Advancing teaching and learning in health sciences across healthcare professionals

Edited by
Mário Gomes, Roger Azevedo, Ana Grilo
and Ana Isabel Gomes Salgado

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Advancing teaching and learning in health sciences across healthcare professionals

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Table of
contents

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Predictors of problem-solving skills among emergency medical services staff in Iran: A cross-sectional correlational study

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Background and aims: Pre-hospital emergency technicians face many problems in the workplace daily, so the ability to solve or overcome them in the workplace is essential. This article aimed to assess the predictors of problem-solving skills among emergency medical services staff in Iran.

Methods: This study was cross-sectional correlational research. Using convenience sampling methods, 140 emergency medical services (EMS) staff were enrolled in the study. Response time was assessed using ASAYAR software, problem-solving skills (PSS) were measured using the Hepner Petersen Problem Solving Questionnaire (PSI), and cognitive emotion regulation strategies were assessed using the Garnfsky Cognitive Emotion Regulation Questionnaire. Descriptive statistics, t-test, one-way analysis of variance (ANOVA), Pearson's r correlation coefficient, and multiple linear regression analysis were applied using SPSS 14.0.

Results: The results of our study showed that the total mean score for problem-solving skills was 136.84 (14.65) (range, 175−107 points). Multiple linear regression indicated that refocusing on planning, positive evaluation, stress management courses, delays and their causes, positive refocusing, catastrophizing, and acceptance were effective predictors of problem-solving skills in emergency personnel, accounting for 54% of the total variances.

Conclusion: This study is one of the first studies in this field. Based on our findings, individuals who consider their emotions and feelings when solving problems are better able to use the process of thinking and problem-solving skills. Therefore, by training people in the field of emotional regulation skills, the skills to solve problems technicians can be increased.

Introduction

Nowadays, providing public health services in a country is highly important. These healthcare services are considered an essential part of the pre-hospital emergency system (Lee et al., 2018). Pre-hospital emergencies in Iran dates back to 1975 when the first emergency care unit was established in the capital, Tehran, after which pre-hospital emergency departments, including urban and road centers, were gradually established in other provinces of Iran (Bijani et al., 2021). The Emergency Medical Services (EMS) personnel have an associate's or bachelor's degree in anesthesiology, operating room, and emergency medicine, or a bachelor's or master's degree in nursing (Habibi Soola et al., 2022; Mirzaei et al., 2022). The EMS personnel are often the first people to be exposed to numerous emergencies, from heavy vehicle crashes and natural disasters to minor injuries and illnesses (Bijani et al., 2021). If emergency services are provided promptly and completely, the mortality rate and disabilities caused by some diseases and accidents will be reduced (Garner et al., 2018).

In pre-hospital emergency care, time frames (seconds and minutes) can mean the difference between life and death or between severe disability and having a normal life (Bijani et al., 2021). Response time is of great importance in pre-hospital emergency care and is considered the most important indicator to control the efficiency of a pre-hospital emergency system (Alnemer et al., 2016; Lee et al., 2018). Studies have shown that a 1 min increase in response time may lead to a decrease in patient survival (Goto et al., 2018). Tim et al. showed that the average response time is much higher than the golden time (Timm et al., 2014), which is ideally considered in different countries to be between 4 and 20 min (Zeraatchi et al., 2018). According to the regulations of the Iranian Ministry of Health, the response times in pre-hospital care in Iranian cities and roads are 8 and 15 min, respectively (Saburie et al., 2017; Taheri et al., 2017). The EMS technician is one of the most important factors involved in reducing or increasing this response time (Cone, 2021). In choosing the EMS technicians, various factors such as personality traits, values, interests, skills, family circumstances, and social conditions should be considered (SafarAbadi et al., 2015). In other words, they must be able to accurately diagnose problems and choose the best solutions in the shortest possible time because they constantly face various professional and stressful problems during the shift and must make the best decision in the fastest time. There are various ways to deal with these problems, including problem-solving and emotion management skills (Huang and Flores, 2011).

Emotion management skills refer to the cognitive emotion regulation by which people can properly moderate their feelings and emotions (Ashori and Najafi, 2021). Given the positive association between cognitive emotion regulation and increased self-confidence as well as the emergence of better social behaviors, it is not surprising that this multidimensional structure- adaptive or maladaptive emotion regulation strategies-affects cognitive problem-solving skills embedded in decision-making and critical thinking ability (Aminabadi et al., 2011; Te Brinke et al., 2018). Problem-solving skills include a combination of behavioral, cognitive, and emotional reactions that manifest when a person encounters everyday problems to adapt to intrinsic actions and overcome the pressures arising from them (Ancel, 2016; Bayram et al., 2022). Accordingly, they try to search for various sources and then apply useful strategies (Huang and Flores, 2011; Tan et al., 2019). Problem-solving skills include the three components of self-confidence in problem-solving, avoidance approach, and personal control, which indicate a person's belief in the ability to solve problems, their willingness to ignore problems, or confrontation with problems, and using different strategies to control behavior and purposefulness in the problem-solving process, respectively (Feizi Konjini et al., 2016). Studies have shown that when a person encounters stressful problems and events, problem-solving skills and emotion management skills become more important and help solve the problems easier and faster (Bahtiyar and Can, 2016; Bayram et al., 2022). Thus, having problem-solving skills is a requirement for EMS technicians. Further, because of their job sensitivity, the EMS staff must be able to think critically to analyze, prioritize, and reorganize emergencies (Heidari and Shahbazi, 2016; Tan et al., 2019). One of the challenging situations that can undermine problem-solving skills or make decision-making difficult is emotion regulation in confrontation with critical situations. The results of studies also show the relationship between problem-solving skills and emotion regulation ability (Madanifard et al., 2016).

Pre-hospital emergency services play a key role in reducing deaths and complications due to injuries and diseases. There is also a need for regular performance monitoring, especially in indices affecting the process of providing services to patients, including human resources, using problem-solving skills. Moreover, studies in problem-solving areas in the pre-hospital emergency system are scarce. Hence, this study was conducted to investigate the predictors of problem-solving skills among emergency medical services staff in Iran.

Materials and methods

The research population of this descriptive-analytical study comprised EMS technicians working in the emergency medical centers of Ardabil city ($n = 160$). The inclusion criteria consisted of more than 6 months of clinical experience in the pre-hospital emergency, willingness to participate in the study, complete missions performed in the base area, and registered in the ASAYAR system. The exclusion criterion was canceled for off-base missions. After observing ethical considerations and obtaining the necessary approval, the researchers obtained

the list of the personnel of urban and road EMS bases by a convenience sampling method. A total of 160 people met the inclusion criteria. The questionnaire was distributed among them, and 140 questionnaires were eventually returned. In this study, the effective recovery rate of the questionnaire was 87% (140/160). For each technician, the demographic characteristics, problem-solving skills, and emotion regulation questionnaires, as well as response time information in 1 month (July 1 to 31, 2019) were completed, from which a total of 3,000 missions were completed. Information was collected from July to 1 October 2019.

Demographic forme

The demographic characteristics included age, work experience, marital status, technician's position, number of children, employment status, level of education, field of study, having a delay and the reasons for it, and passing stress management, problem-solving, and time management courses.

ASAYAR software

This system uses the Global Positioning System (GPS footnote) to record the response time of senior technicians that decide on emergency missions from the time of the emergency call to the scene of the accident or the patient's bed.

Problem solving inventory (PSI)

The Problem Solving Inventory (PSI) is a 35-item tool developed by Hepner and Peterson (Heppner and Petersen, 1982) that measures a person's perceptions of problem-solving abilities and problem-solving style in everyday life based on a Likert scale, ranging from strongly agree (score 6) to strongly disagree (score 1). The PSI has three dimensions of trust in problem-solving with 11 items, avoidance approach with 16 items, and personal control with 5 items. Some items (9, 22, and 29) are not scored. Questions 29, 30, 32, 34, 25, 21, 26, 15, 14, 9, 11, 4, 3, 2, and 1 are negative propositions and have the opposite score (Sahin et al., 1993). A total score can be calculated as a general index of problem-solving appraisal that ranges from 32 to 192 (Sahin et al., 1993). No cut-off point was defined for the evaluation of the scale. Lower scores on each factor and on the total PSI score are considered more functional. The reliability of the instrument in the study of Hepner and Petersen was reported to be 90% by Cronbach's alpha (Heppner and Petersen, 1982). This rate was 83% in the study of Yaghoobi and Motevalli (2020). In the present study, the reliability of the instrument using Cronbach's alpha was 77%.

Cognitive emotion regulation questionnaire (CERQ)

The CERQ, developed by Garnefski and Krraij (Garnefski and Kraaij, 2006), is an 18-item questionnaire that measures cognitive emotion regulation strategies in response to life-threatening and stressful events on a Likert scale ranging from 1 (never) to 5 (always). This questionnaire includes 9 subscales of self-blame, other-blame, rumination, catastrophizing, putting into perspective, positive refocusing, positive reappraisal, acceptance, and planning (Garnefski and Kraaij, 2006). Cognitive emotion regulation strategies in this questionnaire are divided into two general categories, namely, adaptive strategies (adapted) and non-adaptive strategies (non-adapted). Adaptive strategies include positive refocusing, positive reappraisal, acceptance, and refocusing on planning. Maladaptive strategies consist of self-blame, other-blame, rumination, and catastrophizing. The reliability of the questionnaire in Garnefsky and Kraaij's research for the 9 mentioned subscales was reported to be between 62 and 80% (Garnefski and Kraaij, 2006). The reliability of this questionnaire in Hassani's study was between 68 and 82% (Hasani, 2010). In this study, Cronbach's alpha was 76% for positive strategies, 77% for negative strategies, and 0.78 for the whole questionnaire.

Data analysis

SPSS 14 was used for data analysis. Frequency, percentage, mean, and standard deviation were used to describe the participants' characteristics, response time, problem-solving skills, and emotion regulation levels. A Pearson correlation was used to test the associations between the studied variables (problem-solving skills and emotional regulations) and multivariate linear regression tests were used to identify the predictors of problem-solving skills. A significance level of 0.05 was considered.

Ethical considerations

Before data collection, ethical approval was obtained from the Research Committee of Ardabil University of Medical Sciences (approval number: IR.ARUMS.REC.1398.228). The researchers were allowed to access the study site and collect data. All participants expressed their consent after being informed of the research objectives and method. This study adhered to the principles of the 2013 Helsinki Declaration. Participation was voluntary and informed written consent was obtained from each respondent. To ensure anonymity and confidentiality,

TABLE 1 General characteristics of emergency medical services staff (*N* = 140).

variables		*N* (%)	Mean (SD)
Age			32.99 (7.96)
Work experience			8.1 (7.16)
Marital status	Single	51 (36.4)	
	Married	89 (63.6)	
Position	EMT-Intermediate	57 (71.40)	
	EMT-Paramedic	83 (28.59)	
Number of children	No	81 (57.9)	
	1–3	59 (42.1)	
Type of employment	official	50 (35.71)	
	contract	32 (22.58)	
	Contractual	12 (8.56)	
	Projective	46 (33.15)	
Educational level	Associate	25 (17.58)	
	Bachelor's and master's	115 (82.42)	
Reasons for the delay	There was no delay	113 (80.7)	
	Fatigue	4 (2.9)	
	A few cases	10 (7.1)	
	others	13 (9.3)	
Stress management course	Yes	126 (90)	
	No	13 (10)	
Participate in a problem-solving course	Yes	13 (9.3)	
	No	127 (90.7)	
Participate in time management courses	Yes	13 (9.3)	
	No	127 (90.7)	
Field of Study	Nursing	82 (58.6)	
	Anesthesia	15 (10.7)	
	surgery room	6 (4.3)	
	Medical emergency	28 (20)	
	Relief and Rescue	9 (6.4)	

no personal identifier of the respondent was used in the collected data.

Results

The overall response rate in this study was 87%. Their mean age was 32.99 (SD: 7.96), and their mean clinical experience was 8.1 years (SD: 7.16). The majority of the participants (89%) were married, 35.71% were officially employed, and 71.80% had a bachelor's degree. The majority of samples (90.70%) had not passed the problem-solving and time management courses, and

TABLE 2 Descriptive statistics of the study variables (*N* = 140).

Variable	Mean	SD	Min	Max
Total PSI score	136.84	14.65	107.00	175.00
Problem solving confidence	48.12	5.86	29.00	63.00
Approach avoidance style	65.87	7.48	49.00	85.00
Personal control	19.25	4.78	8.00	30.00
Positive strategy	3.54	0.51	1.80	4.70
Acceptance	6.71	1.90	2.00	10.00
Positive refocusing	6.06	2.02	2.00	10.00
Refocusing planning	8.20	1.80	2.00	10.00
Positive appraisal	7.78	1.73	3.00	11.00
Putting in to perspective	6.72	1.69	2.00	10.00
Negative strategy	2.65	0.68	1.13	4.25
Self-blame	4.95	2.31	2.00	10.00
Rumination	7.03	1.85	2.00	10.00
Catastrophizing	4.88	1.70	2.00	9.00
Blame others	4.34	1.86	2.00	9.00

TABLE 3 Mean score response time of participating technicians after receiving the mission message.

Item	Time (minutes)
Time T1	1.21 (0.26)
Response time in the city	10.22 (2.45)
Response time on the road	10.57 (3.36)
Response time in Ardabil	10.21 (2.63)
Response time in counties of Ardabil province	11.41 (3.99)
Total response time (roads and cities)	10.49 (2.79)

80.7% did not have a delay in mission. Other demographic characteristics are shown in Table 1.

The distribution of mean scores of problem-solving skills and its sub-scales showed a mean score of 48.12 (5.86) (range: 29–63) for PSC, 65.87 (7.48) (range: 49–65) for CA, and 19.25(4.78) (range: 8–30) for PC. The overall mean PSI was 136.84(14.65) (range: 107–175). The EMS personnel mostly used positive strategies to regulate emotions in stressful situations. However, the lowest mean score among emotion regulation components was related to the total score of negative strategies and other-blame subscale (Table 2).

The results showed that the total response time of technicians (roads and cities) was 10.49(2.79) minutes (Table 3). The time spent taking patient histories (T1) and the overall response time in cities were statistically longer, i.e., weaker than their defined standards. However, the total response time on the road was significantly less (better) than its defined standards. In addition, the response time was better in Ardabil City than in other cities in Ardabil Province.

TABLE 4 Correlations among the study variables ($N = 140$).

Variable	1	2	3	4	5	6
Total problem-solving inventory score	1	0.778**	0.897**	0.758**	0.133	−0.370**
Problem solving confidence	0.778**	1	0.529**	0.368**	0.344**	−0.198*
Approach avoidance style	0.897**	0.529**	1	0.613**	−0.040	−0.333**
Personal control	0.758**	0.368**	0.613**	1	0.046**	−0.428**
Positive strategies	0.133	0.344**	−0.040	0.046	1	0.131
Negative strategies	−0.370**	−0.198*	−0.333**	−0.428**	0.131	1

1, Total Problem-Solving Inventory score; 2, Problem Solving Confidence; 3, Approach Avoidance Style; 4, Personal Control; 5, Positive strategy; 6 Negative strategy. *P < 0.05, **P < 0.01.

Table 4 shows the relationship between problem-solving skills and their sub-scales and the positive and negative strategies of EMS personnel. Problem-solving skills were significantly inversely correlated with negative strategies ($r = −0.370$, $p < 0.001$), but they were not correlated with positive strategies. Self-confidence in problem-solving had a significantly negative correlation with negative strategies ($r = −0.198$, $P < 0.05$) and a significantly positive correlation with positive strategies ($r = 0.344$, $p < 0.001$). The rest of the results for correlation between the variables are presented in the table.

Table 5 indicates the results of multiple regression analysis regarding the predictors of problem-solving skills. A multiple linear regression analysis was performed using problem-solving skills as dependent variables and emotion regulation and demographic characteristics as independent variables. The Durbin–Watson test statistic was 1.88, thereby falling within 1.5–2.5; as such, there was no linear relation in the data. The variance inflation factor ranged from 1.04 to 4.26, whereas tolerance ranged from 0.23 to 0.95 with no multicollinearity among independent variables. Of these 16 variables, 7 variables were identified as significant predictors of problem-solving skills. The coefficient of determination (R^2) of the regression model showed that 54% of the total score of problem-solving skills can be explained by the input variables of the model. Among the variables fed into the model using the ENTER method, reported in the table, the refocusing on planning, positive reappraisal, passing the stress management course, having delays and their reasons, positive refocusing, and acceptance variables were predictors affecting problem-solving skills among EMS personnel.

Discussion

Problem-solving skills in medical emergencies refer to the ability to quickly solve health problems through critical thinking based on knowledge and experience (Yang and Kim, 2022). Problem-solving skills require confidence, avoidance approach, and control. Self-confidence has a positive effect on the problem-solving process and outcome. The avoidance approach refers to

the hardworking approach to avoiding bad things and is similar to stress coping. In the problem-solving process, it is necessary to have control over the individual's awareness and behavior (Arble and Arnetz, 2017). This study aimed to investigate problem-solving skills and their relationship with emotion regulation and response time among emergency medical services staff in Iran.

EMS staff had poor problem-solving skills, which is consistent with the results of previous studies (Yavuz et al., 2010; Avsarolu, 2019). Further, the results of Altun and Uslu showed that the participants had better problem-solving skills (Altun, 2003; Uslu and Girgin, 2010). However, Heidari et al. showed that the technicians' problem-solving skills improved after passing the problem-solving skills course (Heidari and Shahbazi, 2016). In addition, Chinar et al. reported that participants who rated their problem-solving skills better scored better on problem-solving skills, which is indicative of the effectiveness of self-confidence and self-awareness in this regard (Çinar et al., 2010). Considering the results of this study and the importance of empowering the EMS staff with problem-solving skills, it can be concluded that they have poor problem-solving skills. Therefore, to make the best decisions, providers must receive on-the-job training to strengthen problem-solving skills that can be used in this field and at the forefront of Iranian medical emergencies.

In this study, the participants made more use of adaptive strategies in emotion regulation, which was in line with the results of Habibi and Ebrahim's study (Ibrahim et al., 2020; Habibi Soola et al., 2022; Mirzaei et al., 2022). The results of these studies showed that emergency nurses and EMS staff were more likely to use positive coping strategies in dealing with stressful situations at work. However, as in our study, the participants were less likely to use negative strategies. It seems that in our study, due to repeated exposure to unpredictable and stressful situations, the participants were able to consider positive emotion regulation strategies as an adaptive strategy and change their emotional response to stressful events to improve their performance.

The results showed that refocusing on planning and positive reappraisal had the greatest effect on predicting problem-solving skills, which was consistent with the results of the

TABLE 5 Multiple regression analysis predicting problem-solving skill.

Variables	B	Beta	t	P-value	95% confidence interval for B
(Constant)	142.353		8.196	<0.0001	107.974–176.731
Response. Time	−0.435	−0.083	−1.329	0.186	−1.083–0.213
Self-blame	−0.650	−0.103	−1.449	0.150	−1.539–0.238
Acceptance	−1.606	−0.209	−3.123	0.002	−2.623 to −0.588
Rumination	0.508	0.064	0.811	0.419	−0.732–1.748
Positive refocusing	−1.498	−0.207	−2.869	0.005	−2.532 to −0.465
Refocus on planning	2.687	0.330	4.616	<0.0001	1.535–3.839
Positive reappraisal	2.739	0.324	4.864	<0.0001	1.624–3.853
Putting into perspective	0.565	0.066	0.908	0.366	−0.667–1.798
Catastrophizing	−1.531	−0.178	−2.210	0.029	−2.902 to −0.160
Blaming others	−1.025	−0.130	−1.647	0.102	−2.257–0.207
Age	0.231	0.126	1.061	0.291	−0.200–0.662
Number of children	−3.156	−0.198	−1.769	0.079	−6.687–0.375
Position	2.660	0.089	1.308	0.193	−1.364–6.684
Participate problem-solving course	−12.196	−0.242	−1.922	0.057	−24.753–0.362
Stress management course	−13.736	−0.312	−2.515	0.013	−24.546 to −2.926
Reasons for the delay	−0.866	−0.255	−3.724	<0.0001	−1.326 to −0.405

R^2, 0.541; Adjusted R^2, 0.481; $F_{(9.057)}$, P < 0.001 A Dependent variable: problem-solving skill.

Nasrolahi and Pour (2018) study. To our knowledge, no study has examined the relationship between problem-solving skills and emotion regulation in EMS technicians. It can be argued that executive actions imply the coherent use of several cognitive processes, and individuals use them to solve problems, plan, take action, organize, and monitor purposeful activities (Sam Daliri et al., 2017). Refocusing on planning and positive reappraisal in the problem-solving process are likely to increase the emergency technicians' confidence in their cognitive abilities. Perhaps this group of technicians is very flexible in coming up with strategies to cope with the primary control of stressors (planning and instrumental support) for the sake of secondary control (positive reappraisal) when coping with problems. The results of Betis and Lafuente's study showed that metacognitive self-regulation and executive performance skills (such as replanning and organizing) are important sources to improve students' abilities to make their strategies more flexible in addition to specific training aimed at enhancing their coping strategies (Bettis et al., 2017; De la Fuente et al., 2018). Azizi showed that the main problem for EMS personnel in dealing with accident scenes is psychological stress, with which rescuers deal in two ways: emotion-based management and problem-based approach. Therefore, emotional reactions such as intense emotions, emotional behavior, and emotional thoughts are manifested under emotion-based management (Azizi et al., 2021).

The results of multiple linear regression showed that acceptance and positive refocusing were negatively correlated with problem-solving skills among the EMS staff, which was in consistent with the results of a study by Kraaij and Garnefski (2015) and was not consistent with the results of Nasrallah's study (2018). Problem-solving skills are behaviors that one can rely on to overcome conflict, even during stressful missions (Cuijpers et al., 2018). For frontline health workers, a positive attitude toward a stressful situation is the main factor for protection against stress and is one of the key problem-solving methods (Babore et al., 2020). The results of a study showed that the most common problem-solving strategies used by healthcare providers were accepting a critical situation and using a positive attitude at work (Khalid et al., 2016). Mirzaei et al. reported that teaching life skills enhances adaptive strategies such as positive refocusing, and individuals act positively in consciously regulating their emotions and become more proficient in applying adaptive strategies such as positive refocusing (Mirzei and Hasani, 2015). Catastrophizing was negatively correlated with problem-solving skills among the EMS staff, which was consistent with the results of previous studies (Mirzei and Hasani, 2015; Nasrolahi and Pour, 2018; Bayram et al., 2022). The results of these studies show that increasing life skills reduces adaptive strategies such as catastrophizing. Moreover, Camberley et al. showed that increased catastrophizing elevate stress and anxiety and reduces people's performance and ability to deal with problems (Zlomke and Hahn, 2010). Emotional turmoil in the EMS technicians due to repeated exposure to emergencies and unpredictable events seems to be a reason for them to use catastrophizing solutions. This suggests that negative emotion regulation strategies in stressful situations are due to poor emotional skills and the inability to solve problems.

The results of multiple linear regression showed that passing the stress management course was one of the predictors of problem-solving skills in the participants. This result was consistent with the results of a study by Downey et al. (2011). Regarding the inverse correlation between problem-solving skills and passing the stress management course, it seems that most participants were not familiar with the stress management course and its effect on problem-solving skills in emergencies as only 25% of participants had passed this course. Adequate training is also a protective factor in the development of adverse psychiatric outcomes in medical respondents in all types of natural disasters (Azizi et al., 2021). The goal of the stress management course is to empower people to deal with stress, as a result of which they feel more comfortable and healthy and can cope better and more appropriately with stressful events. The results of multiple linear regression showed that delay and its reasons were predictors of problem-solving skills. Problem-solving skills were better in participants who stated they never had delays for missions than in those who had reasons for their delay. Time management and the absence of delays in missions can save technicians from confusion when the number of casualties is high (Bijani et al., 2021). Therefore, identifying the factors affecting the delay time and taking measures to reduce these factors can improve problem-solving and decision-making skills.

Limitations

Since this study was performed on EMS personnel, it is impossible to generalize the results to other healthcare workers, so it is recommended to perform this study in other nursing departments. The small sample size was one of the main limitations of the study. At present, men are usually employed in pre-hospital emergency services in Iran. Hence, the majority of participants in the present study were male, and the results cannot be logically generalized to the female ones. Thus, it would be helpful to conduct a similar study on female technicians. Also, the use of a convenience sampling method and cross-sectional design based on the questionnaire is one of the main limitations of the present study that may affect the generalizability of the findings. Therefore, further research studies using random sampling and longitudinal design are recommended.

Conclusion

Studies on problem-solving skills and emotion regulation were limited among the EMS personnel. The frontline healthcare staff are considered the most valuable assets in healthcare systems (Mirzaei et al., 2021). Based on the findings of this study and the significance of empowering EMS personnel in problem-solving skills through emotion regulation, it is possible to conclude that they have poor problem-solving skills.

Therefore, to adopt the best coping measures against problems, the healthcare providers should receive in-service training to strengthen their problem-solving skills, which can be used in this field and at the forefront of Iranian medical emergencies. Moreover, today's knowledgeable and demanding society needs EMS technicians who can participate, solve problems, make decisions related to the profession, communicate, and have a mutual understanding. Accordingly, educators should also try to strengthen problem-solving skills, emotion regulation skills, and appropriate response times in a variety of ways. Effective problem-solving skills enable technicians to adapt to difficult and unpredictable situations.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statement

The studies involving human participants were reviewed and approved by Research Committee of Ardabil University of Medical Sciences (Approval Number: IR.ARUMS.REC.1398.228). The patients/participants provided their written informed consent to participate in this study.

Author contributions

Study design: MS, NM, and MM. Data collection: MS and AM. Data analysis: NM, MM, and AM. Manuscript preparation: AM, NM, MM, and MS. All authors read and approved the final manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Methods of increasing cultural competence in nurses working in clinical practice: A scoping review of literature 2011–2021

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Aim: Training for the development of cultural competence is often not part of the professional training of nurses within the European Economic Area. Demographic changes in society and the cultural diversity of patients require nurses and other medical staff to provide the highest quality healthcare to patients from different cultural backgrounds. Therefore, nurses must acquire the necessary cultural knowledge, skills, and attitudes as part of their training and professional development to provide culturally competent care to achieve this objective.

Objective: This review aims to summarize existing methods of developing cultural competence in nurses working in clinical practice.

Design: A scoping review of the literature.

Method: The following databases were used: PubMed, ScienceDirect, ERIH Plus, and Web of Science using keywords; study dates were from 2011 to 2021.

Results: The analysis included six studies that met the selection criteria. The studies were categorized as face-to-face, simulations, and online education learning methods.

Conclusion: Educational training for cultural competence is necessary for today's nursing. The training content should include real examples from practice, additional time for self-study using modules, and an assessment of personal attitudes toward cultural differences.

KEYWORDS

education, training, cultural competence, nursing, development

Introduction

Current demographic changes mean that nurses need to provide quality nursing care for patients from different cultural backgrounds. Horvat et al. (2014) report that health workers will increasingly be obliged to provide healthcare to patients from different cultural groups. Eurostat (2019) states that 4.2 million people from other countries migrated to the European Union in 2019. Germany (88,630), France

(29,910), Spain (29,620), and Romania (23,370) reported the largest number of immigrants. Cruz et al. (2017a) draw attention to the fact that every population group has unique norms, values, and practices that determine the group's perception of health, which is why it is important to implement the principles of culturally specific healthcare.

Cultural competence in nursing

Cultural competence (Ahn, 2017) in nursing care is essential for providing quality care for patients from different cultural backgrounds. It is a specific concept related to transcultural nursing and contains a wealth of skills and knowledge regarding cultural values, health beliefs, religion, and human philosophy. It is a concept linked to culturally specific nursing care (Leininger and McFarland, 2002). Cultural competence in nursing has been defined as a set of knowledge, skills, and attitudes applied in the clinical practice of nursing in an intercultural context (Cerezo et al., 2014; Paric et al., 2021).

Development of cultural competence of nurses

According to Horvat et al. (2014), the development of cultural competencies is a crucial component for addressing health disparities and strategies to improve culturally competent care, and many experts agree (Harkess and Kaddoura, 2016; Mariño et al., 2018; Curtis et al., 2019; Červený et al., 2020; Swihart et al., 2021). Faber (2021) adds that the education of health professionals is also a method of addressing racial and ethnic discrimination resulting from structural inequality. According to Carey (2011), nursing schools should provide adequate opportunities to develop cultural competence. Cruz et al. (2017b) recommend that nursing schools include international standards for culturally competent nursing care.

Moreover, teaching standards should be adapted to local cultural diversity within each country. This ensures that nurses have a proper cultural context that can promote the development of cultural sensitivity, cultural adaptability, and cultural motivation. This type of education is demanding for teachers, who need to have the most up-to-date information from professional literature, constantly evaluate self-esteem, and modify educational methods to develop cultural competence (Prosen and Bošković, 2020). However, according to Faber (2021), there is a wealth of evidence in literature where researchers present the effectiveness of cultural competence training in individual health professions to be more linguistically and culturally aware. Farber also states that there are no coherent sector-wide standards for defining cultural competence, educational practice, evaluation measures, or target results.

Why is a literature review essential?

Accelerating globalization and demographic changes in society, the incidence of patients from different cultural backgrounds, language barriers, discrimination, racism, prejudice, and stereotypes are all factors that affect the quality of nursing care (Červený et al., in press; Shepherd et al., 2019; Williams et al., 2019; Joo and Liu, 2020). Prosen (2018) states that providing culturally competent nursing care for patients from different cultural backgrounds should not be seen as a privilege but as a human right. In order to eliminate barriers to quality care, it is necessary to find the best possible methods for developing cultural competence in nurses in clinical practice.

Research question

1. What methods are effective at increasing the level of cultural competence?
2. What factors can improve existing methods of increasing the level of cultural competence?

Aim of literature overview

The main objective of the review was to summarize the existing methods of developing cultural competence in nurses working in clinical practice.

1. Determine which educational methods effectively increase cultural competence in clinical practice.
2. Identify the impact of education on cultural competence.
3. Identify potential opportunities to improve the development of cultural competence.

Materials and methods

This study is based on a qualitative scoping review using the Preferred Reporting Items for Systematic Reviews and a Meta-Analyses Extension for Scoping review ([PRISMA-ScR], Tricco et al., 2018; Page et al., 2021; Figure 1) and the Participants, Interventions, Comparison, and Outcomes (PICO) listed in Table 1.

Methods of searching the literature

The analyzed publications were collected from the PubMed, ScienceDirect, ERIH Plus, and Web of Science databases using keywords and Booleans operatives: ("transcultural education") OR ("training") AND ("culturally competence") AND ("nurses") AND ("clinical practice"). All sources were academic publications that went through the peer-review process. The focus of this review was on the following elements:

FIGURE 1
PRISMA flow diagram of the scoping review.
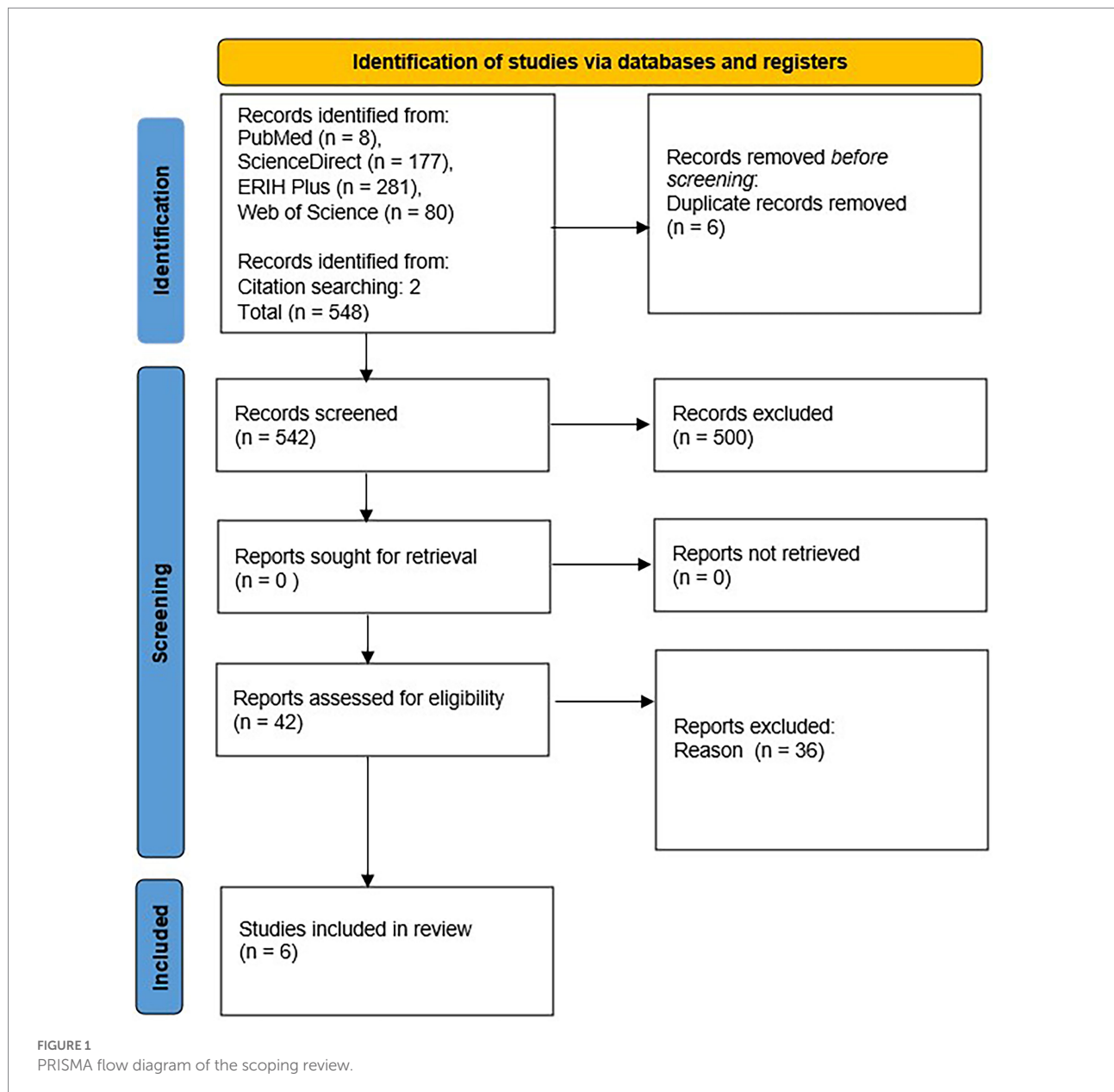
TABLE 1 Inclusion and Exclusion criteria for the scoping review.

Inclusion criteria	Exclusion criteria
Nurses or healthcare professionals working in clinical practice	Nursing students
Published in English	Retired nurses not providing direct patient care
Published from 2011 to 2021	Not original research: opinion, editorial, conference abstract, systematic reviews
Qualitative and quantitative studies	Articles not available in English

- Population: Clinical practice nurses
- Intervention: Education to increase cultural competences
- Related: Clinical practice nurses
- Outcome: Increasing cultural competencies in clinical practice nurses through education (training)

The criteria for the selection of resources are presented in Table 1. We searched for resources dated from 01.12.2011 to 31.12.2021.

Data charting, extraction, and quality evaluation

We used a 3-step screening process that was evaluated in MS Excel. In the first step, we searched the article's title and abstract.

In the second step, we identified and sorted articles that met the outline ranking criteria and assessed their quality. To evaluate the articles' quality, two co-authors independently used the Critical Appraisal Skills Programe (2018). This general tool evaluates any qualitative methodology. It has 10 questions asking the researcher to assess whether appropriate research methods were used and whether the findings were presented meaningfully (Červený et al., 2020; Long et al., 2020). The results of the quality assessment are presented in Table 2. In the third step, the data were extracted.

A total of 548 articles were identified based on database searches, and two other articles were added to the analysis because they met the criteria for selecting articles. After removing duplicates, we approached the analysis of titles and abstracts of individual articles. Based on the analyses of abstracts, we discarded 500 articles. Forty-two articles were selected for full-text analysis, but we discarded another 36 articles after analysis. The articles included in the scoping review were re-analyzed a week after the first reading to avoid erroneous conclusions. The data were sorted, encoded, and categorized into three themes: (1) *Methods of increasing cultural competence, (2) The impact of education on the cultural competence of participants, and (3) Possibilities for developing educational programs in the field of cultural competence.*

Results

Characteristics of articles

The articles included in the analysis were published from 2011 to 2021. The articles came from 6 countries: South Korea (Ahn, 2017), Israel (Slobodin et al., 2021), Sweden (McDonald et al., 2021), Australia (Perry et al., 2015), the Netherlands (Celik et al., 2012), and Finland (Kaihlanen et al., 2019). Three articles used a mixed-method method (Celik et al., 2012; Perry et al., 2015; McDonald et al., 2021). One article was based on a cross-sectional study (Ahn, 2017), and one article used an online education intervention study (Slobodin et al., 2021). Only one article utilized a qualitative study (Kaihlanen et al., 2019).

In terms of study participants, in the study by Celik et al. (2012), there were 31 paramedics, two psychiatric hospital nurses, six hospital nurses, and four nursing home nurses. Kaihlanen et al. (2019) included 20 nurses in their training program. Nurses were explicitly included in all analyzed articles, except for the study by Slobodin et al. (2021), in which participants were described as healthcare professionals, but no further details were provided. Table 3 provides an overview of the studies included in this scoping review.

Theme 1: Methods of increasing cultural competence

Methods for developing cultural competencies in nurses are presented in Table 3.

An online educational program was used in the study by Perry et al. (2015) and Slobodin et al. (2021). Slobodin et al. (2021) divided their training sessions into eight modules lasting about 30 min. Their training was linked to the pandemic situation; therefore, the online training course included a historical review of the pandemic and its impact on the social fabric of society. The study by Perry et al. (2015) included modules lasting about 60 min that focused on understanding the importance of language in the healthcare environment, using interpreters in clinical practice, and addressing linguistic and cultural issues during patient discharge from the hospital. Celik et al. (2012) used a modified six-phase Deming cycle during four training sessions. As the authors stated, the first phase was an attention-free phase (Unawareness), where health professionals were unaware of diversity factors in healthcare and thought these factors or questions were irrelevant to clinical practice. The second phase was the phase of 'limited" awareness, where healthcare workers realize that diversity factors exist but do not implement them in clinical practice. The first two phases, which the authors added, were followed by the usual phases of the Deming cycle (Plan, Do, Study or Check, and Act). The (Plan) in their study means: deliberately paying attention to diversity in clinical practice, the (Do) means to implement knowledge into clinical practice, the (Study or Check) means evaluating the results after implementation of culturally diverse care, and the (Act) means the implementation of modified nursing care based on that process.

McDonald et al. (2021) used Comprehensive Cross-Cultural Training (CCCT), developed in 2016, in response to a health crisis. The authors carried out 12 all-day training and two half-day interventions in this study. In the Kaihlanen et al. (2019) study, training included 16 h of full-time teaching, divided into four, 4-h modules, which ran once a week for 4 weeks. The training timing encouraged trainees to implement the acquired knowledge into practice quickly. The first training focused on the issue of culture (What is culture), the second training involved awareness of one's own culture (Culture in me), the third training covered communication, and the last training focused on understanding attitudes (Meaning of conviction). The teaching method was "storytelling," where the lecturer used real-life experiences from practice and images to demonstrate the cultural aspects of diversity. The image presentation was intended to make participants realize that people with different cultural backgrounds perceive the same image differently. After each module, there was a discussion to assess cultural features and understand why it is essential to apply culturally specific facts to the care of patients. Participants were given access to a Web-based learning platform where they could anonymously share their thoughts with others.

Theme 2: Impact of cultural competence education on participants

Kaihlanen et al. (2019) used three semi-structural small-group interviews, which focused on the general usefulness of training, personal usefulness, usefulness for patients, quality of training, and suggestions for improvement. The participants in the training welcomed the fact that the training was not entirely focused only on cultural competence in healthcare. The lecturer was not a healthcare professional and integrated new ideas and

TABLE 2 Results of critical appraisal checklist results.

Questions of quality, author(s), year, country

	Celik et al., 2012, NLD	Perry et al., 2015, AUS	Ahn, 2017, ROK	Kaihlanen et al., 2019, FIN	Slobodin et al., 2021, ISR	McDonald et al., 2021, SWE
1. Was there a clear statement of the aims of the research?	Y	N	Y	Y	Y	Y
2. Is the qualitative methodology appropriate?	Y	N[1]/CT[2]	N	Y	Y[1]/CT[2]	Y
3. Was the research design appropriate to address the aims of the research?	Y	CT[1]/Y[2]	Y	Y	Y	Y
4. Was the recruitment strategy appropriate to the aims of the research?	Y	Y	Y	Y	Y	Y
5. Was the data collected in a way that addressed the research issue?	Y	Y	Y	Y[1]/N[2]	Y	Y
6. Has the relationship between researcher and participants been adequately considered?	Y	Y	Y	Y	Y	Y
7. Have ethical issues been taken into consideration?	Y	Y	Y	Y	N[1]/Y[2]	Y
8. Was the data analysis sufficiently rigorous?	Y	N	Y	Y[1]/N[2]	Y	Y
9. Is there a clear statement of findings?	Y	Y	Y	Y	Y	Y
10. How valuable is the research?	Y	Y	Y	N[1]/CT[2]	Y	Y
Final quality level/grade						

Y, Yes; N, No; CT, Cannot tell; ROK, Republic of South Korea; ISR, Israel; SWE, Sweden; AUS, Australia; NDL, Netherlands (the); FIN, Finland.
[1]Co-authors answers-by IK.
[2]Co-authors answers-by VH.

insights into actual clinical practice in the hospital. A positive impact can be seen as a general and open debate on cultural issues, which are often not part of the general working culture. Small training groups also facilitated participant involvement in the discussion. After completing the training, participants felt more open-minded and focused on caring for patients with different cultural backgrounds. The training also drew the attention of participants to inappropriate communication skills. The training also benefited patients since participants exited the training with better attitudes, awareness, and ability to recognize and respect the cultural background of the patient without imposing stereotypes and prejudices. After completing the training, most participants stated that they no longer had to use checklists or guidance for treating patients from different cultural backgrounds; however, they continued to express uncertainty regarding religious issues.

Celik et al. (2012), McDonald et al. (2021), and Slobodin et al. (2021) used pre and post-tests to determine the effect of individual training on cultural competence. Perry et al. (2015) used only post-testing. The post-test used by McDonald et al. (2021) statistically confirmed that participants who had experience with patients from different cultural backgrounds had higher cultural assessments than participants who did not. A similar relationship was seen regarding the use of interpreting services. The study Focus-Group showed that CCCT training significantly contributed to a better understanding of cultural competence, cultural viewpoints, and cultural phrases in patients from different cultural backgrounds.

