish a positive, open and inclusive work environment and encourage nurses to participate in decision-making to improve their sense of belonging and responsibility and reduce presenteeism. Second, enhance perceived social support: establish a good social support network; organizations should encourage supportive colleague relationships and teamwork and promote interactions and exchanges through regular team-building activities; nursing managers should strengthen communication with nurses, establish a good team communication mechanism, and encourage information exchange and emotional support among nurses; and provide resources for mental health support by providing resources such as psychological counseling services, guidance and training on work-life balance, to help nurses cope with work stress and emotional distress, promote nurses' physical and mental health, and reduce presenteeism. Third, to improve nurses' sense of self-efficacy in occupational coping, regular training and refresher courses are conducted to improve nurses' professional skills and knowledge and enhance their ability to cope with work challenges; work tasks and resources are reasonably allocated to reduce nurses' overload and stress; and appropriate incentives and recognition mechanisms are provided to stimulate nurses' motivation and self-efficacy and to reduce presenteeism.

Limitation and prospect

First, this study only selected ICU nurses from six tertiary hospitals in Sichuan Province, China, for the survey. As a result, the representativeness of the sample size and the generalizability of the findings are limited. In the future, multi-center and large-sample survey studies can be conducted to explore the presenteeism of ICU nurses in different regions and different levels of hospitals. Secondly, this study was a cross-sectional study and therefore unable to assess the longitudinal

trajectory of change in transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism among ICU nurses. The changes in presenteeism and related influencing factors among ICU nurses can be analysed in depth from multiple perspectives in the future through longitudinal studies.

Conclusions

In summary, China's ICU nurses' presenteeism is at a high level, and transformational leadership can not only directly affect ICU nurses' presenteeism but also indirectly affect ICU nurses' presenteeism by the chain mediating role of perceived social support and occupational coping self-efficacy. Nursing managers should pay attention to developing a transformational leadership style to enhance social support and improve ICU nurses' occupational coping efficacy, thus reducing ICU nurses' presenteeism behavior.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study was approved by the Deyang People's Hospital Ethics Committee (2021-04-056-K01).

