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The application of an escape room teaching method on the training for ICU new nurses: a quasi-experimental study

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Abstract

Background There is a severe shortage of intensive care nurses worldwide, and training a qualified ICU nurse is hard since it takes a very long time to accumulate the intensive care knowledge and skills needed. This study aimed to examine the effect of an escape room teaching method on teamwork attitudes and intensive care knowledge of ICU new nurses, their satisfaction with, and willingness to participate in escape room training.

Methods A convenience sampling approach was utilized to enlist new nurses from April 2023 to March 2024 in China. ICU nurses with less than two years of experience in the First Affiliated Hospital of Kunming Medical University were involved in our study. Most of them were female (85.71%) with bachelor's degrees (85.71%), and without escape room experiences (92.86%). Teamwork attitudes were collected through the TeamSTEPPS Teamwork Attitudes Questionnaire (T-TAQ) developed by the Agency for Healthcare Research and Quality (AHRQ); intensive care knowledge were collected by researchers-made online intensive care knowledge tests; satisfaction with escape room training, and willingness to participate in the escape room training were collected by researchers-made online questionnaires. Finally, the data were analyzed with SPSS v.26. Descriptive statistics, the paired samples test, the Wilcoxon signed-rank test, multivariate regression, and Pearson correlation were utilized for analysis.

Results Fifteen groups of new nurses participated in the escape room training. For teamwork attitudes, there were significant differences in the mean T-TAQ total score ($p < 0.001$) and in the dimensions of teamwork ($p < 0.001$), leadership ($p < 0.001$), situation monitoring ($p = 0.019$), mutual support ($p < 0.001$), and communication ($p < 0.001$) before and after the escape room training. For the learning level, the mean intensive care knowledge scores were significantly different before and after the escape room training ($p < 0.001$). As for the reaction level, the satisfaction of ICU new nurses with the escape room training was high (9.23 ± 0.869), and the majority of them (95.24%) were willing to participate in the escape room training.

Conclusion Implementing the escape room teaching method could promote teamwork attitudes and intensive care knowledge of ICU new nurses, and they were satisfied with and willing to participate in the escape room training. The key limitations in the study are the absence of a control group and data loss, and the results should be taken with caution. Our findings indicate that the escape room can be conducted in clinical practice learning for nursing and medical education settings with some props, and in ways of game playing, which doesn't require expensive

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equipment and can be conducted conveniently, suggesting that escape room might be a promising method with cost-effectiveness value for nursing and medical education globally.

Key points

- The escape room training has a positive influence on new nurses' teamwork attitudes.
- The escape room training has a positive effect on the spread of intensive care knowledge.
- New nurses were satisfied with the implementation of the escape room training and were willing to participate in the escape room training.

Keywords Escape room, Game, New nurses, Intensive care, Teamwork, T-TAQ, Satisfaction, Quasi-experimental study

Introduction

Teamwork is defined as a set of interrelated thoughts, actions, and feelings of each team member that are needed to function as a team [1]. Efficient teamwork may decrease bedside information mistakes, correct data misunderstanding, advance effective communication [2], and ultimately improve patient outcomes. Previous studies showed that good teamwork decreased the frequency of missed nursing care, minimized adverse events, and prevented nurse-sensitive adverse patient outcomes [2–4]. Furthermore, effective teamwork is beneficial for nurses because it improves the work environment, increases job satisfaction and productivity [5, 6], reduces fatigue and burnout, and decreases the intent to leave among nurses [7]. Teamwork attitudes refer to the attitudes towards the core components of teamwork in healthcare, which is a key element and predictor of teamwork and has been evidenced to improve patient safety [8, 9]. Nurses in the ICU are the first group to become conscious of changes in patients' conditions, who can spare patients from injury by collaborating with other medical staff [10, 11]. Higher teamwork attitudes are crucial to providing safe and high-quality patient care, especially in ICU settings where nurses need to handle complex care tasks collaboratively, respond promptly to critical changes in patients' conditions, and ensure comprehensive and individualized care for critically ill patients [8, 9]. Furthermore, higher teamwork attitudes may predict higher teamwork, which may decrease the intent to leave among nurses, and lead to better workforce development [7, 10]. Thus, preparing ICU nurses' teamwork attitudes is of high priority.