The trainees received important information about migration and being an immigrant and understood that they needed to act to benefit the patient (McDonald et al., 2021). The use of eSimulations also significantly impacted the cultural awareness of graduates (Perry et al., 2015). After completing eSimulation training, post-survey questionnaires reported better communication and a better understanding of language and culture in the context of healthcare, as well as the benefits of using an interpreter when talking to patients from

TABLE 3 Characteristics of included studies.

Author(s), Year	Participants	Methods	Content of training to increase cultural competence
Kaihlanen et al., 2019	Registered nurses ($n = 14$); practical nurses ($n = 6$)	Qualitative study	16-h Face to Face training. The training was based on sociocultural differences, perception of pain in individual cultures, personality differences, knowledge from various cultural experts, and knowledge gained from self-reflection.
Slobodin et al., 2021	Healthcare professionals ($n = 303$)	Pre-post web-based intervention study	An online educational program from the historical perspective of the pandemic; program objectives evaluated cultural challenges in the health sector, the importance of cultural competence in emergencies, cultural competence, knowledge, and skills in the context of COVID-19.
Celik et al., 2012	Healthcare professionals ($n = 31$)	Mix-method Quantitative and Qualitative methods	The training program was based on the Deming cycle and was divided into four modules. The training focused on conceptualizing differences in healthcare between the healthcare professionals and applying instructions to address diversity in practice.
Perry et al., 2015	Healthcare professionals ($n = 60$)	Mix-method Quantitative and Qualitative methods	eSimulation module was based on developing participants' knowledge and skills to understand the role of language in healthcare and highlighting the benefits of using an interpreter in clinical work. The use of open-ended, culturally sensitive issues to address language and cultural problems at patient discharge.
Ahn, 2017	Nurses ($n = 275$)	Cross-sectional design and structured equation modeling	Hypothetical model for the development of cultural competence.
McDonald et al., 2021	Mental Healthcare professionals ($n = 248$)	Mix-method evaluation	Comprehensive Cross-Cultural Training included interactive lectures on cultures, psychopathology, migration discussions, and refugee-related studies.

different cultural backgrounds. Participants also expressed new awareness of their assumptions about patients and the dangers of hasty conclusions involving cultural issues in patient care and planning. An online training study by Slobodin et al. (2021) found that only two independent variables had a statistically significant impact on cultural competence (1) the pre-intervention level of self-reported cultural competence ($p = 0.005$) and (2) exposure to previous cultural competence training as part of their overall educational framework. After completing training, the most significant gains were seen relative to culturally competent attitudes, meetings, and skills, and the smallest gains were seen in overall knowledge.

Celik et al. (2012) reported that the degree of cultural awareness improved significantly in mental health workers ($p = 0.026$) and hospital workers ($p < 0.005$). Improvements for those working in nursing homes were not statistically significant ($p = 0.749$). Participants said they became more critical of a neutral approach to diversity and had not previously considered diversity relevant to healthcare, although they reported that they better

perceived each patient as unique, with each having specific health needs.

Theme 3: Opportunities for the development of cultural competence education

The research by Ahn (2017) used a questionnaire investigation to verify the hypothetical model of cultural competence in nurses. The following measuring tools were used: Multicultural Experiences Questionnaire, a Generalized Ethnocentrism Scale, a Cultural Competence Assessment Instrument, the Low and High Context Measure of Attributional Confidence Scale, the Intergroup Anxiety Scale, the Cybernetic Coping Scale, and the Cultural Competence Scale for Clinical Nurses. The authors found that multicultural experience, ethnocentric attitudes, organizational competence support, intercultural anxiety, and coping strategies have statistically significant direct and indirect impacts on cultural competence.

Coping strategies were seen to have a direct impact on cultural competence. Kaihlanen et al. (2019) examined methods

for developing cultural competence training. They suggested using real examples, open discussion, and the lecturer's expertise. However, training participants noted that trainers with other cultural backgrounds should also be included. Trainees suggested that (1) materials should be available online, (2) training should take less time, and (3) each training should be followed by a one-week break (participants said they felt time pressure to complete the assigned tasks). Additionally, more time between training would allow time for reflection on training content. Participants in the study by Celik et al. (2012) also suggested that there be more time between training sessions, again to provide more time to reflect on the concepts of cultural diversity.

Discussion

This scoping review summarizes the available resources on developing cultural competence in nurses in clinical practice. Using the analyzed studies, we identified that attendance and distance training methods could impact the development of cultural competencies in nurses. Participants were offered several methods, such as face-to-face training, simulation training, eSimulation methods, and web-based learning.

The findings of this scoping review suggest that appropriate educational training can increase the cultural competence of nurses. These findings are supported by Cicolini et al. (2015), Yilmaz et al. (2017), Červený et al. (2020), and Antón-Solanas et al. (2021). Marja and Suvi (2021) report that simulations allow the integration of cultural elements into different vocational training and deepen the overall understanding of patient-centered cultural practices among simulation participants.

Workshops aimed at shaping culturally sensitive and competent attitudes, intensive and in-depth interactions with patients from different cultures, increasing knowledge of cultural issues, and intercultural communication training also strengthen the levels of cultural competence. There is a need to create smaller groups and increase practical hours to develop cultural competence (Majda et al., 2021).

Changing demographics make it necessary to prepare nurses to better meet the healthcare needs of patients from different cultural backgrounds. Cultural diversity in healthcare requires healthcare professionals to be aware of cultural needs and provide culturally appropriate healthcare (Turale et al., 2020). Cultural competence is essential in nursing since nurses spend more time in direct patient care than other medical staff (Gallagher and Polanin, 2015). Young and Guo (2016) report that cultural competencies develop through internal reflection and awareness over time. Findings of this review have shown that coping strategies are also an appropriate means of developing cultural competence.

According to Berlin et al. (2010), educational training should also include information on the cultural challenges and concerns of nurses and patients in the context of healthcare.

Addressing these problems could improve daily clinical practice. Cultural competence in healthcare professionals improves patient satisfaction (Govere and Govere, 2016; Watt et al., 2016). Tosun (2021) add that integrating cultural education as an optional subject is insufficient because if nursing students did not choose the subject, they would not get the necessary information and skills to improve their culturally competent care.

This scoping review also shows the importance of overcoming language barriers and the role of interpreters in clinical practice. A systematic review by Govere and Govere (2016) recommends that training aimed at developing cultural competence includes the following topics or focuses: race, religion, sexual orientation, gender, and disability; vocal tones and nonverbal communication; and Latina Cultural Competence, Cultural Sensitivity program, Medical Spanish course, and Cultural Competencemodule.

Cai et al. (2021) draw attention to the need for practical cultural training. They note the need to identify and examine the factors that determine cultural competence. When offering training for cultural competence, there is often a risk of stereotyping since the training content often emphasizes minority groups and draws attention to the differences between minorities and the majority population. Such an approach should include a "do and do not" approach that defines how a nurse should treat a patient from each cultural background (Dogra, 2010).

Limits of literary overview

This scoping review has several limits. The small number of studies analyzed is the main limitation of the study. Additionally, only studies available in English were included in the analysis. Moreover, studies from the "Grey literature" were not included, which may have led to the omission of some relevant studies.

Conclusion

The increasing cultural diversity within global societies has created the need for cultural competence education in clinical practice nurses. The results of this scoping review point to possible methods for increasing cultural competencies among nurses. We report on several methods that can positively impact the development of cultural competence. Furthermore, the rapidly changing cultural demographics mean that societies need to constantly reassess the content of cultural diversity training so that participants are always prepared to provide culturally competent care. Cultural competence training greatly benefits nurses since it improves nurse–patient communication; however, it also benefits patients from different cultural backgrounds *via* improved healthcare and feelings of greater acceptance in society.

Author contributions

MČ and VT: conception and design. MČ: data analysis and interpretation and manuscript draft. IK and VH: critical revision of the manuscript. MČ, IK, VH, and VT: final approval of the manuscript. All authors contributed to the article and approved the submitted version.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Sandwich teaching improved students' critical thinking, self-learning ability, and course experience in the Community Nursing Course: A quasi-experimental study

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The youngest generation of students prefers a more active learning style. Sandwich teaching may suit their learning style by alternating between active individual learning and passive collective learning. Sandwich teaching has been rarely applied to the Community Nursing Course for nursing students, and its teaching effects on this course remain unclear. This study applied Sandwich teaching to the Community Nursing Course for Chinese nursing undergraduates and investigated its effects on students' critical thinking, self-learning ability, course experience, and academic performance. This is a quasi-experimental study with 72 Chinese nursing undergraduates. Students receiving traditional teaching were enrolled in the control group (n = 36), and those who received Sandwich teaching were recruited into the experimental group (n = 36). Both groups received the 12-week, 90-min Community Nursing Course. Our main outcome variable, including students' critical thinking, self-learning ability, and course experience, was assessed by specific questionnaire. The paired t-tests were applied to compare the differences of the same group in the pre-test and the post-test, and the independent-sample t-tests were used to compare the differences between the two groups. We observed that nursing students' critical thinking ability and self-learning ability were significantly improved after receiving Sandwich teaching. Students' course experience of Sandwich teaching was significantly better than that of traditional teaching. The final exam score in the experimental group was not significantly higher than that in the control group. These results suggest that Sandwich teaching in Community Nursing Course improved Chinese nursing undergraduates' critical thinking, self-learning ability, and course experience, but failed in improving academic performance.

Introduction

The youngest generationof students, widely known as Gen Z, is composed of digital natives preferring an independent learning style with less passive but more visual and kinesthetic learning (Hampton and Keys, 2017; Isaacs et al., 2020). It was reported that Gen Z students want to collaborate often, independently thinking at first and then discussing as a group (Williams, 2019). This kind of learning style should be taken into consideration when educators take classes for them, as learning style is one of the most essential factors influencing the highly individual learning process (Zoghi et al., 2010; Burger and Scholz, 2014). Given that the traditional teacher-centered teaching method has difficulty in suiting Gen Z students' learning style, it is necessary for educators to alter educational practices and shift from being teacher-centered to being learner-centered.

A didactic method called Sandwich teaching takes individual learning into account by consecutively alternating between collective and individual learning phases (Bock et al., 2020). Generally, the collective learning phase is passive and similar to classical lectures, lasting for 20–25 mins within the students' attention span (Bunce et al., 2010). The individual learning phase is active learning by applying the previously gained knowledge to finish precise work assignments such as partner discussions, partner interviews, or small-group work. The alternation of collective and individual learning phases contributes to the consecutive switch between passive learning and active learning. The Sandwich teaching, as a student-centered teaching style, suitable for conducting small-class teaching, has been applied to the teaching of various medical courses (Sun et al., 2014; Shi et al., 2016; Wang et al., 2018; Ling et al., 2019) and was reported to have various benefits on learning outcomes. It was revealed that Sandwich teaching in medical oncology can effectively promote students' acquisition of knowledge and skills and enhance the teaching effect (Zou and Li, 2021). Besides, Sandwich teaching is also demonstrated to improve the theoretical and practical performance of nursing students in different nursing courses (Chen and Li, 2019; Hao and Cui, 2021). For instance, Sandwich teaching in basic nursing theory teaching was to effectively improve Chinese nursing students' judging, thinking, and core ability, as well as teaching quality (Zhang, 2022). However, there is a dearth of evidence available about using Sandwich teaching in the Community Nursing.

The Community Nursing Course is a compulsory course for nursing students in China that aims to build up their knowledge of the system of community nursing and boost their ability to solve the community residents' health problems. This course is of vital importance to cultivate excellent community nurses, especially on the background of Healthy China Action 2030 and the increased aging of the Chinese population. The dominant way of delivering this course is still the traditional in-class lecture, which is passive learning and hardly develops students' competencies. Due to the paucity of evidence on Sandwich teaching in nursing education of the Community Nursing Course and the absence of a formula for how to implement Sandwich teaching in this course, the effects of Sandwich teaching in the Community Nursing Course are not yet completely clear.

Therefore, this study proposed the application of Sandwich teaching in the Community Nursing Course and mainly investigated its effects on nursing students' critical thinking, self-learning ability, and the course experience. Our study is significant in that Sandwich teaching, which is characterized by alternating individual and collaborative learning, takes the youngest nursing students' learning style into consideration, and the implementation process, as well as the results, may provide some useful clues for nursing educators to improve the teaching quality of the Community Nursing Course.

Materials and methods

Design

This study adopted a quasi-experimental design using the pre- and post-test and was conducted from 2020 to 2022.

Setting and participants

This study was conducted at a university in South China. The study sample was composed of 72 third-year nursing undergraduates. Purposive sampling was used. Students who had completed the course via the traditional teaching method were enrolled in the control group (n = 36), while those who had not learned Community Nursing were recruited into the experimental group (n = 36) to undergo Sandwich teaching.

Development of Sandwich teaching

Theoretical basis

Sandwich teaching, which originated in the United Kingdom, is a kind of teaching model that alternates and combines theoretical learning and work practice. It was first introduced to medical classroom teaching at Heidelberg University in Germany. This teaching approach highlights the significant role of integrating theory and work practice together through group discussions, cross-learning, and learning reports. With this teaching method, students become the masters of learning via preparations before class, discussions, and interactions in the class, while teachers are in the position to guide and assist students in learning during the teaching process.

TABLE 1 Original subgroups of panel discussion in the experimental group.

Group	Number 1	2	3	4	5	6	Question
Group A	A-1	A-2	A-3	A-4	A-5	A-6	Question A
Group B	B-1	B-2	B-3	B-4	B-5	B-6	Question B
Group C	C-1	C-2	C-3	C-4	C-5	C-6	Question C
Group D	D-1	D-2	D-3	D-4	D-5	D-6	Question D
Group E	E-1	E-2	E-3	E-4	E-5	E-6	Question E
Group F	F-1	F-2	F-3	F-4	F-5	F-6	Question F

Individual learning design

Teaching resources, such as literature, videos, cases, or website links for learning, were provided for students to carry out individual learning. For instance, students were expected to preview by reading textbooks or watching videos, figure out answers to the questions affiliated with practical cases by referring to related information, and make preparations for group discussions in the class. Specifically, when searching the literature, students were required to analyze the nursing assessment methods, nursing diagnoses, and corresponding nursing measures in the literature, and estimate which one could be feasible in the community health center (Dong et al., 2021).

Collaborative learning design

To design collaborative learning, the experience of process-oriented guided inquiry learning (POGIL) pedagogy was drawn from. POGIL is a student-centered active learning approach that works by dividing students into small groups to analyze cases or problems, which was reported to effectively promote learning success with outcomes like course satisfaction (Roller and Zori, 2017) and learning motivation (Smith et al., 2018). Before class, experienced teachers designed distinctive learning materials to guide nursing students to explore new knowledge. When assigned to POGIL activities, participants undertake different roles in the team, including the roles of the leader, recorder, presenter, reflector, checker, and so on. When group members are working together, instructors offer immediate and consecutive feedback according to students' performances in the class (The POGIL Project Team, 2020).

Preparation of Sandwich teaching before class

The investigators reviewed the relevant information on the Sandwich teaching methods, integrating information about the definition of a Sandwich teaching method, its application in nursing education teaching, the detailed teaching process, and the teaching form.

Next, the Sandwich teaching plans were set up based on the course contents by nursing professional teachers with more than 5 years of teaching experience. The teaching plans were composed of opening remarks, teaching objectives, and well-designed reasonable questions for discussion (Lin et al., 2020). At this stage, teachers were required to design concise opening remarks to bring up the topic, be familiar with the course content to determine achievable learning objectives, and condense contents into some appropriate questions in accordance with the teaching focus.

Before class, 36 students in the experimental group were stratified by their grade point average (GPA) in the last year and divided into six equal original subgroups, named groups A, B, C, D, E, and F, to avoid obvious differences between the different groups. Also, students in the same group were assigned numbers 1, 2, 3, 4, 5, and 6 as shown in Table 1.

Implementation of Sandwich Teaching in the Community Nursing Course

The process of Sandwich teaching in a class for the experimental group included the following six steps (Figure 1). Take the community geriatric health care as an example.

Step one (opening remarks, 5 mins): Students were divided into six groups in the classroom; the teacher started class with the following case designed in line with the teaching context to capture students' attention and put forward different questions for each group to discuss.

Case: Mr. Li is a 65-year-old patient with stroke sequelae including a right side of palsy and the declined language function. After 4 months of hospitalization, he was discharged, nearly spent all his time in the bed, and had few opportunities to communicate with others except for family members.

Questions:

1. What are the nursing problems with this patient?
2. What aspects of health guidance should be given to this patient by community nurses?
3. How to ensure this patient's safety at home?
4. How to guide this patient to do the rehabilitation training at home?

FIGURE 1
The teaching frame of Sandwich teaching.
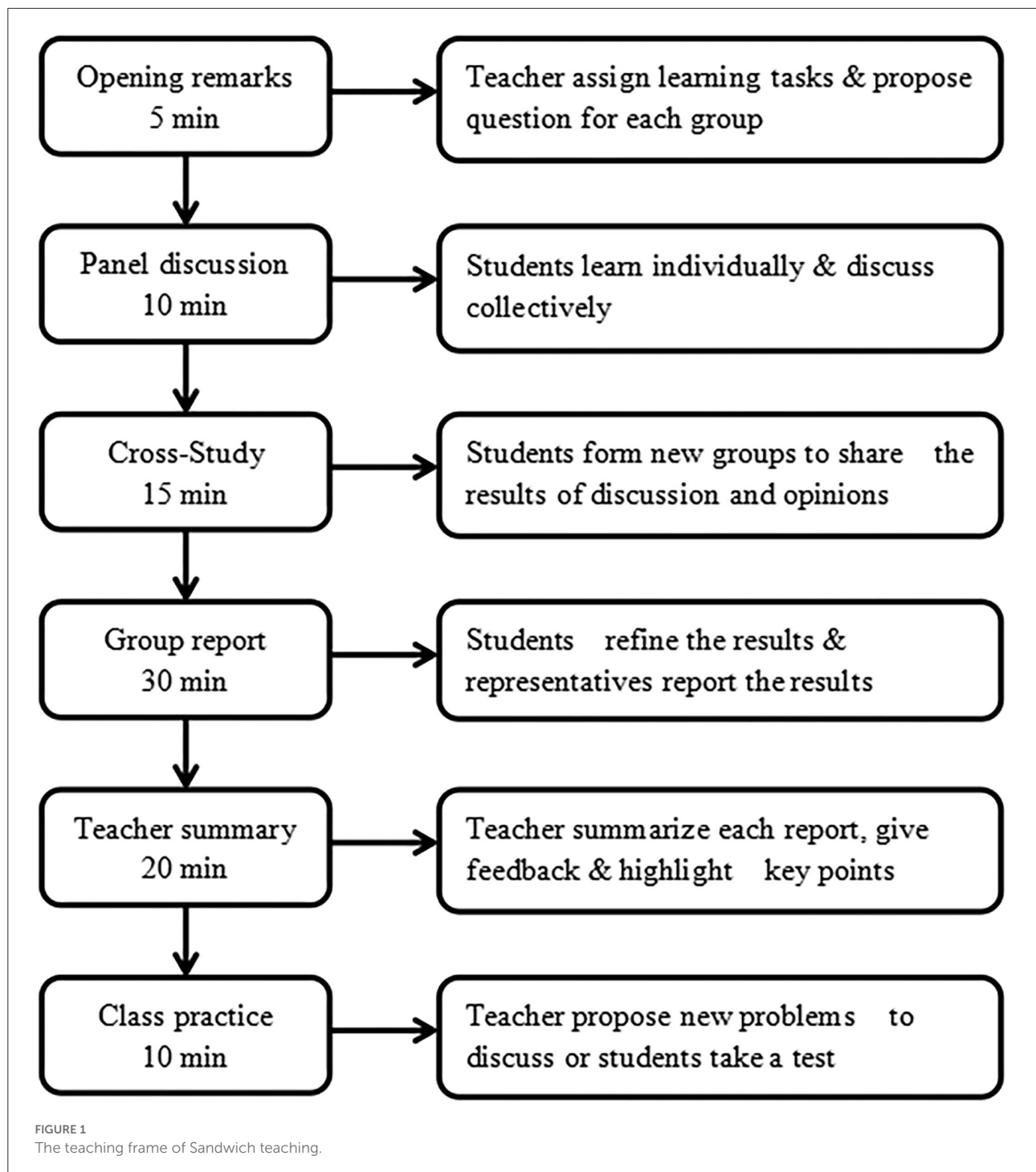
5. How to offer psychological support to this patient?
6. What healthy dietary guidance should be given to this patient?

 Step two (panel discussion, 10 mins): Nursing students in each group learned individually with learning materials (such as textbook) at first and then learned collectively through discussing to reach a consensus on the issues. Each group mainly discussed one of the assigned questions.

 Step three (cross-study, 15 mins): Students in a group separately went to the other five groups to form a new group. For example, A-1, B-1, C-1, D-1, E-1, and F-1 formed a new group, while A-2, B-2, C-2, D-2, E-2, and F-2 formed a new group, as shown in Table 2. Each student was required to share

TABLE 2   New subgroups for cross-study in the experimental group.

Group	Number	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Question
A		A-1	A-2	A-3	A-4	A-5	A-6	Question A
B		B-1	B-2	B-3	B-4	B-5	B-6	Question B
C		C-1	C-2	C-3	C-4	C-5	C-6	Question C
D		D-1	D-2	D-3	D-4	D-5	D-6	Question D
E		E-1	E-2	E-3	E-4	E-5	E-6	Question E
F		F-1	F-2	F-3	F-4	F-5	F-6	Question F

the results of the discussion with new group members, expressed their opinions, and listen to others' opinions, so that they can be fully familiar with the question and participated in this section.

Step four (group report, 30 mins): Students went back to the original group, integrated new results in cross-study with the previous results in panel discussion, and summarized and wrote down the final results; each group sent a representative to report the final results for 4–5 mins.

Step five (teacher's summary, 20 mins): After reporting, the teacher comprehensively and deeply analyzed the case and the questions, guided the students to think, answered the questions involved in the case, pointed out the advantages and disadvantages of each group's report as feedback, supplemented the results, summarized the teaching content, and highlighted the key points of the teaching content by combining the case and the theory in the textbook.

Step six (class practice, 10 mins): Teacher put forward new questions related to the case for students to cogitate and discuss, so as to deepen students' understanding of teaching content and foster their ability to apply knowledge to solve practical problems.

Sandwich teaching was delivered to the experimental group once a week, 90 mins per week, lasting for 12 weeks. The control group received traditional lecture teachings in which the teachers organized students to give concentrated lectures to deliver professional knowledge. The teaching requirements and teachers were the same.

Data collection

Quantitative data on students' critical thinking ability and self-learning ability were collected to better understand the effects of Sandwich teaching by using special scales at the beginning and the end of the course. Besides, participants' age, gender, average grade point average (GPA), final exam scores for this course, and course experience were recorded at the end of the semester.

Critical thinking disposition

The Critical Thinking Disposition Inventory of Chinese Version (CTDI-CV) developed by Pang et al. (2004) was adopted to determine students' critical thinking ability. This scale included seven dimensions, which were truth-seeking, open-mindedness, analysis ability, systematization ability, self-confidence in critical thinking, inquisitiveness, and cognitive maturity, with a total of 70 items. Each dimension consisted of 10 items and used the six-point Likert scale from 1 (strongly disagree) to 6 (strongly agree). The total score ranged from 70 to 420. A total score of <210 indicates a negative critical thinking tendency, a total score of 210–280 indicates a moderate critical thinking tendency, a total score of 281–349 indicates a positive critical thinking tendency, and a total score of 350–420 indicates a strong critical thinking tendency. Each dimension that scored <40 represents a weak disposition, each one that scored 40–49 represents a positive disposition, and each one that scored 50–70 represents a strongly positive disposition. The Cronbach's alpha values ranged from 0.54 to 0.77 for the seven dimensions, and the value was 0.90 for the total scale.

Self-learning ability

The self-learning ability scale developed by Zhang and Li (2009) was employed to anonymously evaluate nursing students' self-learning ability. This scale has 30 items measuring four dimensions, including self-management (11 items), learning motivation (8 items), information management (6 items), and learning cooperation (5 items). Each item uses a five-point Likert score ranging from 1 (completely disagree) to 5 (completely agree). The total score ranges from 30 points to 150 points, and a higher score stands for a better self-learning ability. The internal consistency reliability of the scale was 0.822, and the split-half reliability was 0.788.

Course experience

The Course Experience Questionnaire (CEQ) was widely employed to determine students' perception of teaching quality (Ramsden, 1991). The Chinese version of the CEQ, which was

revised and applied to medical students by Yan et al. (2019), was adopted in our study to investigate learners' course experience. The adopted CEQ contains 25 items divided into three domains, including class quality and harvest (13 items), good teaching (10 items), and the appropriate workload (2 items), using a five-point Likert score ranging from 1 (completely disagree) to 5 (completely agree). The internal consistency reliability of the CEQ was 0.962, and the split-half reliability was 0.861.

Final examination

A theoretical examination was used to evaluate students' mastery of knowledge at the end of the course. The exam included single-choice questions, multiple-choice questions, brief-answer questions, case analysis questions, and noun explanations so as to comprehensively assess students' mastery of theoretical knowledge, analysis, and application ability. The total score of the final exam was 100 points.

Data analysis

The demographic characteristics and changes in scores were described using the mean and standard deviation. Paired sample t-tests were employed to determine differences in critical thinking ability and self-learning ability between the pre-test and the post-test. $P < 0.05$ indicated statistical significance for all tests.

Results

Characteristics of students

A total of 72 third-year nursing undergraduates aged 19–23 years participated in this study. The mean age was 21.17±1.06 for the experimental group and 21.13±1.17 for the control group. There were 11 (30.6%) males and 25 (69.4%) females in the experimental group and 9 (25.0%) males and 27 (75.0%) females in the control group. The average GPA was 3.08 ± 0.59 for the experimental group and 3.12 ± 0.67 for the control group. The experimental group did not significantly differ from the control group in terms of age ($P = 0.598$), gender ($P = 0.793$), and GPA ($P = 0.819$).

Critical thinking ability

As presented in Table 3, in the pre-test, the participants in both groups scored <280 points in CTDI-CV, and the scores in almost all domains were below 40, indicating that the students' critical thinking ability was weak. After the course, the students in the experimental group scored >280 in the critical thinking ability while those in the control group still

TABLE 3 Comparison of CTDI-CV and its dimension score in pre- and post-test and between two groups (M ± SD).

Domains	Group	Pre-test	Post-test	P value[b]
Truth-seeking	CG	35.75 ± 8.94	35.03 ± 7.23	0.693
	EG	34.17 ± 8.90	37.56 ± 7.77	0.037
	P value[a]	0.454	0.157	–
Open-mindedness	CG	36.58 ± 5.67	38.58 ± 6.15	0.106
	EG	38.64 ± 6.50	40.78 ± 6.34	0.114
	P value[a]	0.157	0.140	–
Analytical ability	CG	39.00 ± 5.34	40.06 ± 5.21	0.215
	EG	39.08 ± 6.72	40.56 ± 6.03	0.236
	P value[a]	0.954	0.708	–
Systematization ability	CG	36.00 ± 4.45	35.81 ± 4.64	0.832
	EG	35.64 ± 4.98	39.75 ± 5.58	**<0.001**
	P value[a]	0.746	**0.002**	–
Self-confidence in critical thinking	CG	37.14 ± 8.32	38.25 ± 7.06	0.389
	EG	38.11 ± 7.49	38.83 ± 8.76	0.688
	P value[a]	0.604	0.757	–
Inquisitiveness	CG	39.42 ± 5.90	41.36 ± 6.02	0.131
	EG	41.11 ± 8.02	41.56 ± 7.55	0.757
	P value[a]	0.311	0.904	–
Cognitive maturity	CG	36.67 ± 9.46	36.31 ± 7.46	0.832
	EG	36.58 ± 10.45	41.78 ± 7.63	**0.019**
	P value[a]	0.972	**0.003**	–
Total score	CG	260.56 ± 25.53	265.39 ± 28.35	0.182
	EG	263.33 ± 25.49	280.81 ± 35.60	**0.002**
	P value[a]	0.646	**0.046**	–

CTDI-CV, Critical Thinking Disposition Inventory of Chinese Version; EG, experimental group; CG, control group; M, mean; SD, standard deviation.
[a] The independent-sample t-test; [b] The paired-sample t-test.
The bold values indicate the statistically significant differences of value of $p < 0.05$.

scored <280. The results showed that the experimental group had a significant improvement in the total CTDI-CV score after receiving Sandwich teaching, whereas the control group did not. As for the domains of CTDI-CV, significant differences were noted in the systematization ability and cognitive maturity between the two groups after the course, and the students in the experimental group achieved significant improvements in these two domains.

Self-learning ability

As shown in Table 4, the changes in total scores and all dimensions of self-learning ability in the experimental group were significant ($P < 0.05$) while those in the control group were not. The score of the dimension of the learning cooperation ability in the Sandwich teaching group was significantly higher than that of the control group in the post-test, while this was not the case for other dimensions of self-learning ability.

TABLE 4 Comparisons of self-learning ability in pre- and post-test and between two groups (M ± SD).

Domains	Group	Pre-test	Post-test	P value[b]
Learning motivation	CG	30.78 ± 4.14	31.89 ± 4.71	0.166
	EG	30.42 ± 4.68	32.31 ± 4.43	**0.025**
	P value[a]	0.730	0.700	–
Self-management ability	CG	40.69 ± 4.73	41.44 ± 4.29	0.419
	EG	40.36 ± 4.76	43.03 ± 4.31	**0.001**
	P value[a]	0.767	0.122	–
Learning cooperation ability	CG	17.67 ± 2.45	17.64 ± 2.09	0.957
	EG	17.42 ± 2.44	18.89 ± 2.27	**0.002**
	P value[a]	0.666	**0.017**	–
Information quality	CG	21.97 ± 3.38	22.14 ± 3.15	0.776
	EG	21.94 ± 3.01	23.17 ± 2.37	**0.019**
	P value[a]	0.971	0.122	–
Total Score	CG	111.11 ± 12.02	113.11 ± 11.90	0.350
	EG	110.14 ± 12.59	117.39 ± 11.41	**<0.001**
	P value[a]	0.739	0.124	–

EG, experimental group; CG, control group; M, mean; SD, standard deviation.
[a] The independent-sample t-test; [b] The paired-sample t-test.
The bold values indicate the statistically significant differences of value of $p < 0.05$.

TABLE 5 Comparisons of students' course experience between two groups after the course (M ± SD).

Domains	CG	EG	P value
Class quality and harvest	40.42 ± 11.98	46.67 ± 9.85	**0.018**
Good teaching	36.06 ± 7.14	38.86 ± 6.23	0.080
Appropriate workload	4.83 ± 1.46	5.72 ± 2.00	**0.036**
Total Score	81.31 ± 18.53	91.25 ± 16.09	**0.018**

EG, experimental group; CG, control group; M, mean; SD, standard deviation. The bold values indicate the statistically significant differences of value of $p < 0.05$.

Course experience

Table 5 shows the mean values of the total scores and three domains of the CEQ. The results showed significant differences in the total score, domains of classroom quality and harvest, and appropriate workload, which scored higher in the experimental group. The score of good teaching in the experimental group was higher than that in the control group; however, there was no significant difference between the two groups.

Final exam score

The maximum and minimum scores in the experimental group were 96 and 64 while those in the control group were 96 and 60. The score of the experimental group (83.47 ±

9.35) was not significantly better than that of the control group (80.58 ± 9.49, $P = 0.197$).

Discussion

To the best of our knowledge, this is the first study that used Sandwich teaching in the Community Nursing Course for Chinese full-time nursing undergraduates. Our results revealed that Sandwich teaching exerted some positive effects on third-year undergraduate nursing students in China and was feasible for delivering the Community Nursing Course. As demonstrated in a previous study, Sandwich teaching increased students' learning gain, engagement in learning activities, and satisfaction with teaching (Katsioudi and Kostareli, 2021).

Sandwich teaching improved students' critical thinking ability

The significantly higher score of CTDI-CV in the Sandwich teaching group implied this teaching method may improve the critical thinking ability of nursing students. Our results showed that Sandwich teaching could be a useful strategy in developing students' systematization ability and cognitive maturity, which is consistent with the findings of a previous study by Zhang (2014). Compared to the control group, only two domains (the systematization ability and cognitive maturity) significantly scored higher in this study, whereas six dimensions (except for the systematization ability in the Sandwich teaching group) scored significantly higher in the study conducted by Bao and Hai (2016).

Since the teachers, total class hours, and textbook were the same in both groups in our study, the significantly higher score of the critical thinking ability may be because Sandwich teaching reinforced active learning and helped cultivate various abilities related to critical thinking in some ways. Firstly, group work such as panel discussions and cross-study required students to extensively think, identify, and analyze problems, which involved critical thinking (Geist et al., 2015). Every student in the Sandwich teaching group had the opportunity to participate in the discussion together, which means Sandwich teaching has obvious advantages in harnessing students' learning enthusiasm, training their language organizational ability, and cultivating their ability to analyze and solve problems (Zhong et al., 2019). Additionally, this study adopted active learning strategies, including case studies, group problem-solving, and discussions, to strengthen students' active involvement in learning (Von Colln-Appling and Giuliano, 2017) and thus contribute to the promotion of critical thinking (Nelson, 2017). Moreover, the student–student and student–teacher interactions during the learning process might expand the learners' scope of cognition, make them alert to accept multiple solutions and

carefully make judgments; in the meanwhile, when students made organized and targeted efforts to solve problems in the process of completing group tasks, their ability to systematize was gradually developed.

Sandwich teaching promoted students' self-learning ability

Our study showed that Sandwich teaching exerted positive effects on students' self-learning abilities. There were significant differences in the dimensions of self-management, learning motivation, information management, and learning cooperation. As Lin et al. (2020) reported, Sandwich teaching was conducive to improving students' learning initiative, and the learning initiative score of the students in the experimental group was significantly higher than that of students in the control group. In this study, learning materials were beneficial to create practical situations that may capture the students' attention and inspire them to engage in learning activities; at the same time, this teaching method increased the interaction between teachers and students, as well as among students, which conducive to mobilize students' initiative of learning and improve their abilities of self-learning, thinking, and exploring new knowledge. As a result, students' learning motivations were promoted.

Apart from that, Sandwich teaching was task-driven by assigning learning tasks to every student, and students were driven to manage their time to study in advance and found relevant information to support their opinions during classroom discussions. Eventually, students' abilities of self-management and information management were significantly fostered. Furthermore, Sandwich teaching strengthened students' learning cooperation ability through group work, as joined efforts were needed to turn the results of panel discussion into a complete group report. As concluded by Zhong et al. (2019), Sandwich teaching had obvious advantages in cultivating learners' team spirit.

Sandwich teaching improved students' course experience

This study revealed that Sandwich teaching improved students' course experience. The significantly higher course experience score in the Sandwich teaching group implied this teaching approach may enhance students' engagement and satisfaction with the teaching of this course. A previous study provided strong evidence that Sandwich teaching enhanced not only students' engagement but also their satisfaction with teaching (Katsioudi and Kostareli, 2021). Moreover, students

receiving Sandwich teaching were significantly satisfied with the teaching preparation, teaching process, teaching ability, and teaching outcomes in the experimental group compared to their counterparts receiving traditional teaching (Yang and Liu, 2015).

In our study, students in the experimental group thought that Sandwich teaching imposed an appropriate workload. This is likely because the problems designed for Sandwich teaching were neither too simple nor too difficult, and they were closely related to practical nursing work to maintain students' interest in independent learning and discussion (Lin et al., 2020). In addition, discussing or interacting with counterparts and teachers exposed students to multiple opinions or views; consequently, their understanding of knowledge was deepened, and their cognitive scopes were expanded. Thus, students in the Sandwich teaching group spoke highly of the class quality and harvest and scored significantly better than those in the control group.

However, in terms of good teaching, the students in the experimental group did not score significantly higher than those in the control group. This result is in line with a previous finding that no significant difference between the two groups' course evaluations (Lin et al., 2020). This may be due to the teachers' dedication to delivering the course, which led to good teaching effects on both groups. Generally, Sandwich teaching improved students' course experience by providing them with an interactive learning experience.

Sandwich teaching did not significantly improve students' academic performances

We found that the final exam score in the Sandwich teaching group was higher than that in the classical lecture group although the difference was not statistically significant. This finding was not completely consistent with the results of previous studies. For example, a study conducted on 168 Chinese nursing undergraduates revealed that the score of the final theory test in the Sandwich teaching group (90.84 ± 3.32) was significantly higher than that in the control group (88.72 ± 3.64) (Yang and Liu, 2015). Likewise, Long et al. (2016) and Lin et al. (2020) reported that the theoretical results of nursing students receiving Sandwich teaching were statistically better than those of students receiving classical lectures. Besides, another study reported that the total test score and the scores of multiple-choice questions, discussion questions, and case analysis questions in the Sandwich teaching group were significantly higher than those of the same tests in the control group (Bao and Hai, 2016). Panel discussions and cross-studies may lead to active learning, foster students'

understanding of knowledge, and help students to achieve better academic performances.

Our finding of no significant difference between the two groups may be attributed to some reasons. Firstly, the difficulty of the Community Nursing Course was acceptable for the majority of students; so, they were able to master the main course contents. Secondly, the Chinese students we included in our study were hardworking enough to pass the exam. Thirdly, the curriculum executors may not be proficient enough in using Sandwich teaching at the beginning of the implementation process. In Sandwich teaching, every part of the content and the time need to be carefully designed and arranged to make each part closely linked, interlocked, and deepened step-by-step, and the teachers should effectively guide and control the process of students' discussion in the classroom, which put forward higher requirements for the teacher's ability to control the classroom rhythm and design a scientific, reasonable, effective, and meticulous teaching plan (Long et al., 2016). In addition, this course when delivered by using the same teaching method might not consecutively stimulate and support students' learning interests in the long term.

To fully demonstrate the effect of Sandwich teaching on learning outcomes, combining the Sandwich teaching approach with other diverse teaching methods may be a promising attempt. It was found that role conversion combined with the Sandwich teaching method in obstetrics and gynecology nursing undergraduate education could improve the learning outcomes of knowledge acquisition and the comprehensive ability and promote students' satisfaction with the teaching model (Wang et al., 2017). Moreover, Sandwich teaching combined with situational simulation teaching was demonstrated to have positive effects on the nursing technology training of traditional Chinese medicine (Lyu, 2021).

Overall, the innovative point of this study was that Sandwich teaching was adopted in the Community Nursing Course for Chinese nursing undergraduates. Our findings implicated nursing educators to apply Sandwich teaching in nursing education programs in terms of cultivating students' critical thinking, self-learning ability, and ameliorating course experience.

Limitations and future directions

This study has some drawbacks. Firstly, we only investigated the effects of Sandwich teaching on the Community Nursing Course in a Chinese university, so the universality of our results should be taken into consideration. Therefore, multicentered and large-sample studies conducted in different cultural settings are needed to confirm our findings. Additionally, we investigated the effect of Sandwich teaching on the theoretical teaching of nursing education but did not investigate its

effect on nursing students' practical skills. Moreover, the quasi-experimental study design could not avoid all influences exerted by confounders. Thus, it is essential to examine our findings with more rigorous randomized controlled trials in the future.

Conclusion

This study demonstrated that Sandwich teaching played a significant role in improving Chinese nursing students' critical thinking, self-learning ability, and course experience, but failed in improving academic performance. Our findings suggested that nursing educators implement Sandwich teaching to adapt to the youngest generation of nursing students' learning styles so as to facilitate their learning. Future studies are needed to further explore the learning effectiveness of Sandwich teaching.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Institutional Review Board of Jinan University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

XC and MP contributed to conception and design of the study. JQ and KZ collected the data. ZL performed the statistical analysis. XC wrote the first draft of the manuscript. MP, SY, and FY wrote sections of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Contemporary learning techniques for healthcare professionals: A narrative review

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Background: As medical knowledge continues to expand at an accelerated rate, healthcare professionals face a significant challenge in remaining up-to-date. The goal of this narrative review was to present evidence-based learning strategies that could aid postgraduate clinical education.

Design: Articles were sought for using PubMed, Ovid, PsychINFO, ERIC databases and only included if relevant to the review objective.

Results: A total of 103 articles, chapters, and books were used to compose this narrative review. An additional 135 articles and chapters were examined in full for context. The review is divided into two sections: (1) strategies that can help foster a learning mind-set; and (2) high-yield practical tools that are effective in formal or informal learning domains.

Conclusion: Individual learning is a cornerstone of clinical performance, which influences the quality of care that one can deliver. This review offers a comprehensive set of learning tools for individuals across a variety of settings.

KEYWORDS

medical education, postgraduate, learning theory, continuing professional development, learning skills

Introduction

By the end of 2020, the "doubling period," defined as the time taken for the total amount of medical knowledge to double, shortened to just 73 days (Densen, 2011). It is a challenge for clinicians to remain up-to-date with this growing body of information, whilst maintaining a busy clinical practice.

Indeed, the time and resources required for healthcare professionals to digest and employ such information in clinical practice are lacking. To meet imminent healthcare demands, service provision is frequently prioritised over workplace learning (Dornan, 2012). Healthcare professionals face various profession-specific challenges that can make workplace learning difficult. These include: changing patterns of shift work, the physical

and emotional burdens of caring for sick patients, administrative responsibilities, and the inconsistent quality and quantity of employer-provided educational opportunities.

If we wish to assimilate and apply new knowledge, we need to develop effective and time-efficient learning skills. Unfortunately we are often ill-prepared to develop new learning methods for clinical practice after graduation (Brown et al., 2007), despite the potential for such methods to impact on our performance (Marsick and Watkins, 2001), and the organisations we work in (Senge, 1991). Learning skills nurtured in university may be inappropriate or unsuitable in healthcare contexts (Tynjälä, 2008; Demiroren et al., 2021). For example, the skills required to engage with a lecture are different to the skills required to distil practical learning points from a ward-round. Learning strategies that are adapted to environments where "formal" learning opportunities are scarce are urgently needed.

Much attention has been given in the educational literature towards improving the environment in which we learn (Spouse, 2001). Organisational factors such as the institutional customs and values, characteristics of the practice environment, subspeciality of the professional and characteristics of their set of patients can readily influence learning behaviour and professionalism (West and Shanafelt, 2007). In contrast, methods that encourage cognitive and knowledge-based learning at an individual level are often neglected. This narrative review attempts to meet this demand, and do so with minimal technical jargon. General strategies are first presented that would enable us to foster a successful learning mindset in the workplace. Practical, high-yield learning tools and enhanced technological solutions which can aid our ongoing medical education are then outlined.