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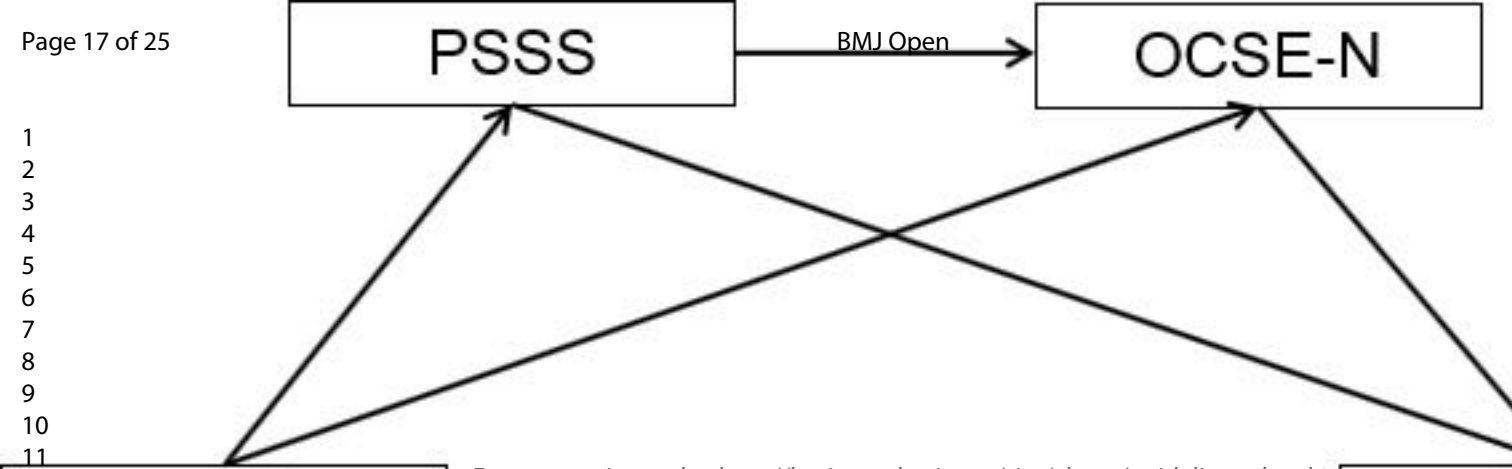
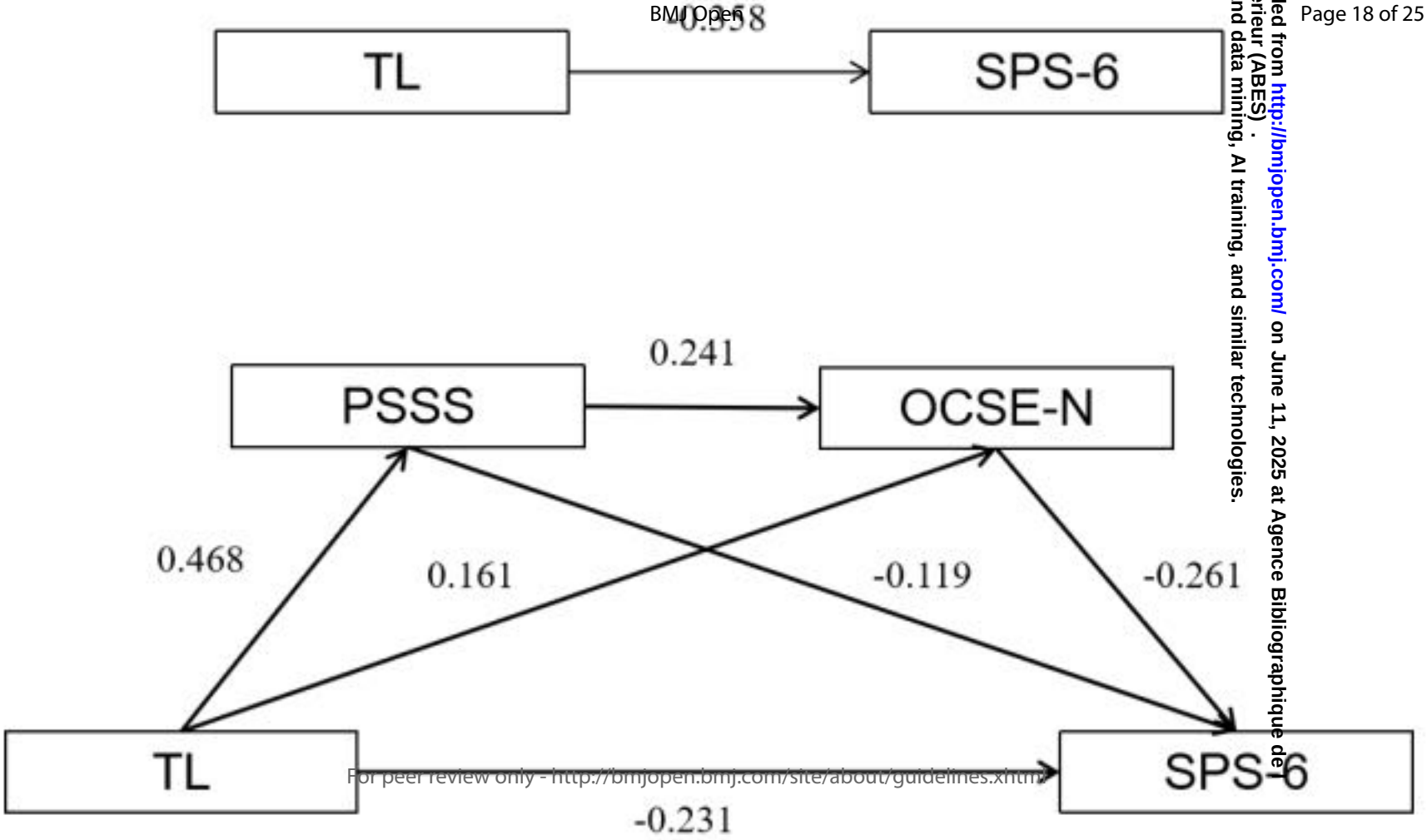
Figure 1: Hypothesized Model of the Relationship between Transformational Leadership（TL), Perceived Social Support(PSSS), Occupational Coping Self-Efficacy(OCSE-N) and Presenteeism（SPS-6）

Figure 2: Schematic diagram of the chain-mediated effects of perceived social support, occupational coping self-efficacy between transformational leadership and presenteeism





Results

Supplementary Table 1: Relationship between demographic characteristics of ICU nurses and

presenteeism

Items	N	SPS-6 Mean ±SD	*t/F*	*P*	Multiple comparisons
Sex			-0.378	0.706	/
male	57	15.25±5.10			
female	533	15.48±4.38			
Age			0.052	0.950	/
< 30	267	15.39±4.32			
30~ < 40	308	15.51±4.66			
≥40	15	15.47±2.10			
Marital status			1.410	0.239	/
unmarried	189	15.87±4.36			
married but not having children	73	15.55±4.14			
married and having children	317	15.15±4.58			
Divorced or other	11	16.82±3.97			

Highest degree					
College and below	93	15.31±4.54	0.086	0.918	/
undergraduate	483	15.49±4.32			
Master's degree or above	14	15.21±4.87			
Professional title			1.971	0.140	/
junior level	102	15.36±4.67			
middle level	315	15.77±4.34			
high level	173	14.94±4.50			
Position			1.476	0.229	/
clinical nurse	509	15.58±4.44			
nursing team leader	68	14.78±4.64			
head nurse	13	14.23±3.47			
Years of experience in ICU			1.903	0.150	/
1~ < 5	252	15.07±4.36			
5~ < 10	204	15.88±4.45			
≥10	134	15.54±4.60			