The number of new ICU nurses has been increasing in recent years, especially after COVID-19. However, the shortage of critical care nurses still exists globally. Critical care nurse vacancy rates were reported to range from 18 to 28% at various hospitals [7, 12, 13]. New nurses in the ICU are also called novice nurses or junior nurses, with the characteristics of short tenure, insufficient work experience, and insufficient knowledge and operational skills, who are trying to adapt to the role of clinical nurses [14]. Edward suggested that the teamwork attitudes of young nurses in the ICU were lower than those of nurses over 35 years old [15]. A study showed that due to poor

quality of collaboration, poor leadership, and lack of coordination, the risk of poor teamwork ranged from medium to high among junior nurses [16]. Intensive care knowledge covers critical patient assessment, patient rescue measures, complication observation, critical patient transport, and other knowledge, etc [17]. Improving intensive care knowledge will help improve nurses' competency and facilitate their career development as well. In addition, mastering and applying the knowledge of critical care can improve the prognosis of severe patients by giving correct and immediate nursing care [17]. Hence, training new nurses in teamwork attitudes and intensive care knowledge is important [6]. However, the present traditional training methods for new nurses have some limitations and often lead to unsatisfactory training outcomes [19]. For traditional training methods, instructors unilaterally impart knowledge to learners [18], and learners passively accept it, without interactive teaching techniques, which can't motivate trainees to learn [19]. The traditional didactic approach is not suitable for adult learning, diverse types of training methods are needed to generate effective learning and allow the learned knowledge and skills to be effectively transferred based on different training content and trainees [20]. Therefore, a new training method is urgent to enhance the training effect.

Rationale for intervention: escape room teaching method

The escape rooms are a popular entertainment phenomenon in recent years, also known as serious games, educational games, simulation teaching, etc., in which players search for clues, solve puzzles, and work as a team to complete missions to escape from one or more rooms in a limited time [21]. The escape room training method incorporates certain scenario simulations. However, it is more exciting, fascinating, interactive, and collaborative than traditional simulation - based teaching methods, as it adds some elements of clearing obstacles by searching for clues and solving puzzles. It fosters the comprehensive capabilities of players by means of playing a game [22]. In nursing education, escape rooms usually require nurses to care for patients as a team using their nursing knowledge. Escape room is convinced to be a welcome

and effective teaching method, which promotes professional teamwork [23–25], increases nursing knowledge [21] and other skills [26]. In addition, it is easy to conduct and can be used in various contexts [27], with a low cost (usually 200 dollars for props).

The Agency for Healthcare Research and Quality (AHRQ) developed an evidence-based approach to teamwork training. It is built on five key principles that are essential for teams: team structure, leadership, situation monitoring, mutual support, and communication. These five principles were applied when designing the escape room. To complete the escape room, one leader was selected by the team members, and they worked together to fight for one goal: to save the patient. Participants needed to find clues by monitoring and giving nursing care to solve the puzzle. When they encountered difficulties, they discussed or communicated with each other and then made decisions [28].

Although some researchers have used escape room teaching method in clinical areas such as pediatric, obstetric, cardiology, emergency, and anatomical fields [29–33], limited evidence on escape room uses in ICU training was found. Furthermore, a review of the literature shows that systematic training courses, rapidly deployed structured simulation education program, and “on-the-job” training method have been adopted in the training of ICU nurses [34, 35], and there is no research on the application of escape room teaching method in the intensive nursing care context for new nurses. To fill the gaps, this study was conducted in an ICU setting to examine the effect of an escape room teaching method on teamwork attitudes and intensive care knowledge of ICU new nurses, and their satisfaction with and willingness to participate in escape room training.

Methods

Setting and context

This escape room training was conducted in a tertiary hospital in Yunnan Province, Southwest China.

Study design

The study utilized a one-group pretest–posttest design from April 2023 to March 2024. An escape room training was implemented for new nurses who met the inclusion criteria.

Population and sample

The study population included new nurses in the ICU of the First Affiliated Hospital of Kunming Medical University. According to the definition of the National Health Commission, new nurses have less than two years of work experience [36]. The inclusion criteria were new nurses with less than two years of work experience and who were willing to participate in the study. The excluded

criteria were nurses who could not attend games for any reason, like sick leave or vacation, and nurses who didn't complete the online questionnaires or examination. We sent a recruitment letter and informed consent to the ICU head nurses. Since all of the new nurses were on the shift, they might have difficulty in taking part in the training in a random sampling manner. Although convenience sampling might increase the bias of the study, it is our priority. To minimize the bias that might be caused by convenience sampling, we selected as many ICU new nurses who were willing to participate as possible. After sampling, we analyzed the characteristics of the selected samples, and found that the distribution of age, gender, education background, etc. of the samples were similar with the population. Nurses who met the inclusion criteria were randomly allocated to one group with 5–7 people and participated in the escape game voluntarily, and each one signed an informed consent on the designated date (Fig. 1). A large proportion of the new nurses (85.71%) were female, with an average age of 23.75 years and a standard deviation of 1.51 years. A total of 7.14% of the new nurses participated in the escape room for fun before this training, and 86.90% had a bachelor's degree.

