ORIGINAL RESEARCH

Effect of Breathing Meditation Training on Nursing Work Quality, Occurrence Risk of Adverse Events, and Attention Level of Operating Room Nurses

Linlin Xu, BM; Junhong Jia, BM; Shaoke Hou, BM; Zhixia Dou, BM; Ruijia Song, MM

ABSTRACT

Objective • To explore the effect of breathing meditation training on nursing work quality, occurrence risk of adverse events, and attention level of operating room nurses.

Methods • Taking the starting time of breathing meditation training of operating room nurses in our hospital in July 2020 as the dividing line, operating room nurses who implemented routine management from April 2020 to June 2020 were selected as the control group (n=30), and operating room nurses who carried out breathing meditation training from July 2020 to September 2020 were included in the intervention group (n=30). The emotional state [Hamilton Anxiety Scale (HAMA) score, Hamilton Depression Scale (HAMD) score], Mindfulness Attention Awareness Scale (MAAS) score, electrocardiogram indicators (blood pressure, pulse, and respiration), electroencephalogram indicators (SMR wave, β wave, and θ wave EEG frequency), attention level (attention quotient, visual attention, and auditory attention), nursing work quality (health education, theoretical knowledge, nursing operation, and operating room management) and the number of reported adverse events were compared between the two groups before and after training.

Results • After breathing meditation training, the intervention group's Hamilton Anxiety Rating Scale (HAMA) and Hamilton Depression Rating Scale (HAMD) scores were significantly reduced ($P < .05$), while the Mindfulness Attention Awareness Scale (MAAS) score was significantly increased ($P < .05$).). In addition, blood pressure and respiratory rate were reduced in the intervention group ($P < .05$), with significant differences compared with the control group ($P < .05$). The SMR waves and beta waves in the intervention group increased ($P < .05$), while theta waves decreased ($P < .05$). Attention quotient, visual attention and auditory attention scores were improved in the intervention group compared with the control group ($P < .05$). The scores of health education, theoretical knowledge, nursing operations and operating room management of the intervention group after training were higher than those of the control group ($P < .05$). The intervention group reported a lower number of adverse events than the control group (74.42% vs. 25.58%). The application of breathing meditation training in special training for operating room nurses can effectively relieve negative emotions, enhance mindfulness scores, reduce blood pressure and respiratory rate, regulate brain wave frequency, improve attention status and quality of nursing work, and reduce the risk of adverse events. These outcomes may have a positive impact on improving the quality of nursing practice and patient care in the operating room. For operating room nurses, the negative emotional stress caused by sustained high levels of mental concentration may affect work efficiency and the entire surgical process. Breathing meditation training can enhance nurses' emotional resilience, thereby improving the efficiency and safety of operating room care.

Conclusion • The application of breathing meditation training in the special training of operating room nurses can effectively alleviate negative emotions, enhance the mindfulness score, reduce blood pressure and respiratory rate, regulate brain wave frequency, improve the attention state and nursing work quality, and reduce the occurrence risk of adverse events. Future research should conduct longitudinal studies to evaluate the long-term effects of breathing meditation training on the quality of nursing work and the prevention of adverse events. Additionally, research could explore advanced neuroimaging techniques to gain structural insights, integrate meditation into existing training programs, tailor interventions for different healthcare settings, assess patient outcomes, explore technology-assisted meditation, and investigate interprofessional collaboration. Through these pathways, a more complete understanding of the impact and best integration of breath meditation in healthcare settings can be achieved, providing valuable insights into improving the well-being of healthcare professionals and potentially overall patient care and satisfaction. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

Operating room nursing is a critical component of daily hospital tasks and requires nurses to possess a wide range of knowledge and skills. However, these nurses face unique challenges such as high-stress workloads and long periods of mental concentration, which often lead to mental health issues, burnout, decreased work attitudes, and increased risk of adverse events compared with other departments. For example, operating room nurses have higher burnout rates than other departments, posing a significant threat to patient safety and quality of care.[1,2] To enhance the quality of healthcare services and address these challenges, effective interventions are essential to maintain positive work attitudes and sustain attention among healthcare workers.[1,2] Numerous studies have affirmed the positive impact of breathing meditation training on reducing negative emotions in healthy individuals.[3] Breathing meditation cultivates awareness and awareness of inner states through focused breathing, resulting in deep