Design

Journal articles (original retro- or prospective studies, technical notes and reviews) and book chapters were identified using PubMed, Ovid, PsychINFO, ERIC, and other medical and non-medical databases. Search parameters included combinations of: "workplace-learning"; "life-long learning"; "continued professional development" OR CPD OR "continuing medical education" OR CME and "self-directed learning." Combinations of medical subject headings (MeSH) corresponding to the search parameters were also used. English-only articles were sought and could be related to any healthcare discipline. The principal focus of this review was to narrate learning strategies focused on improving information gathering and learning methods in the workplace.

The search was performed on January 10th 2022, and repeated 3 months later to ensure newer articles were not missed. Using related references from the initial search data and subject matter experts, additional literature was identified. Using

the search terms above, approximately 1,100 titles and abstracts were screened, of which 135 articles and book chapters were examined in full for context. This included literature related to learning theory, undergraduate education and workplace learning in other industries. A total of 103 articles, chapters and books were included and have been used to compose and support this narrative review. Articles were only included if relevant to the objectives, and were excluded if related to technical skills. Articles focused on communication skills and other soft skills, while equally important, were excluded for this review as they were not part of the intended study objective.

Results

Developing a learning mind-set

What are my learning drivers?

The General Medical Council states in "Good Medical Practice, Domain 1: Knowledge, skills and performance" that "we must keep our professional knowledge and skills up to date; we must regularly take part in activities that maintain and develop our competence and performance" (General Medical Council, 2020). Similarly, the Nursing and Midwifery Council state we must "keep our knowledge and skills up to date, taking part in appropriate and regular learning and professional development activities that aim to maintain and develop our competence and improve our performance" (Nursing and Midwifery Council, 2018). Yet the majority of clinicians find their contractual obligation to engage in life-long post-graduation learning to be an ineffective learning driver.

Why is it important to recognise our learning drivers? Knowledge of why we want to learn provides insight into our learning processes and how best to enjoy the learning. Being aware of our learning drivers, even superficial ones, can help internalise learning motivation, and help learning to become a conscious choice rather than an external obligation (Deci et al., 1991).

Each individual likely responds well to different learning drivers (**Table 1**). External drivers reward completed learning. For example, learning *via* formal appraisals and faculty examinations (General Medical Council, 2012) are often rewarded with career progression. Although examinations can drive learning (Wormald et al., 2009), such learning can be superficial in nature–geared only towards passing the assessment (McLachlan, 2006), and can fail to provide long-term knowledge retention and behavioural change. Internal drivers are allied to our desire for autonomy, sense of curiosity, and educational values. Individuals' optimal development, according to self-determination theory, result from actions motivated by intrinsic interests rather than external reinforcements (Deci et al., 1991). There is evidence to suggest that the greater the influence of our internal motivating drivers, the more likely we

are to succeed academically and keep up-to-date (Abrahamson et al., 1999; Snelgrove and Slater, 2003).

Perhaps the most important driver to consider is our attitude towards learning itself, and whether we have accepted responsibility for our own professional development (Ericsson, 2004; Teunissen and Dornan, 2008). Whilst all regulated healthcare professionals are involved in continuing professional development (CPD) activities, these should not be viewed as isolated one-off activities (Stinson et al., 2009). Commitment to being a lifelong learner is central to individual development, and is associated with a wide range of personal and professional benefits (Laal and Salamati, 2012). Research in continuing medical education shows that doctors learn most when they are motivated to identify their own learning needs, and meet those needs at their own pace (Mazmanian and Davis, 2002).

What are my learning needs?

Identifying one's specific learning needs represents a fundamental aspect of self-directed learning in workplace medicine (Fox and Bennett, 1998). The more explicitly these are articulated, the more likely effective learning will take place (Knowles, 1973). But how do healthcare professionals know what they need to know?

Healthcare workers generally have professional curricula, appraisal, and CPD requirements which represent a template upon which to accrue knowledge and gain competencies. However, learning objectives only offer a narrow view of what is required (Grant, 2002) and shift the focus to be able to work competently and independently, rather than to achieve clinical and personal excellence. Additionally, we have limited insight into our own learning needs, and so this should be done with the support of educational supervisors. Recognising the multitude of sources to stimulate learning, and that feedback and guidance are available from mentors, peers, and patients is key (Walsh, 2006). Below, we present a succinct framework to assess learning needs (**Figure 1**), according to their source, i.e., whether they are instigated by ourselves or by interactions with others. Here, learning needs are shown to be on a spectrum: from an essential

knowledge or skill gap that must be filled, to an opportunity for greater competence, autonomy, and clinical excellence. For a more extensive list, please see *The Good CPD Guide* which outlines over 40 different methods of assessment (Walsh, 2006; Grant and Zilling, 2017).

Embracing an active, reflective learning mind-set

As students we were in an enviable position, in which it was socially acceptable *not* to know things. We were encouraged to be curious, to ask questions, clarify doubts, to seek feedback, and to further our interests (Dyche and Epstein, 2011). In other words, we were encouraged to pursue an "active learning mindset." Now as health care staff, patients and their families often expect us to behave with absolute certainty (Teunissen and Dornan, 2008). One may feel compelled to hide any uncertainty, for fear it may cause a loss of trust and confidence. The heavy demands of the clinical working day can often lead to negative mental states such as "hurry-up syndrome" and cognitive "overload" (McElhatton and Drew, 1993). Consequently, we can unconsciously switch off to learning during interactions or any activity not clearly signposted as learning. If our mindset remains fixed in this way, not only is our capacity for learning stunted, but may be associated with maladaptive cognitions and stress (Ding et al., 2019). Fortunately, this fixed mindset can be changed (Dweck, 2017).

If we feel overloaded, a simple method can be to take a short pause, even as brief as 10 s (Rall et al., 2008), to interrupt our current mental state, reframe our present experience, and enhance learning (Lee et al., 2021). This can be useful when dealing with unexpected events, anticipating difficult ones, and during long, attentionally-demanding tasks (Vesta and Smith, 1979; Ruhl et al., 1987; Moulton et al., 2010; Lee et al., 2021).

All clinical encounters have the potential to stimulate curiosity and desire to learn, but do require active participation. Active learning is defined as any instructional activity "that involves students doing things and thinking about the things

TABLE 1 Internal and external motivations for individual learning.

	Learning driver	Description
External	Examinations	Royal college and professional societies' written and practical examinations, taken at interim stages of training
	Appraisals and revalidation	Learning for the purpose of meeting departmental assessments and completing professional obligations
	Professional incentives	Learning with the aim of obtaining a higher-banded role or a financial reward
	Institutional culture	Learning stimulated by an enthusiastic and open learning culture focused on education and improving clinical care
	Teaching and mentoring	Learning for the purpose of delivering teaching content and/or to commence a mentorship role
	Adverse-event anxiety	Learning provoked by adverse incidents to prevent re-occurrence
Internal	Improving competence and autonomy	Learning provoked by the desire to feel proficient and independent in daily activities
	Intellectual curiosity	Learning stimulated by the natural inclination to answer questions and fill-in knowledge gaps
	Learning attitudes and habits	Learning stimulated by the values and behaviours regarding life-long learning
	Self-concept and innate skill	Learning provoked by prior experience of a particular subject, which can increase the motivation to learn more

FIGURE 1
What do I need to learn? A framework of workplace and educational activities which can help identify learning needs. WBA, workplace-based assessment; SLE, supervised learning event; EBM, evidence-based medicine.
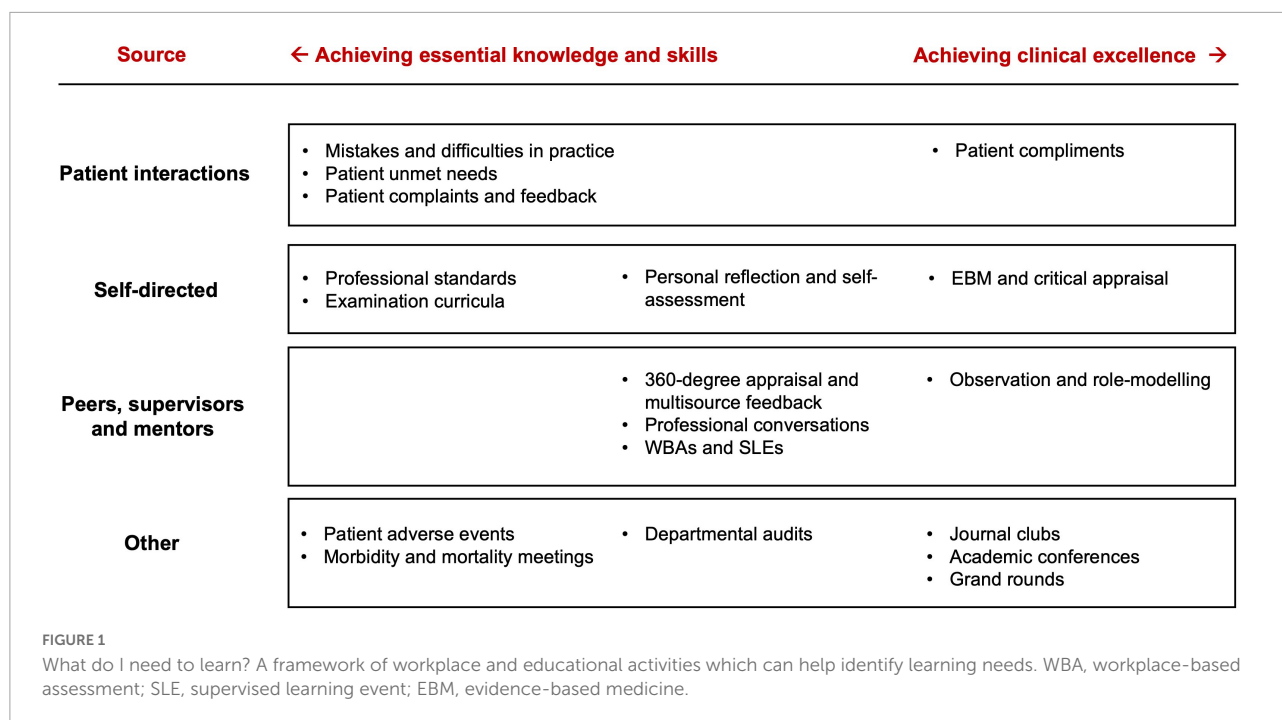
they are doing" (Bonwell and Eison, 1991) and involves efforts to "actively construct knowledge" (Carr et al., 2015). Graffam (2009) describes active learning being made up of three interrelated components: engagement, observation, and reflection. Engagement is influenced by our degree of participation, it is also dependent on our attentional state (Torralba and Doo, 2020). Attention can be recruited by recalling prior knowledge and experience, creating an "educational scaffold." This allows learning to be both contextual and meaningful (Torralba and Doo, 2020). After a clinical interaction, we can reflect critically to identify ways in which we could have improved, acted differently, or acknowledge what we found particularly interesting. Such reflection can prompt curiosity, and engage learning motivation (Ménard and Ratnapalan, 2013; Eve, 2020). A practical way to maintain a learning mind-set is to keep a real-time diary of topics or observed problems that require clarification. Later, when we have an opportunity to talk with a colleague or access medical resources, we can fill-in the previously identified knowledge gaps.

Learning, energy, and well-being

Despite possessing an effective skill set, if we are sleep-deprived, under-nourished and stressed, learning will be a challenge. Eating a balanced, healthy diet, and ensuring one is sufficiently rested are beneficial for learning and memory (Stickgold et al., 2001; Dani et al., 2005; Gais et al., 2006).

The hours in a day is a finite resource, but the level of our personal energy and motivation has the capacity for renewal (Schwartz, 2007). Energy levels fluctuate during the day, and

it may be difficult to study in the limited time period after a clinical shift. Practically speaking, we should cultivate habits to maintain stamina during the shift so as not to be bereft of energy afterwards. Such habits might include taking regular breaks, to utilise breaks to completely disengage from clinical activity (such as going for a short walk off the ward or outside), eating smaller, more frequent meals, and keeping hydrated (Oliver, 2020). We should try to capitalise on business-day-period learning opportunities, such as ward rounds, clinics, and meetings (see Section "Non-formal and informal learning").

Burnout, occupational stress, and mental health are well-known amongst healthcare professionals (Vijendren et al., 2015) and are associated with decreased patient safety and professional performance (Hall et al., 2016). Stress negatively affects how we learn and remember (Vogel and Schwabe, 2016), whereas feeling relaxed and attentive positively affects cognitive performance. Although it is beyond the scope of this review to offer a comprehensive account of how to manage workplace stress, a simple practice is the use of slow, deep, diaphragmatic breathing to diffuse negative emotional states such as anxiety, impatience, or frustration (Loehr and Schwartz, 2003; Schwartz, 2007; Hopper et al., 2019). Paced breathing has been shown to enhance working memory and motor skill acquisition (Khng, 2016; Yadav and Mutha, 2016). For more lasting positive psychological change, cognitive behavioural therapy and mindfulness-based interventions as stress-reduction techniques have shown particular benefit for healthcare professionals (Vogel and Schwabe, 2016; Clough et al., 2017).

Learning tools

Formal learning

Formal learning typically constitutes a structured program in which set objectives (typically designated by an institution) are met through discrete learning experiences. It entails didactic teaching in the classroom or lecture theatre, induction courses, virtual webinars, and e-learning. Below, we outline a set of evidence-based skills useful in formal learning contexts (Dunlosky, 2013; Sumeracki and Weinstein, 2018) and provide relevant programs and links (**Table 2**).

Active note-taking describes the process of recording information from teaching sessions for storage and to aid personal encoding. The effectiveness of note-taking can be enhanced by adding material of personal relevance, linking with concrete examples, annotating, and highlighting points of importance, and creating summaries (Hartley and Davies, 2006). *Spaced repetition* is essential to meaningful learning and retention. Opportunities to re-study learning materials can consolidate understanding and help identify educational gaps (Ausubel and Youssef, 2010). Electronic flashcard applications can prompt repetition, with timing based on algorithms that enhance recall by both distributing and interleaving learning sessions (Wozniak and Abramowicz, 1997). *Active reading*

TABLE 2   Formal learning tools and links to useful software and references.

Learning tool	Useful apps and links
Active note-taking	Evernote, http://evernote.com/ (Web, macOS, Windows, iOS, Android)
	Microsoft OneNote, https://onenote.com/ (Web, macOS, Windows, iOS, Android)
	Google Keep, https://keep.google.com/ (Web, Chrome, iOS, Android)
	Notion, https://www.notion.so/ (Web, macOS, Windows, iOS, Android)
	Apple Notes, https://www.apple.com/app-store/ (Web/macOS/iOS)
Spaced repetition	Anki, https://apps.ankiweb.net/ (Web, macOS, Windows, iOS, Android)
	Quizlet, https://quizlet.com/ (Web, iOS, Android)
	Cram, https://www.cram.com/ (Web, iOS, Android)
Active reading	Robinson method of reading comprehension, https://en.wikipedia.org/wiki/SQ3R (Robinson, 1970)
	The "PQRST" method of studying, https://www.nbss.ie/node/209 (Wilson and Moffat, 2014)
Mind-maps	Coggle, https://coggle.it/ (Web)
	XMind, https://www.xmind.net/ (macOS, Windows, iOS, Android)
	MindMeister, https://www.mindmeister.com/ (Web, macOS, Windows, iOS, Android)
	Mindomo, https://www.mindomo.com/ (macOS, Windows, Android)

uses elaborative interrogation and self-explanation to increase our engagement with reading materials, and are of particular use given the vast amount of written information healthcare staff are exposed to. One well-known active reading system is Robinson's "SQ3R." This system requires readers to sequentially survey, question, read, recite, and review reading materials (Robinson, 1970). *Mind-maps* are network diagrams that organise information and identify relationships (Buzan, 2018). The use of mind-maps increase information retention, integrate clinical thinking, and facilitate problem solving (Noonan, 2013).

Non-formal and informal learning

Non-formal learning constitutes learning that occurs outside of a set curriculum, but is organised in some way. Informal or incidental learning is defined as self-directed learning that has no organisational intention, and is frequently embedded within the work environment. It has been described as "unstructured, unintended, and opportunistic" (Yardley et al., 2012) and can comprise up to 80% of workplace learning (Cross, 2007). Outlined are non-formal and informal learning activities that healthcare professionals frequently participate in, and tips on how to maximise their utility (**Table 3**).

Many clinicians have been exposed to reflective learning through written experiences in portfolios, but these are often mandated for appraisal and can become a check-box exercise. *Personal reflection* is essential to the development of expert, life-long learners (Davis et al., 2014) and is one of the most important tools for generating behavioural change. It can help clinicians increase awareness of their understanding, and how they can integrate new skills (Ertmer and Newby, 1996). Although it is important to reflect on errors, it is equally important to recognise when things have gone well. If time is short, reflections can be done rapidly using voice recordings, a reflective selfie, or a brief note written contemporaneously to capture an experience (Grant et al., 2017).

The *apprenticeship* model remains an important part of clinical education despite the demands of the modern postgraduate environment. An apprentice is shown how to perform their role by an expert, and is assisted before becoming fully independent (Sheehan et al., 2010). An academic coach can help the learner in all stages of the learning cycle: to identify learning needs, facilitate goal setting and accountability, and to assess and contextualise learned skills and knowledge. Experts have a vast wealth of tacit knowledge which the apprentice can learn through observation and role-modelling (Eraut, 2000; Rassie, 2017).

Evidence-based medicine (EBM) has become the approach of choice in appraising, assimilating, and applying new published evidence in modern healthcare. Developing a research question using the population-intervention-comparison-outcome (PICO) format, and establishing the validity and relevance of the derived information remains central (Swanson et al., 2010), but this is time-consuming and ill-suited at the bedside. For

this reason, focusing on a select number of questions that are most important in one's practice is suggested (Slawson and Shaughnessy, 2005). Two methods can make EBM-related practices easier. First, critical appraisal of primary literature can be done in small groups or journal clubs where the workload can be shared. Journal clubs enable postgraduates to keep up to date of new research findings, to enhance their critical appraisal methods, and facilitate greater contextual understanding than what may be achieved alone (Ebbert et al., 2012). Second, software can retrieve relevant and valid evidence automatically (Table 3).

Accessing *evidence at the point-of-care via* pre-synthesised sources, during or after ward-rounds or consultations, enables evidence-based, patient-orientated decisions to be made quickly and shortens the gap between the identification and fulfilment of a learning need (Slawson and Shaughnessy, 2005). Nowadays, guidelines and digestible "best-practice" information are readily accessible *via* the use of smartphones without having to perform extensive critical appraisal.

Workplace based assessments (WBAs) and *supervised learning events* (SLEs) include structured case-based discussions and directly observed procedures. WBAs can promote

self-directed learning (Liu, 2012). Learners must apply critical thinking and decision making, and independently formulate a plan or demonstrate clinical and procedural competencies. There are a number of concerns with regards to their implementation, including a lack of clarity about their purpose and the quality of trainer feedback (Massie and Ali, 2016). While much of the onus to deal with these shortcomings will be on assessors and institutions, learners can be more assertive and see WBAs as more than just another hoop to jump through.

Our daily professional learning environment is dominated by discussions of patients and practice (Grant and Zilling, 2017) ranging from case discussion within multidisciplinary meetings to informal conversations in the coffee room. *Peer discussion*, by engaging in impromptu conversations with colleagues, can digest clinical experiences and clarify difficult topics. In a more organised way, peer-associated learning can be an effective method for postgraduate education (Lockspeiser et al., 2008; Thampy and Kersey, 2017). Peers can better understand the needs of their fellow learners and facilitate a more informal, non-threatening environment in which to learn (Lockspeiser et al., 2008; Thampy and Kersey, 2017).

TABLE 3 Non-formal, informal, and incidental learning tools.

	Learning tool	Tips and links
Towards non-formal ↑	WBAs and SLEs	Trainees generally find face-to-face evaluation and verbal assessments most useful. Be brave: seek specific, timely, and constructive feedback (Algiraigri, 2014) and avoid seeing assessments as a summative tick-box exercise (Massie and Ali, 2016)
	Coaching and apprenticeship	Rangachari et al. (2016) suggest the following mnemonic ("DIRECT") for apprentices to receive effective coaching, summarised below: **Decide/Identify** specific areas for coaching **Reflect** upon one's performance in these areas; use specific examples **Elicit** input from coach by sharing your reflections then asking for input **Clarify:** input from coach where ambiguities exist **Translate** into action with a coach to identify actionable items, develop specific goals, and plan for follow-up.
	EBM: staying up-to-date	Staying up-to-date with current research can be made more efficient with automatic literature alerts from specific databases. Commonly used alert systems include: Stork, https://www.storkapp.me/ and Pubcrawler, http://pubcrawler.gen.tcd.ie PubMed, https://www.nihlibrary.nih.gov/resources/subject-guides/keeping-current/creating-alerts-pubmed
	EBM: at the point-of-care	Accessible, expertly curated best-practice sources include: BMJ Best Practice, https://bestpractice.bmj.com/ (Web, iOS, Android) UptoDate, https://www.uptodate.com/ (Web, iOS, Android) DynaMed, https://www.dynamed.com/ (Web, iOS, Android) Evidence suggests that patients are supportive of the use of digital devices for clinical decision support, providing an explanation of the rationale is given (Patel et al., 2015).
↓ Towards informal and incidental	Personal reflection	Several frameworks are available to facilitate personal reflection. One of the most simple and popular is the Driscoll model (Driscoll, 2000), which contains three elements of reflection: **What?**–A description of the event **So What?**–An analysis of the event **Now What?**–Proposed actions following the event
	Peer discussions	Many staff are happy to explain aspects of particular cases. Such discussions may occur during ward rounds, when making referrals, or during multidisciplinary meetings. It is important that we proactively seek such discussions and the new information they expose us to.
	Social media	Healthcare organisations, speciality leaders, and journals often have social media accounts that provide regular follower alerts regarding events and updates in research fields.

Social media platforms (Twitter®, Facebook®, WhatsApp®) provide extensive opportunities to foster collaborative learning and engagement from any internet-capable device (Cheston et al., 2013; Jalali et al., 2015). Knowledge sharing on news feeds is particularly useful as a communication medium for healthcare-related updates (Jalali et al., 2015; Jeong and Jalali, 2019). Speciality-specific online forums can be used to discuss difficult cases anonymously, and to learn from the experiences of others (Woods et al., 2019). Media-sharing platforms including Youtube® and audio podcasts offer an almost encyclopaedic amount of contemporaneous educational material. The quality is limited by the knowledge of those creating the content, and is generally not peer-reviewed. To help overcome some of these shortcomings we curate a list of postgraduate-focused podcasts, well-rated by online users (see **Supplementary material**).

Building a personal learning strategy

The ways in which individuals learn new knowledge can differ dramatically. Learning depends on a variety of factors including personality, how we process information (Hayes and Allinson, 1994), subspeciality (Curry and Adams, 1991), and prior experiences (Fleming, 2001). Finding a workplace learning strategy that embraces the above and allows us to assimilate and recall critical information is an iterative endeavour. It may take several attempts before finding clinical opportunities that we readily engage with and facilitate effective learning. Generating a workplace personal development plan (PDP) may generate goals which address learning needs. However, they can be rigid and time-limited, may not factor our capacity for informal learning or learning preferences, or take into account the time and energy resources we have available (Jennings, 2007).

While the evidence for individual learning styles remains inconsistent and controversial (Lujan and DiCarlo, 2006; Samarakoon et al., 2013; Kirschner, 2017; Husmann and O'Loughlin, 2019), it is more likely that we engage with, and learn more effectively during, some activities rather than others. If we know our preferred learning strategy, we can select strategy-specific activities to improve our overall learning efficacy. We need to be aware that activities that are less compatible with our preferred learning strategy, will require greater attention and effort. Enhancing our PDP with this information is likely to bring about more effective learning. Following an analysis of a national survey of paediatric residents, Li et al. (2010) proposed a useful paradigm to help achieve learning goals and promote self-directed lifelong learning within a learner's PDP. The model can be remembered as the mnemonic "ISMART" (Important, Specific, Measurable, Accountable, Realistic, and on a Timeline). Given the information provided in this review, we elaborate on aspects of their model (**Table 4**).

Common to all effective learning strategies is the reinforcement of knowledge by application in the clinical

TABLE 4   A paradigm for achieving learning goals.

Important
- Choose relevant goals in line with learning needs and drivers*
- Prioritise achievement of learning goals

Specific
- Break broader goals into incremental steps
- Plan how to accomplish incremental steps by choosing appropriate formal and non-formal learning tools*

Measurable
- Set a measurable outcome

Accountable
- Use a reminder and tracking system
- Build in external accountability
- Establish internal accountability

Realistic
- Create achievable goals accounting for personal resources
- Seek out and use available opportunities including informal and incidental learning activities*
- Self-adjust, acknowledging which learning activities are particularly high yield*

Timeline
- Develop a timeline for achieving goals
- Incorporate goals into daily routine

Adapted from Li et al. (2010). *Indicate further elaborations based on this review.

environment, incorporating this learning into "daily routine" (**Table 4**). Learning in this way mirrors many of the processes required to become a "Master Adaptive Learner" (Cutrer et al., 2018). To help offer the reader practical ways to assimilate the content of this narrative review, we describe several case scenarios regarding clinicians at various stages of training all of whom have the common desire of improving their learning and the strategies and tools used in each case (see **Supplementary material**).

Discussion

This review offers a comprehensive palette of learning tools across a variety of settings and although intended for healthcare postgraduates, students of different disciplines may also find value. Common factors are identified that contribute to positive learning outcomes in formal and informal learning contexts.

This review is however, not without limitations. First is the contemporary nature of some of the resources cited. While attempts have been made to "future-proof" the methods cited, materials including podcasts and types of work-based assessment are likely to change with time. Second, it is likely that further review of other non-medical databases would have identified other useful, relevant learning methods. Third, the review lacks depth in certain areas, in order to provide the reader with a broad armamentarium of tools which, if suitable, can be explored in greater detail.

Technical innovation and changes in healthcare delivery will continue to occur [12], and therefore lifelong learning should be at the core of our thinking (Gopee, 2005; Teunissen and Dornan, 2008). Healthcare staff need to be motivated to learn, and to actively engage with the learning process by recognising their learning drivers and needs. One must assimilate and apply new information in clinical practice contexts.

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The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.939809/full#supplementary-material

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Competency-based pre-service education for clinical psychology training in low- and middle-income countries: Case study of Makerere University in Uganda

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Reducing the global treatment gap for mental health conditions in low- and middle-income countries (LMICs) requires not only an expansion of clinical psychology training but also assuring that graduates of these programs have the competency to effectively and safely deliver psychological interventions. Clinical psychology training programs in LMICs require standardized tools and guidance to evaluate competency. The World Health Organization (WHO) and UNICEF developed the "Ensuring Quality in Psychological Support" (EQUIP) platform to facilitate competency-based training in psychosocial support, psychological treatments, and foundational helping skills, with an initial focus on in-service training for non-specialists. Our goal was to design the first application of EQUIP to implement competency-based training into pre-service education for clinical psychology trainees. With Makerere University in Uganda as a case study, we outline an approach to develop, implement, and evaluate a competency-based curriculum that includes seven steps: (1) Identify core clinical psychology competencies; (2) Identify evaluation methods appropriate to each competency; (3) Determine when competency evaluations will be integrated in the curriculum, who will evaluate competency, and how results will be used; (4) Train faculty in competency-based education including conducting competency assessments and giving competency-based feedback; (5) Pilot test and evaluate the competency-based education strategy with faculty and students; (6) Modify and implement the competency-based education strategy based on pilot results; and (7) Implement ongoing evaluation of the competency-based curriculum with continuous quality improvement. This approach will be formally evaluated and established as a foundation for pre-service training in other low-resource settings.

KEYWORDS

competency, competency-based, curriculum, practicum/internship, EQUIP, training

Background and rationale

Reducing the current global mental health treatment gap requires not only expanding the specialist and non-specialist workforce but also assuring that this workforce is competent to offer effective services. Uganda exemplifies the challenges for low- and middle-income countries (LMICs) which experience myriad war-related traumas, chronic poverty, and high rates of infectious disease with associated early mortality. Training a mental health workforce in Uganda, as with other LMICs, is beset with various challenges including unclear contents of curriculum, unspecified teaching methods, lack of, or inadequate supervision, un-standardized evaluation methods, and poor access to information resources. Nsereko (2015) described mental-health training in Uganda as more comparable to liberal arts training than to a professional degree; for example, there is a lack of consideration for the numbers of trainees per trainer, lack of skill-based counselor trainers' qualification, and failure to effectively build skills during practicums and internships due to poorly resourced placement sites, as well as lack of professionals with the time available and expertise in supervision. These challenges translate into ineffective mental health care as students are poorly trained and may not be competent and effective service providers. To overcome some of the challenges of mental-health training, there is a growing attention to competency-based education, particularly in the field of professional psychology (Roberts et al., 2005; Rodolfa et al., 2005; Mills et al., 2020).

Mills et al. (2020) defined competency as having requisite knowledge, attitude and skills for a particular field: knowledge is an unobservable attribute of competence and can be inferred through performance or specific testing, skill is a specific cognitive or motor ability (observable and unobservable) typically developed through training and practice, and attitude is a person's feelings, values and beliefs, which influence behavior and performance of tasks and can be observed. In competency-based training, the competencies form the basis for identifying the objectives of training, planning training activities, and evaluation process (Kaslow, 2004) and thus facilitate learning, assessment, and supervision. Mental-health professionals who demonstrate competence are more likely to deliver psychological treatments that are effective and safe for their clients (McHugh and Barlow, 2010).

Because of a recognition that there were not standardized methods that could feasibly and consistently be applied in LMICs, the World Health Organization (WHO) and UNICEF developed the Ensuring Quality in Psychological Support (EQUIP) platform (Kohrt et al., 2020). The EQUIP platform is a digital tool, available in online and offline formats, and associated resources to implement competency-based training. Competency assessment tools are available for mental healthcare with adults, children and adolescents, and group-based formats (Kohrt et al., 2015a; Jordans et al., 2021; Pedersen et al., 2021). There are also treatment package competencies for WHO manualized interventions such as Problem Management Plus (PM+) and the Thinking Healthy

Programme (THP), as well as specific techniques for diverse therapy classes including cognitive, problem-solving, interpersonal, trauma-related, motivational enhancement, and stress management techniques (Pedersen et al., 2020, 2021). The platform includes guidance on conducting role plays for competency-based training, incorporating competency-based feedback into training, and a data-tracking and data-visualization feature to monitor changes in competency over time. EQUIP has been evaluated in diverse LMIC settings when training non-specialists.

However, the EQUIP platform has not yet been systematically integrated into pre-service training of mental-health professionals. Formal training institutions are best placed to ensure sustainability of training, and competency maintenance for effective mental-health care. Moreover, if specialist pre-service programs integrate resources such as EQUIP, this prepares their graduates to conduct competency-based approaches in their future training of non-specialists, i.e., it has a potential cascade effect. The current initiative at Makerere University in Uganda therefore aims to develop a competency-based curriculum for pre-service training of mental-health professionals in formal training institutions using the tools and resources in the EQUIP platform.

Current masters of science clinical psychology training curriculum of Makerere University

The School of Psychology at Makerere University in Kampala, Uganda, offers a Master's of Science degree in clinical psychology. The courses are taught through interactive learning approaches including tutorials, field work, case studies, small group and class discussions, and self-study (see Supplementary Table 1). Students on practicums and internships are trained through actual work with patients under supervision of a placement site supervisor and a university supervisor. Students attend weekly class consultation and supervision with the course coordinator to discuss their practicum or internship experiences.

Evaluation, both formative and summative, is based on the learning methods, e.g., case reports based on patients worked with during practicum, class presentations on pre-assigned topics, self-study, and assigned readings. Small groups of three to five students are supervised and assessed for knowledge, attitudes and skills using an assessment guide, and a report is given to the university supervisor. Tests in the form of "true/false" response, multiple choice questions (MCQs), and case scenarios may be given by specific course instructors. Students on practicum placement are supervised by site supervisors who give assessment reports based on the same assessment guide used by university supervisors for small group supervision; thus, for every student there are at least two scores (one from the practicum supervisor and one from the university supervisor) on the domains of knowledge, attitude, and skills. Finally, end of semester examination is administered as a summative evaluation. Certification requires a student to pass all

the courses including the final examination at a minimum 60% mark obtained cumulatively from the different assessment methods described above. Unfortunately, there is no consistency across courses and instructors with regard to what skills are prioritized and how they are evaluated. The choice of assessment format, evaluation method, and grading are not standardized and depend on the individual course lecturer. Moreover, there are not curriculum-wide strategies to address gaps in clinical skills. Furthermore, the 60% minimum requirement does not differentiate among knowledge and skill-based assessments, therefore a trainee could do well on all knowledge assessments but poorly on skill-based demonstrations and still successfully complete the master's program. Based on these concerns, we explored developing a competency-based curriculum for Makerere University, which integrates the EQUIP platform resources and assessments.

Competency-based curriculum

A competency-based framework (Table 1) organizes how trainees acquire knowledge, skills, and attitudes, which together form the desired outcome of the training program and are practice-driven ultimately to achieve clinical behavior change (Anema and McCoy, 2010; Boland, 1998). In this framework, the training setting becomes an intentional, structured environment for context-specific learning, skill development, and assessment (Wittmann-Price and Karen, 2012). The learning resources for each course are aligned with the assessments that evaluate the competencies (Johnstone and Soares, 2014) so that the competency, the content being learned, and the assessment all have a well-defined relationship (Shinners and Graebe, 2019). The end of the semester becomes the "outcome point" (Falender and Shafranske, 2004) measured through summative evaluation. The competency-based curriculum represents a more scientific and systematic approach to tracking training outcomes (Nelson, 2007).

We propose seven steps to develop, implement, and evaluate a competency-based curriculum in pre-service training:

1. Identify core competencies of the curriculum.
2. Identify methods of evaluation appropriate to each competency.
3. Determine when competency evaluations will be integrated in the curriculum, who will evaluate competency, and how results will be used.
4. Train faculty in competency-based education including training, competency assessments, and giving competency-based feedback.
5. Pilot test and evaluate the competency-based education strategy with faculty and students.
6. Modify and implement the competency-based education strategy based on pilot results.
7. Implement ongoing evaluation of the competency-based curriculum with continuous quality improvement.

Below we describe each of these seven steps as they relate to planned activities for the Masters of Science degree in clinical psychology.

Identify core competencies of competency-based curriculum

Professional psychology competencies are broadly divided into two categories: foundational and functional competencies. Foundational competencies, also known as common factors, are the mental-health care provider's skills that relate to building a warm, trustworthy relationship between client and the therapist (Barth et al., 2012; Laska et al., 2014). These factors serve as the foundation for the normal functions of a psychologist (Kaslow et al., 2009). Some foundational skills identified in evidence-based interventions delivered in LMICs include promoting hope and realistic expectancy for change; collaborative goal setting; explaining and assuring confidentiality; family engagement; giving praise; eliciting feedback; psychoeducation; normalization and validation of emotions; rapport building and self-disclosure; assessment of harm; empathy; non-verbal communication; and verbal communication (Pedersen et al., 2020). Foundational competencies are assumed to be universal for the delivery of any effective treatment and play important role in generating effective outcomes (Mulder et al., 2017). Competent use of these skills has been associated with improved treatment outcomes for people accessing mental-health and for the whole range of health services (Han and Pappas, 2018; Mills et al., 2020). Functional competencies are the specific tasks and functions carried out by psychologists, and include assessment, intervention, consultation, and supervision (Rodolfa et al., 2013).

Efforts to define and assess competencies to assure safe and appropriate psychological practice have been ongoing (Rubin et al., 2007; Roth and Pilling, 2008; Gonsalvez et al., 2021). Among different available frameworks, we selected the Cube Model of professional psychological competencies (Fouad et al., 2009; see Table 2), which includes (1) counseling, (2) clinical assessment, (3) case-conceptualization, (4) intervention, (5) ethical attitude and behavior, (6) scientist-practitioner, (7) Professionalism, (8) psychological testing, (9) reflective practice, and (10) supervision competencies.

Identify methods of evaluation appropriate to each competency

Drawing upon Miller's assessment strategies for the hierarchy of clinical skills (Miller, 1990), Kohrt and colleagues (Ottman et al., 2020) outlined approaches to assess knowledge, attitudes, and skills of service providers using conventional measurements as well as role-play based skills assessments. Measurement of conceptual knowledge is assessed through "true/false" questions and MCQs. Knowledge of how to apply theory is measured

TABLE 1 Competency-based curriculum.

	Month	Coursework	Practical skills training	Assessment points	Use competency results to:
Year 1	September	Semester 1			
1	October	Theoretical Models in Clinical	*Practicum exposure*	1. Before practicum	Give results to practicum supervisor so
	November	Psychology	(Butabika NMHRH)	exposure	they can assess trainees' base-line
	December	Professional and Ethical Studies	1-Counseling skills	*Formats*: Role plays, video	competency levels to inform training
		Adult psychopathology	2-Ethical attitude and behavior	recordings, audio	plan (FHS). Record a baseline of
		Advanced Research Methods	3-Professionalism,	recordings, transcripts.	competency to track trainees' progress
			4-Reflective practice.		and performance across training.
		Semester 2			
	February	Psychological Assessment and		2. After practicum	To confirm minimum competency
	March	Interviewing		exposure	levels achieved and compare pre- and
	April	Family and Marital		Formats: Role plays, video	post-assessments to examine
	May	Psychotherapy		and audio recordings,	effectiveness of training program. To
		Adult and Child		transcripts.	focus skill development during
		Psychotherapies			practicum. (FHS)
		Advanced Statistics			
		Psychological Assessment and			
		Interviewing			
		Recess Term			
2	May	Dissertation/ Clinical Proposal	*Practicum*	3. Before practicum	To track progress
	June	Presentation	(Butabika NMHRH)	*Formats*: Role-plays, live	Inform any needed adjustments to
	July	Practicum/ Internship	1-Counseling,	observations, video	training activities. Measure
			2-Clinical -Assessment,	recordings, audio	maintenance or drift in skills.
			3-Case conceptualization	recordings, supervisor	
			4-Intervention.	reports.	
	August	Break			
Year 2		Semester 3			
	September	Global Mental Health		4. After practicum	To confirm minimum competency
	October	Health Psychology		*Formats*: Role plays, video	levels achieved and compare pre- and
	November	Child and Adolescent		and audio recordings,	post-assessments to examine
	December	Psychotherapy		transcripts.	effectiveness of training program. Track
		Psychopharmacology			improvement and maintenance of
		Dissertation/Case write Up I			competencies over time.
					To focus skill development during
					internship. (Treatment specific: IPT, PM+)
		Semester 4			
3	February	Cultural Issues in	*Internship*	5. Before internship	Track progress during internship.
	March	Psychotherapy	(Butabika NMHRH)	*Formats*: Live	(Treatment specific: IPT)
	April	Internship	1-Clinical Assessment,	observations, video	
	May		2-Case conceptualization	recordings, audio	
			3-Intervention	recordings, supervisor	
			4-Supervision	reports	
		Dissertation/Case write Up II		6. After internship	Evaluate trainees to confirm minimum
		Cultural Issues in		*Formats*: Live	competency levels are met.
		Psychotherapy		observations, video	Compare pre- and post-assessments to
		Electives		recordings, audio	examine effectiveness of training
		Psychosocial Care of the Dying		recordings, supervisor	program.
		and Bereaved		reports.	Inform remediation needs and
		Gender Issues In Psychotherapy			activities.
					Determine whether or not ready for work
					in the real world and determine giving
					certificate. (Treatment specific: IPT)

TABLE 2 Clinical psychology competencies.

Competency	Description	Ideal behavior
1. Counseling	Ability to show empathic understanding, to apply basic counseling techniques, and collaborative goal formulation with clients.	(a) Applies basic counseling techniques appropriately including clarification, paraphrase and summarizing responses. (b) Forms and communicates an empathic understanding to clients, careers, and significant others. (c) Formulates client goals in a collaborative manner. (d) Demonstrates accurate empathy in complex situations where affect is covert, controlled or denied.
2. Clinical Assessment	Ability to perform adequate assessments in a time efficient and in a personally/socio-culturally sensitive manner; to appropriately prioritize issues, and assess risk.	(a) Demonstrates knowledge of psychopathology and diagnostic criteria for clients seen at the placement. (b) Demonstrates a systematic and logical sequence of questioning during the clinical assessment interview. (c) Skillful and efficient in conducting a clinical assessment, including a mental state examination. (d) Undertakes clinical assessments in an interpersonally engaging and in a socio-culturally sensitive manner.
3. Case Conceptualization	Ability to appropriately integrate information from multiple sources to inform appropriate case conceptualizations, diagnoses, and treatment plans.	(a) Makes appropriate use of diagnostic frameworks (e.g., DSM5) to arrive at correct diagnoses and differential diagnoses. (b) Draws upon different psychological theories and approaches to derive a meaningful case conceptualization. (c) Integrates cultural knowledge into case conceptualization. (d) Integrates assessment and other information into realistic treatment plans.
4. Intervention	Ability to skillfully implement appropriate, empirically supported treatment interventions; monitor treatment progress and outcomes.	(a) Demonstrates knowledge of principles and procedures of relevant interventions. (b) Demonstrates effective application of theoretical knowledge of evidence-based treatment methods (e.g. CBT, IPT, MI). (c) Implements interventions relevant to the needs of the client. (d) Demonstrates flexibility and responsiveness in the application of treatments and/or in the implementation of scheduled programs. (e) Efficiently conducts evidence-based treatment approaches (e.g. CBT, IPT, MI). Fluently transitions between elements/techniques. (f) Overcomes common difficulties in therapy through skillful interviewing to maintain therapy direction and progress. (g) Uses appropriate measures to regularly monitor treatment progress and outcomes.
5. Ethical Attitude and Behavior	Knowledge of ethical/professional codes, standards and guidelines, and commitment to their application. Ability to maintain appropriate and respectful boundaries and seek consultation on ethical issues.	(a) Demonstrates knowledge of ethical/professional codes, standards and guidelines. (b) Recognizes ethical and legal issues that arise across the range of professional activities, and demonstrates good discernment and judgment in these situations. (c) Acknowledges the limits of one's competence and makes appropriate referrals when required. (d) Demonstrates commitment to ethical practice across a range of clinical situations.
6. Scientist Practitioner	Knowledge of theoretical and research evidence related to diagnosis, assessment and intervention. Able to show respect for scientific methods and empirical evidence and commitment to their application to clinical practice.	(a) Demonstrates knowledge of theoretical and research evidence related to assessment, diagnosis, case conceptualization and treatment, and to intervention monitoring and evaluation of interventions. (b) Demonstrates the ability to critically analyze and evaluate the empirical literature. (c) Demonstrates respect for, and use of, the scientific method in clinical practice. (d) Demonstrates systematic and habitual application of scientific principles (e.g., hypothesis testing) to assessment, diagnosis, case conceptualization and treatment, and to intervention monitoring and evaluation of interventions.