Project design and intervention

A pilot experiment was conducted to evaluate the feasibility of the escape room teaching method. The pilot test had good feasibility. We used a new sound player to make the sound louder and clearer in the final experiment. Then, the escape room trainings were implemented on 15 teams from April 2023 to March 2024. Each team implemented one-time escape room training, and each one lasted 3–4 h. The escape room training included the following seven steps:

Step one: team preparation.

Three game masters organized the escape room program, they were ICU nurses who knew the escape room training very well. Their responsibilities included designing a playful escape room and ensuring the smooth implementation of the escape room teaching method. The first game master A had ten years of working experience, including six years of intensive care unit work experience. Another two game masters, B and C, had more than four years of working experience in the hospital, including two years of intensive care unit working experience.

Step two: room preparation (30 min).

The rooms were decorated thematically, like a mini ICU, which included five rooms: a patient room, a nursing station, a storage room, a therapy room, and an X-ray room. These rooms were decorated with patient beds, electrocardiogram monitors, office desks, stretchers, documents, mobile phones, and other materials associated with the challenges of the escape room. New nurses

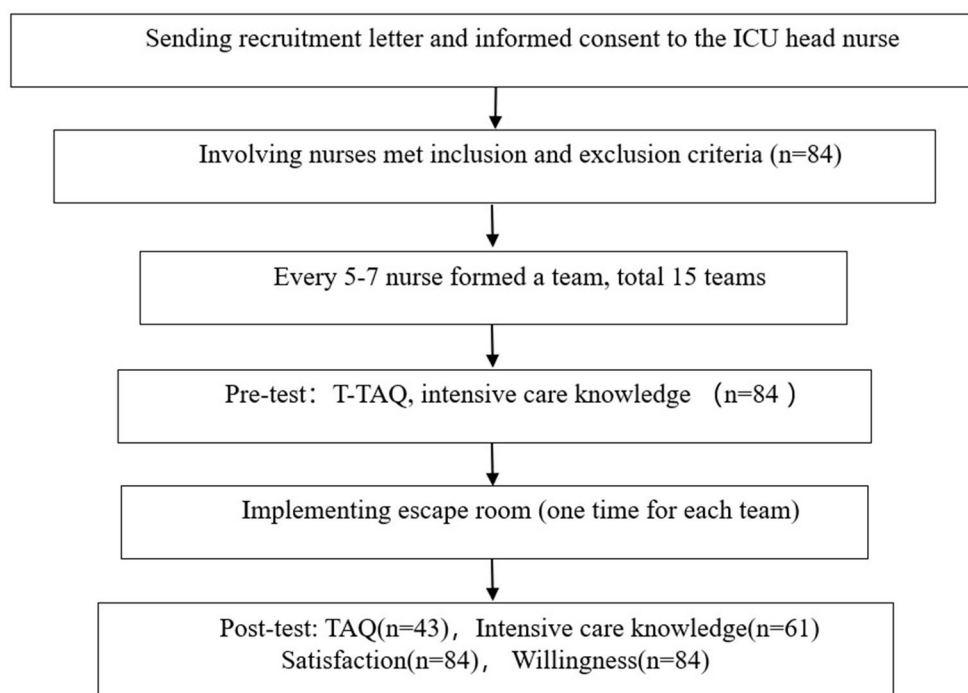


Fig. 1 Flow diagram of the research process

participated in this escape room game as group members, and each group had 5 to 7 nurses.

Step three: pre-test (20 min).

Before starting the activity, game masters asked the players to complete the TeamSTEPPS teamwork attitudes questionnaire (T-TAQ) and an online intensive care knowledge test.

Step four: rule introduction (5 min).

After filling in the questionnaire and test, the players were covered with eye packs to ensure the mystery of the game and to keep them focusing on key points. Game master B played the audio to expound the rules for the game, which was similar to telling a story. The rules were simple: the players were nurses in the intensive care unit, and their tasks were to care for and maintain the safety of the new patient. All clues were within reach, no force or breakage was required, and each clue could only be used once. Each group had 30 min to play the game, three chances to ask for help, and 100 points of energy. If the team completed the game within 30 min by themselves without asking for help, they could get 100 energy; if the team didn't complete the game within 50 min, or they asked for help more than three times and didn't complete the game within 30 min, they lost all the energy; if the team completed the game between 30 and 50 min, and asked for help no more than three times, they would lose energy which was determined by how much time they used more than 30 min and how many times they asked for help. After the introduction of the game rules, new

nurses entered the room. Finally, the audio ended with the situation of the patient.

Step five: escape room gaming (30 min).