relaxation and increased self-control. This practice plays an important role in maintaining positive mood and enhancing sustained attention. It is worth noting that the steps of breathing meditation are simple and the training time is short, making it easy to implement, and practitioners can continue practicing with a high degree of self-discipline after training. Employing this type of intervention is critical to alleviating the mental health challenges unique to operating room nurses, ultimately helping to improve overall well-being and provide high-quality patient care.[4] This study aims to investigate the impact of breathing meditation training as a specialized intervention on the negative emotions, attention levels, and work quality of operating theatre nurses. Drawing inspiration from positive outcomes observed in related international studies, we seek to explore the applicability and effectiveness of breathing meditation training in the context of enhancing the overall well-being and professional performance of operating theatre nurses in China. This study aimed to investigate the effect of breathing meditation training as a specific intervention on negative emotions, attention levels and work quality of operating room nurses. Inspired by the positive results observed in relevant international studies, we wanted to explore the applicability and effectiveness of breathing meditation training in improving the overall well-being and professional performance of Chinese operating room nurses. By understanding the potential benefits of this training approach, we hope to contribute valuable insights to develop tailored interventions to support the psychological and emotional resilience of operating room nursing staff. By understanding the potential benefits of this training method, we hope to contribute valuable insights that can inform tailored interventions to support the mental and emotional resilience of operating theatre nursing staff.

Although there has been research demonstrating the positive effects of meditation training on improving nurses' mental health, relatively little research has been conducted on the impact of breathing meditation training on occupational stress and mental health specific to operating room nurses. Therefore, this study aimed to fill this research gap, focusing specifically on the effects of breathing meditation training on improving attention, reducing negative emotions, and improving work quality among operating room nurses.

It should be noted that this study has certain limitations in interpreting and applying its findings. The study sample size was limited, which may affect the generalizability of the results. Additionally, due to the specific nature of the study design and methods, the findings may not be directly applicable to all operating room care settings. Future studies are needed to verify the generalizability and efficacy of these findings in a broader population and in different healthcare settings.

METHODS

General information

Taking July 2020, when the nurses in the operating theatre of our hospital started breathing meditation training as the dividing line, the nurses in the operating theatre who implemented routine management during April 2020-June 2020 were taken as the control group (n=30), and the nurses in the operating theatre who implemented breathing meditation training during July 2020-September 2020 were taken as the intervention group (n=30).

Table 1. Comparison of the basic data of the two groups [$\bar{x} \pm s$, n (%)]

group		control group (n=30)	Intervention group(n=30)	t/χ^2	*P* value
gender	male	2(6.67)	1(3.33)	0.351	.554
	female	28(93.33)	29(96.67)		
age		32.34±2.36	33.27±2.38	1.52	.134
educational background	junior college	12(40.00)	11(36.67)	0.071	.791
	Bachelor degree or above	18(60.00)	19(63.33)		
professional title	nurse	12(40.00)	14(46.67)	0.423	.673
	primary nurse	8(26.67)	7(23.33)		
	nurse-in-charge	7(23.33)	6(20.00)		
	chief superintendent nurse	3(10.00)	3(10.00)		

Inclusion criteria: 1. age 22-45 years old; 2. working in the operating theatre for 1 year; 3. clinically employed nurses; 4. Did not participate in meditation-related training in the previous period; 5. voluntarily participated in this study.

Exclusion criteria: 1. those who suffered from respiratory diseases; 2. those who suffered from mental diseases; 3. internship and training nurses; 4. and those who were participating in other training intervention programs. These criteria ensure that participants are physically and mentally suitable for breathing meditation training and able to fully participate in the research process.

There was no statistical significance ($P > .05$) in comparing the general information of gender, age, educational status, and title of the two groups, as shown in Table 1. This study followed the Declaration of Helsinki. This study has been approved by Xingtai People's Hospital's Ethics Committee (approval number:20200711-XT), and all participants and their families have signed informed consent forms.

Methods

The control group adopts routine management, regular unified training to improve the nursing staff's knowledge of nursing work, experienced senior nurse practitioners randomly guide daily work, and the head nurse and the nursing department regularly evaluate and assess the stage work of nurses.

The intervention group adopted breathing meditation training on the basis of the management of the control group: (1) Training of breathing meditation training: the main content includes breathing meditation and the use of related software. Firstly, a professional meditation teacher will train and guide the nurses in breathing meditation and require the nurses to master the methods of breathing meditation: 1) First, sit cross-legged in a comfortable and quiet environment, with the waist and back straight, keep the head, neck, and back in a straight line to ensure smooth breathing, with the hands naturally perpendicular or placed on the knees, with the tongue against the palate, and gently close the eyes, and use the consciousness to feel the body's contact with the surroundings, and the body can be stretched if there is tension in the muscles.