(Continued)

TABLE 2 (Continued)

Competency	Description	Ideal behavior
7. Professionalism	Effective organization and time management. Clear and professional expressive skills, professional dress and demeanor. Good interactional skills with colleagues and other professionals.	(a) Demonstrates responsibility and accountability, reliably and punctually attending client appointments and work-related activities. (b) Demonstrates an organized, disciplined, and timely approach to maintaining case notes and records. (c) Effectively prioritizes competing tasks. (d) Demonstrates concern for the welfare of others including the profession, organization and community, and shows respect for cultural values and diversity. (e) Clearly and effectively communicates in verbal, non-verbal and written forms for a range of purposes. (f) Conducts self professionally in dress and demeanor. (g) Works collaboratively with colleagues across a range of disciplines. (h) Copes professionally with disapproval and criticism, and works constructively toward resolution of interpersonal conflicts at work. (i) Demonstrates progress in developing an integrated sense of self as a professional psychologist.
8. Psychological Testing	Able to apply knowledge to correctly select, administer, score and interpret common psychometric tests, and to generate psychometric reports. Knowledge of psychometric issues and testing theory.	(a) Correctly administers and score common/core psychological tests. (b) Demonstrates knowledge of psychometric issues, testing theory, and bases of assessment methods. (c) Interprets and integrates information in accordance with psychometric principles. (d) Demonstrates ability to write psychological test reports that are clear, accurate, and tailored appropriately to the user.
9. Reflective Practice	Self-care, self-awareness and reflectivity, reflection on own emotions, beliefs, values and behavior and their effect on others. Appropriately self corrects.	(a) Demonstrates problem-solving ability, organized reasoning, intellectual curiosity and flexibility. (b) Demonstrates affect tolerance, understanding of interpersonal conflict, tolerance of ambiguity and uncertainty. (c) Demonstrates consideration of the way in which personal issues and concerns impact on one's professional practice. (d) Effectively uses observation and feedback including supervision to hone reflection skills. (e) Actively reflects on ways in which others' cross-cultural values and perspectives influence one's own responses and vice versa. (f) Accurately assesses own strengths and weaknesses and level of competence and plans necessary learning to address gap. (g) Demonstrates appropriate and timely care of personal health and wellbeing to ensure effective professional functioning.
10. Supervision	Able to show good preparation and collaboration within supervision, openness to and effective use of feedback.	(a) Demonstrates adequate preparation for supervision. (b) Seeks and accepts supervisory input, including direction. (c) Appropriately balances autonomy and dependency needs.

through decision-making questions following clinical vignettes. Ability to apply skills is measured through standardized role-plays and standardized patients. Lastly, how therapists apply skills in practice (therapist quality) is assessed through standardized rating of treatment sessions. These methods will be replicated in Makerere's program and used in training and assessment of pre-service psychology students. EQUIP tools relevant for Makerere's clinical psychology program include the Enhancing Assessment of Common Therapeutic factors (ENACT) for measuring adult professional psychology skills; Working with children—Assessment of Competencies Tool (WeACT) for assessing service providers' competencies in helping children and adolescents; the GroupACT used for group facilitation assessment; and treatment specific tools for Interpersonal Psychotherapy (IPT) and Problem Management plus (PM+). These tools have been used in various settings for low-intensity psychological interventions (Kohrt et al., 2015a, 2018; Pedersen et al., 2021) and found to be effective for training, supervision and assessment of competencies (Singla et al., 2017; Ottman et al., 2020).

Role plays will be used with standardized clients and scored by trained raters, and the results will form the basis of scores to reflect competency attainment. All of the EQUIP assessment tools are structured in a format to allow for easy scoring and delivery of competency-based feedback. The ENACT and other tools have a scoring system consisting of skill categories with a short description of observable behaviors associated to a level for each behavior. The score categories are unhelpful or potentially harmful behaviors (Level 1); lack of harmful behaviors with demonstration of some basic helping behaviors (Level 2); demonstration of all basic helping behaviors (Level 3); and demonstration of all basic helping behaviors plus some advanced helping behaviors (Level 4). Trained raters observe and score behaviors demonstrated by the trainee in structured role plays. The results are used to guide decision-making about the need for improvement and remediation of training and supervision. Feedback tailored to Level 1 is reducing harmful behaviors; for Level 2, the goal is to learn and demonstrate more basic skills; for Level 3, feedback reinforces use of the basic skills and encourages integration of advanced skills; Level 4 emphasizes affirmation of the broad range of skills demonstrated. The system allows for continuous improvement in training and supervision as needed (Kohrt et al., 2018). In the Makerere curriculum, MCQs and "true/false" questions will be administered to supplement the observable skill ratings. This is helpful to determine if a lack of knowledge underlies the gap in skills.

Determine when competency evaluations will be integrated in the curriculum, who will evaluate competencies, and how results will be used

The competency evaluation will be carried out by university faculty and placement site supervisors, all are qualified mental-health professionals, who will receive training on the EQUIP platform including how to conduct competency assessments and how to give competency-based feedback. We propose six assessment points (see Table 3) during the two-year training period for clinical psychology students including: before initial clinical exposure, after initial clinical exposure, before practicum, after practicum, before internship, and after internship.

The initial clinical exposure assessment will record a baseline of competency so that trainees' progress and performance can be tracked across training and enable supervisors to plan appropriately for training during the exposure. The assessment after the initial clinical exposure will confirm the competency levels that trainees were able to achieve during the exposure and enable comparison between pre-and post-exposure assessments to determine the effectiveness of the first clinical component of the curriculum. Later in the training

program, pre-practicum assessment results will be used to determine baseline functional competency of trainees and help supervisors focus on appropriate skill development during practicum. Post-practicum assessment will confirm minimum competency achieved during the practicum and enable comparison of pre-and post-practicum assessments to determine effectiveness of the training program. Further, the results will enable practicum and clinical supervisors to identify and focus skill development during internship. Pre-internship assessment aims at tracking progress in order to determine remediation or refocusing on skills partially or not yet attained because this is the last opportunity before graduation to have clinical encounters and achieve minimum competency levels. Post-internship assessment will seek to evaluate trainees to confirm minimum competency levels met, and make comparison between pre-and post-assessments to determine effectiveness of internship training program and inform any remediation needs and activities. Importantly, the assessment will determine trainee readiness for work in the real world and the need for further training and determination of trainee certification.

The training and assessment of competencies will follow professional developmental trajectory (Blackburn et al., 2001; Gonsalvez and Calvert, 2014) to allow for both formative and summative assessments at various points of the professional development of the trainees. Assessment results will be used to improve future training strategies on the part of supervisors and to help students who might be learning slower than the rest to catch up. Additionally, the results will be used to determine the program feasibility and utility in formal education settings.

Training faculty in competency-based education and competency assessments and giving competency-based feedback

One fundamental requirement for effective implementation of competency-based curriculum is having skilled faculty members and clinical supervisors in competency-based training, assessment skills, and competency-based feedback provision. Faculty need to know and be able to explain what competency-based training is, organize and carry out role-plays, reliably and accurately rate a standardized role play, select, train and assess actors for competency-based training. Additionally, trainers need to be able to train raters and establish standards for rating role-plays during competency-based trainings and give effective feedback to students based on structured competency assessments. The EQUIP Foundational Helping Skills (FHS) Trainer's Curriculum which is a brief course designed for training, supervision and assessment of common factors in trainees (Kohrt et al., 2015b) will be adapted to include functional competencies (see Table 2) and used in a four-day EQUIP training for faculty (see Table 4).

TABLE 3 Competency assessment schedule.

Assessment #	When conducted	Competencies (e.g., foundational skills, IPT)	Format (structured role play, or client observation)	Who acts as client	Who conducts rating	Who receives results	How are results used	What modifications are needed for implemen-tation
1	Before practicum exposure	*Fundamental* 1-Counseling skills 2-Ethical attitude and behavior 3-Professionalism 4-Reflective practice.	*Modality*: Standardized role plays with mock group members *Formats*: Live observations, video recordings, audio recordings, transcripts	Trainers and students	University rators and supervisors	Students, Practicum coordinator and university supervisors	Assess trainees' competency levels to inform training plan; Record a baseline of competency to track trainees' progress and performance across training.	Training and assessment skills to supervisors and program coordinators
2	After practicum exposure	*Fundamental* 1-Counseling skills 2-Ethical attitude and behavior 3-Professionalism 4-Reflective practice.	*Modality*: Standardized role plays with mock group members *Formats*: Live observations, video recordings, audio recordings, transcripts	Trainers and students	University rators and supervisors	Students, practicum coordinator and university supervisors	Assess trainees' competency levels to inform training plan; Record a baseline of competency to track trainees' progress and Performance across training.	Training and assessment skills to supervisors and program coordinators
3	Before practicum	*Functional* 1-Counseling skills 2-Clinical -Assessment, 3-Case conceptualization 4-Intervention	Modality: Periodic role-plays; single competency role plays Formats: Live observations, video recordings, audio recordings, transcripts	Trainers and students	University rators and Supervisors	Students, practicum coordinator and university supervisors	To track and record trainees' progress during training; Measure maintenance or drift in skills; Inform any needed adjustments to training activities.	
4	After practicum	*Functional* 1-Counseling skills 2-Clinical -Assessment 3-Case conceptualization 4-Intervention	*Modality*: Standardized role plays with mock group members *Formats*: Live observations, video recordings, audio recordings, transcripts	Students	University rators and Supervisors	Students, practicum coordinator and university supervisors	To track and record trainees' progress during training; Measure maintenance or drift in skills; Inform any needed adjustments to training Activities; Evaluation of trainees to confirm minimum practicum competency levels are met; Compare pre- and post-assessments to examine effectiveness of training program; Inform remediation needs and activities; Highlight supervision needs; Inform promotion of trainee for further training as interns.	

(Continued)

TABLE 3 (Continued)

Assessment #	When conducted	Competencies (e.g., foundational skills, IPT)	Format (structured role play, or client observation)	Who acts as client	Who conducts rating	Who receives results	How are results used	What modifications are needed for implementation
5	Before Internship	*Functional* 1-Clinical Assessment, 2-Case conceptualization 3-Intervention 4-Supervision	*Modality*: Standardized role plays with mock group members *Formats*: Live observations, video recordings, audio recordings, transcripts	Students (peers)	Students, University rators and Supervisors	Students, Internship coordinator and university supervisors	To track and record trainees' progress during training; Measure maintenance or drift in skills; Inform any needed adjustments to training Activities; Evaluation of trainees to confirm minimum practicum competency levels are met; Compare pre- and post-assessments to examine effectiveness of training program; Inform remediation needs and activities; Highlight supervision needs; Inform promotion of trainee for further training as interns.	
6	End of internship	*Functional* 1-Clinical Assessment, 2-Case conceptualization 3-Intervention 4-Supervision	*Modality*: Standardized role plays with mock group members *Formats*: Live observations, video recordings, audio recordings, transcripts	Students (peers)	Students and University Supervisors	Students, Internship coordinator and university supervisors	Measure maintenance or drift in skills; Evaluation of trainees to confirm minimum practicum competency levels are met; Compare pre- and post-assessments to examine effectiveness of training program; Inform remediation needs and activities; Determine trainee readiness to work in real world; base for certification.	

Pilot testing and evaluation of the competency-based education strategy with faculty and students

Following training of faculty, a pilot implementation of competency-based training will be conducted with students at the School of Psychology at Makerere University. This is done to help improve the instruments and processes before full rollout (Gross, 2006). Results of the study will inform if the feasibility and utility criteria of the EQUIP instruments and procedures were met and identify the need to modify the instruments or method of administration in preparation for the full rollout of the training. The objectives of the pilot study are to (a) Determine the feasibility of EQUIP resources in training students to acquire functional psychology competencies, and (b) Establish the utility of the EQUIP resource for training students in high-intensity psychological interventions in formal pre-service training settings.

Qualitative and quantitative methods will be employed to evaluate the training. Interviews with faculty and site supervisors,

TABLE 4 Training schedule and objectives for competency-based education using EQUIP training curriculum.

Day	Session	Learning objective
1	(a) What is EQUIP Competency Based Training?	To be able to explain what EQUIP competency-based training is.
	(b) Role-Play Assessments in Competency Based Training	To be able to explain what EQUIP competency-based training is.
2	(a) Implementing Role Play Assessments	To be able to reliably and accurately rate a standardized role play.
	(b) Training Actors	To be able to select, train and assess an actor for competency-based training.
3	(a) Training Raters	To be able to train raptors and establish benchmarks for rating role-plays during competency-based trainings.
	(b) Feedback in Competency-Based Training	To be able to give effective feedback to students based on structured competency assessments.
4	How to turn curriculum into Competency-Based Training	To be able to effectively implement competency-based training and assessment.

both pre- and post-test will be carried out. The results will be augmented with information obtained from students through administration of EQUIP tools and questionnaires. Qualitative interviews will be conducted with faculty pre- and post-training on EQUIP. Interviews with site supervisors will be conducted prior to student placement and 2 months later after student activities on site are completed. Students will complete standardized role-plays pre- and post-clinical placement. The expected outcome of the study will be the determination of the viability and effectiveness of using EQUIP resource to train, supervise and assess foundational and functional professional psychology competencies in pre-service institutions of learning.

Modify and implement the competency-based education strategy based on pilot results

The pilot study results will be used to change training, supervision and assessments strategies, e.g., which competencies to focus on, what method of training is effective, how long the training should last, what additional preparation the faculty need, how to improve assessment methods, how to improve supervision methods, and how to improve evaluation of competencies.

Implement ongoing evaluation of the competency-based curriculum with continuous quality improvement

The EQUIP protocol for training, supervising and assessing competency incorporates frequent assessment, tracking of student progression, and enabling student-centered approach to training, to optimize learning and customize curricular elements for each student. Successful implementation will necessitate approval by Makerere University Ethics Committee for compliance with ethical and regulatory issues relating to implementing a developed curriculum.

Changes in the current curriculum

The developed curriculum will reflect changes in content, method of teaching, assessment and supervision during the implementation of the curriculum, particularly during practicum and internship. The practical course units will have clearly identified competencies and will employ standardized methods of training, assessment and supervision following the EQUIP protocol. Role-play based competency assessments will be conducted throughout the training to monitor progress, to determine minimum competency, and to ensure that the trainees do not engage in harmful behaviors (Kohrt et al., 2018). Additionally, attainment of competence is judged by predetermined output indicators (e.g., number of basic helping skills demonstrated) and not by measures of input (e.g., number of classroom didactic hours completed). Clear methods and prior expected output give a better and easier angle to supervision of competencies (Kavanagh et al., 2003; Watts et al., 2021). The education will additionally follow a modular format, to allow tailoring training to trainees' needs (Gross, 2006). Finally, grading and the end of training certificate award will both depend on the achievement of the specified competencies rather than on hours completed during practicum and internship.

Anticipated challenges

There is need train faculty in order to be able to appreciate and embrace the competency-based curriculum and effectively use it in training, assessment and supervision. This involves attitude change. Additionally, there is only one major placement site (Butabika National Mental Referral Hospital) in Uganda which offers appropriate training facility for the students. It is anticipated that the quality of supervision at the placement site might be compromised as many students from other training institutions also use the same facility for mental-health training. Moreover, the staff is numerically limited. Discussion with the staff at the placement site will explore possibilities of better helping the students on practicum through use of group supervision for example. In the long term it is hoped that a Trauma and Stress Center at the School of Psychology Makerere University will be established and will have among other facilities, a

mental-health teaching hospital that will cater for the practicum and internship needs of the students. Limited accessibility to eLearning materials and devices (e.g., computers), makes accessing online EQUIP platform learning difficult. Additionally, the cost of using internet is quite high in addition to inconsistent and low-quality internet supply, coupled with intermittent power outages. To offset the problem of accessibility of information resources related to competency-based training and assessment, hard copies of training materials could be made available to the trainers and students.

Conclusion

The development of a competency-based curriculum for training psychology professionals in formal pre-service training institutions aims to meet an indispensable need of ensuring that the growing workforce of health care professionals are competent, not only in foundational skills but importantly also in functional helping skills. This will hopefully lead to improved quality of care and will be a step in the right direction to achieving the goal of a competent health workforce as outlined in WHO's Universal Health Coverage goals, and thus contribute to the ideal of equity in mental health care for all people worldwide.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The authors made equal, substantial, and direct contribution to the work in the conception, design, draft, and revision of the final version of the manuscript, and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

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Stressors and difficulties perceived during the pandemic in the teaching activity of nursing professors

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Background: The coronavirus 2019 (COVID-19) pandemic has prompted several changes in teaching methods in addition to the ways of learning by students.

Objective: To check whether a relationship between factors, such as resilience, self-esteem, depression, anxiety, academic stressors, and a change in teaching methods and learning since the first epidemic outbreak exists.

Materials and methods: This study was a cross-sectional descriptive one with a non-random sample of nursing degree teachers who did or did not participate in clinical activities but had been teaching online since the start of the pandemic. Data were collected with online questionnaires validated for self-completion with Google Forms.

Results: Regarding the analysis of the descriptive data of each scale, we can verify that data indicate very high levels of resilience and self-esteem in the normal range with minimal levels of depression, moderate anxiety, and finally not worrying about sources of stress in teachers. Also, negative correlations were found between the 10 Connor−Davidson Resilience Scale, Beck Depression Inventory (BDI 2), Beck Anxiety Inventory (BAI), and Scale of Sources of Stress in Teachers with a statistical significance of $p < 0.001$. The Rosenberg Self-Esteem Scale also showed negative correlations with the three previously mentioned scales with a statistical significance of $p < 0.001$. Finally, positive correlations between the Beck (BDI 2), Beck (BAI), and Sources of Stress in Teachers scales and between the Rosenberg Self-Esteem scale and the 10 CD RISC scale were found ($p < 0.001$).

Discussion: Our study shows that nursing degree teachers combine teaching with activities and presented moderate levels of anxiety, depression, and tolerance to academic stressors and were able to maintain optimal levels of self-esteem and resilience, indicating that these two factors act as protectors against these stressors.

Tweetable abstract: Nursing teachers presented moderate levels of anxiety, depression, and academic stressors due to optimal levels of self-esteem and resilience.

Background

The coronavirus 2019 (COVID-19) pandemic has caused profound social changes. In the university, especially during the first wave, a rethinking of teaching methods and ways to receive feedback from students has occurred (Barry and Kanematsu, 2020; Pokhrel and Chhetri, 2021).

Due to the ongoing pandemic with different pandemic spikes during the academic year 2020–2021, universities in general throughout the world and in Spain, in particular, adopted new teaching models for teaching health sciences, which also includes nursing. During the pandemic, some universities established a learning online model and exclusively physical presence for clinical and preclinical practices, because the classrooms were not prepared to maintain social distancing measures (Leigh et al., 2020).

The sudden change in the teaching model combined with pandemic fatigue in our field and in the university is reflected throughout the university community as a sense of abandonment, sadness, lack of motivation, and job performance below the average of the years before the pandemic (Torda et al., 2020; Day et al., 2021; Santos et al., 2021). The group of teachers with less experience in new technologies is the one that suffered and is suffering the most with this change (Rasheed et al., 2020). Also in healthcare professions, such as nursing, in which the face-to-face component has been established as being a very important aspect for which to acquire skills and competencies, teachers have been subject to greater pressure to reconcile non-face-to-face teaching with the decrease in teaching quality (Costa et al., 2020).

Preliminary studies have shown the urgent need to develop preventive interventions and strategies to address the mental health of university professors (Brooks et al., 2020; Besser et al., 2022) as teachers show psychological stress linked to the symptom of somatization, depression, anxiety, and/or catastrophic thoughts in addition to academic, health, and lifestyle concerns directly caused by the pandemic (Wang et al., 2020; Amaral-Prado et al., 2021). In a study carried out with nursing professors, up to 16 pandemic-related psychological consequences were described with depression, decreased concentration, and apathy as the most important ones (Sepahvand and Taghipour, 2020).

Objective

For these reasons, the main objective of this research was to assess whether a relationship between factors, such as resilience, self-esteem, depression, anxiety, academic stressors, and changes in teaching and learning methods exists and to check whether the pandemic is having an impact on teachers of the nursing degree who have taught online continuously since the first epidemic outbreak. Also, it shows if the nursing professors with clinical activity in the pandemic had different levels from professors without clinical activity.

Materials and methods

Design and setting

A cross-sectional descriptive study with a non-random sampling of nursing degree teachers who participated or did not participate in clinical activities and who had been teaching online since the start of the pandemic was conducted at the Rey Juan Carlos University of Madrid-Spain with a total of 55 professors teaching nursing degrees. The data were collected with online questionnaires validated for self-completion with Google Forms.[1]

The Google Forms included an informed consent sheet, sociodemographic variables (age, sex, marital status, weight, height, employment status within the Universidad Rey Juan Carlos, children and dependents in their charge, whether they had COVID-19 during the past course), and the selected validated questionnaires: (1) Rosenberg Self-Esteem Scale or RSE (Rosenberg, 1989; Atienza et al., 2000); (2) Connor–Davidson Risk Resilience Scale or CD-RISC (Connor and Davidson, 2003; Notario-Pacheco et al., 2011); (3) Beck Anxiety Inventory or BAI (Beck et al., 1988); (4) Inventario de Beck Depression Inventory or BDI, BDI-II (Beck et al., 1996); and (5) Escala de Fuentes de Estrés en Profesores or EFEP "Scale of Sources of Stress in Teachers" (Nogareda, 2000). Finally, an open question asking for any kind of academic stressor not shown on the scales but important for informants was given.

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1 https://forms.gle/uNYrWncYUeUDXKG5A

Sample

Participants were drawn from the Professor's staff of the Degree of Nursing at Universidad xxx xxxx, xxx. The study took place between October 1, 2021 and November 29, 2021.

The sample size was calculated with software from Unidad de Epidemiología Clínica y Bioestadística, Complexo Hospitalario Universitario de A Coruña, Universidade A Coruña.[2] From a sample of 55 individuals with an α error of 0.05, a confidence level (CI) of 95%, and heterogeneity of 50%, the required number of final participants was calculated to be 49. Finally, the final sample consisted of 53 staff nurses and nurses' professors who had worked for a minimum of 3 years in the Universidad xxx xxxx, xxx. The inclusion criteria consisted of two parameters: (1) nursing professors and nurses from the Universidad xxx xxxx, xxx of the Nursing Degree with a minimum of 3 years of teaching at that University and (2) adequate knowledge of Spanish in both oral and written levels. The exclusion criterion was inadequate completion of the questionnaires.

Assessment scales

Rosenberg self-esteem scale

This questionnaire consists of 10 questions, scored from 1 to 4 points (4 = strongly agree, 3 = agree, 2 = disagree, 1 = strongly disagree); five statements have a positive direction, and five have a negative direction. The authors of the questionnaire did set limits for this scale, but a range of scores between 20 and 30 points is usually considered a normal range. If the score is greater than the normal range, such a result would indicate high self-esteem, whereas if the result is less than normal, low self-esteem is indicated. The RSE shows strong convergent validity for men and women from different ethnic groups (Robins et al., 2001). The scale has high reliability, with test-retest correlations in the range of 0.82–0.88 (Rosenberg, 1989) and 0.87 for the Spanish population (Atienza et al., 2000).

10 CD-risk, Connor–Davidson risk resilience scale

Resilience was evaluated using the short version of the Connor–Davidson Risk Resilience Scale (CD-RISC) which was validated in Spanish by Notario-Pacheco et al. (2011). The scale consists of 10 items (those numbered 1, 4, 6.7, 8, 11, 14, 16, 17, 19) from the original scale designed by Connor and Davidson (2003).

Using this scale, participants were asked to answer to what extent they agree with each of the sentences presented to them (for example, item 1: "I am able to adapt to changes." The response format is a five-point Likert-type scale from 0 to 4.

The final score is the sum of all the responses obtained for each item (range 0–40), and the highest scores indicate the highest level of resilience.

The reliability of the 10-item CD-RISC is defined by a Cronbach's alpha of 0.85, and the weights in factor analysis are within the range of 0.48–0.76 (Notario-Pacheco et al., 2014).

Beck anxiety inventory

The Beck Anxiety Inventory (BAI) questionnaire contains a list of 21 symptoms indicating anxiety with a 4-point Likert scale ranging from not at all to severe and the degree to which each symptom affected them during the last week. The values of each element were added up, and a total score ranging from 0 to 63 points was obtained. A total score from 0 to 7 was interpreted as a minimum level of anxiety, from 8 to 15 as mild, from 16 to 25 as moderate, and from 26 to 63 as severe (Beck et al., 1993). Also, in the adapted version for the Spanish population, the instrument showed high internal consistency with a Cronbach's alpha coefficient of 0.92 and test-retest reliability of 0.75. The BAI has a high internal consistency (Cronbach's alpha from 0.90 to 0.94). The correlation of the items with the total score ranges between 0.30 and 0.71. The test-retest reliability after 1 week ranged from 0.67 to 0.93, and after 7 weeks, the reliability was 0.62 (Comeche et al., 1995).

Beck depression inventory (BDI, BDI-II)

The Beck Depression Inventory (BDI) is a questionnaire with a group of 21 items, all questions used a Likert scale for answers. The internal consistency measure was alpha = 0.78. Sample items (sadness, for example) included responses, such as "I feel sad most of the time" or "I don't feel sad." The original BDI-II manual (Beck et al., 1996, p. 11) proposed the following cut-off estimates and corresponding depression grades: (1) 0–13 indicates minimal depression, (2) 14–19 mild depression, (3) 20–28 moderate depression, and (4) 29–63 severe depression. The Spanish adaptation of Sanz and Vázquez (1998) assumes the cut-off scores designed by Beck et al. (1996), and the reliability of the instrument is high both in terms of internal consistency (Cronbach's alpha coefficient = 0.83) and temporal stability (test-retest correlations ranged between 0.60 and 0.72 for three different subgroups of the total sample).

Escala de Fuentes de Estrés en Profesores, "Scale of sources of stress in teachers"

To detect sources of stress, the Scale of Stress Sources in Teachers (EFEP) was a questionnaire created and validated by the National Institute of Safety and Hygiene at Work (2000) in Spain with which sources of stress are detected and rated on intensity. The questionnaire contains 56 items, answered using a Likert scale from "a lot" to "nothing." The total score on the stress scale ranges from a minimum score of 56 to a maximum of 280. Three levels of stress are established on this scale: (1) green

TABLE 1 Descriptive data of the participant's total population.

Descriptive data	Total group	Male	Female	P-value*
	Mean ± SD (95% CI) N = 53	Mean ± SD (95% CI) n = 16	Mean ± SD (95% CI) n = 37	
Age (years)	45.43 ± 8.50 (43.08–47.77)	39.35 ± 9.85 (35.37–43.33)	44.64 ± 9.16 (41.59–47.70)	0.155
Weight (kg)	73.11 ± 20.66 (67.41–78.80)	69.63 ± 15.48 (63.38–75.89)	67.48 ± 21.03 (60.47–74.50)	<0.001
Height (m)	1.65 ± 4.99 (1.60–1.70)	1.66 ± 0.10 (1.62–1.70)	1.60 ± 19.55 (1.54–1.67)	<0.001
BMI (Kg/m^2)	25.03 ± 4.37 (23.83–26.24)	25.08 ± 4.62 (23.22–26.95)	23.92 ± 4.20 (22.52–25.32)	<0.001

BMI, body mass index; Kg, kilograms; M, meters; SD, standard deviation; CI, confidence interval. *Independent t-student was applied. In all analyses, $p < 0.05$ (with a 95% confidence interval) was considered statistically significant.

level or not worrying; score between 56 and 140; (2) yellow level or worrying; score between 141 and 196; and (3) red level or severe; score above 196. It is also convenient that the data are analyzed item by item to establish a ranking of the items that generate more academic stress (Nogareda, 2000).

In addition, an open question was included so that any individual who considered that a stressor was missing from the list of the questionnaire could let us know.

Ethical considerations

All participants marked the point of conformity of the informed consent before completing the questionnaire provided in the Google link. The study was approved by the Ethics Committee of the Universidad Rey Juan Carlos (2910202121221 number).

Data analysis

All variables were examined for normal distribution using the Kolmogorov–Smirnov test, and data were considered normally distributed if $p > 0.05$.

TABLE 2 Descriptive data based on different assessment scales.

Scale	Mean (SD) (CI 95%)	Median (CI 95%)
10 CD RISC	31.11 ± 5.94 (29.47–32.75)	32.00 (29.89–35.00)
Beck (BDI 2)	10.69 ± 9.27 (8.14–13.25)	8.00 (5.00–13.20)
Beck (BAI)	13.20 ± 14.20 (9.29–17.12)	8.00 (5.00–14.00)
Rosemberg self-steem	29.88 ± 4.68 (28.59–31.17)	31.00 (29.00–32.00)
Scale of sources of stress in teachers	136.50 ± 56.97 (120.80–152.21)	143.00 (108.79–162.51)

SD, standard deviation; CI, confidence interval.

An analysis of quantitative variables was performed using means and deviations, and for categorical variables, counts and percentages were used. Spearman's correlation was performed to measure the strength of the association between quantitative variables. Pearson's correlation and Mann–Whitney U tests were performed to verify associations between variables. All statistics were considered statistically significant at $p < 0.05$ (SPSS for Windows, version 20.0; SPSS Inc., Chicago, IL, USA). The open question was analyzed using the Nvivo 8 program to illustrate the answers, findings, and interpretations on a digital mental map. An analysis of the content of the answers was carried out following a series of steps, including the selection of keywords, which were grouped following a morphological criterion to later form categories and subcategories, and finally, the word cloud was eliminated. These clouds were interpreted following a spiral arrangement since the most repeated responses were displayed as larger text and in the center of the cloud.

Results

All variables showed a non-normal distribution ($p < 0.05$) for age, weight, height, and body mass index (BMI) $p > 0.05$) as shown in Table 1.

Regarding the analysis of the descriptive data of each scale, it was verified that very high levels of resilience (31.11 ± 5.94), self-esteem in the normal range (29.88 ± 4.68), minimal levels of depression (10.69 ± 9.27), moderate anxiety (13.20 ± 14.20), and finally, in the green range, not worrying based on the Sources of Stress in Teachers scale (136.50 ± 56.97) as shown in Table 2.

In the top 10 ranking of academic stressors, the one that caused the most stress was "How much my academic activity is valued by others" followed by "Receiving incompatible or opposite instructions," "Teaching classes in a language that is not my mother tongue," "I do not define my responsibilities," "Witnessing aggression among students," "Lack of information about how I should do my job," "Lack of opportunities for promotion," "Inconsideration by students," "Pressures within

TABLE 3   Correlation and differences between scales.

Scale	10 CD RISC	Beck (BDI 2)	Beck (BAI)	Rosemberg self-steem	Sources of stress in teachers
10 CD RISC	1				
Beck (BDI 2)	−0.532 (<0.001)	1			
Beck (BAI)	−0.581 (<0.001)	0.802 (<0.001)	1		
Rosemberg self-steem	0.645 (<0.001)	−0.785 (<0.001)	−0.675 (<0.001)	1	
Scale of sources of stress in teachers	−0.407 (<0.001)	0.432 (<0.001)	0.285 (0.038)	−0.431 (0.001)	1

rho (p-value) Spearman's correlation coefficient; statistical significance for a $P < 0.05$, with a 95% confidence interval (CI).

TABLE 4   Differences in sex.

Scale	Female ($n = 37$)		Male ($n = 16$)		P-value
	Mean (SD) (CI 95%)	Median (CI 95%)	Mean (SD) (CI 95%)	Median (CI 95%)	
10 CD RISC	31.78 ± 5.66 (29.73–33.82)	32.00 (29.47–32.75)	30.09 ± 6.35 (27.20–32.98)	31.00 (26.24–35.00)	0.361
Beck (BDI 2)	9.25 ± 8.25 (6.27–12.22)	7.00 (3.00–15.00)	12.90 ± 10.48 (6.13–17.67)	8.00 (5.56–19.87)	0.003
Beck (BAI)	11.37 ± 13.08 (6.65–16.09)	6.50 (2.00–13.00)	16.00 ± 15.66 (8.86–23.13)	10.00 (5.00–18.75)	0.029
Rosemberg self-steem	30.06 ± 4.70 (28.36–31.75)	31.00 (28.99–32.00)	29.61 ± 4.74 (27.45–31.78)	31.00 (27.56–32.43)	0.108
Scale of sources of stress in teachers	128.09 ± 57.84 (107.23–148.25)	110.50 (85.99–159.00)	149.33 ± 54.45 (124.54–174.12)	167.00 (120.72–180.19)	0.337

SD, standard deviation; CI, confidence interval; p-value from Mann–Whitney U-test; Statistical significance for a $p < 0.05$, with a 95% confidence interval (CI).

the center to obtain certain results," and "Poorly defined work schemes."

The analysis of correlations between the different scales shows negative correlations between the 10 CD RISC scale and the Beck (BDI 2), Beck (BAI), and Sources of Stress in Teachers scales with a statistical significance of $p < 0.001$ in addition to the Rosenberg Self-Esteem Scale, which also shows negative correlations with the Beck (BDI 2), Beck (BAI), and Sources of Stress in Teachers scales with a statistical significance of $p < 0.001$. Finally, positive correlations between the Beck (BDI 2), Beck (BAI), and Sources of Stress in Teachers scales and between the Rosenberg Self-Esteem and the 10 CD RISC scales with a statistical significance of I < 0.001 as shown in Table 3.

Differences between socio-demographic variables in the four questionnaires

Analyzing the differences between sexes, significant data from the Beck questionnaires, BDI 2 ($p = 0.003$), and BAI ($p = 0.029$) were found (Table 4).

No significant differences between professors with and without clinical activity, professors who contracted COVID-19 (or not), and marital status were found (Table 5).

Analysis of the contents of the open-ended question

By analyzing the content of the teachers' answers about other sources of stress not mentioned in the questionnaires

and using the Nvivo 8[TM] program, some common responses, emotions, and experiences were revealed. The main and most repeated topic was the possible conflicts between teachers due to discrepancies in teaching methods and ways to address these conflicts. Teachers also expressed great concern about job stability during this pandemic period and how their daily work has been overloaded with new academic responsibilities (Figure 1).

Discussion

The main objective of this research was to determine the relationship between factors, such as resilience, self-esteem, depression, anxiety, and academic stressors on nursing teachers and the impact of these factors on these teachers. In light of the results, it was verified that the teachers were able to withstand the emotional demands and work overloads with a new and different method of teaching due to optimal levels of self-esteem and resilience. We also found that men had higher levels of depression and anxiety than women in the study with no differences between the sexes with respect to the other analyzed variables.

Regarding our main results, maintaining adequate levels of self-esteem and resilience was manifested as essential to avoid becoming depressed and anxious; these same results were verified in previous studies that demonstrate that people with high levels of resilience and self-esteem possess better problem-solving coping strategies than those showing lower levels (Morales-Rodríguez, 2021; Özdemir and Adıgüzel, 2021; Janzarik et al., 2022).

TABLE 5 Differences between professors with and without clinical activity and differences in those with/without coronavirus 2019 (COVID-19).

Scale	Professor without clinical activity (n = 32)		Professor with clinical activity (21)		P-value
	Mean (SD) (CI 95%)	Median (CI 95%)	Mean (SD) (CI 95%)	Median (CI 95%)	
10 CD RISC	31.78 ± 5.66 (29.73–33.82)	32.00 (30.00–35.00)	30.09 ± 6.35 (27.20–32.98)	31.00 (26.24 –35.00)	0.343
Beck (BDI 2)	9.25 ± 8.25 (6.27–12.22)	7.00 (3.00–15.00)	12.90 ± 10.48 (6.13–17.67)	8.00 (5.56 –19.87)	0.142
Beck (BAI)	11.37 ± 13.08 (6.65 –16.09)	6.50 (2.00–13.00)	16.00 ± 15.66 (8.86–23.13)	10.00 (5.00–18.75)	0.201
Rosemberg self-steem	30.06 ± 4.70 (28.36–31.75)	31.00 (28.99–32.00)	29.61 ± 4.74 (27.45–31.78)	31.00 (27.56–32.43)	0.776
Scale of sources of stress in teachers	128.09 ± 57.84 (107.23 –148.25)	110.50 (85.99–159.00)	149.33 ± 54.45 (124.54 –174.12)	167.00 (120.72–180.19)	0.138
Scale	**COVID-19 (n = 35)**		**NO COVID-19 (n = 18)**		**P-value**
	Mean (SD) (CI 95%)	Median (CI 95%)	Mean (SD) (CI 95%)	Median (CI 95%)	
10 CD RISC	32.05 ± 6.76 (28.69–35.41)	32.00 (28.79–38.00)	30.62 ± 5.52 (28.73–32.52)	32.00 (29.00–34.75)	0.258
Beck (BDI 2)	7.97 ± 8.34 (3.79–12.09)	4.00 (2.39–14.01)	12.11 ± 9.52 (8.84–15.38)	10.00 (7.00–15.75)	0.090
Beck (BAI)	12.83 ± 15.84 (4.95–20.71)	5.50 (2.00–16.01)	13.40 ± 13.51 (8.75–18.04)	11.00 (5.00–16.00)	0.540
Rosenberg self-esteem	30.50 ± 5.46 (27.78–33.21)	32.00 (29.39–34.60)	29.57 ± 4.27 (26.10–31.03)	30.00 (28.00–31.00)	0.192
Scale of sources of stress in teachers	140.22 ± 70.20 (105.31–175.13)	138.00 (79.17–185.00)	134.60 ± 49.88 (117.46–151.73)	143.00 (109.00–159.00)	0.873

SD, standard deviation; CI, confidence interval; p-value from Mann–Whitney U test; statistical significance for a $p < 0.05$ with a 95% confidence interval (CI).

FIGURE 1
Digital mind map derived from the open-ended study question and used to illustrate simulation-based answers, feelings, and experiences.
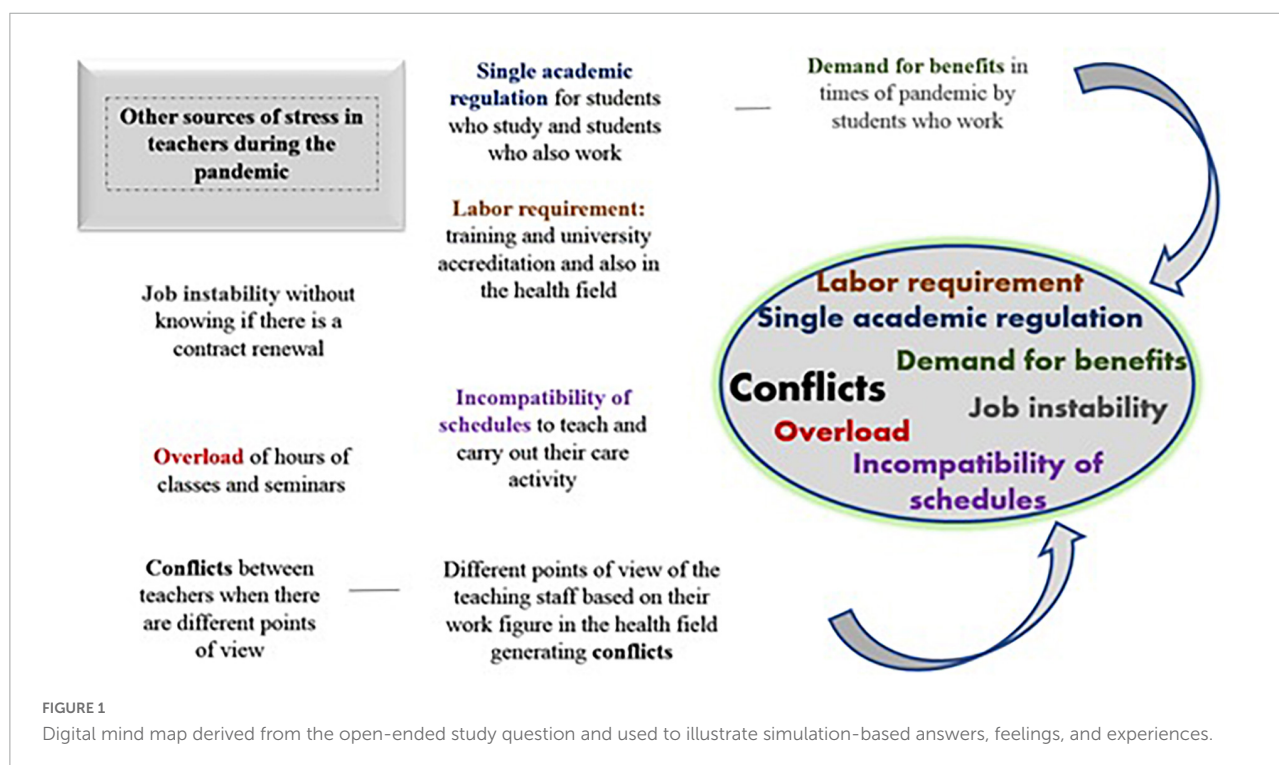
In a recent systematic review (Ozamiz-Etxebarria et al., 2021), the results suggest that teachers are experiencing adverse psychological symptoms during the COVID-19 pandemic and that anxiety levels vary between different countries. Therefore, based on our results, educational organizations should consider and encourage these teachers to maintain optimal levels of self-esteem and resilience. The negative effects of this prolonged stress and anxiety have already been reported as post-traumatic stress disorder among teachers in other studies (Kukreti et al., 2021).

Our results also point to gender differences with respect to levels of anxiety and depression with men reporting the highest levels of anxiety and depression in this study. Our results are different from other studies reviewed in the scientific literature that show that female teachers have higher levels of stress and anxiety than male teachers. In these other studies involving primary and secondary teachers, it was shown that women obtained high stress, anxiety, and depression scores (Jakubowski and Sitko-Dominik, 2021; Ozamiz-Etxebarria et al., 2021; Santamaría et al., 2021). In studies involving hospital nurses (without academic activity), female nurses were found to have higher levels of anxiety and depression (Liu et al., 2021). The explanation for the differences between those studies and our results is the different makeup of university professors in addition to depression and anxiety levels that were also well below those shown by the other studies. Specifically, our sample obtained optimal scores for resilience and self-esteem in such a way that comparing our study to other studies is more complicated.

Regarding academic stressors, the professors in our study reported moderate levels for the stressors that have the most negative impact on work, such as those related to the value given to academic work by others in addition to contradictory orders or excessive demands of work and pressure to obtain results without considering conflicts and the possibility of witnessing violence in the classroom. These data are consistent with both sets of data obtained from the questionnaire and those obtained from the open question. Our results coincide with a recent study in which pressure on academic efficacy is a very stressful factor for faculty members (Han et al., 2021). In another article, it was clearly stated that the lack of academic recognition together with overload, conflicts, and salaries below expectations are sources of academic stress and are analogous to results collected by the survey and the open question of our study (Ezenkiri et al., 2021). Balancing the workload together with clear orders from bosses can provide a good strategy for reducing academic stress as shown in the article by Lee et al. (2022) in conjunction with our results.