Afterward, the countdown emerged, and each team, in a cooperative manner began to take part in the escape room training. Four challenges were designed for the escape room, which were evaluating intensive patients, administering mannitol infusion, transferring patients with spinal injury, and observing complications. If the players couldn't complete the challenges, they could ask for help. Players were obliged to hunt for clues in the room related to the four challenges. For example, players were told by the audio that doctors' prescription was locked in the box as a clue, and they had to find a four-digit password to open the box. To obtain four digital passwords, the players needed to have the right assessment of the patient, including the pupillary response, consciousness, and muscle strength of both sides. Game master C acted as a standard patient in the challenges settings, such as evaluating consciousness and muscle strength, and transferring patients with spinal injury.

Game masters A and B inspired players to operate as a team and made the best use of the time, and provided assistance when they needed help.

Step six: training conclusion(30 min).

After the escape room gaming, master A reviewed the game process, discussed the difficulties, and explained unclear details or knowledge to the new nurses.

Step seven: post-test (40 min).

Finally, the players were required to complete the T-TAQ, an online intensive care knowledge test, and the questionnaires developed by the researchers to examine participants' satisfaction with and willingness to participate in the escape room training.

A total of 84 players who participated in the escape room training were divided into 15 groups. Eleven groups completed the game within 30 min; the minimum and maximum time to complete the game were 21 and 37 min, respectively, and the average completed time was 27.53 min. Nine teams asked for help for 12 times, and three teams didn't find clues correctly to solve the puzzles for five times; evaluating intensive patients was the setting that participants asked for help most. The final average energy was 84 for 15 teams.

Outcome measures

Primary outcome

The T-TAQ created by AHRQ was employed to assess the teamwork attitudes of new nurses in ICU [9]. The T-TAQ encompasses 30 items and includes five dimensions: team structure (Q4: A team's mission is of greater value than the goals of individual team members), leadership (Q7: It is important for leaders to share information with team members), situation monitoring (Q14: Monitoring patients provides an important contribution to effective team performance), mutual support (Q21: Providing assistance to team members is a sign that an individual does not have enough work to do), and communication (Q26: Poor communication is the most common cause of reported errors). Every dimension has six items along with five response options ranging from 1, meaning strongly disagree, to 5, meaning strongly agree, on a Likert scale. Four items are negatively related, including three items in the mutual support dimension and one item in the communication dimension. The scores of the total scale, as well as for each dimension, are determined by combining all items and dividing the score by the number of items in each dimension. The questionnaire was translated and cross-culturally adapted by Ye Xuechen et al. in 2018 [37]; according to the translation methodology proposed by the World Health Organization, forward translation, expert panel, back translation pre-testing, and cognitive interview were used [37]. According to experts' requirements, some expressions of sentences were condensed, and several words were revised to suit the Chinese culture. Finally, the Chinese version of the T-TAQ was formed without any item being deleted or added [38]. The Chinese version of the T-TAQ and the original version of T-TAQ in the concept, semantics, and other aspects are equal, and it is in line with Chinese cultural characteristics and language habits. It is applied to evaluate the teamwork of medical staff in China. In 2020, Huang Zhe et al. tested the reliability and validity of the

Chinese version of T-TAQ. The Chinese version of the T-TAQ had good reliability and validity, with the Cronbach's α coefficient of the Chinese T-TAQ being 0.938, the split-half reliability being 0.959, the test-retest reliability being 0.964, and the content validity being 0.95 [39]. The participants were required to finish the T-TAQ before starting and after the escape room.

Secondary outcomes

The initial and secondary levels of Kirkpatrick's four-level model, which are the reaction level and learning level, respectively, were applied to evaluate the effectiveness of this training. At the reaction level, satisfaction with and willingness to participate in the escape room training were evaluated using the questionnaires developed by the researchers after the escape room training. For satisfaction, a single item of satisfaction evaluation was used, "Are you satisfied with the escape room training program?" The answer varied from 0 to 10, with 0 representing entirely dissatisfied and 10 representing entirely satisfied. For the willingness to participate in the escape room training, a single question was used, "Are you willing to participate in a similar escape room training?", participants answered "yes" or "no".

Learning level was evaluated using an online scenario-based intensive care knowledge test designed by the researchers. This test included six multiple-choice questions and ten single-choice questions based on the escape room teaching method and the textbooks. Six experienced experts evaluated the content validity of the test. These experts had been engaged in the nursing education, nursing management, and intensive care nursing, including two teachers with Ph.D. qualifications with 11 and 21 years of nursing education experiences respectively; two nursing managers with master's degrees with 11 and 18 years of nursing management experiences respectively, and two clinical nurse specialists with 18 and 25 years of working experience specializing in intensive care, and all of them can provide maximal guidance and assistance in optimizing this test. They were requested to evaluate each question's relevance level for its corresponding construct on a 4-point scale (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant). The content validity index for items (I-CVI) was all ≥ 0.83 , scale-level content validity index, universal agreement calculation (S-CVI/UA) = 0.94, scale-level content validity index, averaging calculation method (S-CVI/Ave) = 0.98 for the test. The results suggested that the content validity of the test was good. Two links to the online test and questionnaires respectively were sent to a Wechat group in which we invited all the participants to join. Mandatory responses were established for all questions of the online test to ensure the integrity of the test. Furthermore, before the online