If the body muscle tension can be taken to stretch and other actions to do appropriate relaxation of muscles. 2) start breathing meditation, using abdominal breathing to do a few deep breaths, exhale and inhale for as long as the time to maintain a natural, smooth, slow breathing rhythm, focusing on the exhale, pause, inhale breathing cycle, feel the body to participate in the movement of the parts of the breath for 20 min, if during this period to be aware of the distraction or thinking, the heart of the silent recitation of "thinking! If you realize that you are distracted or thinking during this period, silently say "think" in your mind, don't pay too much attention to it, and then slowly turn your attention to your breathing. After finishing the breathing meditation, you can feel your own body again and express your appreciation for your perseverance. Finally, a professional teacher will train the nurses on the use of Flanker software. (2) Breathing meditation training: all nurses were guided by a professional teacher to collectively conduct 20 min of breathing meditation training at 8 am in the department and 20 min of training at home at 8 pm on their own, in which they recorded and filmed the video of each training session and uploaded it to the WeChat group of the department to punch the card, and adhered to the breathing meditation training twice a day, five days a week for a total of eight weeks. (3) Evaluation of the effect of breathing meditation training: Use scales, electronic devices, and software to collect the negative emotional state, positive awareness score, ECG indicators, EEG indicators, and attention level data of the nurses, and collect the above data before and after the training to evaluate the effect of breathing meditation training. Nurses in the intervention group conducted breathing meditation training for eight weeks. Daily training includes two 20-minute breathing meditation exercises, which are conducted collectively in the department at 8 AM. and individually at home at 8 PM. This training duration is designed to ensure maximum effectiveness of the meditation, while being brief enough to make it easy to adhere to and integrate into daily life.

Observation indicators

To enhance clarity, here is an overview of each indicator: 1) Negative emotion assessment: using the Hamilton Anxiety Rating Scale (HAMA) and Hamilton Depression Rating Scale (HAMD); 2) Mindfulness level measurement: using the Mindful Attention Awareness Scale (MAAS); 3) Electrocardiogram indicator monitoring: blood pressure, pulse and respiratory rate; 4) Electroencephalogram assessment: sensorimotor rhythm (SMR), theta wave and beta wave frequency; 5) Attention assessment: using Flanker software; 6) Quality of care Assessment: conducted by the charge nurse; 7) Adverse event risk analysis: record the number of adverse events reported during the trial.

(1) Assessment of Negative Emotions: Pre- and post-training evaluations utilized the Hamilton Anxiety Scale (HAMA)[5] to gauge anxiety levels among nurses, scored on a scale of 0-56, where <7 indicates no anxiety symptoms. Similarly, the Hamilton Depression Scale (HAMD)[5] assessed depression levels, with a score >7 indicating more severe depression symptoms.

(2) Measurement of Mindfulness Levels: The Mindful Attention Awareness Scale (MAAS)[6] was employed before and after training, scoring emotions, cognition, and interpersonal relationships on a 15-90 scale. Higher scores denote greater mindfulness in daily life, reflecting enhanced awareness and attention in the present moment.

(3) Monitoring ECG Indicators: Pre- and post-training, electronic sphygmomanometers measured blood pressure and pulse, while respiratory rates were assessed in the supine position based on chest wall movements.

(4) Electroencephalographic Evaluation: A digital video electroencephalograph detected sensorimotor rhythm (SMR), theta, and beta wave EEG frequencies before and after training.

(5) Attention Assessment: Flanker software measured attention levels, including attention quotient, visual attention, and auditory attention, both before and after training.

(6) Quality of Nursing Care Evaluation: Post-training, the head nurse conducted assessments on health promotion, theoretical knowledge, nursing operations, and operating theatre management during nurses' trial periods. Each aspect was scored out of 100, with higher scores indicating superior nursing care quality.

(7) Adverse Event Risk Analysis: The number of reported adverse events during the trial period was recorded for both groups.

Statistical analysis

IBM Statistic Package for Social Science (SPSS) 26.0 statistical software (IBM, Armonk, NY, USA) was used to analyze the data. Measurement data conforming to normal distribution were expressed as ($\bar{x} \pm s$), and LSD-t or paired t test was used; comparison of count data was expressed as [n (%)], and χ^2 test was used, and $P < .05$ was taken as a statistically significant difference.