Some limitations of this study should be discussed. First, it is a convenient sampling technique that may produce partial outcomes so that findings are not universal. Another limitation is the sample that consists of only university nursing degree teachers, so the applicability of our results should be limited to this type of faculty. Therefore, increasing the sample by adding professors from other health sciences degrees together with random sampling could consolidate these results.

Conclusion

The pandemic has caused a sudden divergence in teaching and learning methods in universities around the world, so understanding the impact that these changes have had and

are producing is essential for educational organizations. Our study shows that nursing degree teachers, even though many of them combine teaching and care activities, reported moderate levels of anxiety, depression, and tolerance to academic stressors largely due to optimal levels of self-esteem and resilience, a result indicating that showing these two factors act as protectors for them.

Relevance for clinical practice

Nursing teachers combine teaching with activities and presented moderate levels of anxiety, depression, and tolerance to academic stressors and were able to maintain optimal levels of self-esteem and resilience, indicating that these two factors act as protectors against these stressors. Balancing the workload together with clear orders from bosses can provide a good strategy for reducing academic stress.

Data availability statement

The data supporting the conclusions of this article will be made available by the authors upon reasonable request.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of the Universidad Rey Juan Carlos (2910202121221 number). The patients/participants provided their written informed consent to participate in this study.

Author contributions

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Sharing intention of electronic health records in online health communities: Patients' behavioral decisions in the context of privacy protection measures

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Online health communities (OHCs) have become more important to people's daily lives on the foundation of the voluntary sharing of electronic health records (EHRs). However, no in-depth investigation has been conducted concerning the influence of the perceptions of privacy protection among patients on their willingness to share EHRs. To fill the knowledge gap, by combining and modifying the theory of planned behavior (TPB) and the health belief model in the context of the privacy protection models implemented by OHCs, an empirical research method using a questionnaire approach is conducted to validate the hypotheses. The results indicate that the more positive a patient's attitude toward medical information sharing behavior is, the higher that patient's level of perceived behavioral control; in addition, the greater the social rewards obtained from this process, the more willing the patient is to share his or her EHRs after privacy protection measures are implemented by OHCs. Meanwhile, the effects of past positive experiences and disease severity have also been tested. The findings of this study can be used to promote patients' full participation in OHCs from a privacy perspective and offer theoretical and practical suggestions to promote the development of OHCs.

1. Introduction

1.1. Electronic health records shared in online health communities

Due to the continuous development of health information technology, the emergence of online health communities (OHCs) has greatly facilitated interactions between physicians and patients (Cotten and Gupta, 2004; Jadad et al., 2006; Guo et al., 2017, 2018). These interactions are based on sharing and exchanging personal electronic health records (EHRs) on the part of patients through the use of OHCs. EHRs are defined in terms of all information pertaining to the following factors related to the patient or their family: physical or mental health, medical history, treatment process, treatment outcomes and satisfaction, medications taken, experiences with medical care or treatment, and other health-related information posted by the patient as part of his or her participation in the community (Escoffery et al., 2008). For example, a patient must disclose information regarding his or her health condition, illnesses, symptoms, and medications to the doctor or other patients when consulting a doctor, and when sharing experiences of previous medical care, the related treatment methods, therapeutic effects, etc., should also be shared. As a platform for information sharing and interaction between doctors and patients or between patients and other patients, the personal EHR shared by patients in the context of OHCs can help doctors working online test the effectiveness of their diagnoses and treatments and improve their treatment methods, which can also alleviate the difficulties caused by information asymmetry and a shortage of medical resources. On the other hand, an EHR shared with other patients (such as PatientLikeMe) can enrich the health knowledge available in OHCs and serve as a reference for other patients, which can promote the level of health care available to other patients (Dang et al., 2020). Therefore, the voluntary sharing of personal EHRs is the foundation of the development of online health communities.

1.2. Privacy protection measures in online health communities

To facilitate EHR sharing behavior in the context of OHCs, studies have explored ways of allowing OHCs to protect EHRs shared by patients in legal or technical terms (Scheibner et al., 2021). As incidents of data leakage increase, the sharing behavior of users of a platform is influenced by the patient privacy protection policies implemented by the platform (Rainie and Duggan, 2016). Recent studies have shown that only a small percentage of users trust the personal data protection services of such platforms (Aïmeur et al., 2016). The key barriers to EHR sharing acceptance are health care coverage, privacy, and the security of EHRs. When users gradually discover that platforms generate revenue from the data that users share online, this discovery contradicts the patients' desire to protecting their

personal privacy, which can influence users' beliefs regarding the platform and further influence their willingness to share EHRs *via* the platform. In fact, OHCs have gradually implemented a series of privacy protection measures, such as concealing patients' personal information (e.g., name/gender/address/contact information), ensuring that test results such as images are visible only to doctors, and intelligently identifying the privacy of offline treatment information (hospital/section/doctor visited, etc.). In other words, in existing OHC applications, the EHRs shared by patients are already the target of some privacy protection strategies to offset the privacy concerns expressed by some patients and to increase patients' willingness to share their EHRs. However, some studies have noted that most patients have no clear and specific understanding of health care privacy (McGuire et al., 1985). Studies have shown that most internet users do not read lengthy privacy policies in their entirety when sharing information (Furnell and Phippen, 2012; Ermakova et al., 2014). In the context of sensitive health information, people merely tend to make intuitive judgments regarding whether to disclose such information and do not give much attention to privacy leaks or levels of protection (Yawn et al., 1998; Merz et al., 1999). Additionally, if patients desire to use an OHC platform, they must agree to the platform's privacy policy, or they may be unable to use the services offered the platform in full. However Patients are unable to choose which parts of their information they desire to disclose when they agree to the current privacy policy (Kim et al., 2019).

In summary, most existing studies have focused on the protection methods used with respect to patients' shared EHRs in OHCs (i.e., in terms of network technology, sharing protocol, or hardware services) but have not explored the impact of users' perceptions of the privacy protection policy used for patients in OHCs on those patients' willingness to share. Therefore, the effectiveness of the privacy protection policies of OHCs (i.e., the ways in which patients make decisions regarding the sharing of EHRs due to their perceptions of the patient privacy protection offered by OHCs) remains unclear and is worth investigating.

1.3. Research objective

Privacy calculus theory, which is based on the assumption of rationality, has been widely used in research concerning the protection of health information privacy in the context of OHCs (Dang et al., 2021). Privacy calculus theory explains patients' online privacy disclosure behaviors in terms of risks and benefits. If the benefits outweigh the risks, patients may choose to disclose their private information (Culnan and Armstrong, 1999), and patients' access to social support is one of the most important benefits in this context (Dang et al., 2021). That is, patients' EHR sharing behaviors, such as by sharing their medical history, medications taken, and medical experiences, are not driven by financial gain but rather by the moral needs to help other patients and obtain information and emotional support. However, other

studies have noted that people are not fully compliant with the reciprocal privacy calculus in the context of privacy breaches; on the one hand, people exhibit a stronger tendency to refuse to share when their privacy feels threatened, but they occasionally exchange their privacy for small favors (e.g., small gifts) (Dang et al., 2021). On the other hand, patients have different levels of willingness to share different forms of private health care information. With respect to some information, patients prefer to share with medical personnel rather than family members or third-party machines, while with regard to other contexts, such as data from genetic test reports, patients are more likely to share information within their families (Tessaro et al., 1997; Applebaum-Shapiro et al., 2001). Thus, in practice, patients' decisions concerning EHR sharing are also influenced by psychological factors and personal preferences, which are not entirely identical with rational privacy calculations. In particular, the uncertainty associated with EHR sharing decisions is increased when patients feel that their privacy is protected by OHCs. Therefore, the theory of planned behavior (TPB), which adds "perceived behavioral control" to the theory of rational behavior, is more applicable in this context. Therefore, this study uses an empirical method to investigate the willingness of patients to share their EHRs in OHCs in the context of the privacy protection strategies employed by such platforms. The results of this study can help encourage patients to share EHRs proactively and thus develop the necessary conditions to ensure the sustainable development of OHCs.

1.4. Theoretical model construction and hypothesis formulation

1.4.1. Theory of planned behavior

The theory of planned behavior (TPB) proposed by Ajzen and Fishbein is the successor to the theory of reasoned action (TRA; Fishbein & Ajzen, 1975). Icek Ajzen found that human behavior is not completely voluntary but rather faces certain forms of control (Ajzen, 1991). Therefore, he added the new concept of "perceived behavior control" to the theory of reasoned action and thus proposed the theory of planned behavior. According to the theory of planned behavior, an individual's actual action is determined by that individual's behavioral intention, and this behavioral intention is influenced by the individual's attitude regarding the behavior, subjective norms and perceived behavioral control. A schematic representation of the theory of planned behavior is shown in Figure 1.

The theory of planned behavior has good explanatory and predictive power with respect to behavior and has been widely used in studies of various forms of behavior, such as consumer behavior, entertainment online behavior, and exercise and learning behavior (Webb and Sheeran, 2006). The theory of planned behavior has been applied in many cases to explain users' online behavior. For example, Lee used an extended theory of planned behavior to investigate the online transaction behavior of internet users, in which context they added two variables, i.e.,

trust and perceived risk, to the model and achieved good explanatory effects (Lee, 2009). Some scholars have also applied the theory of planned behavior alongside theories such as those pertaining to privacy concerns to study the information disclosure behavior of users of social networks (Li et al., 2020). In the field of health, the theory of planned behavior has also been used widely. Achterberg et al. combined the theory of planned behavior with other theories to explain people's dietary and nutritional behaviors (Achterberg and Miller, 2004). The theory of planned behavior can also explain the factors that motivate or hinder people's actions in order to explain and predict people's behavior, which can also be used to facilitate interventions in people's behavior.

Although the theory of planned behavior has been supported and validated by a large number of studies, it has also been revealed to have many shortcomings and deficiencies in the context of long-term empirical tests. In contrast to other affective processing models, the theory of planned behavior has ignored the negative or positive emotions of individuals to some degree (Dutta-Bergman, 2005). Especially in the context of studies concerning health behaviors, emotional feelings are an important variable that cannot be ignored. Therefore, a number of scholars have argued that the existing variables included in the theory of planned behavior cannot explain the behaviors and intentions of individuals adequately. These scholars have tried to add variables such as personality, behavioral experience, and anticipated regret to the model to improve its explanatory power (Sutton, 1994; Aarts et al., 1998). The theory of planned behavior has also been expanded in many respects *via* the addition of a variety of variables. All of these attempts are valuable as long as they lead to an improved explanation of the research problem.

1.4.2. Factors related to planned behavior and willingness to share

According to the theory of planned behavior, actual behavior is determined by behavioral intentions, which are influenced by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). Among these factors, subjective norms reflect the behavior beliefs affected by social pressure; however, Sheeran and Orbell argued that social pressure is difficult to investigate directly due to the fact that it is affected by the subjective willingness of others, which indicates that subjective norms cannot effectively reflect the influence of social pressure on individual behavior (Sheeran and Orbell, 1999). Meanwhile, Eisenberger defined social reward in terms of the pleasure, satisfaction, and fulfilment that individuals obtain from interpersonal interactions (Eisenberger et al., 1990). Jiang et al. extended the concept of social rewards and applied it to the online social environment to elaborate its perceived benefits based on privacy calculus theory (Jiang et al., 2013). When individuals realize that a certain social relationship can allow them to receive social rewards, they tend to make greater efforts to maintain or deepen the relationship in question (Schimel et al., 2001). Accordingly, social rewards can reflect the amount of online social pressure to some extent. Previous studies have already used social rewards to explain and

FIGURE 1
Theory of planned behavior.
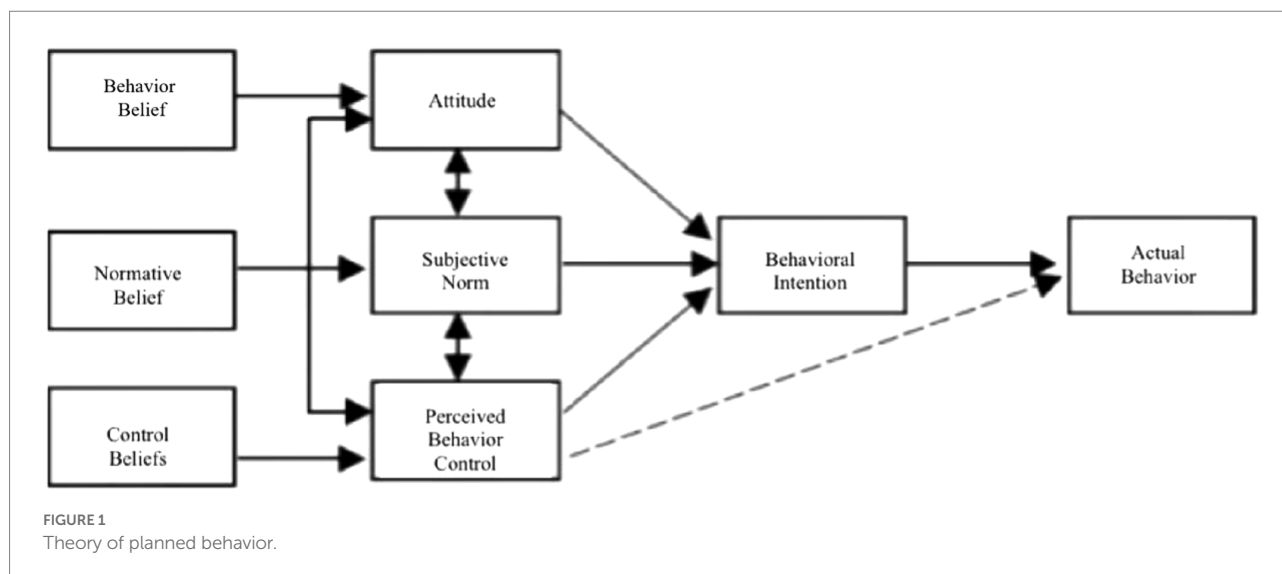
predict the online information publishing and sharing behaviors of internet users (Tidwell and Walther, 2002; Jiang et al., 2013). This study focuses on the online environment of OHCs, in which context patient use and sharing behaviors are rarely influenced by their offline social environment but rather depend on their online interactive experiences and the rewards received. Against this backdrop, this study uses social rewards as a replacement for subjective norms to reflect social pressure more adequately. Therefore, we propose that the factors that influence patients' willingness to share EHRs are social rewards, attitudes, and perceived behavioral control.

1.4.3. The relationship between social rewards and willingness to share

During social interactions, individuals are restricted by the needs for reciprocal exchange and fair information exchange (Lawler and Thye, 1999). Tidwell and Walther studied personal information exchange in the context of computer-mediated communication and found that individuals tend to disclose their personal beliefs, needs, values, etc. (Tidwell and Walther, 2002). to those with whom they share a social interest. In fact, when engaging in social exchange, individuals are expected to share personal information to reciprocate for the benefits provided by others (Lawler and Thye, 1999). In addition, Jiang et al. noted that individuals on the internet are more willing to share their personal information to obtain social rewards and receive personal benefits (Jiang et al., 2013).

First, patients can engage in doctor–patient communication in OHCs to evaluate the effects of treatment and the service attitudes of doctors, share information regarding how to choose doctors, and exchange medical experiences, among other goals. During these processes, patients can help other patients either directly or indirectly and can receive gratitude or respect from those others; meanwhile, they can also obtain psychological satisfaction from helping others. In addition, friendship among

patients can be promoted and better interpersonal relationships can be constructed when patients post in OHCs, communicate and share EHRs candidly with doctors and patients online. Previous studies have shown that patients with mental health issues tend to utilize online depression communities to share experiences and exchange valuable information and emotional support to cope with their own diseases (Lu et al., 2021). Moreover, another study verified that the information provided *via* OHCs is moderately understandable and reliable, which can encourage and motivate patients to participate in such communities to improve their health (Kavosi et al., 2020). Specifically, both the psychological satisfaction and the doctor–patient relationship discussed above can be identified as "social rewards." The existence of social rewards facilitates the exchange and circulation of EHRs in OHCs. If patients who use OHCs are not rewarded for contributing their EHRs, they tend to lose motivation to contribute content in the future. In contrast, when such patients realize the rewards of sharing EHRs voluntarily under conditions characterized by the privacy protection measures of OHCs, they may be more motivated to do so and thus become more active with respect to the subsequent instance of sharing. Therefore, we propose that the more social rewards are available, the more willing patients in OHCs are to share.

> *H1*: Social rewards have a positive effect on the intention to share EHRs.

1.4.4. The relationship between attitude and willingness to share

Attitude is a positive or negative feeling experienced by an individual when performing a particular behavior, and this factor has been used widely in behavioral research models. In the target risk assessment (TRA) model, the theory of planned behavior (TPB) model and the technology acceptance model (TAM),

attitude has been proven to be directly related to users' behavioral intentions.

In OHCs, patients must communicate with doctors and other patients to receive medical assistance, engage in experience sharing, etc. Presently, sharing is profitable, and patients can share EHRs pertaining to factors such as their current health conditions or the names and symptoms of their diseases to receive advice concerning how to treat their diseases or study the experiences of other patients with the same conditions. They can also share their experiences with other patients and evaluate the effectiveness of the treatments and services provided by their doctors to gain recognition and appreciation from other patients. However, potential risks are associated with sharing EHRs in the context of personal privacy. Patients in OHCs may have certain privacy concerns when sharing EHRs and may even cease sharing when they encounter unknown risks. Therefore, sharing EHRs can have both positive and negative effects, and patients may intuitively feel positively or negatively regarding such behavior. Specifically, when patients are informed of the privacy protection measures implemented by OHCs, they are willing to share their EHRs if they believe that OHCs can protect them from privacy invasions resulting from their EHR sharing behavior. Conversely, if patients believe that such behavior would be detrimental to them or have a negative impact on them, they tend to be unwilling to share. Pouyan showed that when patients perceive the privacy protection measures implemented by OHCs to be transparent, this perception tends to influence patients' attitudes and beliefs and ultimately promote patients' willingness to disclose their health information (Esmaeilzadeh, 2019). Therefore, patients' positive or negative evaluation of EHR sharing behavior in the context of OHCs' privacy protection measures, i.e., their attitudes toward such behavior, affect the willingness associated with their behavioral intentions directly.

H2: Attitude has a positive effect on intention to share EHRs.

1.4.5. The relationship between perceived behavioral control and willingness to share

Like attitudes, perceived behavioral control has also been widely applied to behavioral research models; this term refers to the individual's perceived degree of control or mastery when performing a specific behavior. Perceived behavioral control reflects the individual's past experiences, the availability of second-hand information, and the expected impediments to the behavior. In the TRA, TPB, and TAM models, perceived behavioral control has been shown to have a direct relationship with an individual's behavioral intention.

Because EHRs have differences from other forms of information, they are associated with a high degree of sensitivity and may be private or intimate. Many uncertainties may arise when patients share EHRs in OHCs, such as concerns that the website may disclose such EHRs to others or that unscrupulous people may steal the individual's health information. There are

also many unknown risks in this context, for example, the possibility that social discrimination may result from privacy leaks. Therefore, the consequences of sharing EHRs are beyond patients' ability to control. However, patients are willing to share their EHRs in the OHC if they feel that the privacy protections provided by the OHC are effective and they have sufficient information (e.g., concerning privacy settings on the website or legal requirements) to ensure that the information that they post is secure. Additionally, patients are glad to use OHCs to obtain information or help if they believe that they have sufficient ability and the necessary means to address the adverse consequences of posting information. Otherwise, patients are more likely to hesitate or even cease disclosing their EHRs. Therefore, it can be argued that perceived behavioral control directly affects patients' willingness to share EHRs in OHCs.

H3: Perceived behavioral control has a positive effect on the intention to share EHRs.

1.4.6. Health beliefs as salient beliefs

Individuals possess a large number of behavioral beliefs, and the theory of planned behavior identifies salient beliefs as the cognitive and emotional basis for behavioral attitudes, perceived behavioral control and subjective norms. The health belief model was the first theoretical model to explain individual health behaviors; this model was first proposed by the American psychologist Hochbaum in the 1950s and subsequently revised by Becker and Maiman (Wang et al., 2022). The health belief model explains the factors that influence people's engagement in certain health behaviors from the perspective of the formation of health beliefs (Poss, 2001). The health belief model was first applied to the task of screening people for disease prevention, such as by predicting breast screening behaviors (Yarbrough and Braden, 2001; Wu and Yu, 2003). The health belief model has now been extended to other areas, such as daily exercise behaviors, the prevention of chronic diseases, and intervention in cases of maladaptive behaviors (Hossain et al., 2021). Many studies have confirmed that when explaining and predicting health-related behaviors, the health belief model may function better when combined with other theories of behavior. Some scholars have combined the health belief model with the theory of rational behavior to explain tuberculosis screening behavior (Poss, 2001). Sun, X. sleet et al. suggested that the concepts and connotations of some variables included in the health belief model and the theory of planned behavior are similar and complementary; thus, they can be combined to explain and predict health-related behaviors to increase explanatory power (Sun et al., 2009).

Considering the characteristics of OHCs, we organized the key factors of health beliefs (Glanz et al., 2008) into three factors: disease severity, past positive experiences and EHR sensitivity. First, disease severity is a concept representing an extension of perceived susceptibility and perceived seriousness. Patients' psychological characteristics and their concerns regarding and

perceptions of illness vary across diseases, and health-related behaviors are influenced by the type of illness in question. Some studies have confirmed that people with different disease types exhibit different attitudes and levels of willingness to engage in medical behaviors. Second, past positive experience is a concept that ranges from cue to action. Previous use experiences represent cues regarding the patient's ability to master actions and can help guide future actions. Positive interaction experiences can promote trust and motivate users' behaviors (Song, 2007; Bansal and Gefen, 2010). Finally, health information sensitivity is a concept that encompasses the perceived benefits of taking action and the perceived barriers to taking action. Health information sensitivity refers to the degree to which a patient weighs his or her beliefs regarding the barriers to and benefits of shared action at the level of health information privacy protection. Thus, based on the health belief model, we identified the antecedents of the planned action theory as past positive experiences, disease severity, and health information sensitivity.

1.4.7. Influence of past positive experiences on attitudes, social rewards, and perceived behavioral control

Past positive experiences refer to positive experiences that users have encountered during their previous use of OHCs. Previous studies have found that internet users' past positive experiences on certain websites can increase users' trust as well as their number of visits to the website in question (Jarvenpaa et al., 1998). Similarly, Song also noted in an article that past positive experiences have a positive effect on high levels of behavioral belief, which can enhance the individual's behavioral intention to use technology systems (Song, 2007). In a study concerning the sharing of health information, Bansal et al. suggested that past positive experiences can influence the behavioral intentions of website users to share health information online directly (Bansal and Gefen, 2010). Many studies have shown an influential relationship between trust and attitude (Cook and Wall, 1980; Jones, 1996).

OHCs are consultative communication platforms that facilitate doctor–patient interactions, and these experiences influence users' levels of trust and dependence on OHCs. When users trust OHCs, they may have a friendlier attitude and exhibit a higher level of willingness to share their personal EHRs. Conversely, previous negative experiences can damage users' level of trust in OHCs, which in turn may affect their attitudes toward sharing their EHRs. Therefore, past positive experiences may influence the attitudes of patients in OHCs with respect to the action of sharing EHRs.

Simultaneously, patients with past positive experiences in OHCs are bound to be well adapted to OHCs that feature an online environment. In this case, such patients are also more likely to receive more social rewards from the website, doctors and other patients. Therefore, users in OHCs who have had past positive experiences are more likely to receive social rewards. The more

past positive experiences that a user has had, the more social rewards they tend to receive.

Perceived behavioral control is itself a hindrance that reflects an individual's past experiences and expectations, and this factor is necessarily influenced by past positive experiences. Patients with more past experiences of OHCs tend to be more familiar with such websites and to have access to better resources. Furthermore, the resistance such patients encounter when using the website tends to be lower. The more positive a patient's experiences, the more capable that patient in of behaving in the appropriate manner. In other words, the higher a patient's level of past positive experience is, the higher that patient's perceived behavioral control in the context of sharing his or her EHRs.

> *H4a*: Past positive experiences have a positive effect on the social rewards received by OHC users.
> *H4b*: Past positive experiences have a positive impact on patients' attitudes toward sharing EHRs in OHCs.
> *H4c*: Past positive experiences have a positive effect on patients' perceived behavioral control when sharing EHRs in OHCs.

1.4.8. Effect of disease severity on attitudes

Disease severity refers to the perceptions of users of OHCs who subjectively experience their health status as good or poor. In addition to personality traits, personal health status also influences one's attitudes toward one's personal EHRs. Tisnado et al. investigated the effect of the relationship between demographic characteristics and individual health status on the consistency between real health records and self-shared EHRs (Tisnado et al., 2006). These authors found that this consistency only differed significantly with respect to patient health status. Patients who perceived their health status as poor tend to be more sensitive to their EHR than others. Patients may fear that once their medical health information is disclosed, this information is no longer be confidential (Rindfleisch, 1997). Applying these studies to the online environment, the perceived health status of internet users can influence their attitudes regarding the behavior of sharing their personal EHRs (Bansal and Gefen, 2010).

The primary purpose of users of OHCs is to obtain medical help and facilitate patient communication. Their levels of participation and activity in such communities varies across different states of health. When patients are healthy, they do not need to consult with doctors or contribute content such as their medical experiences. Considering the privacy of EHRs, such patients may reject the possibility of sharing their medical health information. When patients are in poor health, in contrast, they must obtain assistance to improve their health, and a prerequisite for obtaining help is explaining their own condition to the persons from whom they are seeking help; therefore, these patients are forced to share their EHRs autonomously. Simultaneously, the attitudes of such patients

toward this behavior tend to change. Hence, we assume that OHC users' perceptions of disease severity affect their attitudes regarding sharing their personal EHRs.

> *H5*: Disease severity has a positive effect on the attitudes of OHC users regarding sharing their EHRs.

1.4.9. Influence of health information sensitivity on attitudes and perceived behavioral control

On the one hand, health information sensitivity refers to the perceived sensitivity of OHC users with respect to their personal EHRs. An individual's perception of information sensitivity depends on his or her individual characteristics and health status. Previous research concerning privacy has found that consumers' willingness to disclose personal information is closely related to their levels of information sensitivity (Milne, 1997; Phelps et al., 2000; Malhotra et al., 2004). Wang and Petrison noted that consumer reactions to privacy threats depend on the type of information that marketers are asking them to reveal (Wang and Petrison, 1993). This claim is also supported by the research of Milne, who found that when personal information is collected from people, the eligibility rates of the information they provide vary in accordance with the level of sensitivity involved in the information (Milne, 1997). Concerning online EHRs, it has been argued that the greater the sensitivity of this health information is, the more serious are the privacy concerns that people have when posting it, which in turn affects their attitudes toward such behavior (Simon et al., 2009; Bansal and Gefen, 2010). Thus, even when privacy protection measures are implemented by OHCs, EHR-sensitive patients maintain more negative attitudes regarding EHR sharing than nonsensitive patients.

Perceived behavioral control, on the other hand, refers to the patient's perceived ability to control or remain in control of EHR sharing behavior. The factors that influence perceived behavioral control during internet use can be summarized in terms of four points: (1) the voluntary nature of user information submission; (2) the privacy settings of the website; (3) the type of information collected by the website; and (4) the transparency of information use by the website. That is, information sensitivity can impact perceived behavioral control. Low sensitivity of the information requested by the website not only reduces the user's sense of apprehension regarding the possibility of his or her personal information being leaked or shared, thus causing the user to feel a high degree of control regarding such personal information, but also increases users' levels of perceived control over the act of sharing information and vice versa (Hoadley et al., 2010). Therefore, we hypothesize that when privacy protection measures are implemented by OHCs, patients with greater information sensitivity continue to feel less control with respect to sharing their EHRs.

> *H6a*: The sensitivity of health information has a negative effect on the attitudes of OHC users when sharing EHRs.
> *H6b*: Health information sensitivity has a negative effect on OHC users' levels of perceived behavioral control when sharing their EHRs.

1.4.10. Moderating effect of chronic diseases

An increasing number of people tend to obtain health information *via* the internet; meanwhile, many patients have also improved their health conditions by consulting health information on the internet. Chronic diseases are a collective term for a group of diseases that is represented by hypertension, coronary heart disease, diabetes, etc. Such diseases are characterized by long durations, complex causes, high levels of recurrence and difficulty with respect to curing, which prompt patients to seek health information more actively in order to receive help and support. Compared with other disease groups, patients with chronic diseases exhibit higher information needs. Simultaneously, chronic patients' psychological characteristics are different from those exhibited by patients associated with other disease groups. Some studies have concluded that the psychological characteristics most closely associated with chronic disease patients are anxiety, tension, depression, and negative pessimism (Dyrehag et al., 1998; van Montfort et al., 2017).

Approximately 60% or more of OHC users are chronic disease patients, making OHCs the main way that chronic disease patients are able to obtain and share EHRs. Compared with patients associated with other disease groups, to improve their health and relieve psychological stress, chronic disease patients require more social support and help and exhibit higher demands for information; thus, these patients rely more on and tend to trust OHCs. In addition, the quality and quantity of information is more important in this context than are spiritual satisfaction and material rewards. Therefore, for patients with chronic diseases, social rewards have less influence on their levels of willingness to share EHRs. However, due to their demand for social support and care, chronic patients tend to have a stronger sense of trust in and dependence on OHCs and more positive attitudes regarding EHR sharing behavior; in addition, the role of attitudes and perceived behavioral control on their willingness to share tends to be more pronounced (Andreou et al., 2022).

> *H7a*: Chronic diseases have a negative moderating effect on the relationship between social rewards and willingness to share EHRs.
> *H7b*: Chronic diseases have a positive moderating effect on the relationship between attitudes and willingness to share EHRs.
> *H7c*: Chronic diseases have a positive moderating effect on the relationship between perceived behavioral control and willingness to share EHRs.

1.4.11. Control variables

The control variables included in the model used in this study mainly include the following:

1.4.11.1. Gender

Men and women have different social roles and personality traits; women are usually passive, while men tend to be more active. Moreover, different genders feel and act differently in the same situation (Zhang et al., 2014). Therefore, gender may have an impact on individuals' willingness to share their EHRs.

1.4.11.2. Age

People of different ages have very different physical conditions and life experiences, so their perceptions and feelings in the same situation may also differ (Reuter et al., 2010). Younger people have a more positive attitudes regarding their experiences, while older people are more conservative. Therefore, age may have an impact on individuals' willingness to share their EHRs.

1.4.11.3. Level of education

The more educated people are, the better their judgment and cognitive abilities and the more likely they may be to behave differently (Ng and Feldman, 2009). Therefore, educational attainment may affect individuals' willingness to share their EHRs.

Computer use experience. Computer use experience affects people's attitudes and decisions regarding objects encountered online. The longer people use computers and the more proficient they are in using computers, the more likely they are to choose to share their information. Therefore, computer use experience may have an impact on individuals' willingness to share their EHRs.

Based on the preceding analysis, this study constructs a model of the factors influencing patients' levels of willingness to share their EHRs in the context of the privacy protection measures implemented by OHCs. The underlying theoretical framework of the model is the theory of planned behavior, and the antecedent variables are identified based on the health belief model, with chronic disease as the moderating variable. The model structure is shown in Figure 2.

2. Materials and methods

2.1. Variable measurement and questionnaire design

In this study, the model hypotheses were tested empirically by using a questionnaire research method. First, based on previous research results, this study designed a measurement scale for model construction (see Table 1 for details). The questionnaire included four parts: the first part was used as a basic introduction and to explain the privacy protection measures implemented by OHCs; the second part was intended to allow us to understand respondents' usage of OHCs; the third part measured the model construction; and the fourth part

focused on the basic information of respondents. In the second part of the questionnaire, respondents were asked to indicate their level of agreement or disagreement with the descriptions included on the questionnaire using a 7-point Likert scale. Points 1 to 7 indicated "strongly disagree," "disagree," "basically disagree," "neutral," "basically agree," "agree," and "strongly agree," respectively. The third part of the indicators allowed us to collected the basic information of respondents, including their genders (GEN), ages (AGE), academic qualifications (EDU), length of internet use (IUT), whether they were suffering from chronic diseases (CD), length of medical website use, and annual frequency of illness.

2.2. Sample data collection

2.2.1. Prestudy and questionnaire validity test

The validity of the questionnaire must be tested prior to the formal mass distribution of the questionnaire. In this study, the questionnaire was modified and improved in accordance with the results of this test in terms of both content validity and structural validity.

First, the content validity of the questionnaire was examined. The questionnaire was evaluated by other scholars to highlight its shortcomings. Subsequently, the questionnaire was simplified and modified to address these shortcomings. The content of the questions concerning perceived behavioral control and social rewards was largely simplified. The wording of some questions was also modified, such as by replacing "a lot" with "very much."

Subsequently, the questionnaire was tested to examine its construct validity. During this stage, a small-scale presurvey was conducted mainly *via* the internet, and online questionnaires were distributed to OHC users. Eighty questionnaires were distributed, and 59 valid questionnaires were returned.

2.2.1.1. Convergent validity test

The indicators used to test convergent validity were factor loading, Cronbach's alpha, composite reliability, and average variance extraction (AVE). The relevant literature has indicated that the following conditions, shown in Table 2, should be met during the convergent validity test.

Factor analysis was first conducted with respect to each construct by using software Smart PLS, and factor loadings less than 0.75 were removed. Subsequently, the retained prestudy data were reanalyzed for convergent validity (Appendix A), and it was found that the Cronbach's alpha coefficient and the composite reliability coefficient of each construct were greater than 0.75 and that the mean variance extracted was greater than 0.6. Therefore, each construct exhibited good convergent validity with respect to its measure (Chin et al., 2003).

2.2.1.2. Discriminant validity test

Discriminant validity tests are usually measured in terms of two indicators: (1) the correlation coefficients among

FIGURE 2
Theoretical framework.
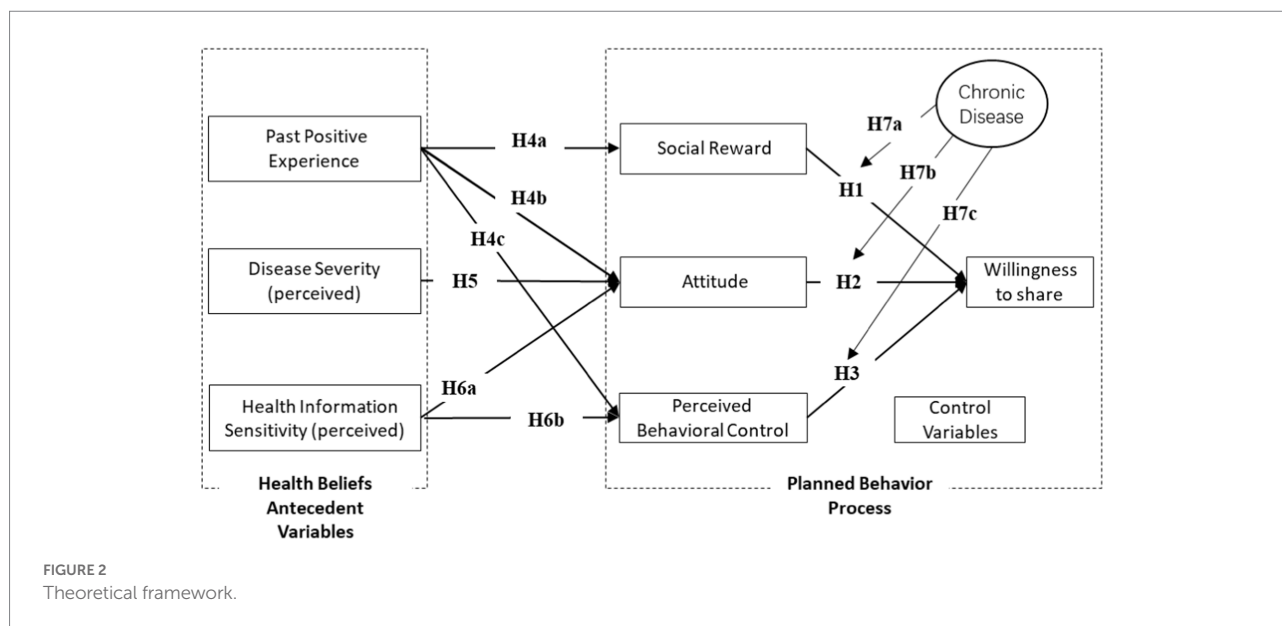
constructs are less than the arithmetic square roots of the mean variance extracted from the constructs themselves and (2) the cross loadings for each measure on a construct are greater those on the other constructs. Discriminant validity tests were conducted on the prestudy data using Smart PLS (Appendix B). The results showed that the correlation coefficients for each construct were smaller than the diagonal data, i.e., the arithmetic square root of the mean variance extracted for the constructs themselves. In addition, the factor loadings of each measure on the constructs were greater than those on other constructs. Therefore, there was good discriminant validity among the constructs.

In summary, this prestudy questionnaire exhibited good convergent validity and discriminant validity, and the measures of each construct were valid for large-scale distribution to collect sample data for empirical research.

2.2.2. Questionnaire distribution and collection

The results of the prestudy and questionnaire validity tests indicated that this research questionnaire was valid; some of the questions with small factor loadings were deleted, and the remaining questions were renumbered. Subsequently, the final research questionnaire was designed (see Appendix C for details). A large-scale distribution of the final questionnaire was conducted for the purposes of this study. The target population mainly included patient users of OHCs, and there were no restrictions concerning particular communities and websites. The questionnaires were mainly created *via* the Questionnaire Star platform and were sent to respondents in the form of an internet link; a few questionnaires were distributed on paper. A total of 331 questionnaires were distributed and 234 valid questionnaires were collected; accordingly, the effective return rate of the questionnaire was 70.7%.

2.2.3. Descriptive statistical analysis of the sample

A total of 234 valid questionnaires were collected for this study, and the collected samples were statistically described in terms of seven aspects, including gender, age, education, length of internet use, length of online medical website use, frequency of illness per year, and whether the respondent suffered from a chronic disease, as shown in Table 3.

According to data drawn from the "China Online Medical Market Research Report" by Enfodesk, the ratio of male to female users of online medical websites in China is 49.7%:50.3%, with a higher proportion of female users; youths aged 19–35 are the main group of such users, accounting for 69.1% of the total population; the majority of users have an undergraduate level of education or higher, accounting for 73.9% of the total; and patients with chronic diseases account for a large proportion of the population. By comparing the sample statistics of this study with the report from Enfodesk, it can be seen that the proportions basically match. This fact indicates that the sample is representative of the overall population to a certain degree. Moreover, approximately 80% of users included in the sample have used online medical websites for more than 2 years, making the sample highly representative.

2.2.4. Test for normal distribution of sample data

Bentler et al. noted that a prerequisite of structural equation modeling analysis is that the sample dataset must satisfy the requirements of normal distribution (Bentler and Chou, 1987). In this study, the absolute values of skewness and kurtosis should be less than the threshold of 2 and 5, respectively, to determine whether the sample data satisfied the requirements of normal distribution according to the criteria proposed by Bentler. Descriptive statistical analysis was performed on the

TABLE 1 Measurement scales.

Constructing	Number	Measurement scales	Sources
Willingness to share	PHID1	I am willing to provide my EHRs to OHC sites and other users (doctors, patients)	Yoo et al. (2013)
	PHID2	I am willing to have my EHRs used by OHC sites and other users (doctors, patients)	
	PHID3	I do not feel bad about disclosing my EHRs to OHC sites and other users (doctors, patients)	
	PHID4	I may share my EHRs with OHC sites and other users (doctors, patients)	
Attitudes	A1	Sharing EHRs with OHC sites and other users (doctors, patients) is a good idea	Kim et al. (2009)
	A2	Sharing EHRs with OHC sites and other users (doctors, patients) is a wise practice	
	A3	I like the practice of sharing EHRs with OHC sites and other users (doctors, patients)	
	A4	The practice of sharing EHRs with OHC sites and other users (doctors, patients) is enjoyable	
Perceptual behavioral control	PBC1	I am able to control the EHRs that I post and share in the OHC	Kim and Kankanhalli (2009)
	PBC2	I have the necessary resources to reduce the likelihood of adverse outcomes from posting and sharing EHRs in OHCs	
	PBC3	I have the necessary knowledge to address the problems that can arise from posting and sharing EHRs in OHCs	
Social rewards	SR1	I feel that using an OHC will satisfy my social needs (e.g., for money, respect, and social status) to some extent	Jiang et al. (2013)
	SR2	I believe that participating in interactions *via* the OHC improves my interpersonal relationships with the site and its users (doctors, patients)	
	SR3	I believe that I can derive spiritual pleasure and satisfaction from participating in an interactive OHC	
Past positive experiences	PPE1	In the past, OHCs and interactions with their users (doctors, patients) have been useful to me	Song (2007)
	PPE2	In the past, I have benefited from OHCs and their users (doctors, patients) a great deal	
	PPE3	In the past, I have frequently had positive interactions with OHCs and their users (doctors, patients)	
Disease severity	DS1	My body rarely suffers from prolonged illness or discomfort	Bansal and Gefen (2010)
	DS2	I do not believe that I have any chronic illnesses in my body	
	DS3	I believe that my general health is very good	
Health information sensitivity	IS1	I feel that the level of sensitivity of the EHRs requested from me by the OHC is not sensitive/sensitive	Bansal and Gefen (2010)
	IS2	I believe that the level of sensitivity of EHRs shared by other users in OHCs is not sensitive/sensitive	
	IS3	I feel that the level of sensitivity of the EHRs that I share in OHCs is not sensitive/sensitive	

sample data using SPSS 19.0 software (Appendix D). The results showed that the absolute values of skewness of the sample data were all less than 2 and that the absolute values of kurtosis were all less than 5. Therefore, the sample data satisfied the normal distribution requirement and were suitable for structural equation analysis.

The structural equation analysis conducted for this study consisted of two steps: measurement model analysis and structural model analysis. Measurement model analysis was used to test the reliability of the sample data, while the structural model was used to test the model hypothesis.

3. Results

3.1. Measurement model analysis

A measurement model analysis was first conducted to examine the convergent validity and discriminant validity of the sample data. The results of the convergent validity analysis (Table E.1 in Appendix E) showed that the factor loadings of each measure were greater than 0.75, the Cronbach's α coefficients for each construct were greater than 0.8, and the composite reliability coefficients and mean variance extracted were greater than 0.7,

thus indicating that the convergent validity of the measurement model was good. The discriminant validity test results showed that the arithmetic square root of the mean variance of each construct was greater than the correlation coefficient (Table E.1 in Appendix E) and that the factor loading coefficients of each construct on its measurement items were greater than the loadings on those of others (Table E.2 in Appendix E). Therefore, the discriminant validity of the measurement models in this study was acceptable.