Table 1 Demographic characteristics of the new nurses ($n = 84$)

Demographic characteristics	Number	%
Gender	Female	72 85.71
	Male	12 14.29
Work year	First year	51 60.71
	Second year	33 39.29
Education background	Bachelor degree	73 86.90
	Master degree	11 13.10
Escape room game experience	Yes	6 7.14
	No	78 92.86
Age (year); (standard deviation)	23.75 (1.508)	
Minimum-maximum	21–27	

test, we fully explained to the principals about the online test and that the test scores had no impact on their work evaluation. We would remind the participants to finish the online test and questionnaires by Wechat message for two times in the following week. The participants were required to complete the online intensive care knowledge test before and after the escape room, and to finish the questionnaires to examine participants' satisfaction with and willingness to participate in the escape room training after the escape room.

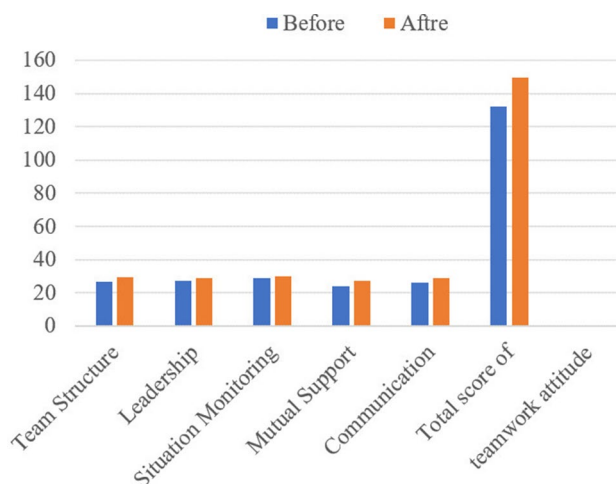
We screened the collected data and excluded cases with a high proportion of missing data, such as answering less than 80% of the questionnaire, and giving the same answer for all items in the T-TAQ questionnaire.

Statistical analysis

The data were analyzed using SPSS v26.0. The Kolmogorov–Smirnov test was used to assess the normality of the distribution of intensive care knowledge ($n = 61$), and the Shapiro–Wilk test was used to assess the normality of the distributions of the total T-TAQ score and scores on the five dimensions ($n = 43$). Descriptive statistics (mean and standard deviation) and the paired samples test were used for normally distributed data, while descriptive statistics (median and interquartile range) and the Wilcoxon signed-rank test were utilized for analysis for nonnormally distributed data. Multivariate regression was used to analyze the demographic characteristics and outcomes. Pearson correlation was used to test the relationships among outcomes. A P value less than 0.05 was considered to indicate statistical significance.

Table 2 Teamwork attitudes before and after the escape room training ($n = 43$)

Variable	Escape room training $\bar{x} \pm SD$ / M (P25, P75)		95% CI (difference)		t/Z	P values
	Before	After	Lower	Upper		
Team Structure	26.53 \pm 2.31	29.21 \pm 1.79	-3.520	-1.828	-6.379	<0.001
Leadership	27.30 \pm 2.41	28.98 \pm 1.91	-2.412	-0.937	-4.579	<0.001
Situation Monitoring	29(24,30)	30(28, 30)	-2.093	-0.279	-2.355	0.019
Mutual Support	24.16 \pm 3.46	27.19 \pm 3.22	-4.233	-1.814	-5.043	<0.001
Communication	26(24,28)	29(26,30)	-3.127	-1.245	-4.036	<0.001
Total score of T-TAQ	132.12 \pm 9.79	149.77 \pm 8.90	-20.826	-14.476	-11.220	<0.001

**Fig. 2** Teamwork attitudes before and after the escape room training

Ethical consideration

This project was approved by the research committee of the First Affiliated Hospital of Kunming Medical University.