RESULTS

Negative emotions and positive thoughts scores

In the intervention group, HAMA and HAMD scores decreased significantly ($P = .01$ and $P = .02$, respectively), while MAAS scores increased significantly ($P = .03$). Blood pressure and respiratory rate were also significantly reduced in the intervention group ($P = .02$ and $P = .04$, respectively), and these indicators were significantly lower in the intervention group compared with the control group ($P < .05$). In the electroencephalogram assessment, SMR waves and beta waves increased ($P = .03$) and theta waves decreased ($P = .02$) in the intervention group. Scores of attention quotient, visual attention, and auditory attention were higher in the intervention group than in the control group ($P < .05$)., see Table 2, Figure 1.

Cardiac indicators

After training, blood pressure and respiratory rate decreased in the intervention group ($P < .05$), and the

Table 2. Comparison of HAMA, HAMD, and MAAS between the two groups ($\bar{x} \pm s$)

group	HAMA		HAMD		MAAS	
	Before training	After training	Before training	After training	Before training	After training
control group	9.01±1.34	9.24±1.48	8.67±1.02	8.58±0.98	51.34±6.34	52.71±6.42
Intervention group	9.12±1.37	6.34±0.64[a]	8.64±1.04	6.18±0.72[a]	52.04±6.42	83.24±8.64[a]
t	0.314	9.851	0.113	10.810	0.425	15.535
P value	.754	<.001	.911	<.001	.672	<.001

[a]Comparison with pre-training in this group, $P < .05$

Figure 1. Comparison of HAMA, HAMD, and MAAS between the two groups

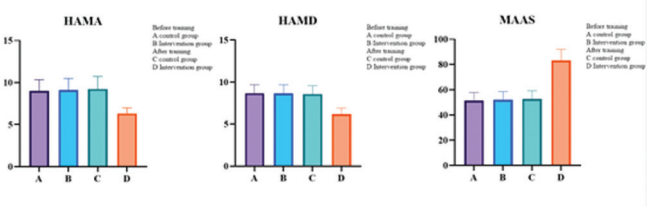


Table 3. Comparison of blood pressure, pulse rate, and respiratory rate between the two groups ($\bar{x} \pm s$)

group	systolic pressure /mmHg		diastolic pressure /mmHg		Pulse / time / min		The respiratory rate / time / min	
	Before training	After training	Before training	After training	Before training	After training	Before training	After training
control group	118.52±5.25	117.31±4.98	78.51±5.32	77.38±5.41	86.21±4.85	86.74±4.43	33.21±4.31	33.76±4.39
Intervention group	118.71±5.62	91.31±3.74[a]	78.72±5.63	68.33±3.89[a]	86.95±4.37	85.12±4.12	33.24±4.43	21.24±2.67[a]
t	0.135	22.866	0.148	7.439	0.621	1.467	0.027	13.346
P value	.893	<.001	.882	<.001	.537	.148	.979	<.001

[a]Comparison with pre-training in this group, $P < .05$

Table 4. Comparison of brain wave frequencies between the two groups ($\bar{x} \pm s$)

group	Brain wave frequency / Hz					
	SMR wave		Θ wave		B wave	
	Before training	After training	Before training	After training	Before training	After training
control group	6.82±0.62	6.71±0.63	24.52±2.34	24.38±2.41	5.85±0.82	5.74±0.73
Intervention group	6.78±0.67	7.91±0.91[a]	24.42±2.42	20.33±1.87[a]	5.95±0.84	6.72±1.21[a]
t	0.240	5.938	0.163	5.490	0.467	3.798
P VALUE	.811	<.001	.871	<.001	.643	<.001

[a]Comparison with pre-training in this group, $P < .05$

Figure 2. Comparison of brain wave frequencies between the two groups

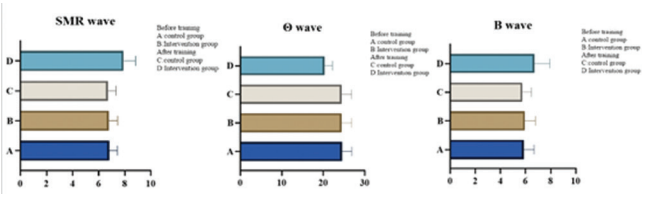
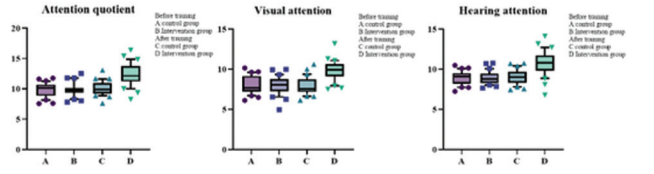