3.2. Structural model analysis

The measurement model analysis described above demonstrated that the sample data of this study exhibited good reliability and validity. Subsequently, structural model analysis was conducted to validate the model hypotheses. This analysis consisted of two main steps. First, the validation of the base model was used to test the significance of the relationships among the constructs. Second, the validation of the complete model after adding the moderating variables was used to observe the moderating effect of chronic diseases.

The base model test was first conducted by ignoring the moderating variables and considering only the effect of the antecedent variable on the independent variable and the effect of the independent variable on the dependent variable; this process was mainly used to verify Hypotheses H1–H6. The results of the base model validation are shown in Appendix F. The complete model validation was conducted on the basis of the base model, and the moderating effect of chronic disease was then added to the base model to test the significance of the moderating effect of chronic disease, as shown in Table 4 and Figure 3.

3.3. Hypothesis testing results

The results of the structural equation analysis produced the hypothesis testing results of this study, as shown in Table 5.

4. Discussion

4.1. Discussion of model estimation results

This study investigated the factors influencing patients' willingness to share their EHRs after OHCs implement privacy protection measures based on the TPB model alongside the antecedents defined by the health belief model, constructed a theoretical model of the factors influencing willingness to share, and proposed nine significance hypotheses and three moderating hypotheses. Analysis of the empirical results showed that the significance hypotheses were all valid with the exception of H6a

TABLE 2 Aggregate validity test table.

Indicators	Conditions to meet	Literature sources
Factor loading coefficient	>0.75	Chin et al. (2003) and Mun and Davis (2003)
Cronbach's α	>0.70	
Overall confidence coefficient	>0.70	
Mean variance extraction	>0.50	

and H6b, while only H7a was valid among the moderating effect hypotheses.

According to the base model analysis, 52.5% of the variance in attitudes was explained, 50.9% of the variance in social reward was explained, 45.3% of the variance in perceived behavioral control was explained, and 69.4% of the variance in willingness to share was explained by attitudes, perceived behavioral control, and social rewards, thus indicating that the model has good explanatory power and that the independent variables included in the model are the main factors influencing the dependent variable. According to the complete model analysis, the inclusion of the moderating effects of chronic diseases increased the degree of explanation of willingness to share by 1.0%, thus validating H7a.

4.1.1. Analysis of the effects

According to the results of this study, willingness to share is determined by three factors, namely, attitude, perceived behavioral control and social rewards, and the effect of all these factors are all significantly positive. In other words, after patients are informed of the privacy protection measures implemented by OHCs, their positive attitudes toward the OHCs, their higher levels of perceived control and the greater social rewards they receive all cause an in their willingness to share; this result is consistent with planning theory. Moreover, past positive experience indirectly affect patients' willingness to share *via* its positive effects on social rewards, attitudes and perceived behaviors. However, health information sensitivity has no significant effect on attitude and perceived behavioral control and thus has no effect on willingness to share.

Past positive experience represents patients' past positive experiences with participation in OHCs, and these experiences influence patients' current perceptions of such websites and their sharing behavior. When patients have had past experiences with OHCs that were positive or pleasant, they may exhibit more precise and optimistic perceptions of the mental and psychological rewards that can be obtained *via* OHCs when deciding whether to share their health information online, and their attitudes regarding the ways in which they may share their health information are also favorable or approving. Meanwhile, patients with high levels of perceived behavioral control, namely, patients who perceive that they have mastered the skills or abilities that are necessary to perform certain behaviors, tend to

TABLE 3 Descriptive statistics of the sample.

Statistical indicator	Statistical variable	Number of respondents	Frequency
Gender	Male	85	36.3%
	Female	149	63.7%
Age	≤20 years old	3	1.28%
	21–30 years old	101	43.16%
	31–40 years old	112	47.86%
	41–50 years old	16	6.84%
	51–60 years old	1	0.43%
	Over 60 years old	1	0.43%
Academic qualifications	Junior high school or below	0	0.00%
	High school	8	3.42%
	Specialized training school	21	6.34%
	Bachelor's degree	166	70.94%
	Master's degree	34	14.53%
	PhD or above	5	2.14%
Length of internet use	≤1 year	0	0.00%
	2–4 years	18	7.69%
	5–7 years	63	26.92%
	8–10 years	75	32.05%
	More than 10 years	78	33.33%
Length of online medical website use	≤1 year	52	22.22%
	2–3 years	129	55.13%
	4–5 years	43	18.38%
	6–7 years	8	3.42%
	More than 7 years	2	0.85%
Annual frequency of illness	≤1 time	38	16.24%
	2–3 times	144	61.54%
	4–6 times	44	18.80%
	7–10 times	6	2.56%
	More than 10 times	2	0.85%
Suffering from a chronic disease	YES	87	37.18%
	NO	147	62.82%

be more willing to share their health information. In contrast, when patients perceive low rewards from sharing and are suspicious that their ability is insufficient to cope with the consequences of sharing, their willingness to share in OHCs is

limited due to their negative past experiences. Moreover, it should be noted that past positive experiences have a high level of impact on social rewards, attitudes and perceived behavioral control. In other words, past positive experience is the most significant of the many factors that influence willingness to share, which means that patients rely strongly on past experience when considering participation in OHCs, and patients who have had positive experience are more likely to use OHCs for EHR sharing and communication when offered privacy protection measures by OHCs.

Disease severity refers to patients' perceptions of their individual health situations. The ultimate goal of patients' usage of OHCs is to improve their individual health, and patients have an intuitive sense of their own diseases, which can influence patients' attitudes toward health information sharing behavior. When patients consider themselves to be seriously ill, they tend to be more positive with respect to sharing their health information to obtain support from doctors or other patients. Conversely, when a patient's disease is moderate, his or her attitude toward such sharing tends to be less positive. This difference indicates that disease severity has a positive effect on attitudes and an indirect influence on willingness to share, but the effect of disease severity is weaker than the effect of past positive experience.

Health information sensitivity refers to the patients' perceptions of the degree to which their health information is sensitive, which pertains to their concern for personal privacy. Our research hypothesizes that information sensitivity has a negative impact on attitudes and perceived behavioral control. However, the results of our empirical research show that these two hypotheses are invalid. These findings indicate that health information sensitivity has no indirect effect on willingness to share. This lack of an effect might be due to the fact that the influential role played by health information sensitivity is weakened by privacy protection measures, indicating that health information sensitivity has no effect on attitudes and perceived behavioral control and thus no influence on willingness to share. However, this study did not verify this hypothesis.

Social reward is a new variable introduced in this study as a modification of the TPB model; it refers to the rewards such as money, materials, or the improvement of interpersonal relationships that can be obtained *via* participation in a website, and it is used as a substitute for the subjective normative variable "social pressure." Social rewards, alongside attitudes and perceived behavioral control, jointly influence willingness to share. This impact indicates that social rewards such as material, monetary rewards or friendly interpersonal relationships online are also one of the purposes for which patients participate in OHCs in addition to the improvement of their personal health situations; both a sense of pleasant engagement and positive experiences can promote sharing behavior.

Attitude and perceived behavioral control are both included in the original construction of the TPB model, and these factors have positive impacts on willingness to share, which is consistent with the findings of previous studies; in addition, OHCs can

TABLE 4 Complete model validation results.[a]

Hypothesis	Route	Coefficient	T-test value	Significance	Degree of variance explained R2
H1	Attitude → willingness to share	0.595	7.633	***	0.704
H2	Perceptual behavioral control → willingness to share	0.155	1.758	**	
H3	Social rewards → willingness to share	0.149	1.754	**	
H7a	Social rewards * chronic diseases → willingness to share	−0.117	1.434	*	
H7b	Attitudes * chronic diseases → willingness to share	0.026	0.351	NS	
H7c	Perceptual behavioral control * chronic diseases → willingness to share	0.035	0.414	NS	
Control variables	Gender → willingness to share	−0.046	1.178	NS	
	Age → willingness to share	0.03	0.718	NS	
	Level of education→ willingness to share	−0.013	0.312	NS	
	Computer use experience → willingness to share	0.02	0.502	NS	
H4a	Past positive experiences → social rewards	0.713	22.512	***	0.509
H4b	Past positive experiences → attitudes	0.711	16.568	***	0.525
H5	Disease severity → attitudes	0.104	1.834	**	
H6a	Health information sensitivity → attitudes	−0.014	0.195	NS	
H4c	Past positive experiences →perceptual behavioral control	0.657	15.587	***	0.453
H6b	Health information sensitivity → perceptual behavioral control	0.069	1.152	NS	

[a]*** Indicates significance at the 0.01 confidence level; ** indicates significance at the 0.05 confidence level; * indicates significance at the 0.1 confidence level; NS indicates non significance.

improve attitudes and perceived behavioral control by shaping past positive experiences and disease severity to enhance patients' willingness to share.

According to the preceding analysis, this study explored the explanatory power of the TPB model in the context of the privacy protection measures implemented by OHCs. In this context, the TPB model was revised by introducing the variable of social rewards to ensure better explanatory power. Moreover, the influence of antecedent variables such as past positive experience and disease severity on willingness to share were recognized.

4.1.2. Analysis of the moderating effect

Chronic diseases are characterized by long disease courses, complex causes, high levels of recurrence and difficulty with

respect to curing, and patients with chronic diseases thus exhibit unique psychological characteristics and behavioral patterns. This study includes chronic disease as a moderating variable in the theoretical model to determine whether chronic diseases influence health information sharing behavior in the context of OHCs, and the results show that chronic diseases have only a negative moderating effect on the relationship between social rewards and willingness to share.

As shown in Figure 4, for patients with chronic diseases, the effect of social rewards on willingness to share is decreased. This decrease also reduces patients' willingness to share to a certain degree. This effect is due to the fact that patients with chronic diseases have greater information needs and are more motivated to participate in OHCs; compared to their information needs and
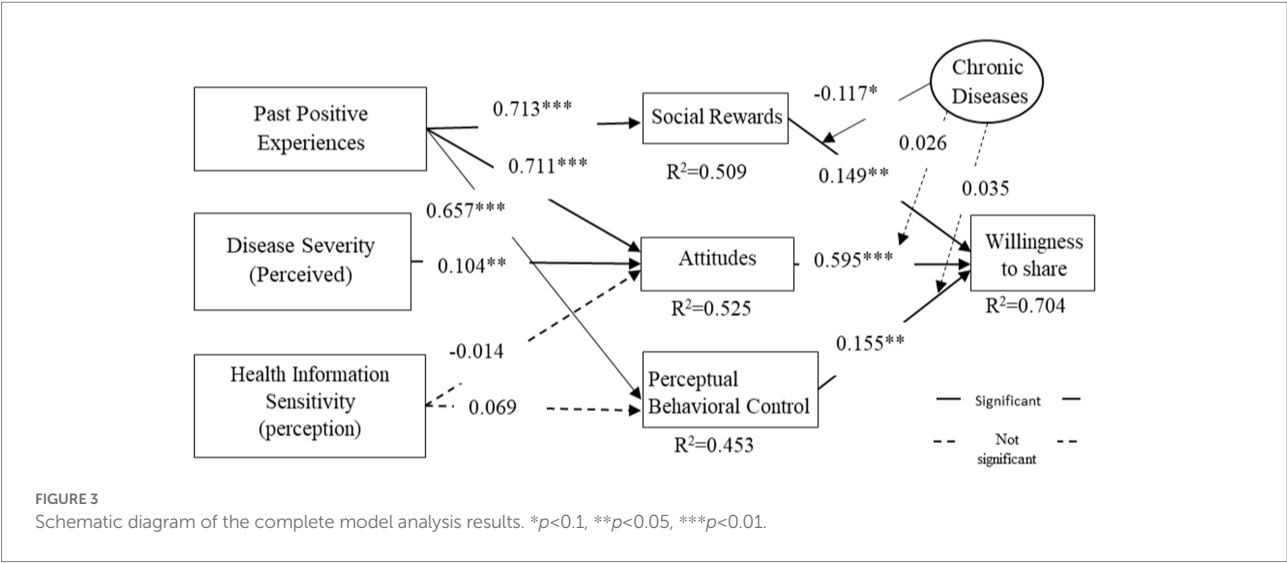
FIGURE 3
Schematic diagram of the complete model analysis results. *p<0.1, **p<0.05, ***p<0.01.

TABLE 5 Hypothesis validation results.

| Number	Hypothetical propositions	Result
H1	Social rewards have a positive effect on the intention to share their EHRs	Supported
H2	Attitudes have a positive effect on the intention to share their EHRs	Supported
H3	Perceived behavioral control has a positive effect on the intention to share their EHRs	Supported
H4a	Past positive experiences have a positive effect on OHCs users' social rewards	Supported
H4b	Past positive experiences have a positive impact on patients' attitude toward sharing their EHRs in OHCs	Supported
H4c	Past positive experiences have a positive effect on patients' perceived behavioral control with respect to sharing their EHRs in OHCs	Supported
H5	Disease severity has a positive effect on the attitudes of OHCs users toward sharing their EHRs	Supported
H6a	The sensitivity of health information has a negative effect on the attitudes of OHC users when sharing their EHRs	Unsupported
H6b	Health information sensitivity has a negative effect on OHCs users' perceived behavioral control with respect to sharing their EHRs	Unsupported
H7a	Chronic diseases have a negative moderating effect on the relationship between social rewards and willingness to share EHRs	Supported
H7b	Chronic diseases have a positive moderating effect on the relationship between attitudes and willingness to share EHRs	Unsupported
H7c	Chronic diseases have a positive moderating effect on the relationship between perceived behavioral control and willingness to share EHRs	Unsupported

the urgency of improving their health status, social rewards are less important to them. Accordingly, when such patients share health information, social rewards do not significantly influence their willingness to share, and so the increase in behavioral intentions typically associated with social rewards is more moderate in such a case.

4.2. Theoretical implication

Based on the TPB model, this paper analyses the factors influencing patients' willingness to share their EHRs in the context of the privacy protection measures implemented by OHCs from the perspectives of patients and the health belief model. The purpose of this study is to enrich and improve the extant theoretical research concerning information sharing.

First, this research is grounded in the study of the strongly privacy-related behaviors associated with EHR sharing in OHCs and uses an innovative method to explore decisions pertaining to EHR sharing behavior in the context of the privacy protection measures implemented by OHCs. Instead of the widely used privacy calculus theory, this study utilizes the theory of planned behavior to analyze the behavioral patterns exhibited patients who use OHCs and engage in EHR sharing in further detail, thus avoiding the

FIGURE 4
Schematic diagram of the regulatory effect of chronic diseases.
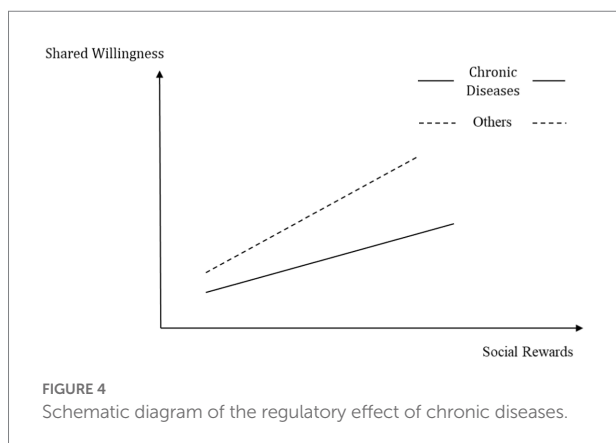
concern of a high privacy factor while simultaneously expanding the range of influencing factors. Based on TPB, this research investigates the roles played by attitudes, perceived behavioral control, and social rewards in patients' willingness to share EHRs. In particular, the substitution of the original variable of subjective norms in TPB by the introduction of the variable "social rewards" contributes to the development of the theory of planned behavior with respect to application to the field of online health care. The research results verify that attitudes and perceived behavioral control have positive effects on personal behavioral intention, which is consistent with the theory of planned behavior. Furthermore, this research reveals the fact that social rewards also influence patients' willingness to share their EHRs, which highlights the influence of social pressure, thus indicating that patients consider the material rewards, online interpersonal relationships, mental pleasure and satisfaction and respect or gratitude from others. The more valuable these social rewards are, the more willing patients are to share their EHRs. This finding illustrates that although patients continue to value the ability to control their privacy (i.e., they take into account their possible losses), the perceived value of shared rewards increases after OHCs implement privacy protection measures.

Second, this research identifies health belief patterns in the context of actors' (i.e., patients') personal perceptions alongside the characteristics of OHCs and constructs antecedent variables for the TPB model to improve the explanatory power of the model, thus providing new ideas and methods that can be used by similar studies in the future. This research ultimately introduces disease severity, information sensitivity, and past positive experience to the model as antecedent variables based on these health belief patterns and explores the mechanisms by which they operate on patients' health information sharing behavior empirically. The results show that past positive experience significantly and positively influences attitudes, perceived behavioral control and social rewards and that disease severity significantly and positively influences attitudes, which jointly and indirectly influence patients' willingness to share EHRs. However, information sensitivity has no impact on willingness to share, thus indicating that the privacy protection measures implemented by OHCs can diminish the information sensitivity of privacy-sensitive patients.

Furthermore, this study also investigates the moderating effect of chronic diseases on patients' willingness to share their EHRs. Populations with different diseases have different levels of sensitivity to the social rewards that are generated by OHCs. Compared to other disease populations, chronic disease patients have lower levels of sensitivity to social rewards, thus reflecting the uniqueness of their psychological characteristics and behavioral patterns to a certain degree.

4.3. Practical implications

In practical terms, this study explores the factors influencing patients' willingness to share their EHRs and provides an in-depth analysis of the mechanisms operative in their actions, which can assist OHC providers in improving their understanding of the values and behavioral patterns of patient users and in distinguishing between chronic disease patients and other disease patients. Subsequently, we can utilize the findings reported above to (1) optimize the service and experiences associated with OHCs, thus promoting the sustainable development of OHCs, (2) provide appropriate incentives to promote sharing behavior and enrich medical resources and information, (3) alleviate the asymmetry of information and resources and assist other patients in obtaining proper treatment swiftly, and (4) alleviate the problem of shortages and uneven distributions of health resources, help patients realize online consultation and treatment, and provide comments and suggestions for the development of OHCs and medical and health care services in China.

When patients share their EHRs in OHCs, they have an intuitive perception of the severity of their own diseases and a strong degree of reliance on previous experiences. Past experiences determine patients' perceptions of the social rewards that can be obtained *via* OHCs and their own ability to control their EHR sharing behaviors, and such experiences also influence patients' attitudes toward the behaviors associated with sharing health information. Moreover, information sensitivity has no impact on patients' sharing behaviors. This outcome reflects the importance of the privacy protection measures implemented by OHCs and the necessity of informing patients of those measures, which can both significantly impact patients' EHR sharing behavior and facilitate OHC service providers in the tasks of developing programs and measures to incentivize patient contribution behaviors and promoting OHC development.

In addition, OHC service providers must offer physical or mental rewards to users who exhibit a high rate of contributions to ensure a positive use experience. It is also advisable to implement certain evaluation functions to allow other users to comment on or like patient contributions. Certain incentive measures can be adapted to encourage friendly relationships between patients and doctors and between patients and other patients, thus allowing patients to experience care and respect from others. Meanwhile, the moderating effect of chronic diseases suggests that OHC providers should treat the group of chronic disease patients differently from other patient populations to

improve the survival rates and service experiences of chronic disease patients. OHC service providers may not be as effective in increasing EHR sharing behaviors by offering lucrative rewards to patients with chronic diseases; measures other than social rewards, such as charity clinics, patient meetings and offline events, may be more effective in this context.

4.4. Limitations

The study reported in this paper has certain limitations and shortcomings:

1. The sample used in this study is relatively small and unevenly distributed. Users of OHCs are a large group and are distributed across various cities throughout the country. Although the data used in this study were obtained *via* the internet, the sample size was insignificant compared to the large group of OHC users, and the sample did not cover all cities, which may affect the results of this study.
2. The factors influencing patients' willingness to share their EHRs are complicated and multifaceted. This study summarizes only three influencing factors, which represents a limitation of this study and prevents us from providing a comprehensive explanation of patients' EHR sharing behavior.
3. When verifying the moderating effect of chronic diseases, the sample was differentiated only in terms of an indicator of the presence of a chronic disease, which was a quite simple measure. Future studies can consider different types of disease and employ richer measures to verify the moderating effect of disease types on patients' behavioral patterns, such as by reference to mental health (Lu et al., 2021) or albinism (Bi et al., 2020).

5. Conclusion

This study investigates patients' willingness to share EHRs in OHCs and focuses on the context of the realistic developmental stages at which OHCs implement privacy protection measures. This study combines the health belief model and the theory of planned behavior to construct a model of the factors that influence patients' willingness to share EHRs in OHCs, and the TPB model is modified and extended to improve the explanatory power of the proposed model. The variables of disease severity, health information sensitivity, and past positive experience are introduced as antecedent variables of the model from the perspective of patients' perceptions of three relevant aspects, i.e., their health status, health information sensitivity, and community website participation experiences, as well as the main factors influencing patients' willingness to share EHR highlighted by this study. In addition, chronic diseases were added as regulating variables in the model to investigate the regulating effect of disease type in this context. The relevant findings also provide theoretical and practical suggestions for promoting patients' full participation in OHCs and encouraging OHC development from a privacy perspective.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

SG contributed to the research idea and paper writing. YD contributed to the paper writing and revised version. YL contributed to the data analysis and paper writing. BS contributed to the data analysis. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1047980/full#supplementary-material

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Risk factors for college students' online lending between different genders-A cross-sectional study in China

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Background: Online lending on campus is given more attention by researchers as its prominent adverse effects on students. The deficiencies of the previous studies on its psychological factors and intervention strategies were only based on qualitative research. Moreover, there is no study on gender differences. Therefore, our study aims to analyze the gender differences in psychological risk factors and give some practical suggestions for the intervention by quantitative methods.

Method: This is a cross-sectional survey among medical college students in Chengdu. A total of 984 effective questionnaires were collected. The questionnaire includes demographic data, monthly expenses, self-evaluation for three central psychology causing online lending based on empiricism (conformity, comparison, and hedonism), and three psychological assessment instruments (the Chinese version of the Satisfaction with Life Scale, Egna Minnen av Barndoms Uppfostran, and 144-item version of Temperament and Character Inventory). T-test/χ^2-test and Binary logistic regression were used to analyze the gender differences in variables and the risk factors of online lending for males and females, respectively.

Results: The utilization rate of online lending exhibited a significant gender difference ($p<0.001$). In addition, there were gender differences in the scores on SWLS and some subscales of C-EMBU and TCI-144. The risk factors for males' were family members using online lending (OR=5.527, 95% CI=1.784–17.125) and lower scores on HA (OR=0.938, 95% CI=0.888–0.990). The risk factors for females' online lending were family members using online lending (OR=2.288, 95% CI=1.201–4.362), hedonism (OR=5.913, 95% CI=1.327–26.341), and higher scores on mother's punishment (OR=1.099, 95% CI=1.007–1.199).

Conclusion: The utilization rate of online lending in males was significantly higher than in females. More attention should be paid to gender differences and the impact of family members' using online lending on students when intervening in online lending.

Introduction

Various kinds of online lending platforms are expanding as China's Internet economy grows. Online lending in China currently has no official definition and is split into two categories: platforms for e-commerce services like Ant Check Later, and lending platforms for reducing financial stress, such as P2P, Ant Jie-bei (Chang, 2018). As its application procedure does not require the permission

TABLE 1 Descriptive statistics of participants' demographic information.

Variable	n (N=984)	%
Gender		
Male	349	35.47
Female	635	64.53
Parental education		
Primary school	243	24.7
Junior middle school	388	39.4
Junior high school	235	23.9
Junior college	76	7.7
Graduate and above	42	4.3
Family structure		
Single parent family	126	12.8
Core family	858	87.2
Using online lending		
Yes	681	68.2
No	303	30.8

TABLE 2 The survey questions of three central psychology causing online lending based on empiricism.

Questions	Answers
Conformity: People around are using online lending, I should follow this trend	0-disagree; 1-agree
Vanity: Luxury will attract more envious persons	0-disagree; 1-agree
Hedonism: We should enjoy life as soon as possible even through using online lending	0-disagree; 1-agree

of students' parents or legal guardians and its approval is fast (even in a few minutes), online lending overspreads quickly among college students. Despite the government's efforts to crack down on P2P with high-interest rates, many students continue to use online lending, such as Ant Jie-bei. Thus, the shortcomings, influencing factors, and intervention strategies of online lending became the research foci for Chinese scholars.

Studies abroad on college students' debt revealed that the debt in medical students increased yearly and had a negative effect on their choice of internship, marriage age, graduate destination, and quality of life (Jette, 2016; Ling et al., 2018; Gray et al., 2019; Amin et al., 2021). On the other hand, although the annual interest rate of online lending is above 13%, many college students (approximately 42%) still hold a positive attitude toward it. Additionally, in repayment, more than half of college students transferred the loans to their parents; worse still, some students repaid the debt by applying for another online lending (Xiao et al., 2018; Tang and Tang, 2020).

According to some scholars' conclusions based on qualitative research, there were three critical psychological factors (conformity, comparison, and hedonism) and several intervening strategies for online lending, including conducting ideological and political education, strengthening legal supervision, and enhancing risk awareness (Dong, 2017; Xiao et al., 2018; Yang et al., 2019; Tang and Tang, 2020). The deficiencies of previous studies were the lack of

quantitative research and gender differences in online lending. Thus, this study aims to analyze the gender differences in psychological risk factors and offer some practical suggestions for the intervention by quantitative methods.

Materials and methods

Study population and setting

This was a cross-sectional survey. A total of 984 questionnaires (from 349 males and 635 females) were obtained after excluding 316 invalid questionnaires with the artificial method by three prominent researchers, including the same choice for each question, two-thirds of options blank, or regular answers (effective rate = 75.69%). The questionnaire consisted of demographic information (Table 1), monthly expenses, self-evaluation for conformity, comparison, and hedonism (Table 2), as well as the following three psychological assessment instruments. Informed consent was secured from all participants.

Assessment instruments

The Chinese version of SWLS for life satisfaction (C-SWLS)

The SWLS is widely used to measure life satisfaction and contains five items scored on a 7-point Likert scale (1, strongly disagree, to 7, strongly agree) (Diener et al., 1985). It has measurement invariance across gender and age and high internal reliability with *Cronbach's* $\alpha > 0.70$ (Bai et al., 2011; Silva et al., 2014).

The Chinese version of EMBU for parenting styles (C-EMBU)

The C-EMBU involves six subscales for the father's parenting styles, including emotional warmth, punishment, over-interference, favoring subjects, rejection, and over-protection; five subscales for the mother's parenting styles with emotional warmth, punishment, favoring subjects, rejection, and over-protection. The subjects evaluated 116 items by using a 4-point Likert scale (1-never, to 4- always). The *Cronbach's* α for each subscale ranged from 0.46–0.88 (Yue et al., 1993).

The 144-item Chinese version of TCI for personality (TCI-144)

The TCI-144 consisted of a four-factor structure for temperament domains and a three-factor structure for character domains as follows: novelty seeking (NS), harm avoidance (HA), reward dependence (RD), persistence (P), self-directedness (SD), cooperativeness (C), and self-transcendence (ST). The subjects evaluated the items using a 5-point Likert scale (1, "very unlikely" to 5, "very likely"). The *Cronbach's* α for each subscale ranged from 0.488 to 0.823 (Chen et al., 2013).

Data analysis

Data analysis was conducted using IBM SPSS Statistics 19.0. Data interpolation was used to supplement the missing data. χ^2-test/t-test was used to examine the gender differences among variables, and binary logistic regression was used to explore the risk factors of online

TABLE 3 Comparisons of variables between different genders.

Variable	Gender (N/M±SD)		T/χ^2	P
	Male (N=349)	Female (N=635)		
Using online lending				
Yes	269	412	15.718	0.000
No	80	223		
Monthly expenses (Yuan)	1333.7.41±410.89	1324.91±348.03	0.356	0.722
SWLS	22.63±6.50	23.73±6.21	−2.588	0.009
Father's parenting styles				
Emotional warmth	51.98±9.99	54.43±11.10	−3.543	0.000
Punishment	20.18±6.35	16.80±5.03	8.566	0.000
Over-interference	20.02±4.07	18.10±4.08	7.067	0.000
Rejection	9.80±3.11	8.72±2.87	5.348	0.000
Over-protection	12.26±2.74	11.36±2.85	4.778	0.000
Favoring subjects	10.44±3.21	10.63±3.84	−0.857	0.392
Mother's parenting styles				
Emotional warmth	50.23±9.84	53.36±10.84	−4.592	0.000
Punishment	14.52±5.23	12.33±3.93	6.858	0.000
Over-interference	33.26±6.69	30.93±6.97	5.087	0.000
Rejection	13.53±5.03	12.02±4.22	4.771	0.000
Favoring subjects	10.42±3.37	10.49±3.52	−0.307	0.759
Personality				
NS	58.17±5.61	55.89±6.33	5.828	0.000
HA	59.63±6.47	61.48±7.56	−4.029	0.000
RD	59.71±5.01	61.36±5.80	−4.673	0.000
P	61.66±8.11	61.72±8.06	−0.110	0.912
SD	61.35±8.44	62.59±9.14	−2.089	0.037
C	57.52±7.04	54.00±7.28	7.342	0.000
ST	56.07±10.56	53.71±9.51	3.581	0.000

lending for males and females, respectively. The level of statistical significance was set at $p < 0.05$.

Results

The gender differences among variables

A total of 681 students had used online lending (utilization rate = 68.2%). The comparisons for using online lending, monthly living expenses, the scores of SWLS, family parenting styles, and TCI-144 between genders are listed in Table 3. In terms of the utilization rate of online lending, negative parenting styles (punishment, over-interference, rejection, and over-protection in father's parenting styles; punishment, rejection, over-protection in mother's parenting styles), NS, C, and St, males were significantly higher than females. In contrast, positive parenting styles (emotional warmth of father's parenting style and mother's parenting style), HA, RD, and SD in males were significantly lower than that of females.

The risk factors of online lending for males and females

Binary logistic regression was used to explore the risk factors of online lending for males and females. Both of the models were well fitted ($\chi^2_{male} = 7.362$, $p = 0.498$, Cox & Snell $R^2 = 0.179$; $\chi^2_{female} = 9.155$, $p = 0.329$, Cox & Snell $R^2 = 0.107$). Family members using online lending and low harm avoidance are the risk factors for males' online lending (Table 4). The number of male users whose family members also used online lending was 5.527 times that of those whose family members did not. Each unit increase in the scores of injury avoidance was associated with a 0.062 times reduction in the risk of online lending. Family members using online lending, hedonism, and mother punishment are the risk factors for females' online lending (Table 5). The number of female users whose family members also used online lending was 2.288 times that of those whose family members did not. The number of female users who were hedonistic was 5.931 times that of those who were not. Every one-unit increment of the scores of mother punishment was a 0.099 times increase in the risk of online lending. The most important explanatory variable was the family members using online

lending in the males' model (Wald = 8.780) and in the females' model (Wald = 6.327).

Discussion

Utilization rate of online lending

The utilization rate for online lending among medical students in Chengdu was 68.2%, much higher than the other studies based in different cities (Table 6; Zhang et al., 2018; Fu et al., 2019; Zhang, 2019; Pan, 2020; Li, 2021; Shi et al., 2021). Comparing the surveys conducted in Chengdu in 2018, it could be deduced that the utilization rate increases over time, which could be attributed to the widespread advertising of online lending platforms. Therefore, it is crucial to strengthen online lending platforms' supervision actively. Additionally, a correlation study was conducted between the utilization rate of online lending and the annual GDP for each city by assuming that the utilization rate might have a relationship with the city's GDP (Table 6). Sadly, the correlation coefficient was only 0.5 and was not statistically significant ($p = 0.253$). The reason might be that few quantitative studies can be studied for correlation analysis. As a result, our assumption should be explored by more quantitative research in the future.

Gender differences in C-EMBU, TCI-144 and risk factors of online lending

Despite the fact that the Japanese version of EMBU differed from C-EMBU in some subscales, we found the following similarities: In contrast to females, males scored lower on the emotional warmth subscale and higher on the emotional rejection subscale (Someya et al., 2000). Besides, the parenting styles for males were more negative (rejection, punishment, and less communication) than that of females in our study. The reason might be that there are some parallels in child-rearing practices due to East Asian culture. However, it is crucial to note that the C-EMBU is different from the Japanese's, and that there is little literature on gender differences in parenting styles among college students' in China. Thus, more research needs to be done on our findings.

In line with other research in China and abroad, females in our study scored significantly higher on the HA than males. However, the findings for other subscales varied from different samples (Zohar et al., 2001; Chen et al., 2002; Shimizu and Ishikawa, 2011) and even were inconsistent with the research conducted in Beijing and the southwestern and northeastern regions of China, which also used TCI-144 as the assessment tool (Chen et al., 2013). Therefore, we speculate that the HA is mainly affected by biological factors, and the other subscales might be more related to sociocultural factors.

TABLE 4 Binary logistic regression of online lending for males.

	Reference		B	S.E.	Wald	P	OR	95% CI
Family members using online lending	No	Yes	1.710	0.577	8.780	0.003	5.527	1.784–17.125
HA			−0.064	0.028	5.326	0.021	0.938	0.888–0.990

TABLE 5 Binary logistic regression of online lending for females.

	Reference		B	S.E.	Wald	P	OR	95% CI
Family members using online lending	No	Yes	0.828	0.329	6.327	0.012	2.288	1.201–4.362
Hedonism	Disagree	Agree	1.777	0.762	5.436	0.020	5.913	1.327–26.341
Punishment of mother's parenting style			0.094	0.044	4.497	0.034	1.099	1.007–1.199

TABLE 6 The information and results of previous studies in China.

Cities	Conducted time	An estimated Monthly Expense	Rate of online lending	Number of questionnaires	Comparison of utilization rate of online lending	GDP (Unit: Yuan)
Chengdu	2022	1,300	68.2	984	male>female	1.99 trillionin 2021
Dongguan	2021		33.89			1.09 trillion
Datong	2021	1,200	42.2	382		168.1 billion
Changchun	2020	1,250	84.18	411		663.8 billion
Changde	2019	1,200	5.8	241		362.42 billion
Zaozhuang	2019	1,200	6	396		169.39 billion
Chengdu	2018	1,000	50.6	1,118	Male > Female	1.57 trillion

The results of the risk factors of online lending exhibited gender differences, which was in line with our hypothesis. The low score of HA was the risk factor for males only, and hedonism was solely for females (except for conformity and comparison). Thus, among many intervention measures based on qualitative research, our study showed that the effective ones were increasing education about the harm of online lending for males and ideological education about hedonism for females. Most notably, the variable of family members using online lending was the most important explanatory variable in the two models, consistent with data analyzed by neural networks. Furthermore, Bussmann and Giudici suggested that the Shapley-Lorenz-based approach was more accurate and explanatory than the above methods; therefore, it can be used in future risk management (Bussmann et al., 2020; Giudici and Raffinetti, 2021). To sum up, while intervening in students' online lending, the community should actively intervene in their family members' online lending.

Conclusion

We should intervene in online lending rapidly because it is expanding quickly over time. Moreover, the impact of family members using online lending on students and gender differences should also be taken into consideration.

Limitations

Here are some suggestions for future studies: first, our study's generalizability was limited by the fact that it only included medical college students in Chengdu as a sample. We hope that the sample in future studies can be more diversified. In addition, the explanatory power of prediction variables to the utilization rate of online lending for males and females was 17.9 and 10.1%, respectively; thus, other risk factors (such as peer influence) need to be further studied.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Chengdu Medical College. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The mediating role of self-efficacy between workplace violence and PTSD among nurses in Liaoning Province, China: A cross-sectional study

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Purpose: Nurses are at high risk for workplace violence, which can lead to psychological problems. The purpose of this study was to determine the relationship between workplace violence, self-efficacy, and PTSD, and to further explore whether self-efficacy mediates the relationship between workplace violence and PTSD among Chinese nurses.

Materials and methods: This cross-sectional study was conducted in Liaoning Province, China in 2020. A total of 1,017 valid questionnaires were returned. Each questionnaire included the Workplace Violence Scale, the General Self-Efficacy Scale, the Post-traumatic Stress Disorder Scale (PTSS-10), and demographics information. A hierarchical multiple regression approach was used to explore the mediating role of self-efficacy in the relationship between workplace violence and PTSD. The mediation model was then tested by the PROCESS macro in SPSS.

Results: A total of 1,017 nurses were included in this study, and the average score of PTSD among Chinese nurses was 26.85 ± 13.13 (mean$\pm$SD). After further adjustment for control variables, workplace violence was positively associated with PTSD, explaining 13% of the variance. High self-efficacy was associated with low PTSD, explaining 18% of the variance. Self-efficacy partially mediated the role of workplace violence and PTSD.

Conclusion: The high scores of PTSD among Chinese nurses demand widespread attention. Workplace violence is an important predictor of PTSD in nurses. Self-efficacy is a significant factor in improving PTSD in nurses and mediates the relationship between workplace violence and PTSD. Measures and strategies to improve self-efficacy may mitigate the effects of workplace violence on PTSD in nurses.

1. Introduction

The World Health Organization (WHO) defines workplace violence (WPV) as abuse, threats, or assaults against employees in work-related settings or on their way to and from work, which involve explicit or implicit challenges to their safety, well-being, or health (WHO, 2021). Most nurses in both developed and developing countries are subjected to different types of violence (Liu et al., 2019a), which can not only harm them physically and psychologically but also jeopardizes the effectiveness of the health system (Kim, 2020; Hilton et al., 2022). WPV has long been recognized as a global problem, and medical personnel, especially nurses, are among the professionals that are most vulnerable (Sun et al., 2021; Aljohani, 2022). WPV from patients and visitors is a major occupational hazard for medical personnel (Aljohani et al., 2021).

The problem of WPV has continued to increase in recent years, and there is growing concern about nurses' exposure to it (Babiarczyk et al., 2020; Shi et al., 2020). Studies have shown that 55.7 to 95.5% of nurses are usually exposed to at least one type of WPV (Havaei et al., 2020). Nurse in Ethiopia (Fute et al., 2015), South Korea (Park et al., 2015), Jordan (Al-Omari, 2015), Germany (Schablon et al., 2012), and Iran (Khoshknab et al., 2015) experienced rates of physical violence ranging from 18.22 to 56% and verbal abuse from 63.8 to 89.58% in the past 12 months, as well as sexual harassment, which ranged from 4.7 to 19.7%. Recently, there has been a general increase in this phenomenon, including in China (Lu et al., 2020).

WPV can lead to a number of serious consequences; studies have shown that it can negatively affect the physical and mental health of victims (Wang L. et al., 2022), and it is also associated with low job satisfaction and high turnover rates among healthcare workers (Akbolat et al., 2021). WPV can be associated with stress and distress, which in turn expose the victim to WPV (Magnavita et al., 2020). Furthermore, WPV is associated with both job burnout (Liu et al., 2019b) and mental fatigue (Wolf et al., 2017). Exposure to one or more types of WPV puts nurses at increased risk for mental health problems, which can eventually evolve into post-traumatic stress disorder (PTSD) and burnout (Kobayashi et al., 2020; Akbolat et al., 2021; Wang J. et al., 2022). In addition, WPV can reduce productivity (Ghavidel et al., 2019), work engagement (Tian et al., 2020), affect job performance, and negatively impact the therapeutic relationship (Duan et al., 2019). Although violence in hospitals directly harms nurses and hospitals, the ultimate victims are patients (Zhang et al., 2015; Njaka et al., 2020). As WPV increases, the hospital environment becomes unstable, which can lead to less autonomy for nurses, poorer relationships with physicians, more patients waiting to be placed, and a greater likelihood of nurses not giving medications on time or committing medication errors that can affect patients. Furthermore, WPV affects the perception of the profession, and medical professionals may not support their children entering the medical field, which may lead to a shortage of nursing staff in China (Yang and Gao, 2015; Liu et al., 2018).

Self-efficacy is the belief that one has the ability to make plans and take actions to achieve goals (Bandura, 1977). People with low

self-efficacy have little motivation to take action and avoid difficulties. Nurses' self-efficacy is a key predictor of how they function in terms of choosing behavior, effort expenditure, thought patterns, and emotional responses (Yao et al., 2018). Studies have shown that nurses with low self-efficacy cannot cope with stressful situations under high workload, which may lead to problems such as job burnout, anxiety and mental fatigue (De Simone et al., 2018).

PTSD is defined as an anxiety disorder caused by exposure to traumatic events. These events often involve serious threats of death or injury, to which the individual responds by feeling intense fear and helplessness (Meeting, 1994). Most people experience a traumatic event at least once in their lifetime, and some will develop PTSD. Some studies have shown that witnesses of traumatic events can develop PTSD symptoms even without direct involvement in the traumatic event (Ratrout and Hamdan-Mansour, 2020). There are at least two types of trauma that healthcare workers face on a regular basis (Shi et al., 2017a). The first type of trauma is physical assault or threats from a patient or a patient's family (Al-Maskari et al., 2020), which is a form of WPV and is increasingly common in hospitals (Shi et al., 2017b). The second type of trauma comes from indirect sources, such as treating and witnessing a patient's traumatic experience, death, or serious injury (Ratrout and Hamdan-Mansour, 2020). Therefore, PTSD is an increasingly serious and concerning problem among medical personnel (Petrie et al., 2018; Giorgi et al., 2020).

Some studies have shown that WPV and PTSD are related. A prospective study by Pihl-Thingvad showed that PTSD among social educators was positively associated with the frequency and extent of WPV (Pihl-Thingvad et al., 2019). Similarly, a review also showed a positive association between nurses' exposure to WPV and PTSD (Wang J. et al., 2022). While some studies have confirmed the relationship between WPV and PTSD, less research has been done on the relationship between WPV, PTSD and self-efficacy. If self-efficacy plays an important role in WPV and PTSD, this may have important implications for nurse clinical practice, as the impact of WPV on nurse PTSD may vary depending on the nurse's self-efficacy. In an experimental study on maternity, self-efficacy was shown to be negatively associated with PTSD (İsbir et al., 2016), with mothers with low self-efficacy having more severe postpartum PTSD symptoms. Self-efficacy has also been shown to play a mediating role in the perception of organizational support and PTSD symptoms among frontline healthcare workers in the outbreak of COVID-19 (Zhou et al., 2021). Based on the above literature, we hypothesized that self-efficacy plays an important role in nurses PTSD, and if self-efficacy is a mediating product between WPV and PTSD, it would provide an important direction for intervention to mitigate the adverse effects of WPV on PTSD. In conclusion, this article aimed to test three hypotheses of nurses: (1) Workplace violence is positively associated with PTSD; (2) self-efficacy is negatively associated with PTSD; and (3) self-efficacy mediates the relationship between WPV and PTSD.