Average monthly income			1.945	0.121	/
1~ < 6000	150	15.63±4.46			
6000~ < 8000	268	15.75±4.49			
8000~ < 10000	132	14.64±4.28			
≥10000	40	15.53±4.57			
Type of contract			-1.266	0.206	/
professional preparation	90	14.91±3.96			
labor contract	500	15.56±4.53			
Self-assessed health status			36.031	＜0.001	①＜②＜③
good	328	14.27±4.20			
general	233	16.62±4.14			
worse	29	19.59±4.89			
Whether or not you have a chronic disease			1.598	0.111	/
No	87	16.16±4.39			
Yes	503	15.34±4.46			

Perceived work stress			28.679	＜0.001	④＜⑤＜⑥
lower	13	11.77±3.81			
middle	292	14.34±3.93			
high	285	16.78±4.58			
ICU human resources			1.732	0.178	/
< 1:2.5~3	347	15.25±4.58			
=1:2.5~3	143	15.45±4.27			
>1:2.5~3	100	16.19±4.24			
Exposure to workplace violence in the past year			5.763	＜0.001	/
No	386	14.71±4.39			
Yes	204	16.87±4.24			

Note:①good；②general；③worse；④lower；⑤middle；⑥high

Supplementary Table 2：Correlations between transformational leadership, perceived social support, occupational coping self-efficacy, and presenteeism

Variables	*Mean* ±*SD*	1	2	3	4
Transformational leadership(1)	104.06±17.68	1	-	-	-

Perceived social support(2)	62.58±11.92	0.515**	1	-	-
Occupational coping self-efficacy（3）	31.13±6.58	0.369**	0.417**	1	-
Presenteeism(4)	15.46±4.45	-0.445**	-0.412**	-0.486**	1

**P <0.05

Supplementary Table 3: Multiple stratified regression analysis of presenteeism of ICU nurses in China

	Step1	Step2	Step3	Step4
Step1				
Self-assessed health status	1.883**	1.475**	1.290**	1.057**
Perceived work stress	1.729**	1.392**	1.268**	0.803**
Exposure to workplace violence in the past year	-1.371**	-0.939**	-0.892**	-0.584
Step2				
Transformational leadership	—	-0.090**	-0.069**	-0.058**

Step3				
Perceived social support	—	—	-0.068**	-0.044**
Step4				
Occupational coping self-efficacy	—	—	—	-0.177**
F	42.575**	61.893**	55.090**	56.639**
R^2	0.179	0.297	0.320	0.368
Adjustment R^2	0.175	0.293	0.315	0.362

**P <0.01

Supplementary Table 4: Paths of indirect mediating effects of perceived social support, occupational coping self-efficacy between transformational leadership and presenteeism

Path	Coeff	95%CI	
		LLCI	ULCI
Transformational leadership→Perceived Social Support →Presenteeism	-0.055	-0.104	-0.012
Transformational leadership→Occupational Coping Self Efficacy→Presenteeism	-0.042	-0.076	-0.017

Transformational leadership→Perceived Social Support →Occupational Coping Self Efficacy→Presenteeism	-0.029	-0.046	-0.016

Supplementary Table 5 : Analysis of the chain-mediated effects of perceived social support, occupational coping self-efficacy on the relationship between transformational leadership and presenteeism

	R^2	F	Coeff	SE	*t*	*P*	LLCI	ULCI
Outcome	0.297	61.700						
Perceived Social Support								
Transformational leadership			0.468	0.036	12.980	＜0.001	0.397	0.538
Outcome	0.300	50.176						
Occupational Coping Self Efficacy								
Transformational leadership			0.161	0.041	3.941	＜0.001	0.081	0.241
Perceived Social Support			0.241	0.041	5.830	＜0.001	0.160	0.322
outcome	0.368	56.639						
Presenteeism								

Transformational leadership			-0.231	0.039	-5.865	＜0.001	-0.308	-0.153
Perceived Social Support			-0.119	0.040	-2.935	0.003	-0.198	-0.039
Occupational Coping Self Efficacy			-0.261	0.039	-6.638	＜0.001	-0.339	-0.184
Outcome	0.297	61.893						
Presenteeism								
Transformational leadership			-0.358	0.036	-9.929	＜0.001	-0.428	-0.287
Total effect			-0.358	0.036	-9.929	＜0.001	-0.428	-0.287
Direct effect			-0.231	0.039	-5.865	＜0.001	-0.308	-0.153
Total indirect effect			-0.127	0.027	-	-	-0.184	-0.080