Table 5. Comparison of attention levels between the two groups ($\bar{x} \pm s$)

group	Level / score of attention					
	Attention quotient		Visual attention		Hearing attention	
	Before training	After training	Before training	After training	Before training	After training
control group	9.87±1.12	10.05±1.14	8.09±1.13	7.95±1.08	8.94±0.84	9.02±0.89
Intervention group	9.84±1.11	12.34±1.85	8.10±1.12	9.84±1.24	8.92±0.81	10.72±1.57
t	0.104	5.772	0.034	6.295	0.094	5.159
P value	.917	<.001	.973	<.001	.926	<.001

[a]Comparison with pre-training in this group, $P < .05$

Figure 3. Comparison of attention levels between the two groups



intervention group was significantly lower than the control group ($P < .05$), see Table 3.

Electroencephalographic indicators

After training, SMR and β waves were increased ($P < .05$), and θ waves decreased ($P < .05$) in the intervention group. The difference between the intervention group and the control group was statistically significant ($P < .05$); see Table 4, Figure 2.

These results indicate that breathing meditation training has a significant impact on improving negative emotions and enhancing mindfulness among operating room nurses. Additionally, this type of training helps reduce physiological stress indicators such as blood pressure and breathing rate, thereby improving overall health. These findings are consistent with the study's goal of improving operating room nurses' attention and quality of work through breathing meditation training.

Attention level

After training, the attention quotient, visual attention, and auditory attention scores of the intervention group were higher than those of the control group ($P < .05$), see Table 5, Figure 3.

Quality of nursing care

After training, the scores of health promotion, theoretical knowledge, nursing operation, and operation theatre management in the intervention group were higher than those in the control group ($P < .05$), see Table 6.

Incidence of adverse events

In the intervention group, the number of reported adverse events was 11 (25.58%), while in the control group it was 32 (74.42%). This suggests that breathing meditation training may help reduce the risk of adverse events for

Table 6. Comparison of the quality of nursing care between the two groups ($\bar{x} \pm s$)

group	Quality / score of nursing work			
	Health education	speculative knowledge	nursing procedure	managment of operating room
control group	83.69±4.26	83.62±4.25	86.67±4.40	89.02±4.47
Intervention group	91.78±3.27	95.84±5.23	94.64±5.49	94.37±4.52
t	8.251	7.494	6.205	4.610
P value	<.001	<.001	<.001	<.001

Table 7. Comparison of adverse event reporting between the two groups

group	Number of reports	constituent ratio
control group	32	74.42%(32/43)
Intervention group	11	25.58%(11/43)

operating room nurses at work. Specific types of adverse events include work fatigue, errors due to distraction, and poor communication with patients. After training, the number of reported adverse events was lower in the intervention group than in the control group, as shown in Table 7.

DISCUSSION

The results of this study highlight the positive effects of breathing meditation training on operating room nurses, including improvements in mood, physiological indicators, concentration, and work quality. These improvements not only benefit individual nurses, but also have the potential to promote better patient outcomes and reduce medical errors, thus improving the overall quality of care. For example, by reducing negative emotions and improving concentration, nurses can focus more on patient care, reduce operational errors, and improve the safety and efficiency of surgical procedures. However, further research is needed to evaluate the long-term effects of breathing meditation training. Continued research could provide insights into the lasting effects of meditation training on nurse well-being and performance, helping to develop more effective long-term care strategies.