Results

Demographic data

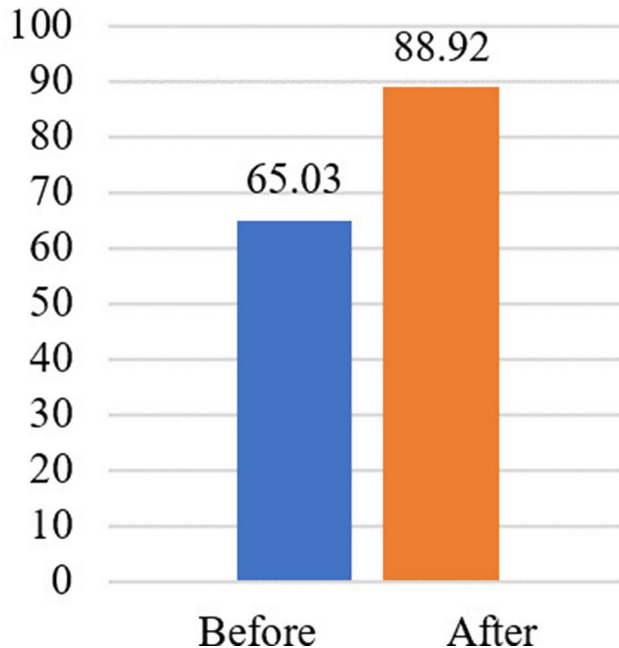
Among the 84 nurses, 61 players finished the online intensive care knowledge test before and after the escape room, and 43 players finished the T-TAQ questionnaire before and after the escape room. The demographic characteristics are presented in Table 1.

Teamwork attitudes

There were significant differences before/after the escape room training in the five dimensions of the T-TAQ and in the total score, team structure (26.53 \pm 2.31)/(29.21 \pm 1.79), leadership (27.30 \pm 2.41)/(28.98 \pm 1.91), situation monitoring 29 (24, 30) /30 (28, 30), mutual support (24.16 \pm 3.46)/(27.19 \pm 3.22), communication 26 (24, 28) /29 (26, 30) and total score (132.12 \pm 9.79)/(149.77 \pm 8.90) (Table 2). Among ICU new nurses, the total score and scores in all dimensions of T - TAQ after the escape room training are higher than those before participating in the escape room training (Fig. 2).

Table 3 Intensive care knowledge before and after the escape room training ($n=61$)

Variable	Escape room training $\bar{x} \pm SD$		95% CI (difference)		t	P values
	Before	After	Lower	Upper		
Intensive care knowledge	65.03 \pm 13.63	88.92 \pm 11.76	-27.916	-19.855	-11.854	<0.001

**Fig. 3** Intensive care knowledge before and after the escape room game**Table 4** The willingness to participate in the escape room training ($n=84$)

Variable		Number	%
Willingness to participate in the escape room training	Yes	80	95.24
	No	4	4.76

Table 5 Satisfaction after the escape room training ($n=84$)

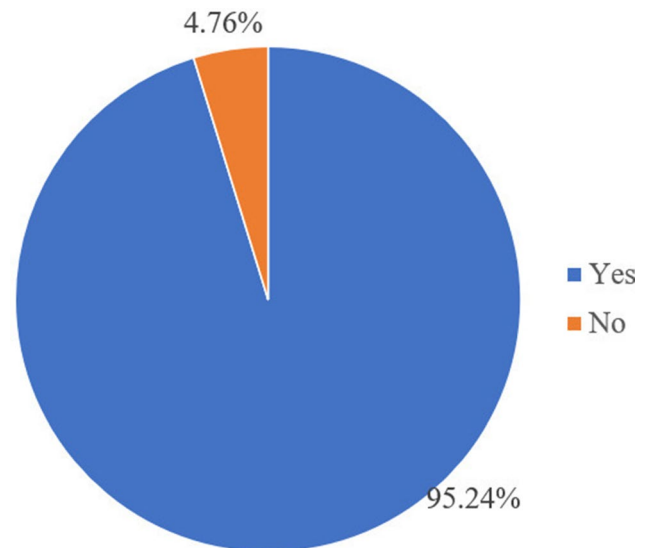
Variable	Minimum	Maximum	$\bar{x} \pm SD$
Satisfaction	7	10	9.23 \pm 0.869

Learning level: intensive care knowledge

The average intensive care knowledge score before the escape room training was 65.03 ± 13.625 , and the average score after the escape room training was 88.92 ± 11.759 (Table 3); there was a significant difference between the scores before and after the escape room training. Among ICU new nurses, the score of intensive care knowledge after the escape room training is higher than those before participating in the escape room training (Fig. 3).

Reaction level: satisfaction with and willingness to participate in the escape room training

Generally, new nurses were satisfied with this escape room training, and 80 (95.24%) new nurses were willing to participate in the escape room training (Fig. 4). The

**Fig. 4** Willingness to participate in the escape room training after the escape room

satisfaction scores ranged from 7 to 10, and the average score was high (9.23 ± 0.869) (Table 5).

Multivariate regression analysis of demographic characteristics and teamwork attitudes, intensive care knowledge, satisfaction

As presented in Table 6, escape room experience influenced the intensive care knowledge and satisfaction ($P < 0.01$), but didn't influence the teamwork attitudes (> 0.05). Other demographic characteristics didn't influence teamwork attitudes, intensive care knowledge and satisfaction (all $P > 0.05$).