1.1. Ethical approval and consent to participate

Ethical approval was obtained from the Ethical Committee of Dalian Medical University (Approval NO.: 2022-017). Each participant signed an informed consent form. Participants were informed of the

purpose of the study prior to participation and were assured that their information was confidential. We confirmed that all the methods we used were in accordance with relevant guidelines and regulations.

2. Methods

This study was conducted from September 2020 to March 2021, relying on a cross-sectional design with a multistage random sampling method, in which one tertiary hospital was randomly selected from each of the five regions (east, west, south, north, and central) in Liaoning Province. As male nurses account for less than 1% of Chinese nurses, our study focused solely on female nurses (Yu et al., 2019). 240 nurses were randomly selected from each hospital to conduct the self-administered questionnaire survey, for a total of 1,200 nurses. All respondents signed an informed consent form prior to filling out the questionnaire. With the help of hospital staff, 1,200 questionnaires were distributed, and the study population included all nurses working full time in these hospitals with at least 1 year of experience. Interns were excluded from the study. 183 study participants were excluded because they did not complete the questionnaire due to time constraints or had data missing from the questionnaire. Thus, a total of 1,017 nurses were included in this study, with a participation rate of 85%. The study contained seven independent variables: age, household registration, monthly expenditure, sector of work, years of experience, WPV, and self-efficacy, totaling 20 entries. According to the requirements of multiple linear regression, the sample size should generally be 5–10 times the number of independent variable entries, and considering an 80% effective response rate, the minimum sample size required for this study was about 250 cases. In this study, as part of a large study, to explore the relationship between WPV and nurses' mental health and reduce sampling error, we expanded the sample size as much as possible. Finally, 1,017 valid questionnaires were collected, which satisfied the minimum sample size required for the study.

2.1. Instruments

2.1.1. Workplace violence scale

The WVS was used to measure the frequency of workplace violence experienced by the study participants in the past 12 months. The scale consists of five dimensions: physical assault, emotional abuse, threat, verbal sexual assault, and sexual assault. Each item ranged from 0 to 3, reflecting the frequency of participants' exposure to WPV (0 = zero times, 1 = 1 time, 2 = 2 or 3 times, and 3 = more than 3 times). The total score is the sum of the items and ranges from 0 to 15, with higher scores implying more frequent exposure to WPV (Peek-Asa et al., 1998). WVS has been shown to have good reliability and validity among Chinese medical professionals, with a Cronbach coefficient of 0.92 in one study (Wang et al., 2006). In this study, the Cronbach coefficient was 0.80.

2.1.2. General self-efficacy scale

The GSES consists of 10 items on a 4-point Likert scale (1 = not at all true, 2 = hardly true, 3 = moderately true and 4 = exactly true). The total score is the sum of the items and ranges from 10 to 40, with higher scores indicating higher self-efficacy (Shang et al., 2007). The Chinese version of the GSES has been confirmed to have good

reliability, with a Cronbach coefficient of 0.87 in one study (Shang et al., 2007). In this study, the Cronbach coefficient was 0.90.

2.1.3. Post-traumatic stress syndrome 10-questions inventory

The PTSS-10 is a 10-item self-report scale described in the Diagnostic and Statistical Manual, Fourth Edition (DSM-IV), for assessing symptoms of PTSD. Symptoms are rated on a scale of 1 (never) to 7 (always). The total score ranges from 10 to 70, with a higher score indicating the more severe PTSD symptoms (Weisæth, 1989; Stoll et al., 1999). The PTSS-10 showed good reliability in previous studies, with a Cronbach coefficient of 0.92 (Weisæth, 1989). In this study, the Cronbach coefficient was 0.94.

2.2. Sociodemographic variables

A total of five demographic variables were included in this study: age, household registration, monthly expenditure, sector of work, and duration of work. Age was divided into two categories: "<32 years" or "≥32 years." Household registration categorized as "Liaoning Province" or "other provinces." Monthly expenses were categorized as "<8,000 RMB" or "≥8,000 RMB." Work departments were categorized as "ward," "outpatient," or "emergency." Years of experience was divided into two categories: "<10 years" or "≥10 years." The cutoff for age and monthly expenses categories is based on the median.

2.3. Statistical analyses

We used IBM SPSS Statistics 21.0 (IBM, Asia Analytics Shanghai) for statistical analysis. Two-sided p-values of <0.05 were considered statistically significant. Independent sample t-tests and one-way ANOVAs were used to test for between-group differences in continuous variables. Correlations between age, WPV, self-efficacy, and PTSD were examined using Pearson correlation analysis. Hierarchical multiple regression was conducted to analyze the significant influences of PTSD and the mediating role of self-efficacy in the relationship between WPV and PTSD. In the first step, all demographic variables (age, household registration, monthly expenditure, sector of work, and years of experience) were added to the model as control variables. In the second step, the independent variable WPV was added to the model. In the third step, the mediating variable self-efficacy was added to the model. In this study, the Variance Inflation Factor (VIF) value was less than 10, and there was no problem of multicollinearity.

The role of self-efficacy in mediating WPV and PTSD (Model 4) was tested in PROCESS macro (version 3.0 by Andrew F. Hayes) for SPSS based on a bias-corrected nonparametric percentile Bootstrap method (Hayes, 2013). All demographic variables were used as control variables, with WPV as the independent variable, PTSD as the dependent variable, and self-efficacy as the mediating variable. Prior to model testing, scores for WPV, self-efficacy, and PTSD were standardized. Total effects (path c), direct effects (path c′), and indirect effects (path a*b) were examined. Bias-corrected accelerated 95% confidence intervals (BCa 95% CIs) were calculated for the indirect effects. If the CI for the indirect effect did not contain zero, a mediating effect was considered to be present.

TABLE 1 Relationship between demographic characteristics and PTSD, self-efficacy, and WPV.

Variable	N (%)	Mean±SD		
		PTSD	Self-efficacy	WPV
Age				
<32	533 (52.4)	26.55 ± 12.93	27.66 ± 4.06	5.98 ± 2.18
≥32	484 (47.6)	27.18 ± 13.35	27.45 ± 4.22	6.45 ± 2.62
p-value		0.22	0.78	**0.00**
Province				
This province	778 (76.5)	27.03 ± 13.13	27.52 ± 4.04	6.25 ± 2.48
Other provinces	239 (23.5)	26.28 ± 13.13	27.67 ± 4.41	6.04 ± 2.18
p-value		0.78	0.31	0.88
Monthly expenditure				
<8,000 RMB	573 (56.3)	25.86 ± 12.69	27.54 ± 4.17	6.08 ± 2.35
≥8,000 RMB	444 (43.7)	28.12 ± 13.57	27.58 ± 4.09	6.37 ± 2.48
p-value		**0.00**	0.43	**0.02**
Sector				
Wards	740 (72.8)	27.22 ± 13.43	27.59 ± 4.06	5.89 ± 2.12
Outpatient	154 (15.1)	24.24 ± 12.12	27.38 ± 4.90	6.78 ± 2.97
Emergency	123 (12.1)	27.88 ± 12.16	27.62 ± 3.51	7.36 ± 2.77
p-value		**0.02**	0.83	**0.00**
Years of experience				
<10	551 (54.2)	26.65 ± 12.51	27.58 ± 3.96	6.00 ± 2.16
≥10	466 (45.8)	27.09 ± 13.83	27.53 ± 4.33	6.45 ± 6.21
p-value		0.29	0.58	**0.00**

The bold value $p < 0.05$.

TABLE 2 Correlations among age, WPV, self-efficacy, and PTSD.

	Mean±SD	1	2	3	4
Age	33.27 ± 7.27	1			
WPV	6.20 ± 2.41	0.133*	1		
Self-efficacy	27.56 ± 4.13	−0.013	−0.148*	1	
PTSD	26.85 ± 13.13	0.008	0.339*	−0.277*	1

*$p < 0.05$.

3. Results

The mean age of the participants was 33.27 ± 7.27 (mean ± SD), with 47.6% of the nurses being over 32 years old. 76.5% of the participants were from Liaoning Province, and 56.3% had monthly expenditures of less than 8,000 RMB. The highest percentage of nurses worked in wards (72.8%), and more than half of them (54.2%) had worked for less than 10 years. Among the five variables, monthly expenditure and work sector were significantly associated with PTSD, and PTSD symptoms were more severe in those with monthly expenditures of ≥8,000 RMB than in those with <8,000 RMB ($p < 0.05$). Nurses working in emergency departments had the highest

scores for PTSD ($p < 0.05$). Age, monthly expenses, work sector, and years of experience were all relevant in terms of WPV (Table 1).

3.1. Correlations among continuous variables

There was a positive correlation between WPV and PTSD symptoms ($r = 0.339$, $p < 0.05$), a negative correlation between WPV and self-efficacy ($r = −0.148$, $p < 0.05$), and a negative correlation between self-efficacy and PTSD ($r = −0.277$, $p < 0.05$; Table 2).

3.2. Results of hierarchical multiple regression

In the first step of the hierarchical multiple regression, age, household registration, monthly expenditure, work sector, and years of experience were added to the model as control variables. After excluding the effects of the above control variables in the second step, WPV and PTSD were positively correlated ($\beta = 1.940$, $p < 0.00$), with WPV having a significant effect on PTSD, explaining 13% of the variance. In the third step, self-efficacy and PTSD were negatively correlated ($\beta = −0.730$, $p < 0.00$), and adding the mediating variable self-efficacy to the model explained an additional 18% of the variance in PTSD. The standardized regression coefficient of WPV decreased from 1.940 in the second step to 1.745 in the third step and was still statistically significant, tentatively indicating that self-efficacy partially mediated the relationship between nurse WPV and PTSD (Table 3).

First, the relationship between WPV and PTSD was examined (path c). WPV and PTSD were positively correlated (c = 1.940, $p < 0.00$), and WPV had a significant indirect effect pathway on PTSD through self-efficacy (a*b, a = −0.267, b = −0.730, a*b (BCa 95% CI) = 0.195 [0.114, 0.293]). The confidence interval for the indirect effect did not contain 0, suggesting a mediating role of self-efficacy between WPV and PTSD. In addition, when self-efficacy was added to the model as a mediating variable, the direct effect of WPV on PTSD remained significant (c′ = 1.745, $p < 0.00$; Table 4). Therefore, self-efficacy played a partially mediating role in the relationship between WPV and PTSD. A visualization of the model is shown in Figure 1.

4. Discussion

Our study explored the relationship between WPV, self-efficacy, and PTSD and examined the mediating role of self-efficacy in the relationship between nurses suffering from WPV and PTSD. We found a positive correlation between WPV and PTSD and a negative correlation between self-efficacy and PTSD, with self-efficacy playing a mediating role in the relationship between WPV and PTSD. The average score of PTSD in this study was 26.85 ± 13.13 (mean ± SD), which was higher than that of other studies by some patients (sample size = 132; Milton et al., 2017), indicating a high level of PTSD among Chinese nurses, which should be of broad concern. Several studies have shown gender differences in the extent of PTSD, and female nurses tend to report higher levels of PTSD symptoms compared to

TABLE 3 Hierarchical multiple regression analysis results for PTSD.

	Step 1	Step 2	Step 3
Step 1			
Age	0.868	0.446	0.228
Province	−0.426	−0.342	−0.258
Monthly expenditure	2.244**	1.601*	1.701*
Sectors	−0.161	−1.663**	−1.522**
Years of experience	−0.779	−1.122	−0.913
Step 2			
WPV		1.940**	1.745**
Step 3			
Self-efficacy			−0.730**
F	24.40**	17.89**	38.66**
Adjusted R²	0.00	0.12	0.17
△R²	0.01	0.13	0.18

*$p < 0.05$; **$p < 0.01$.

TABLE 4 Mediation analysis results.

Path	Coefficient/ Effect	value of p	BCa 95% CI	
c	1.940	<0.01	1.616	2.263
a	−0.267	<0.01	−0.375	−0.159
b	−0.730	<0.01	−0.910	−0.550
a*b	0.195	--	0.114	0.293
c′	1.745	<0.01	1.427	2.062

BCa 95% CI: the bias-corrected and accelerated 95% confidence interval; age, household registration, monthly expenditure, sector of work, and years of experience were covariates; a: the direct effect of WPV on self-efficacy; b: the direct effect of self-efficacy on PTSD; a*b: the indirect effect of WPV on PTSD via self-efficacy; c′: the direct effect of WPV on PTSD; c: total effect of WPV on PTSD.

male nurses, making the study of PTSD in female nurses even more important (Qi et al., 2022).

First, there was a positive correlation between WPV and PTSD, which is consistent with other studies (Zafar et al., 2016). Studies of WPV in various occupational groups have consistently indicated that WPV is associated with mental health (Rudkjoebing et al., 2020). Previous studies have shown that nurses are at very high risk of exposure to violence in the workplace, with three times the risk of experiencing WPV than any other occupational group (Kennedy and Julie, 2013). WPV affects the normal operation and reputation of hospitals, threatens the safety of medical staff, and acts as a stressor causing emotional distress to medical staff, which can develop into PTSD (Wang et al., 2015; Hilton et al., 2017). In a survey of more than 750 psychiatric hospital staff, 16% of participants met the screening threshold for PTSD on a self-report scale as a result of experiencing WPV (Hilton et al., 2020). Nurses with PTSD may experience physical distress such as headaches, insomnia, and anxiety, eventually leading to depression, absolute pessimism, or other psychiatric disorders (Mealer et al., 2009; Germain, 2013). In addition, nurses with PTSD are more likely to experience decreased productivity, burnout,

medication errors, and lower overall quality of care (Lauvrud et al., 2009; Gates et al., 2011; Czaja et al., 2012). On the other hand, nurses with PTSD are at higher risk of WPV due to the fact that individuals with PTSD may be overly irritable, which can lead to interpersonal conflict and self-aggression (Kuijpers et al., 2012). Moreover, they may exhibit emotional numbness, making them less alert to environmental factors around them that signal danger, which may put them at increased risk of being targeted by their abusers (Chu, 1992), creating a vicious cycle. Research aimed at exploring ways to mitigate the effects of WPV on PTSD is critical, and we found that self-efficacy may fill this role.

Resilience can be considered a process, a trait, or outcome, but it can be broadly conceptualized as adaptation in the face of adversity (Southwick et al., 2014). Self-efficacy is widely associated with resilience, a form of cognition that promotes positive coping and adaptive responses to obstacles, thereby increasing resilience to traumatic environments (Connor and Davidson, 2003; Gallagher et al., 2020). In this study, we found a negative correlation between nurses' self-efficacy and PTSD, which is consistent with other studies (Bosmans and van der Velden, 2017). In fact, high self-efficacy functions as a resilience factor among victims of different traumatic events. People with higher self-efficacy are less likely to experience PTSD (Cieslak et al., 2008; Guerra et al., 2018) because self-efficacy affects a person's alertness to potential threats, and those who believe they can control those threats are less likely to feel distressed. In contrast, people with low self-efficacy are more likely to overestimate threats and worry about negative outcomes (Zhou et al., 2021). In previous studies, the protective effect of self-efficacy on PTSD symptoms was demonstrated for various traumatic experiences (Ginzburg et al., 2003; Gil, 2005).

More importantly, in this study, we found that self-efficacy can act as a mediator between WPV and PTSD symptoms, similar to the finding that self-efficacy can mediate between sexually abused adolescents and PTSD symptoms (Guerra et al., 2018). Previous studies focused more on the effect of self-efficacy on PTSD, whereas our study found that higher WPV may lead to lower self-efficacy and further lead to higher levels of PTSD symptoms. Self-efficacy is one of the cognitive factors that can explain the emotional response to traumatic situations. In this context, this factor refers to the individual's belief in their ability to cope with the excessive demands caused by a traumatic event (Benight and Bandura, 2004). Although this factor has received little attention in the literature in relation to female nurse victims, theory suggests that self-efficacy can play a mediating role between traumatic events and the symptoms they cause. Specifically, it has been suggested that violent scenarios may reduce self-efficacy because the victim personally believes that they do not have the necessary resources to overcome the dilemma (Bandura, 1977; Benight et al., 1999; Diehl and Prout, 2002). Higher WPV leads to lower self-efficacy, which in turn is associated with high PTSD symptoms. These studies suggest that we can reduce PTSD symptoms in female nurses by reducing WPV and increasing self-efficacy; however, it is noteworthy that WPV still had a significant direct effect on PTSD, suggesting that self-efficacy is only a partial mediator, and there may be other variables that were not considered in this study.

Based on the results of this study, we propose the following recommendations in the hope of improving the severity of symptoms of PTSD in nurses and reducing the occurrence of WPV. First, the
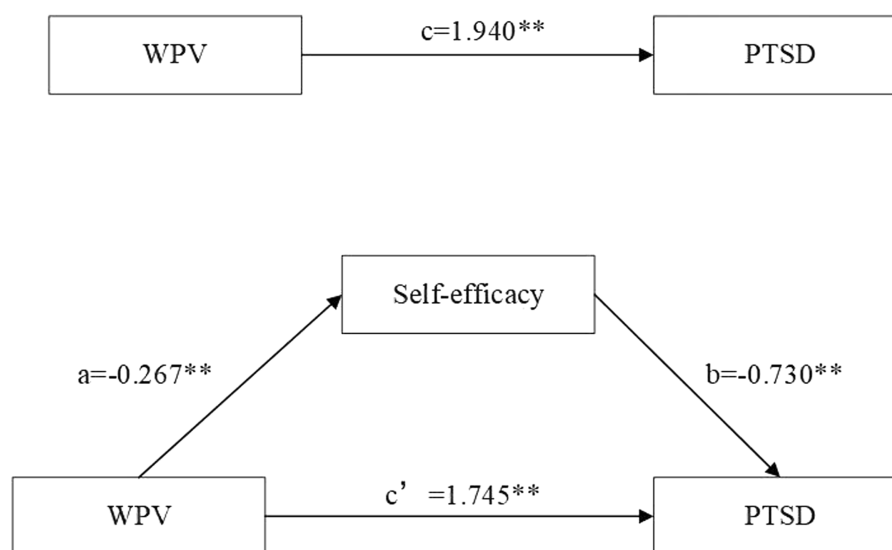
FIGURE 1
Model of the mediating role of self-efficacy between WPV and PTSD. **p <0.01.

number of security guards should be increased and appropriate security measures should be improved in hospitals so that the risk of WPV can be reduced and victims can seek immediate professional help in the event of its occurrence. Second, we found that self-efficacy plays an important role in the relationship between WPV and PTSD and recommend that hospital administrators conduct health education activities about it and provide the necessary support for nurses. For the government, the health administration should improve the standardized management and guarantee system for nurse registration and promotion, as well as establish independent professional systems and academic organizations to increase nurses' sense of belonging. For hospitals, nursing managers should adopt effective strategies to support nurses and give positive expectations to relieve their stress. Social persuasion is an effective measure to increase self-efficacy. Therefore, nurses who lack experience or support should be coached by confident, authoritative, and optimistic nurses to improve their confidence. In addition, simulation training in the department can effectively improve nurses' self-efficacy, promote learning and communication among the team, and contribute to the improvement of nurses' professional theories, skills, and problem-solving abilities. Finally, hospital support and care have the potential to reduce the harm caused by WPV to nurses, who should also be aware of all resources available in community homes for problem solving and maintaining good mental health (Shi et al., 2017b).

There are many studies on WPV in China, but most of them focus on its prevalence and influencing factors. As a stressor, WPV is closely relevant to PTSD, but there are not many related studies in China, especially for occupational groups such as nurses. This study is the first to explore the relationship between WPV and self-efficacy and PTSD among Chinese nurses, and to analyze the mediating role of self-efficacy. In this study, we found that WPV was an important predictor of PTSD for Chinese nurses; WPV was positively correlated to nurse PTSD, whereas self-efficacy was negatively correlated to PTSD. Self-efficacy mediated the

relationship between WPV and PTSD. Measures and strategies to reduce WPV and improve nurse self-efficacy may reduce the occurrence of nurse PTSD. However, this study has some limitations. First, our data on workplace violence was collected retrospectively, an approach that relies on participants' ability to recall events that occurred in the past 12 months, which can lead to recall bias. Second, the cross-sectional study could not draw a causal relationship between WPV, self-efficacy, and PTSD. Finally, this study was only conducted in Liaoning Province, and future research should expand the study population and region.

5. Conclusion

In conclusion, for nurses, WPV and PTSD were positively correlated, whereas self-efficacy and PTSD were negatively correlated. Self-efficacy mediated the relationship between WPV and PTSD. Strategies and measures to improve self-efficacy are expected to mitigate the effects of WPV on nurse PTSD.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was obtained from the Ethical Committee of Dalian Medical University. Each participant signed an informed consent form. Participants are informed of the purpose of the study prior to participation and are assured that their information is confidential. We confirmed that all the methods we used were in accordance with relevant guidelines and regulations.

Author contributions

All authors made significant contributions to the conception and design, acquisition of data, or analysis and interpretation of data, participated in drafting the article or critically revising important intellectual content, agreed to submit the article to the current journal, gave final approval of the version to be published, and agreed to take responsibility for all aspects of the work.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Bibliometric analyses of turnover intention among nurses: implication for research and practice in China

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Objective: The aim of this study was to analyze the current status of research on nurses' turnover intention and to provide suggestions and references for promoting research on turnover intention and for promoting hospital talent development.

Methods: We used the bibliometric method "turnover intention" or "intention to leave" and "nurse*" as subject terms, and 1543 articles from 2017 to 2021 were retrieved from the WoS database using VOSViewer and CiteSpace software. Article based on this descriptive statistical analysis was performed on the year of publication, region, institution, journal of publication, and cited articles.

Results: A total of 1,500 articles met the inclusion criteria. There is an overall upward trend in the number of articles published in the field of nursing in terms of turnover intention from 2017 to 2021. The United States has the highest number of publications and the highest number of institutions, while China ranks second in terms of publications, but there are no Chinese research institutions in the top 10. The top three journals in terms of the number of articles published are the Journal of nursing management, the Journal of advanced nursing, and the Journal of clinical nursing; Oman's League had the highest number of citations for their article in 2021; the most frequently occurring keywords are burnout, stress, satisfaction, model, work environment, organizational commitment, perception, predictor, mental health, and mediating role.

Conclusion: There is a great need for further research on how to develop sound measures to tackle nurse turnover intention. The following improvements should be made, such as to enhance research institutional settings for nurses' turnover intention in China and to increase attention to nurse burnout and possible mediating influences in future studies.

KEYWORDS

bibliometric, nurses, turnover intention, status, trend

1. Introduction

In recent years, the shortage of nurses due to turnover has become a global problem (Hayes et al., 2006). Their departure exacerbates the serious shortage of nursing human resources, which affects the quality of care and patient safety and the development of nursing careers (Tuckett et al., 2015; Gray et al., 2018; Ryan et al., 2019). With the rapid growth of the world population and the strengthening of the aging trend, people's living standards are improving, and the requirements for healthcare are getting higher, especially for the quality of nursing services (Qiqi et al., 2021). Therefore, how to reduce the nurse turnover rate and stabilize their workforce has become an urgent problem for their managers to solve. Willingness to leave is the best predictor of turnover (Hom et al., 1979). In terms of the use of research tools, the current research articles on nurses' turnover intention are vast, extensive, and mixed. Using traditional literature search methods to collect and organize literature related to this topic through the general academic search tool, it is easy to miss important literature on the topic. A comprehensive and systematic analysis in the form of mapping is conducted with the help of the CiteSpace visual metric analysis tool, which improves the research efficiency of researchers by providing macroscopic perceptions and predictions of research content from a quantitative perspective. In addition, there is a gap in the current research on bibliometric analysis conducted on nurses' turnover intention. Therefore, this study uses bibliometric analysis to sort out and analyze global research results related to nurses' turnover intentions from 2017 to 2021, to provide a certain database, to fill the gap of turnover intention research analysis based on bibliometric methods, to provide a comprehensive grasp of the progress of current research, and to provide a reference for predicting future research related to nurses' turnover intention.

2. Objects and methods

2.1. Objects

2.1.1. Inclusion criteria

Our study was based on the Web of Science (WoS) database, which is one of the most widespread databases in different scientific fields which are frequently used for searching the literature (Joshi, 2016). Various scholars for bibliometric evaluation across the sciences, social sciences, and arts and humanities to find the high-quality research most relevant to our area of interest.

2.1.2. Exclusion criteria

The following studies were excluded: (a) duplicate publications and (b) those whose content was not relevant or of little relevance to the topic of nurses' turnover intention.

2.1.3. Searching strategy

The retrieve strategies were as follows: TS = ("turnover intention "or "intention to leave "and "nurse*"). The time span is from January 2017 to January 2022. The implementation search was conducted from 10 September 2022 to 11 September 2022. The type of literature included "Article," "Review," and "Editorial." Language = English.

#1 turnover intention: ("turnover intention")OR ("intention to leave").

#2 Nurse:(Nurse*).

#3 Combination:#1AND#2.

2.1.4. Study selection

The database search was performed on 2 days to avoid the possibility of introducing bias due to the daily citation updates. Two members of our research team (zhf和wjx) independently assessed the retrieved documents, including journals, institutions, and countries. If there are differences of opinion, they are resolved by consensus.

2.1.5. Searching results

A total of 1,500 articles met the inclusion criteria. According to the retrieve strategies, a detailed search for publications obtained 1,543 articles from the Web of Science ("WoS"), in which one duplication was deleted, leaving 1,542 articles. Afterward, 42 articles were removed due to their unmatched key terms after careful screening.

2.1.6. Data abstraction

The following data were retrieved from the included articles, including publication time, institutional information, regional information, journal publications, and cited articles.

2.2. Methods

2.2.1. Bibliometric analysis

To save the information of the search results, we used the search analysis function provided by the WoS database and compared the title, author, abstract, and content to exclude duplicates, invalid, or incomplete papers. In addition, keywords with the same prefix but not focused on the intention of leaving the nursing field were excluded. Analysis of the most cited articles by journal, region, institution, and the number of citations predicted important trends in research. When analyzing the data, the words or phrases with the same or similar meanings in the included literature were combined into one keyword. For example, "turnover intention" stands for "intention to leave," and "nurse" stands for "nursing," "nurses," etc. Journal impact factors are based on the latest data from the Web of Knowledge JCR (2021). The keywords with higher frequency reflect the hot spots of research in the field, so the keywords are regarded as the concentration of research hot spots in the field. These high-frequency words are analyzed by network clustering, and the clustering effect is presented in the form of a graph; the higher the frequency, the more closely related the group of words. Bibliometric mapping were performed using the VOSViewer software (Leiden University, the Netherlands). VOSViewer uses text mining to recognize publication terms and then employs the mapping technique called visualization of similarities (VoS), which is based on co-word analysis, to create bibliometric maps or landscapes (Kokol et al., 2022).

2.2.2. Cluster analysis

CiteSpace software is a tool that identifies and displays new trends and developments in science in the scientific literature, which is used to find research advances and current research frontiers in a subject area and their corresponding knowledge base. The main functions include research subject and region analysis; mediated centrality is a measure of the importance of nodes in the network, and the higher the value, the greater the importance. In this study, the keywords are counted, and the topics are clustered and analyzed.
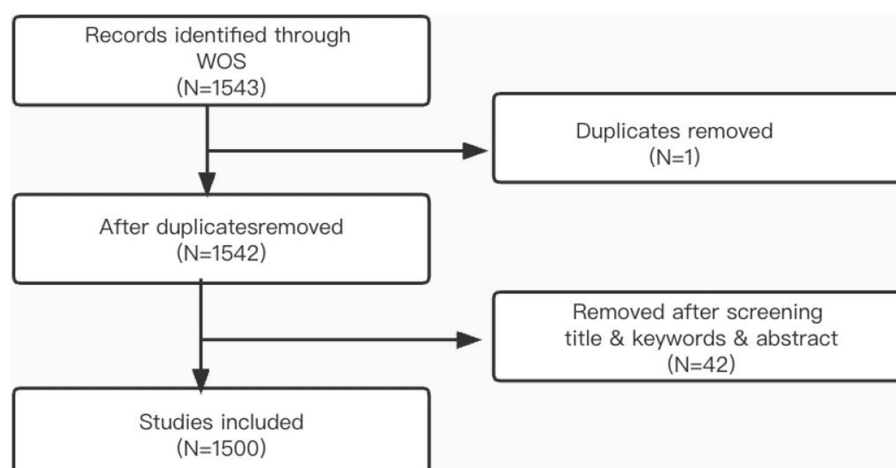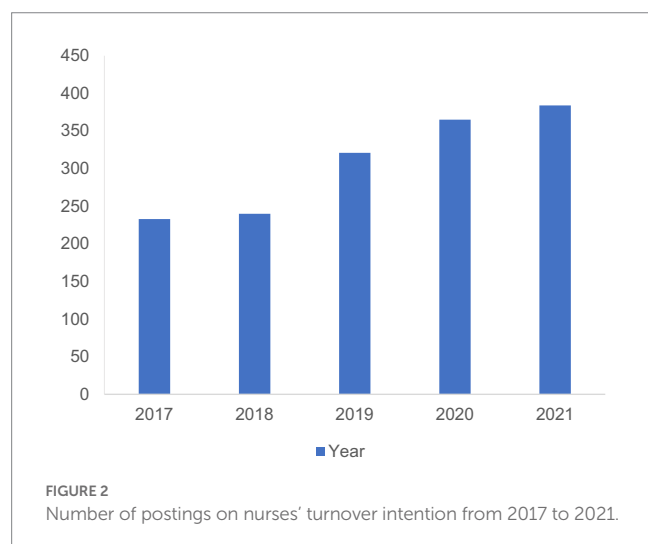
FIGURE 1
PRISMA flow chart.

FIGURE 2
Number of postings on nurses' turnover intention from 2017 to 2021.

3. Results

3.1. Original articles reached

An analysis of trends in the volume of literature provides a perspective on the level of attention and trends in research related to nurses' turnover intention (Zhou et al., 2011). The preferred reporting items for systematic reviews and meta-analysis (PRISMA) diagram explains how articles are selected (Mohera et al., 2009). In this study, PRISMA guidelines guided the process of systematic review (Figure 1). They are respectively 233,240,321,365 and 384 from 2017 to 2021, There ia a sharp increase after 2019 (Figure 2) , in which 1 duplication were deleted, leaving 1542 articles. Afterward, 42 articles were removed due to their unmatched key terms after careful screening. Therefore, a total of 1500 articles were included and saved for the next step in the process.

3.2. Order of productive affiliates

The distribution of institutions may be related to the and high priority given to nursing staff turnover in these regions. The contributions of the 10 most productive institutions are ranked (Table 1). University of California System, in which the publication number ranked first (32), followed by University of Texas System. Sultan Qaboos University ("SQU") published the highest percentage of cited articles. Among them, seven were from university institutions, eight were from the United States, one was from Sudan, and one was from Canada.

3.3. Order of productive regions

An analysis of the geographical distribution provides insight into the direction and development of research on nursing turnover intention in various countries around the world (David Mohera et al., 2009). The retrieved articles were from 92 countries, of which the United States ranked first, followed by China, Australia, and Canada (Table 2). The number of published articles in the United States exceeds that of China by about three times, and the academic research capacity maintains a leading position, with 10 for developed countries and six for developing countries.

3.4. Order of productive journals

The quality of the literature can be reflected, to some extent, by the journals in which the literature is published. Articles of inclusion were published in 306 different journals, of which the Journal of Nursing Management ranked first (112,7.47%), followed by the Journal of Advanced Nursing (63,4.20%) and the Journal of Clinical Nursing (493.27%) (Table 3). The International Journal of Nursing Studies established by Elsevier, United Kingdom, is an internationally renowned SSCI and SCI double-search journal, (Li Yule and Xinjuan,

TABLE 1 Top 10 highly prolific research institutions from 2017 to 2021.

Rank	Institution	Number	Times cites	Percent
1st	University of California System, US	32	494	2.84%
2nd	University of Texas System, US	28	419	2.41%
3rd	Harvard University, US	28	314	1.80%
4th	US Department of Veterans Affairs, US	27	451	2.59%
5th	Veterans Health Administration VHA, US	26	366	2.10%
6th	University of North Carolina, US	23	252	1.45%
7th	Sultan Qaboos University, Sultanate of Oman	21	646	3.71%
8th	University of Wisconsin System, US	20	261	1.50%
9th	University of Toronto, Canada	19	238	1.37%
10th	Pennsylvania Commonwealth System of Higher Education (PCSHE), US	18	231	1.33%

TABLE 2 Top 10 productive corresponding author countries from 2017 to 2021.

Rank	Country	Number	Percent
1st	US	532	35.47%
2nd	China	154	10.27%
3rd	Australia	124	8.27%
4th	Canada	115	7.67%
5th	South Korea	88	5.87%
6th	UK	84	5.60%
7th	Iran	49	3.27%
8th	Sweden	43	2.87%
9th	Taiwan (China)	42	2.80%
10th	Saudi Arabia	41	2.73%

TABLE 3 Top 10 productive journals turnover research from 2017 to 2021.

Rank	Journal names	Number	Percent	IF
1st	Journal of Nursing Management	112	7.47%	4.68
2nd	Journal of Advanced Nursing	63	4.20%	3.057
3rd	Journal of Clinical Nursing	49	3.27%	4.423
4th	International Journal of Environmental Research and Public Health	44	2.93%	4.614
5th	Journal of Nursing Administration	34	2.27%	4.423
6th	BMC Health Services Research	28	1.87%	2.908
7th	International Journal of Nursing Studies	27	1.80%	6.612
8th	BMJ Open	23	1.53%	3.006
9th	Nursing Open	23	1.53%	1.942
10th	BMC Nursing	22	1.47%	3.189

2009) which is ranked in the JCR SSCI division in the Nursing category, Region 1. Most of these journals focus on research related to nursing medicine.

3.5. Order of active cited articles

Citation frequency is an important indicator used in bibliometrics to measure the social salience and academic impact of academic papers

(Yang and Cai, 2010). The 10 most cited articles in the field of turnover intention are shown in Table 4. The most frequently cited article was "Fear of COVID-19, psychological distress, work satisfaction and turnover intention among frontline nurses" by Labrague, published in 2021 in the Journal of Nursing Management. This article has been cited more than 150 times, followed by "The role of job satisfaction, work engagement, self-efficacy, and agentic capacities on nurses' turnover intention and patient satisfaction" by De Simone, S et al., published in 2018 in Applied Nursing Research. Both are cited more than 2000

TABLE 4 Top 10 cited articles on turnover intention research from 2017 to 2021.

Rank	Article title	Journal	Times cites	Year	IF/JCR
1	Fear of COVID-19, psychological distress, work satisfaction and turnover intention among frontline nurses, Oman	Journal of Nursing Management	199	2021	4.68 (Q1)
2	The role of job satisfaction, work engagement, self-efficacy and agentic capacities on nurses' turnover intention and patient satisfaction, Italy	Applied Nursing Research	143	2018	1.847 (Q1)
3	Effects of nurse work environment on job dissatisfaction, burnout, intention to leave, Thailand	International Nursing Review	132	2017	3.384 (Q1)
4	Workplace violence, job satisfaction, burnout, perceived organizational support and their effects on turnover intention among Chinese nurses in tertiary hospitals: a cross-sectional study, China	BMJ Open	94	2018	3.006 (Q1)
5	Relationships between burnout, turnover intention, job satisfaction, job demands and job resources for mental health personnel in an Australian mental health service, Australia	BMC Health Services Research	93	2019	2.908 (Q2)
6	Factors predicting Registered Nurses' intentions to leave their organization and profession: A job demands-resources framework, New Zealand	Journal of Advanced Nursing	91	2018	3.057 (Q1)
7	Moral distress in physicians and nurses: impact on professional quality of life and turnover, USA	Psychological Trauma-Theory Research Practice and Policy	90	2017	9.398 (Q1)
8	The determinants and consequences of adult nursing staff turnover: a systematic review of systematic reviews, UK	BMC Health Services Research	86	2017	2.908 (Q2)
9	The relationship between job satisfaction, work stress, work–family conflict, and turnover intention among physicians in Guangdong, China: a cross-sectional study, China	BMJ Open	86	2017	3.006 (Q1)
10	Relationship between ethical work climate and nurses' perception of organizational support, commitment, job satisfaction and turnover intent, Egypt	Nursing Ethics	85	2017	3.344 (Q1)

times. All of these top articles were published in high-impact journals and shared an average citation number of 1,265. In total, 90% of the articles were published in 2020. Among them, eight are JRC Q1, all of them are high-impact journals in this field, and two are from China.

3.6. Keywords and cluster analysis

The keywords are a general summary of the article content, from which the overall research content and research concerns can be seen. In this study, we extracted and analyzed 9,141 keywords, in addition to the subject keyword of turnover intention and nurses, some of the keywords are closely related synonyms, and the top 10 keywords with higher frequency are in order of appearance: burnout, stress, job satisfaction, model, work environment, organizational commitment, perception, predictor, mental health, and mediating role (Table 5). It is shown that nurse burnout is still a hot research topic (Figure 3).

According to the domain to which each cluster belongs, the keyword cluster analysis is divided into four clusters, the general directions of which can be divided into job satisfaction, mental health, strategy, and teamwork (Table 6).

4. Discussion

The data show a positive trend of increasing articles published on turnover intentions during the last 5 years, although there is a slow rise in 2017–2018, but still slowly increasing articles, and an active period

TABLE 5 Top 10 keywords in the field of nursing from 2017 to 2021.

Rank	Keywords	Number	Centrality	First annual
1	Burnout	254	0.02	2017
2	Stress	181	0.01	2017
3	Job satisfaction	155	0.00	2017
4	Model	97	0.01	2017
5	Work environment	97	0.01	2017
6	Organizational commitment	95	0.01	2017
7	Perception	86	0.01	2017
8	Predictor	83	0.01	2017
9	Mental health	55	0.01	2017
10	Mediating role	55	0.02	2017

in 2019–2021, with a surge in articles and increased attention, which is consistent with Naila Ufiidatul Uzkiyyah study (Uzkiyyah et al., 2022), suggesting nursing managers and researchers became to pay attention to the problem of nurses' turnover intention. The reasons might be associated with the shortage of nursing human resources, and the orientation of national policy (Li and Liu, 2011; Li et al., 2015). Turnover intention among nursing staff is a growing and highly visible issue globally (Li and Liu, 2011; Li et al., 2015; Lyua et al., 2016). In addition, due to the long-term pandemic that has taken over almost
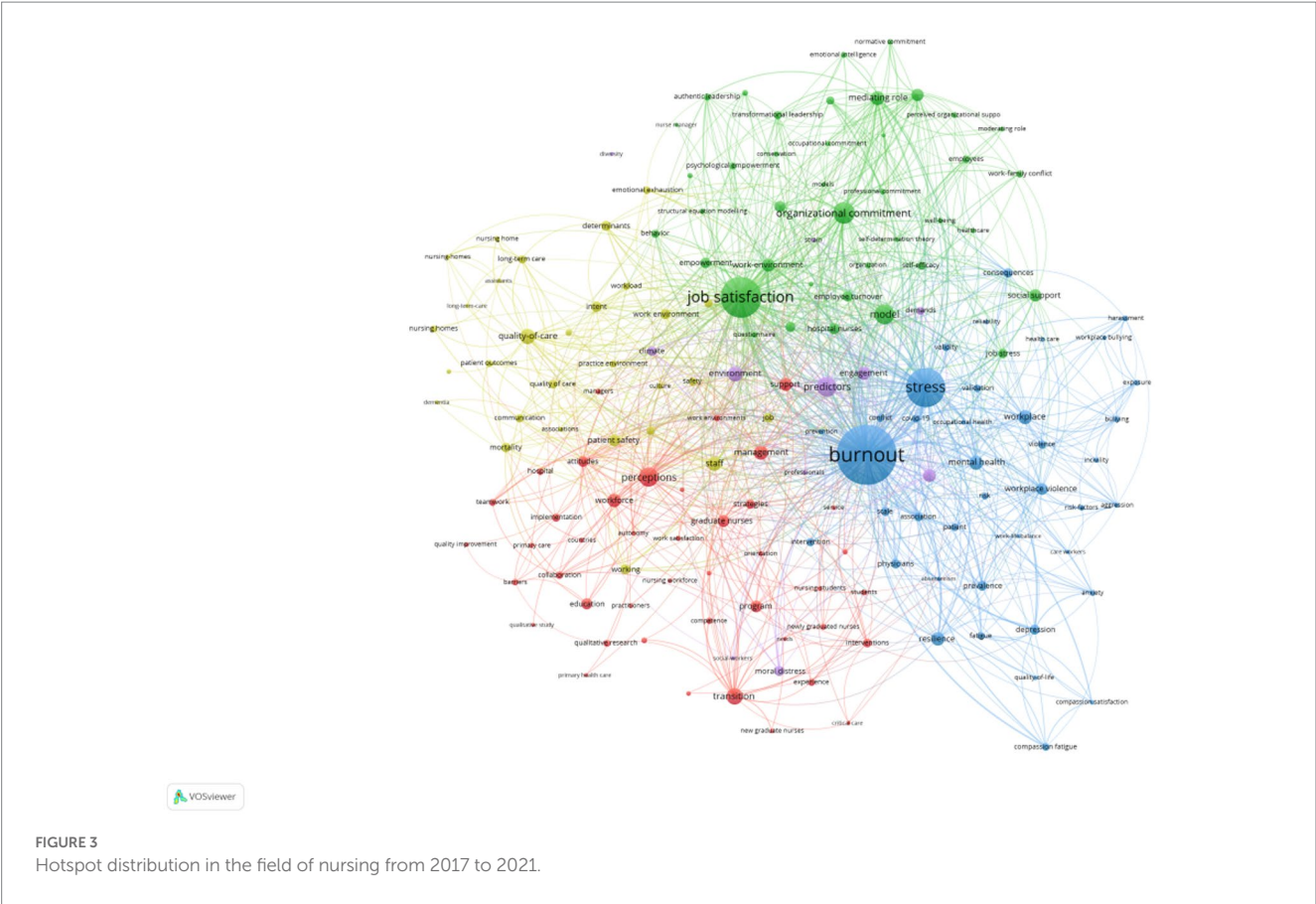
FIGURE 3
Hotspot distribution in the field of nursing from 2017 to 2021.

TABLE 6 Keyword clustering groups in the field of nursing from 2017 to 2021.

Clusters	Number	Name	LLR
A	#0	Job satisfaction	Commitment, performance, workplace, environment, and justice
B	#1	Mental health	Stress, burnout, depression, disease, and quality of care
C	#2	Strategy	Model, factors, mediating role, predictor, and management
D	#3	Teamwork	Leadership, staff, employee, perception, and empowerment

the entire world, the intention to leave is starting to occur in various countries and is expected to increase by the end of 2023.