The escalating elderly population and the rising prevalence of cardiovascular, cerebrovascular, and oncological diseases in China have led to a substantial surge in medical demand and an annual increase in surgical procedures. Consequently, there is a growing emphasis on the crucial role of operating theatre nursing care. Given the critical nature of surgical interventions, any lapse in nursing performance may pose risks to surgical safety and patient well-being, potentially escalating into doctor-patient conflicts.[7] The demanding nature of operating theatre nursing, characterized by the need for sustained high mental concentration, often results in prolonged exposure to negative emotions. Over time, this emotional strain may compromise nurses' attention levels, impacting work efficiency and the overall surgical process. In response to these challenges, recent studies have explored mindfulness meditation as an intervention to mitigate nurses' emotional stress and negativity over 12 weeks.[8] However, positive thinking meditation emerges as a promising alternative. With simpler and more accessible steps, it fosters both physical and mental well-being, making it highly suitable for operating theatre nurses. In contrast to the intricate procedures of positive thinking meditation, mindfulness training is perceived as cumbersome and potentially challenging to ensure compliance. Therefore, the simplicity and high compliance of positive thinking meditation position it as a more practical and effective approach for enhancing the emotional resilience of operating theatre nurses. In this study, the nurses who took breathing meditation training as the intervention group, compared with the control group who did not take any interventions, the results showed that after the training, the HAMA and HAMD scores of the intervention group were lower than those of the control group. The MAAS scores were higher than those of the control group, which indicated that the breathing meditation training could effectively reduce the negative emotions of anxiety and depression and improve the positive thoughts scores. Analyzing the reasons, operating room nurses are prone to depression and other adverse emotions when facing critically ill patients for a long time, and the survey shows that there is a general phenomenon of negative emotions and lack of emotion management ability among medical staff, in which the proportion of negative emotions among ICU medical staff accounts for about two times of positive emotions.[9] Studies have shown that meditation training applied to the nurses' group can cause nurses' anxiety and other negative emotions get better improvement, breathing meditation training by relaxing the whole body, the nurses' attention will be focused on their breathing, and this perception can enhance the activity of the prefrontal lobe of the brain and narrow the amygdala.[10,11] The prefrontal lobe of the brain is closely related to attention and higher cognitive functions, and when a person is stimulated by stress, the activity in the prefrontal cortex decreases, and the activity in the hypothalamus and anterior cingulate cortex that activates the stress response increases, and the amygdala is the place where negative emotions such as anxiety and fear are generated in the brain, and meditation has the effect of reversing the stress response, and its increase in prefrontal lobe activity not only moderates the body's stress response to further reduce the risk of stress-related diseases but also directly or indirectly stimulates the brain's ability to respond to the stress of the body. The increased prefrontal activity not only regulates the physical stress response to further reduce the risk of developing stress-related diseases but also directly or indirectly stimulates the vagus nerve, activates the parasympathetic nerves, and promotes the release of endorphins, thus relieving stress and reducing the level of anxiety and depression.[12] Wen, et al.[13] demonstrated that meditation can increase the level of positive attention and awareness, which is in line with the results of the current study, and the reason for this is that meditation can change the nurses' qualities of attention and awareness in the present moment by regulating the emotions of anxiety and depression. Meditation's impact on

neurobiology involves intricate processes that contribute to emotional regulation and stress reduction. Focused attention during meditation, particularly in breathing exercises, engages the prefrontal cortex, enhancing cognitive control and emotional regulation. This activation may counteract the typical decrease in prefrontal cortex activity during stress, facilitating improved decision-making and emotional management. Simultaneously, meditation's calming effects extend to the amygdala, a key emotional processing center.[10,11] By modulating amygdala activity, meditation mitigates the generation of negative emotions, such as anxiety and fear. This modulation aligns with the observed decrease in anxiety and depression scores among nurses.[10,11] The practice also influences the hypothalamus and anterior cingulate cortex, attenuating their hyperactivity during stress. By regulating these components of the stress response, meditation contributes to a more balanced and controlled emotional state. Moreover, meditation triggers vagus nerve activation, stimulating the parasympathetic nervous system.[12] This physiological response induces relaxation, reduces heart rate, and promotes an overall sense of well-being. The associated release of endorphins further contributes to mood elevation, alleviating symptoms of anxiety and depression.[13]

After the training, the blood pressure and respiratory rate of the intervention group were lower than those of the control group, indicating that meditative breathing training improves physiological indicators of blood pressure and respiratory rate. To analyze the reasons, operating room nurses often face unexpected situations, the body is often in a state of stress and high-pressure situations, and nervousness and excitement will enhance sympathetic nerve activity, resulting in increased blood pressure and respiratory rate. Bhasin et al.[14] conducted relaxation training such as positive thinking meditation on hypertensive patients, and the results showed that as many as 50% of the people had a significant decrease in blood pressure and the mechanism is related to the fact that meditation training can change gene expression, confirming the effectiveness of meditation in controlling blood pressure in hypertensive patients. Balban et al.[15] showed that breathing meditation training could significantly reduce the respiratory rate, and compared with the positive meditation training group to a greater extent, presumably with the sympathetic nerve innervation of the fine bronchial smooth muscle and effect the respiratory rate, the sympathetic nerve is in the state of excitement, usually cause an increase in respiratory rate, shortness of breath, the results of the study suggest that breathing meditation training is more effective in reducing sympathetic tone than positive thinking meditation training.