Correlations between teamwork attitudes, intensive care knowledge and satisfaction

As presented in Table 7, intensive care knowledge was positively correlated with satisfaction ($r = 0.705$, $P < 0.01$), other outcomes were not correlated (all $P > 0.05$).

Discussion

This is the initial interventional study with the objective of assessing the influence of escape room training on Chinese new ICU nurses' teamwork attitudes and knowledge of intensive care.

Teamwork attitudes

Teamwork is quite important in the ICU; patients are serious, and their condition may change at any time.

Table 6 Multivariate regression analysis of demographic characteristics and teamwork attitudes, intensive care knowledge, satisfaction ($n = 43$)

Variable	T-TAQ		Intensive care knowledge		Satisfaction	
	β	t value	β	t value	β	t value
Gender	-0.075	-0.461	0.032	0.232	-0.015	-0.119
Age	-0.106	-0.538	0.119	0.706	-0.087	-0.575
Education background	-0.030	-0.178	0.019	0.132	0.050	0.381
Work year	0.237	1.184	0.010	0.060	-0.184	-1.195
Escape room game experience	-0.227	-1.316	0.564	3.809**	0.644	4.833**

Note: * $P < 0.05$, ** $P < 0.01$

Table 7 Correlation analysis of teamwork attitudes, intensive care knowledge and satisfaction ($n = 43$)

Variable	T-TAQ	Intensive care knowledge	Satisfaction
T-TAQ	1	0.084	0.020
Intensive care knowledge	0.084	1	0.705**
Satisfaction	0.020	0.705**	1

Note: * $P < 0.05$, ** $P < 0.01$

Many nursing tasks cannot be performed by oneself; they require cooperation with other nurses and other disciplines, such as doctors and technicians. Good teamwork performance can increase the quality of nursing and can increase patient outcomes [40]. The results showed that the teamwork attitudes were significantly different before and after the escape room training in terms of the total score and for the following dimensions: team structure, leadership, situation monitoring, mutual support, and communication. The results were consistent with previous studies, which have indicated that the escape room teaching method has a positive effect on facilitating communication, improving leadership, and promoting teamwork [41–43].

Traditional teaching methods have teachers as leaders, with students listening and answering [9]. Students lack teamwork chances. In the escape room training, a leader and team members work together for the same goal [26]. To complete the escape room successfully, monitoring patient situations is required to find clues and solve the puzzles [28]. Meanwhile, mutual support and communication are essential to saving game time, they need to share the knowledge and information they already knew, and decide whether to ask for help when they meet the difficulties [21]. Due to the advantages of escape rooms, ICU new nurses can improve their teamwork attitudes, which include team structure, leadership, situation monitoring, mutual support and communication [41–43].

Learning level: intensive care knowledge

Intensive care is complex and emergent; high-quality care is related to patient clinical outcomes. To address this issue, the development and execution of intensive

care-related escape room training have been a top priority. Research has indicated that intensive care training programs have proven successful in enhancing patient outcomes [2]. The outcomes of the current study demonstrated the presence of a significant distinction between the mean knowledge scores related to intensive management before and after the escape room training. The results were in agreement with previous studies in different settings and contexts. Kinlaw and his colleagues [44] certified the success of the escape room teaching method in improving nurses' knowledge about the perioperative setting. Ferrer-Sargues's study indicated that students who employed the escape room teaching method were more knowledgeable in the application of knowledge in cardiovascular physiotherapy than students who utilized conventional training methods [45]. The results illustrated that the escape room game experience might enhance intensive care knowledge and satisfaction of new nurses. Additionally, a positive relationship between intensive care knowledge and satisfaction was found out in our study. Our results suggest that the escape room experience may boost the training effect. In addition, trainees' satisfaction with the training might be associated with their grasp of knowledge, indicating that trainees' satisfaction should be considered in the development of training method.

Reaction level: satisfaction with and willingness to participate in the escape room training

The study showed that new nurses were satisfied with this escape room training and would like to participate in a similar training, which was regarded as favorable. It also indicated that escape room training is welcomed. Traditional training is usually conducted in a lecture manner. Studies have shown that an escape room is an interesting teaching method that provides a relaxing learning environment [42]. Participants can learn professional knowledge by playing an exciting game [23], which decreases the anxiety of learners and motivates their studies [22]. Our research results were consistent with studies conducted in other countries despite different studies using different methods to measure satisfaction. In Spain, Ferrer-Sargues et al. reported that 100% of nursing students

were satisfied with the escape room teaching method [45]. In the USA, Dawkins and colleagues reported that the escape room could motivate students to learn, which was good for team building and increased students' satisfaction [46].