Institutions can be classified as government departments, research institutions, universities and affiliated hospitals, the Centers for Disease Control and Prevention (CDC), and others. Among the top 10 institutions, universities account for 70% of research output, indicating that universities are the most dynamic and creative. Among them, there is consistency with NU studies showing that research results mostly occur in universities. As an important educational and research institution, the university assumes an important role in the training of nurses and is more able to closely combine practical and theoretical aspects and use the practice to improve the quality of nurse training. However, the most productive institutions were the University of California System in the United States, a consortium of 10 universities located in California, United States. It is the largest university system in the state and one of the most influential public university systems in the world. It is also possible and closely related to the mass departure of nurses in the United States, which has been reported in recent years (Buerhaus et al., 2022). The highest percentage of cited frequency of

articles published by SQU may be related to its first cited frequency of articles published in 2021. This is a reflection of the efforts and high impact of foreign research on burnout. The United States and China were the most productive countries, contributing more than 686 (45.74%) articles. This is also consistent with Naila Ufiidatul Uzkiyyah's ranking of the top two countries contributing the most to research results. Australia and Canada also topped the list, ranking third and fourth, respectively. The United States has been critical in promoting and participating in turnover intention research, early start, and is related to the intensity of its economic impact, and scientific and technological strength. In addition, China is one of the country most severely affected by nursing departures and has a late start in research, requiring great efforts to stabilize the nursing workforce, but the fact that many articles are published in Chinese and that China promotes writing in its own country has likely led to a significant lag in the number of articles published in the United States. They have played a very important role in the research and academic exchange of nurses' turnover intention.

The journals that published the articles were mainly from the more influential journals in the field of nursing. The journal impact factor is

an important indicator of the influence of academic journals, and the larger the impact factor, the higher the average citation rate of journal papers, and the higher the international recognition. As a carrier of the research progress of the intention to load separation, it promotes the solution of the talent pool stability program. This is consistent with the Su Yanbing study, where nursing human resource management has been a popular topic in the Journal of Nursing Management (Yanbing et al., 2019). This indicates that research on nurses' turnover intention has received attention from high-level journals. Therefore, researchers can track and pay attention to the abovementioned key journals to keep abreast of the latest developments in the current research on turnover intention, predict the direction of research development, and increase at the same time when publishing relevant research results, they can choose journals that are consistent with the research content.

The top ranking 2021 of highly cited papers came from Oman, and the articles were published during COVID-19, indicating that the outbreak was followed by a rapid response from Oman researchers and that nurse turnover intentions were given high priority in that country. Two of these articles were from China, demonstrating that the issue of turnover intention remains a hot topic of research in China, but that there has been a relative lack of empirical research in recent years. We found that studies related to nurses' intention to leave covered topics related to job satisfaction and mental health and that burnout and regulatory roles were major concerns in the turnover intention studies. Burnout among nurses remains a hot topic. This coincides with Huiyun Yang, where nurses' intention to leave is influenced by a variety of factors such as burnout and job stress (Yang et al., 2017). Burnout includes three major components: emotional exhaustion, depersonalization, and low personal fulfillment (Galdino et al., 2021). It usually occurs in the final stage of work stress and can be said to be a long-term, multifaceted result of work stress, leading to a psychological state of fatigue and apathy, which is a key factor forcing nurses to leave the profession. Burnout is a complex issue and an important predictor of the modern workplace, and its prevalence has increased dramatically in recent years, especially among nursing professionals (Leiter and Maslach, 2009; Cañadas-De la Fuente et al., 2015). Some scholars intervened to improve nurses' time allocation by implementing time management methods and improved nursing scheduling patterns to reduce nurses' burnout and thereby alleviate turnover intentions (Şenormancı et al., 2014). Therefore, to make nursing work more orderly and reasonable and reduce nursing workforce attrition, it is necessary to pay attention to nursing staff burnout and give timely help.

Research on the mediating factors of turnover intention may be the future research direction (Shah et al., 2021). There is a relative lack of empirical research on the mediating factors of turnover intention, interventions in terms of external organizational teams and internal self-perceptions, and developing a favorable working atmosphere, creating a healthy public opinion environment, strengthening nursing staff's learning, and promoting social support in healthcare institutions (Yang et al., 2022). It suggests that nursing researchers should expand the depth and breadth of research on nursing turnover intention.

5. Conclusion

Bibliometrics is a multidisciplinary interdisciplinary discipline based on bibliography, information science, mathematics, and

statistics (Poghosyan et al., 2009; Thompson and Walker, 2015; Xuang et al., 2021). CiteSpace software is a tool to visualize literature information data (Peter et al., 2021), which can not only assist in analyzing research hotspots in the nursing field about the intention to leave for clustering analysis but also predict the trend of theme evolution and prepare nurses in advance. Our study made a comprehensive analysis of all included articles and showed the present status, focus, and perspectives of research on nurse turnover intention between 2017 and 2021 and provided a reference for future related in-depth research. Currently, there is still a gap between the setting of influential research institutions engaged in the field of turnover intention in nursing in China and the international level, job burnout in nursing may still be a research hotspot for some time, and the focus of turnover intention research on the mediating factors of nursing staff may be the focus of future attention.

6. Limitations

One of the limitations is that the analysis was limited to publications indexed in WoS which does not index all journals, so articles from other databases (e.g., Scopus and PubMed) may have been overlooked. In addition, we only included publications in English, which may introduce publication bias. For example, the official languages are Chinese and Arabic in China and Saudi Arabia, and many cases are published in local language.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Author contributions

HZ responsible for the writing, conception and design of the article, and data collection. LW and VH provided critical review of the intellectual content of the article and corresponding work support. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Utility analysis of an adapted Mini-CEX WebApp for clinical practice assessment in physiotherapy undergraduate students

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Clinical workplace-based learning is essential for undergraduate health professions, requiring adequate training and timely feedback. While the Mini-CEX is a well-known tool for workplace-based learning, its written paper assessment can be cumbersome in a clinical setting. We conducted a utility analysis to assess the effectiveness of an adapted Mini-CEX implemented as a mobile device WebApp for clinical practice assessment. We included 24 clinical teachers from 11 different clinical placements and 95 undergraduate physical therapy students. The adapted Mini-CEX was tailored to align with the learning outcomes of clinical practice requirements and made accessible through a WebApp for mobile devices. To ensure the validity of the content, we conducted a Delphi panel. Throughout the semester, the students were assessed four times while interacting with patients. We evaluated the utility of the adapted Mini-CEX based on validity, reliability, acceptability, cost, and educational impact. We performed factor analysis and assessed the psychometric properties of the adapted tool. Additionally, we conducted two focus groups and analyzed the themes from the discussions to explore acceptability and educational impact. The adapted Mini-CEX consisted of eight validated items. Our analysis revealed that the tool was unidimensional and exhibited acceptable reliability (0.78). The focus groups highlighted two main themes: improving learning assessment and the perceived impact on learning. Overall, the eight-item Mini-CEX WebApp proved to be a valid, acceptable, and reliable instrument for clinical practice assessment in workplace-based learning settings for undergraduate physiotherapy students. We anticipate that our adapted Mini-CEX WebApp can be easily implemented across various clinical courses and disciplines.

1. Introduction

In undergraduate health professions, such as physical therapy, clinical workplace-based learning is crucial (WCPT, 2011). This learning process involves observation and supervision, which provide valuable performance information (Kogan et al., 2009; Hauer et al., 2011). However, challenges arise due to the high clinical workload and restrictions on clinical practice, which often hinder the ability to provide adequate observation and supervision (Schopper et al., 2016). Furthermore, there is often a lack of observation and appropriate feedback (Haffling et al., 2011; Boud, 2015; O'Connor et al., 2018; Fuentes-Cimma et al., 2020; Noble et al., 2020). Consequently, students struggle with knowledge integration, clinical reasoning, practical skills, and learning new clinical topics (Milanese et al., 2013).

Well-conducted feedback has the potential to significantly impact student learning (Norcini and Burch, 2007; Boud and Molloy, 2013). The utilization of observation and feedback as strategies in workplace-based assessments has shown satisfactory results among medical residents (Hicks et al., 2018; Singhal et al., 2020; Pinilla et al., 2021). One important assessment instrument in this context is the Mini Clinical Evaluation Exercise (Mini-CEX), which was originally developed for medical residents and has been adapted for undergraduate health students (Norcini et al., 1995, 2003; Kim and Hwang, 2016; Fuentes-Cimma et al., 2020; Mortaz Hejri et al., 2020). The Mini-CEX has demonstrated robust psychometric properties (De Lima et al., 2007; Cook et al., 2010; Pelgrim et al., 2011; Al Ansari et al., 2013) and has shown educational impact (Montagne et al., 2014). Multiple preceptors can utilize the Mini-CEX on several occasions during a clinical rotation (De Lima et al., 2007; Cook et al., 2010; Pelgrim et al., 2011; Al Ansari et al., 2013). The assessment process begins with direct observation of a student while interacting with a patient (Norcini et al., 1995, 2003; De Lima et al., 2007). Then, the student presents clinical findings, a diagnosis, and an intervention plan. Finally, the observer provides timely and individualized feedback to the student (Norcini et al., 1995; De Lima et al., 2007).

In the context of a culture of assessment for learning, assessment instruments like the Mini-CEX have gained increased importance. Notably, within the field of physical therapy, there have been initiatives to incorporate assessment into learning practices (Fuentes-Cimma et al., 2020; Walker and Roberts, 2020). However, there remains a need to share experiences regarding the development and implementation of clinical assessment systems. O'Connor et al. (2018) conducted a systematic review that highlighted the necessity for further research in workplace-based assessments within physical therapy.

Unfortunately, despite the recognition of the Mini-CEX as an excellent assessment tool, the high clinical workload often poses challenges to its implementation. Therefore, technological advancements such as the development of a WebApp can offer potential solutions for workplace-based assessments. A WebApp refers to a software program accessible through a web browser that provides interactive functionalities to users *via* the Internet.

Hence, we conducted a utility analysis of an adapted Mini-CEX implemented in the form of a WebApp designed for mobile devices. Our aim was to assess the validity, reliability, and acceptability of this adapted Mini-CEX WebApp as a tool for assessing physical therapy undergraduate students during their clinical practice. We hypothesized that the implementation of this adapted Mini-CEX WebApp would result in a valid, reliable, and acceptable tool for both students and preceptors.

2. Methodology

The fourth-year undergraduate physical therapy students were assessed using an adapted Mini-CEX WebApp on four occasions during their final semester (6 months of clinical practice, Figure 1). The assessments were conducted by clinical educators in outpatient musculoskeletal clinical placements. To implement the Mini-CEX WebApp, we conducted a utility analysis that encompassed various aspects, including validity, reliability, acceptability, costs, and educational impact (Van Der Vleuten, 1996). Both quantitative data from the Mini-CEX WebApp and qualitative data from focus groups were collected to provide a comprehensive evaluation. The study was approved by the Ethics Committee of the Faculty of Medicine of the Pontificia Universidad Católica de Chile (ID 170707003).

2.1. Participants

A total of 24 clinical educators from 11 different clinical placements and 95 undergraduate physical therapy students were invited to participate in the study. The students came from an undergraduate 4-year physical therapy curriculum at the Pontificia Universidad Católica de Chile (Santiago, Chile).

Our methodology and results are described in six sections (content validity, construct validity, reliability, acceptability, costs, and educational impact) to didactically simplify the comprehension of the utility analysis purpose of our study.

2.2. Content validity

In line with the learning outcomes of the course, the first step involved engaging in a discussion with faculty members regarding the utilization of the original eight Mini-CEX items. As a result, this discussion resulted in the first version of the adapted Mini-CEX tool. Then, a Delphi panel was conducted remotely with the purpose of evaluating the level of consensus among the items in terms of their relevance, pertinence, and comprehensibility. The consensus was determined by achieving an average score of 4.5 points on a 5-point Likert scale (1: strongly disagree; 5: strongly agree). A total of 23 experts in health science education or musculoskeletal physiotherapy agreed to participate in the Delphi panel through a Google Forms© survey.

2.3. Construct validity

The construct validity of the Mini-CEX was obtained through exploratory and confirmatory factor analysis. The exploratory factor analysis aimed to detect the constructs (Byrne, 2012) underlying the instrument items' scores (Flora and Curran, 2004), while the confirmatory factor analysis confirmed the number of factors proposed in the exploratory analysis (Byrne, 2012). We

used Kaiser's rule to determine the number of factors that should be retained in the exploratory factor analysis with an eigenvalue >1. This criterion explains more variance than a single variable (Goretzko and Measurement, 2019).

Since the items were ordinal variables, the robust Weighted Least Squares Mean-Variance (WLSMV) adjusted method was used (Byrne, 2012). The WLSMV method has high accuracy in estimating statistical tests, model parameters, and their
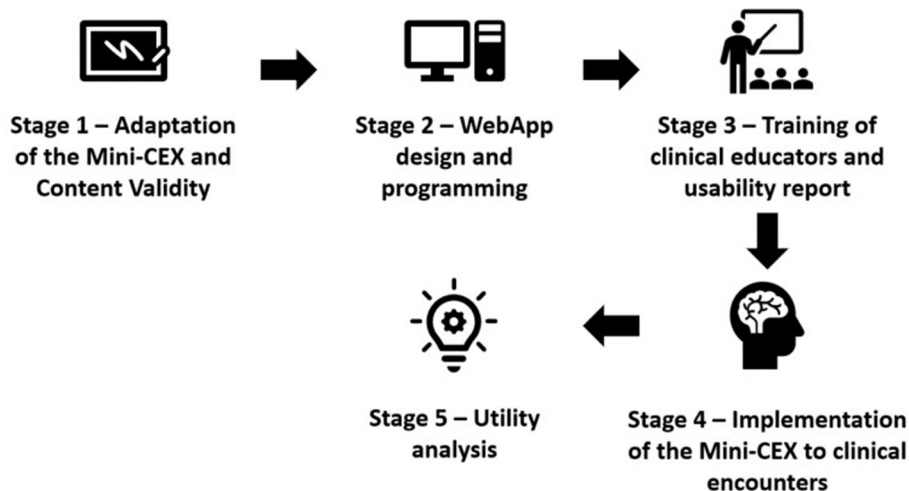

FIGURE 1
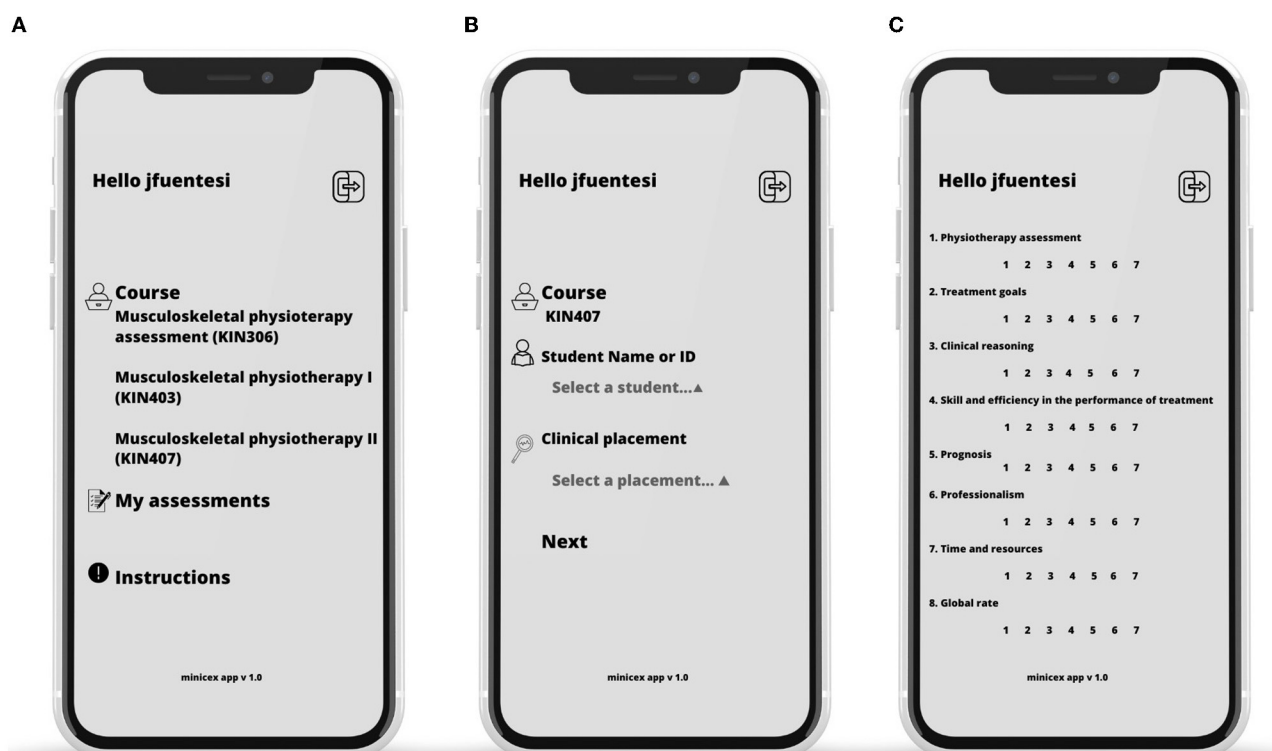The 8-item Mini-CEX WebApp implementation and assessment.

FIGURE 2
WebApp implementation flow. **(A)** Mini-CEX Web-App welcome view. **(B)** Student and clinical placement selection view. **(C)** Mini-CEX items and scoring.

TABLE 1 Standardized factor loadings and the Kaiser-Meyer-Olkin (KMO) index of the Mini-CEX items obtained through an exploratory factor analysis.

Items	Factor loading	KMO
1. Physiotherapy assessment: the student performs a complete and accurate physiotherapy assessment, including a clinical interview and physical examination.	0.71	0.83
2. Planning of treatment goals: the student proposes treatment goals according to the patient's condition and progression.	0.72	0.85
3. Clinical reasoning: the student selects therapeutic techniques that are consistent with the patient's health condition and progression.	0.68	0.86
4. Skill and efficiency in the performance of treatment: the student demonstrates skills and efficiency in the performance of treatment techniques.	0.41	0.84
5. Prognosis: the student establishes a functional prognosis for the patient based on the assessment, functional diagnosis, and treatment goals.	0.52	0.83
6. Professionalism: the student demonstrates punctuality, respect, empathy, interest in the task, and adequate communication during the assessment.	0.21	0.84
7. Time and resources: the student organizes his/her time and resources correctly, and the clinical process is organized in an efficient manner.	0.45	0.88
8. Overall rating as a fourth-year physiotherapy student (knowledge, skill, and attitude).	0.86	0.81

KMO, Kaiser-Meyer-Olkin index.

TABLE 2 Standardized factor loadings and R^2 of the items included in the Mini-CEX obtained through a confirmatory factor analysis.

Items	Factor loading	R^2	p-value
1. Physiotherapy assessment	0.71	0.51	<0.001
2. Planning of treatment goals	0.69	0.47	<0.001
3. Clinical reasoning	0.68	0.46	<0.001
4. Skill and efficiency in the treatment performance	0.42	0.17	<0.001
5. Prognosis	0.47	0.22	<0.001
6. Professionalism	0.21	0.04	0.083
7. Time and resources	0.44	0.19	<0.001
8. Overall rating as a fourth-year physiotherapy student	0.88	0.77	<0.001

TABLE 3 Median and 25−75 percentiles (p25−p75) for items included in the Mini-CEX.

Items	Median (p25−p75)
1. Physiotherapy assessment	6 (5–6)
2. Planning of treatment goals	6 (6–7)
3. Clinical reasoning	6 (5–7)
4. Skill and efficiency in the performance of treatment	6 (5–6)
5. Prognosis	6 (6–7)
6. Professionalism	7 (7–7)
7. Time and resources	6 (6–7)
8. Overall rating as a fourth-year physiotherapy student	6 (5–7)

p25, 25th percentile; p75, 75th percentile.

respective standard errors (Flora and Curran, 2004; Byrne, 2012). Additionally, the Kaiser-Meyer-Olkin (KMO) index was used to determine whether the sample was suitable for factor analysis. The KMO takes values between 0 and 1, where small values indicate that the variables have weak correlations to perform factor analysis. A KMO index above 0.80 was considered "excellent" (Kaiser, 1974).

Standardized factor weights were obtained from exploratory and confirmatory analyses, representing the relationship between the latent factor (measured construct) and the item scores. Furthermore, the coefficient of determination (R^2) was obtained to quantify each item's variance percentage explained by the factor identified in the exploratory analysis (Kaiser, 1974). Several goodness-of-fit indexes were calculated for the confirmatory factor model: (a) comparative fit index (CFI), which relates to the degree of correlation between survey items; (b) Tucker-Lewis index (TLI), which penalizes complex models (Wang and Wang, 2012); and (c) root mean square error of approximation (RMSEA), which quantifies the model's lack of adjustment (Wang and Wang, 2012). The RMSEA incorporates a hypothesis test called the close-fit test, which enables the statistical evaluation of the confirmatory model's

goodness of fit. The CFI and the TLI indexes have a cutoff point of 0.9 (Wang and Wang, 2012). The RMSEA index has a cutoff point of ≤0.06, and the range of acceptable adjustment was between 0.05 and 0.08 (Hu and Bentler, 1999; Wang and Wang, 2012). An index equal to or greater than 0.05 was considered "excellent" (Wang and Wang, 2012).

2.4. Reliability

Cronbach's alpha reliability coefficient was calculated to determine the internal consistency of each item obtained from the factor analysis. Cronbach's alpha coefficient equal to or >0.70 was considered "adequate" (Kline Rex, 2015). The interpretation of the coefficient magnitude should consider the number of items on the scale and the sample size (Ponterotto and Ruckdeschel, 2007). For instruments consisting of 7–11 items and a sample size below 100 participants, an alpha coefficient of 0.75 is considered "good" (Ponterotto and Ruckdeschel, 2007).

After content, construct validity, and reliability, the 8-item Mini-CEX was implemented in musculoskeletal clinical placements. The 8-item Mini-CEX was designed into a WebApp for mobile use (cellphones or tablets, Figure 2). Two independent

researchers constantly ensured network accessibility, the availability of mobile equipment, and the completeness of the assessment. The Webapp allowed score data to be collected from each clinical practice assessment, and comments were accepted for feedback items. When the assessment ended, the WebApp instantly sent a report to the student, clinical educator, and faculty email, respectively. All obtained data were stored in a server (database) implemented for this project.
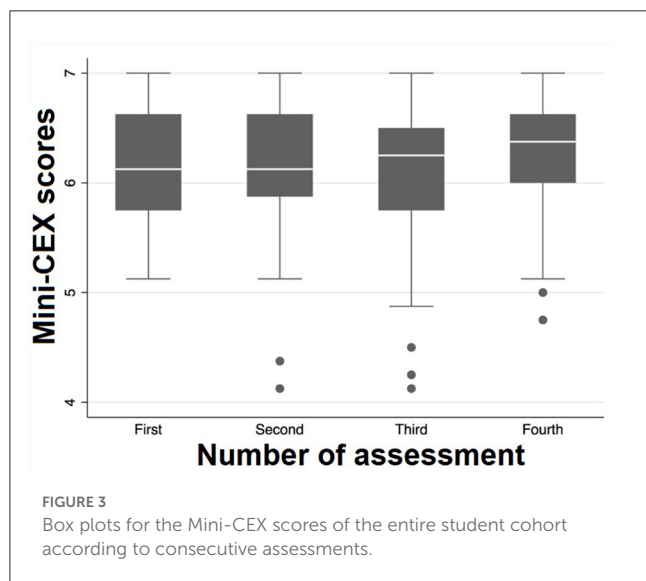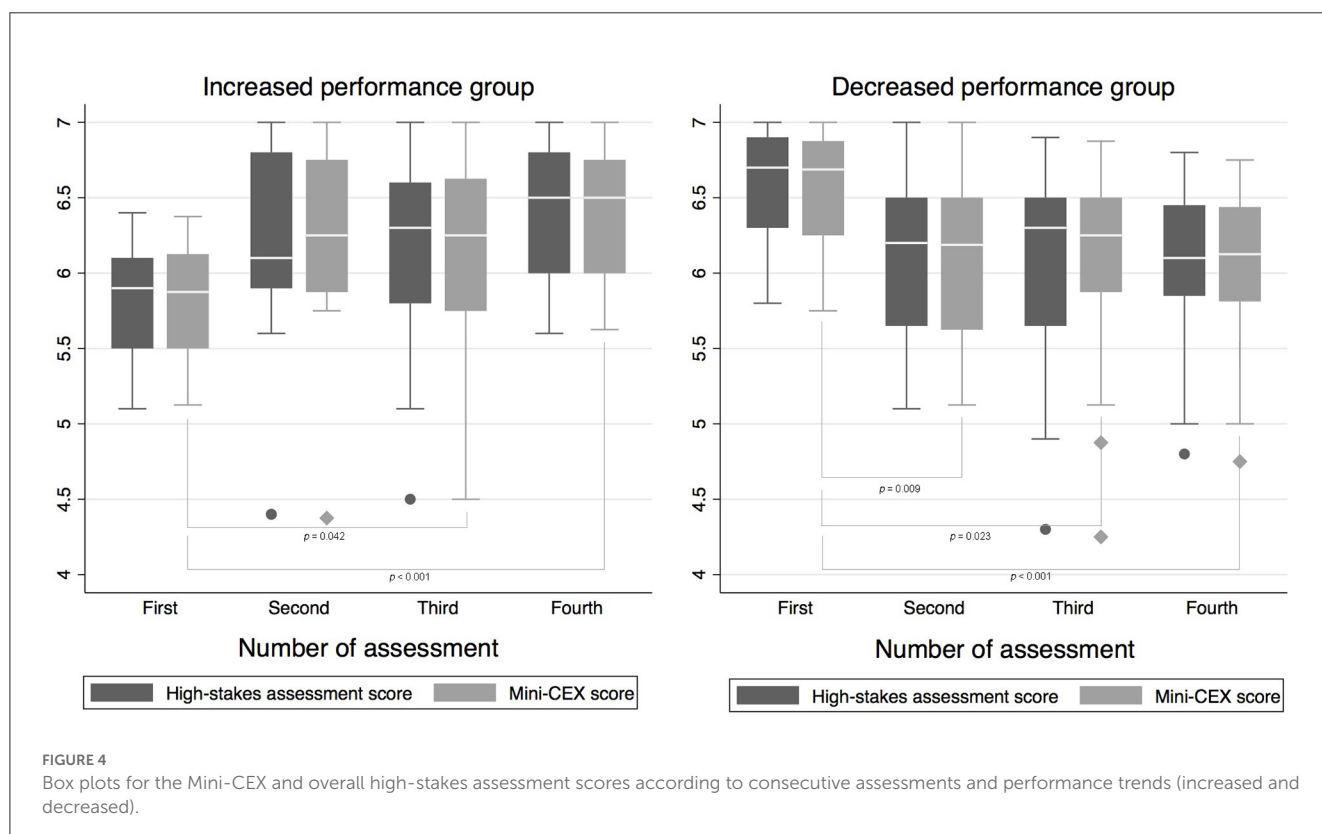
Prior to student assessments, the clinical educators underwent training on how to use the Mini-CEX WebApp in simulated assessment sessions. Furthermore, a workshop was conducted at the university during the same semester, aiming to enhance feedback practices using the assessment tool.

2.5. Acceptability

A pragmatic qualitative approach was used to assess the acceptability of the adapted Mini-CEX WebApp by conducting two focus groups of students and clinical teachers. To ensure impartiality and prevent biased assumptions, an expert in qualitative research facilitated the focus groups (see the Supplementary material). The focus was to investigate the participants' perspectives on aspects related to the acceptability of the new Mini-CEX WebApp. Additionally, the study aimed to gain insight into the participants' discussions and interactions regarding their opinions. The information obtained from the focus groups was recorded and transcribed verbatim. Subsequently, a thematic analysis was conducted employing open coding techniques (Nowell et al., 2017).

FIGURE 3
Box plots for the Mini-CEX scores of the entire student cohort according to consecutive assessments.

2.6. Costs

In evaluating the costs associated with the implementation, several factors were considered, including usability, preceptor

FIGURE 4
Box plots for the Mini-CEX and overall high-stakes assessment scores according to consecutive assessments and performance trends (increased and decreased).

training, time spent per encounter, and the resources allocated to measure stakeholder perceptions and experiences. Usability factors included aspects such as Internet access, availability of mobile equipment, operating system, and recording of forms.

2.7. Educational impact

To determine the educational impact, the first two levels of the Kirkpatrick model for program evaluation were utilized (Kirkpatrick, 1994). For level 1, the reaction was assessed by conducting a descriptive analysis of two satisfaction items—one for the student and one for the teacher. These items had a 7-point scale, ranging from 1 indicating "low satisfaction" to 7 indicating "high satisfaction." Both items were incorporated into the same WebApp, enabling immediate evaluation of the Mini-CEX. Additionally, the time spent by the teacher on observing the student-patient interactions and providing feedback was measured.

For level 2, learning outcomes were evaluated by analyzing the Mini-CEX scores of the students. A comparison was made between the scores obtained at four different assessments throughout the semester, distinguishing between improved scores and those that did not show improvement. To further determine the effectiveness of the intervention, the difference between the fourth measurement and the baseline measurement was calculated, enabling the identification of performance improvement or failure to improve. This analysis helped determine if non-significant results were due to a significant number of students showing a decreasing trend while others exhibited the opposite trend. Furthermore, the overall high-stakes assessment score, representing a final examination conducted at the end of the semester, was described and compared.

The Shapiro-Wilk test showed a non-normal distribution for the scores obtained by students who improved ($p < 0.01$) and who did not improve ($p < 0.001$). Therefore, we assessed a linear trend of scores increasing or decreasing over time using a non-parametric trend test based on the method proposed by Cuzick (1985). Furthermore, the median of the four measurements was estimated and compared over time for both groups. Using these, we built Quantile regression models with robust and clustered standard errors (Machado et al., 2011) to assess score differences over time in both groups. The Quantile regression with robust and clustered standard errors expresses the estimations in medians, considering the intra-cluster correlation. Hence, similar consecutive measurements of the Mini-CEX scores should have a high positive correlation.

2.8. General statistical methods

The data description, exploratory factor analysis, and quantile regression models were analyzed using the STATA version 17 (StataCorp, 2021), while the confirmatory factor analysis was conducted using MPlus software version 7 (Muthén and Muthén, 1998). A significance level of 5% was applied to all statistical analyses performed.

3. Results

A total of 24 available clinical educators (∼6 years of experience), at 11 different clinical placements, and 95 undergraduate physical therapy students (64 women and 31 men, aged 22.4 ± 1.4 years) were enrolled. A total of 378 clinical encounters were assessed since one student attended only two of his four visits.

3.1. Content validity

The initial version of Mini-CEX consisted of seven items. Two rounds of the Delphi panel were needed to reach an agreement on the items and ensure the validity of the content. In the first and second rounds, 18 and 12 experts, respectively, answered the online survey within the requested time. After two rounds of the Delphi panel, an 8-item Mini-CEX was obtained, with all items above 4.5 on the five-point Likert scale.

3.2. Construct validity

The polychoric correlations among the eight items demonstrated moderate to strong relationships, with values ranging mostly between 0.4 and 0.9 (Supplementary Table 1). The construct validity in the exploratory factor analysis showed one factor with an eigenvalue greater than one (Kaiser's rule). This factor explained 73% of the total variance in Mini-CEX scores. All standardized factor loadings for the questionnaire items were found to be high, with values >0.4, except for question 6. Additionally, the Kaiser-Meyer-Olkin (KMO) index exceeded 0.8 for all questions, indicating an adequate to excellent sample (Table 1). The highest fit was obtained for one factor [X_2 (7) = 11.22; $p = 0.129$], and the CFI and the TLI indices (0.94 and 0.92, respectively) were the highest.

The confirmatory factor analysis obtained standardized factor loadings >0.4 for most items, with a maximum of 0.88 for item 8. Thus, each item was strongly correlated with the previously identified latent factor (Table 2). In addition, the R^2 was over 0.4 for most items, fluctuating between 0.04 (item 6) and 0.77 (item 8). In the latter case, 77% of the variability in scores from item 8 was explained by the single factor identified in the confirmatory factor analysis.

The goodness-of-fit (improved confirmatory model) indicates that the CFI and TLI indices were 0.98 and 0.97, respectively. The RMSEA = 0.04 was within a good fit range ($p < 0.05$), and the upper limit of its 95% confidence interval ($p = 0.06$) was within the acceptable fit range. Considering that the close-fit test was not statistically significant ($p = 0.78$), it was not possible to reject the goodness-of-fit hypothesis of the confirmatory model (RMSEA < 0.05). Item 6 obtained the highest scores (Table 3).

3.3. Reliability

The obtained Cronbach's alpha was 0.78.

3.4. Acceptability

Two focus groups were conducted to explore participants' acceptance of the WebApp. The first focus group consisted of five clinical teachers, while the second involved nine students. Through the focus groups, two themes were identified: improvement in the assessment of learning and perception of the impact on learning.

3.4.1. Improvement in the assessment of learning

One of the strengths identified by participants was the perceived efficiency of the adapted Mini-CEX due to the reduced time required for the assessment process and the user-friendly nature of the Mini-CEX WebApp. Therefore, it allows for more time for student feedback. The following excerpt reflects this idea:

> … in this tool, it is much easier, much simpler, and that makes you spend less time with the student in the evaluation and have more time to give feedback afterward… (Student 1, paragraph 10).

The simplicity of the Mini-CEX was perceived as a significant advantage, particularly in a busy workplace environment with a heavy patient care workload. The following excerpt from one of the clinical teachers explains this impression:

> ... I had a lot of patients at the same time when 3 or 4 students arrived, the feedback time was much more effective... I tell them "look, the summary will be sent to you by mail so that you can look over it well", I give them the necessary feedback, and you move forward much faster with each student... (Teacher 4, paragraph 20).

However, students expressed a somewhat different perspective regarding the efficiency of the Mini-CEX WebApp, mentioning that it has led to a sense of impersonality in the assessment process. Their viewpoint is captured in the following statement:

> ... it becomes a little bit more impersonal, the assessment becomes a little bit distant in the sense that you are quiet and sitting down and the tutor is like [gestures typing on the phone] and doesn't say anything, then he is like 5, 3, 7, and says "okay I sent your grade"... (Student 8, paragraph 38).

Additionally, students highlighted the significance of implementing actions that contribute to sustainability by reducing the use of printed paper. Students also perceived that the 7-point scale utilized in the assessment was more subjective compared to a rubric that provides clear and specific criteria for evaluation.

3.4.2. Perception of the impact on learning

The most critical aspect in terms of its impact on learning is timely feedback. Both groups perceive that there is a greater amount of time for student feedback, highlighting strengths and weaknesses based on clinical activity.

> ..., since the app is individualized, the possibility of assessing them with a patient is great for learning as well as more personalized for each student... (Teacher 3, paragraph 106).

3.5. Costs

The design of the WebApp incurred a one-time cost financed by an internal fund (US$1,400). Additionally, there was a monthly cost of US$50 for server hosting. Usability aspects of the WebApp were provided by the clinical placements or each clinical tutor. Two research assistants helped monitor these aspects. To ensure the successful implementation of the Mini-CEX Webapp, the research team organized a training session for the participating clinical teachers. Furthermore, a feedback workshop was conducted at the university during the same semester to promote feedback processes using the adapted instrument. In total, these faculty training activities involved a total duration of 20 h.

3.6. Educational impact

For level 1, the reaction was assessed by conducting a descriptive analysis of two satisfaction items, namely, teacher satisfaction, which had a median (IQR) of 6, and student satisfaction, which had a median (IQR) of 6, on a 7-point scale. Furthermore, the time spent observing the student-patient interaction was 22.5 ± 6.5 min, and the feedback time was 9.4 ± 2.9 min. Regarding learning, the assessment of the entire student cohort using Cuzick's test with rank scores did not reveal a significant trend in scores over time ($p = 0.230$; Figure 3). However, a group of students improved (49.9%) their scores compared with the baseline assessment (Figure 4). For the group that improved their scores, Cuzick's test showed a significant and positive trend over time ($p < 0.001$). The subsequent median scores were 5.9 (95% CI 5.7–6.1), 6.3 (95% CI 5.9–6.6), 6.3 (95% CI 6.0–6.5), and 6.5 (95% CI 6.3–6.7). The third ($p = 0.042$) and fourth ($p < 0.001$) assessments were significantly higher than the baseline. The largest difference in medians reached 6.3-tenths point (95% CI 3.4–9.1), corresponding to the difference between the first and fourth assessments.

On the contrary, for the group that did not improve their scores, Cuzick's test showed a significant and negative trend over time ($p = 0.0005$) (Figure 4). The subsequent median scores were 6.6 (95% CI 6.4–6.8), 6.1 (95% CI 5.9–6.4), 6.3 (95% CI 6.0–6.5), and 6.1 (95% CI 5.9–6.3). The second ($p = 0.009$), third ($p = 0.023$), and fourth ($p < 0.001$) assessments were significantly lower than the baseline. The largest difference in medians reached 5.0-tenths point (95% CI -6.8 to -3.2), corresponding to the difference between the first and fourth assessments. A similar pattern was observed for both groups of students in the overall composite high-stakes assessment, which closely follows the performance of the Mini-CEX (Figure 4).

4. Discussion

The main findings about the 8-item Mini-CEX WebApp were that (1) the tool is a valid, acceptable, and reliable instrument for students, faculties, and clinical educators for clinical practice assessment in workplace-based learning settings for health undergraduate professions. (2) The tool is designed to measure the progress or change in student performance, particularly in those who started with the lowest scores followed by a few encounters ($n = 4$). (3) There was high satisfaction among students and clinical educators. Both agreed that there was more time for feedback. (4) The tool was able to show the same patterns of change as the overall high-stakes assessment score. (5) Some students perceived the Mini-CEX WebApp implementation as more impersonal and subjective than a rubric that clearly describes the assessment criteria.

Our findings support the idea that the Mini-CEX WebApp helped provide timely, individualized, and specific feedback to students while also aiding faculty in managing assessment data. These findings align with previous research on the benefits of observation and feedback in facilitating workplace-based assessments (Lefroy et al., 2017; Levinson et al., 2019). Furthermore, our findings are consistent with the growing integration of technology in higher education, such as simulation, blended methodologies, and apps, which have significantly advanced and become more common among faculties and students in the last decade (Masters et al., 2016). Although our instrument was adapted for the purpose of assessing the learning outcomes of undergraduate physiotherapy students, given that it has been modified from the original instrument, all items could be readily adapted to other contexts.

The development of the 8-item Mini-CEX WebApp involved a rigorous construction and content validation process. The high level of reproducibility achieved indicates its positive impact on participants' satisfaction. Factor analysis helped us understand the unidimensional nature of the Mini-CEX and select the right items for our clinical educators (Cook et al., 2010; Véliz et al., 2020). The confirmatory factor analysis showed Mini-CEX characteristics similar to previous studies by Cook et al. (2010) and Berendonk et al. (2018). Moreover, the 7-point scale we applied was easier to answer compared with the original 9-point scale. This distinction was made because the 7-point scale was better accepted and more familiar to our clinical educators and students. Because of that, the 7-point scale encouraged no interference with student grading (Fuentes-Cimma et al., 2020; Véliz et al., 2020). As for the R^2 of item 6, which was low and not significant, there is an explanation based on the data. There is a ceiling effect in that item (median 7, with the 25th and 75th percentiles, also at 7). The effect of this bias (extreme response bias) has been studied in factor analyses (Liu et al., 2017). Furthermore, this item refers to professionalism, which has been intentionally developed in curriculum reforms in our faculty (Cisternas et al., 2016), and it is also the item with the highest score in previous applications (Fuentes-Cimma et al., 2020).

The Mini-CEX WebApp proved to be a perceptive tool for measuring progress and changes in student performance, particularly for students who initially had lower scores. This finding aligns with the study of Holmboe et al. (2003) who suggested that the Mini-CEX can distinguish between poor or marginal performance and satisfactory or superior performance. Thus, the Mini-CEX we implemented is a valuable tool for distinguishing student performance over time. Students with the lowest initial scores are habitually those who require more support. In contrast, we identified a second group that showed inverse performance over time (declined performance). Notably, both groups showed significant statistical median differences over time, reflecting the change in performance compared to the baseline measurement. The scores of the first application of the Mini-CEX served as the baseline measure where they received the first feedback using the WebApp. Prior to this assessment, no interventions or feedback had been provided. Following the first assessment, students underwent three additional experiences or assessments, which allowed for tracking and analyzing their performance over time.

Several factors could potentially explain the decline in performance observed in half of the sample over time. First, the literature has previously established a higher number of encounters, 6 or 8, needed to improve student performance using the Mini-CEX (Mortaz Hejri et al., 2020). Thus, more encounters would be necessary to show improvements for students with higher scores (Véliz et al., 2020). Second, the variability in clinical cases and the students' own knowledge levels may have contributed to the perception that some clinical cases were less challenging for students who achieved high scores early on. Third, it is worth considering that some students may have perceived the Mini-CEX WebApp as more impersonal and subjective compared to a rubric-based assessment approach. This subjective perception may have influenced their performance and responses, potentially impacting the observed results. All these hypotheses must be tested with new studies.

Interestingly, clinical educators appreciated having a brief tool set in a WebApp for mobile devices, optimizing the time spent on multiple assessments. However, students perceived it as a more impersonal process because it limited the possibility of discussing the assessment criteria. These results are consistent with Lefroy et al. (2017), who pointed out that mobile applications in workplace-based assessments can disrupt the necessary social interaction required for feedback conversations. Here, we can discuss why it is relevant to instruct that feedback sent over email cannot replace feedback conversations. Nevertheless, students and clinical educators perceived that the 8-item Mini-CEX WebApp is an excellent tool for observing student improvement and strengths, consistent with previous studies (Schopper et al., 2016; O'Connor et al., 2017, 2018; Fuentes-Cimma et al., 2020). The students particularly appreciated that this paperless strategy was an excellent faculty policy due to environmental concerns.

The present study is not without limitations. First, the literature recommends a minimum of 6–8 encounters per student, and there was no comparison with a non-reduced Mini-CEX tool because the organization of the course did not allow it. Second, the focus groups had a limited number of participants, which could limit the study's value. Third, we could not randomize the participants due to feasibility issues. Finally, our confirmatory analysis should have used different samples, according to Tavakol and Dennick (2012).

5. Conclusion

The 8-item Mini-CEX WebApp is a valid, acceptable, and reliable instrument for students, teachers, and clinical educators for clinical practice assessment in workplace-based learning settings for physical therapy undergraduate students. The enhanced direct observation allows for better feedback for the worst-performing students.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Pontificia Universidad Catolica de Chile Ethics Committee (ID170908016). The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2023.943709/full#supplementary-material

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