After the training, the theta wave of the intervention group was lower than that of the control group, and the SMR wave and β wave were higher than the control group. SMR wave is also known as logical thinking wave, which is related to the level of concentration, and β wave is the most common high-frequency wave of a person during waking hours, which is related to conscious activities such as cognitive reasoning, calculating, reading, communicating as well as thinking, and it will be increased in mental tension and emotional excitement, and theta wave is significant in a person's trance or depression. As operating theatre nurses perform continuous high-intensity work, they have a high prevalence of fatigue, and fatigue affects the nurses' level of sustained concentration, with too few SMR and beta waves and too many theta waves, which ultimately affects work efficiency. The results of this study suggest that meditative breathing training can regulate brainwave frequency, increase SMR and beta wave activity, and reduce theta wave activity to stimulate the functioning of consciousness and logical thinking in order to focus on easily and efficiently completing work tasks and reduce the probability of depression.

After training, the attention score and work quality score of the intervention group were higher than those of the control group, and the number of adverse events reported was lower than that of the control group after training. It indicates that breathing meditation training can improve nurses' attention, improve work quality, and reduce adverse events. To analyze the reasons, Savanth, et al.[16] studied the brain structure and found that meditation can increase the cerebral blood flow in the prefrontal and temporal lobe and other brain regions. Several regions of the brain were activated in long-term meditators, involving the dorsolateral prefrontal cortex for attention, the visual cortex for attracting attention, and the superior frontal sulcus for attentional orienting, etc. It was also found that long-term meditators could maintain their attention to a specific object for a longer period. And that this activation pattern was stronger in long-term practitioners compared to novices. Meditation can also increase the degree of concentration while regulating negative emotions, thus improving work efficiency and work quality and reducing the occurrence of adverse events.

Limitations of this study include the relatively small sample size and specific hospital setting, which may affect the generalizability of the findings. Future research should be conducted in a wider range of settings and with larger samples to enhance the applicability and reliability of the results.

Breathing meditation training may have advantages in terms of feasibility, effectiveness, and sustainability compared with other interventions such as mindfulness-based stress reduction or cognitive behavioral therapy. For example, its simple and easy steps and short training time may make it easier to implement in busy healthcare settings. Additionally, given the potential benefits of meditation in healthcare settings, interprofessional collaborations among nurses, physicians, and other healthcare providers could be explored to implement meditation programs and evaluate their collective impact on patient care and healthcare outcomes.

As technology-assisted interventions become more popular, the potential role of guided meditation sessions offered by mobile apps and online resources can be mentioned. These digital tools may enhance accessibility and compliance among medical professionals. Although this study focuses on nurses, potential downstream effects on

patient care and satisfaction can also be considered. Studying the relationship between healthcare provider well-being and patient outcomes could strengthen the case for implementing meditation programs in healthcare settings.

In summary, breathing meditation training demonstrates notable benefits for operating room nurses, including reduced negative emotions, enhanced positive scores, physiological regulation, improved attention, work quality, and a decreased risk of adverse events. Future research should embark on longitudinal studies to assess sustained effects, delve into advanced neuroimaging for structural insights, integrate meditation into existing training programs, customize interventions for diverse healthcare settings, evaluate patient outcomes, explore technology-assisted meditation, and investigate interprofessional collaboration. By addressing these avenues, a more comprehensive understanding of the impact and optimal integration of breathing meditation in healthcare settings can be achieved, offering valuable insights for enhancing the well-being of healthcare professionals and potentially improving overall patient care and satisfaction.

CONFLICT OF INTEREST

The authors have no potential conflicts of interest to report relevant to this article.

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AUTHOR CONTRIBUTIONS

LX and RS designed the study and performed the experiments, JJ and SH collected the data, LX, SH, and ZD analyzed the data, LX and RS prepared the manuscript. All authors read and approved the final manuscript.

ETHICAL COMPLIANCE

This study was approved by the ethics committee of Xingtai People's Hospital. Signed written informed consents were obtained from the patients and/or guardians.

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