Although the present studies have explored the function of escape rooms in nursing education, most of which were concerned with nursing students, the application of escape rooms among new nurses in the ICU is still in its infancy. ICU new nurses need to learn much knowledge from textbooks and bedside in a short period of time, and teamwork is key to their daily work. We identified the positive impact of the escape room on teamwork attitudes and intensive care knowledge among new nurses in the ICU context, which can contribute to the training of new ICU nurses in a new perspective. In further research, researchers can explore more escape room training based on different settings, especially for departments that require high teamwork and difficult knowledge, such as emergency [33], obstetrical department [28, 29], cardiology department [26] etc. Our findings imply that escape room with some props can be used for nursing education in clinical settings. Trainees can learn by playing a game by escape room without expensive equipment, suggesting that escape room might be a promising method with cost-effectiveness value for nursing and medical education globally. Also, an escape room based on multidisciplinary work in the ICU can be designed to reflect the real clinical setting. What's more, based on a review study [47], online escape rooms can be helpful for learners. As it is a fun activity, learners are more participatory and engaged with curricular content. Thus, future studies can try online escape rooms adaptations in the ICU or other settings. Compared with other innovative teaching strategies such as problem-based learning, flipped classroom, traditional simulation-based training, and VR teaching, the escape room training is highly interactive and realistic, more exciting and fantastic, and more cost-effective [21, 27, 46].

Limitation

Online tests and questionnaires were used to collect data; it was convenient that nurses could leave as soon as the game was over and fill in the online test and questionnaires later, thus saving nurses' time and not delaying their normal work. However, it is a limitation in collecting the data; it may increase the risk of omission. After the escape room training, 41 nurses didn't fill in the T-TAQ online questionnaire, and 23 nurses didn't take part in the online intensive care knowledge examination. The loss of data may increase the bias risk of the result. Text and questionnaires on paper are recommended for further research. Because of time and resource restrictions, we didn't conduct a control study and we used a

one-group pretest-posttest design. In addition, the stability of teamwork attitudes and intensive care knowledge was not investigated again over a duration after the training due to the limited number of new ICU nurses and the fact that one-third to a half of the sample were lost in the early stage. All of the above limited the ability to attribute observed changes solely to the intervention and decreased the reliability of the study results. For future research, it is necessary to conduct multicenter studies to involve more participants, including controlled trials, and follow up the training effect. Besides, the potential impact of self-selection bias and cultural factors unique to the Chinese healthcare system may limit the generalizability of findings. Thus, exploring multidisciplinary and multicultural escape room training are needed to make the results more profound and extensive.

Conclusion

The results support the idea that the escape room training method can promote the teamwork attitudes and improved intensive care knowledge. According to the training satisfaction survey findings, a large proportion of the new nurses would like to participate in a similar escape room training to gain knowledge, and the average satisfaction was highly valued at 9.21 points. The outcomes of this study present valuable information to trainers at healthcare establishments as well as continuous and in-service education facilities. Since escape room training can be carried out without expensive equipment in any context and discipline, it's a promising method with cost-effectiveness value for nursing and medical education globally. Especially under the poor training transfer circumstance, the escape room might be a choice to be selected to improve training transfer and save constrained resources in healthcare settings.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-025-06906-4>.

Supplementary Material 1

Acknowledgements

This study was conducted at the First Affiliated Hospital of Kunming Medical University. The participants were new nurses, and some of them had just finished night shifts. The authors express their sincere gratitude to the new nurses. Additionally, we are thankful that some departments permitted new nurses to participate in our training program during working time, which means that some people finished their work in place for our participants.

Author contributions

HQ and MF constructed the research idea and wrote the main manuscript text. HQ, MY, and MR designed the escape room and organized the escape room training program. MY, BY and DL designed the intensive care test. ZM and ZY performed the statistical analysis and prepared Tables 1, 2, 3, 4 and 5 to decorate the escape room. All authors reviewed the manuscript.

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Data availability

Complete written data are not available for publication owing to language obstacles (the language employed is Chinese, which is the native language of the participants and the authors). Nevertheless, the corresponding author is prepared to supply the data for our peer review process if needed.

Declarations

Ethics approval and consent to participate

We affirm that all experiments were carried out in accordance with the Declaration of Helsinki. This project was approved by the research committee of the First Affiliated Hospital of Kunming Medical University. Written informed consent was obtained in accordance with ethical regulations based on interventional studies. In this manner, prior to the commencement of the study, a project description statement regarding the means of conducting the research was provided. The nurses were clearly informed that their participation in the study was voluntary. The informed consent statement approved by the hospital's ethics committee was presented to them. All of the participants provided written informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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