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Original Article

Effects of deep breathing relaxation technique on clinical practice stress and sleep quality in novice nursing students

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Purpose: The purpose of this study was to explore the effect of the deep breathing relaxation technique (DBRT) on reducing clinical practice stress and improving sleep quality in clinical practice of nursing students.
Methods: A quasi-experimental study. The data collection period was January to February 2021; including the intervention group (IG, $n = 49$) and the control group (CG, $n = 49$). DBRT was self-administered by IG participants during the clinical practice period, while CG learnt as usual. The demographic information form, the Clinical Practice Stress Scale (CPSS), and the Pittsburgh Sleep Quality Index (PSQI) were used for data collection. Paired *t*-tests and independent *t*-tests were used for data analysis.
Results: The difference in CPSS and PSQI between the two groups before and after the intervention was statistically significant, indicating that clinical practice stress within the group was reduced and sleep quality was improved. The independent *t*-test showed that there was a statistical difference in CPSS between the two groups, but there was no statistical difference in PSQI; indicating that DBRT has an effect on reducing the stress of IG in clinical practice, but there was no significant difference in sleep quality.
Conclusions: DBRT may reduce clinical practice stress in clinical practice. Although there was no significant difference in sleep quality between the groups, DBRT could still be prioritized when designing interventions to modify stress and sleep quality in clinical practice.

Keywords: nursing student, deep breathing relaxation technique, clinical practice stress, sleep quality

1. Introduction

Elevated stress levels and poor sleep quality in clinical practice are common among nursing students in first-time clinical practice (1). Nursing students are often under pressure due to clinical practice, especially first-time clinical practice and school requirements, and face daunting obstacles in completing assignments and clinical placement. First-time clinical practice was considered to have the greatest impact on nursing students, as it can determine the right choices for their future career (2). Students must undertake fundamental nursing clinical practice within the expected hours or days to meet the requirements of nursing programs. However, clinical nursing practice can be challenging due to struggles and stress; in addition, they will face human suffering, which exposes them to intense emotional

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and psychological distress (3). When they realize that there is a difference or gap between the content of theoretical teaching and the actual experience in clinical practice, their confusion will become more serious (4). Psychological well-being, sleep quality, and clinical practice stress affect nursing students' clinical practice performance, which is their most challenging experience in the learning process (5-7).

The "clinical practicum-related stress" may be caused by the following reasons: lack of experience in the clinical field, fear of demanding from patients, fear of making mistakes, and are evaluated by the clinical staff of hospitals (5). Students are under considerable pressure due to academic stress; some of the reasons for their anxiety about clinical practice are having to face uncertainties, being unprepared, lack of belonging, inability to maintain patient safety, and fear of making mistakes (6). Additionally, unskilled nursing techniques, lack of self-confidence (4), difficulty adapting to clinical practice, inadequate interpersonal relationships, lack of communication skills, mistrust of family members, patients, and medical personnel are other factors that contribute to student stress (8, 9). Understanding the stress of these students is a great help in reducing stress and avoiding unnecessary early dropout (10, 11). Most nursing students are stressed (7-9); they have trouble falling asleep most of the time due to the amount of homework, exams, and other academic responsibilities, and lack of sleep may affect students' academic performance (12, 13). Nearly 82% of the students reported sleep problems, 90.53% of the nursing students did not get enough sleep, and peer-related problems led to poor sleep quality (7). Furthermore, stress and sleep problems can affect student learning outcomes, which can reduce concentration and memory, causing confusion and interfere with learning (7, 12, 13).

In clinical practice, students face many challenges and are aware of the sources of stress that result from it to be able to develop stress reduction strategies (14). Several strategies such as muscle relaxation, music therapy, and biofeedback training are used to reduce stress and promote sleep in clinical settings and are now widely adopted by nurse educators (15). Most students use these relaxation techniques, furthermore, inner self-awareness methods such as mindfulness or meditation may also be considered to help reduce stress in clinical practice and improve sleep quality (15). In millennia-old Eastern traditions, breathing exercise is an important aspect of most meditative practices, and it is considered a key factor in reaching a meditative state of consciousness (16), and is an act of being conscious at every moment, focusing the awareness on bodily sensations, feelings, and thoughts in the here and now (17). In addition, deep breath relaxation has been shown to reduce stress, anxiety, depression, and increase comfort, relaxation, pleasantness, vigor and alertness (18) as well as significantly improve sleep quality and psychological well-being (19-21).

In the past, many studies have mentioned the effects of DBRT on stress and sleep quality in different populations (22-24). The main subjects of this study are nursing students who do not have clinical practice experience and are practicing for the first time. The first practicum experience is considered to have the greatest impact on nursing students, and the quality of the clinical practicum experience can determine whether a student chooses to continue in the nursing profession(2). Therefore, this study aimed to determine the effects of DBRT on stress and sleep quality in clinical practice of novice nursing students.

1.1. Deep breathing relaxation technique

DBRT increases feelings of calm and decreases feelings of stress. Stress feelings can include physiological responses such as increased heart rate, shortness of breath, and muscle tension, as well as subjective emotional experience (25, 26); DBRT can help reduce these symptoms. Changes due to DBRT include lower blood pressure, decreased heart rate, decreased muscle tension (25), bronchial dilate, and increased the breathing rate, which increases oxygenation and thus relaxes the body (26); in addition, improve fitness, increase concentration, and find solutions to improve the ability to cope with stressors, then do not focus on stressors and relax (25). Research shows that various forms of relaxation training, such as progressive muscle relaxation, meditation, and deep breathing exercise, can help reduce stress, enhance relaxation, and improve overall health(27). Deep breathing, also known as diaphragmatic breathing, is a technique based on the

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concept of mind-body fusion producing relaxation. (27). Several studies support the idea that DBRT can be effective in improving mental and physical relaxation; and numerous studies have shown that deep breathing has a positive effect on everything from stress to anxiety to negative affect (19, 20, 24). The technique requires participants to contract their diaphragm and slowly inhale and exhale. Deep breathing is useful in multiple populations, and a study by Muhamad et al. (2021) showed that DBRT was effective in reducing dysmenorrhea among nurse students.(28); (29). Dincer et al. (2022) also showed that breathing therapy can relieve anxiety. To reduce clinical practice stress and sleep problem need to be addressed. Choose DBRT as a stand-alone intervention to reduce stress and improve sleep quality (26). DBRT can be learnt through self-help (30), which is one of the actions given by DBRT, which is an effective and simple way to reduce anxiety and stress (31).

1.2 Effects of DBRT on stress and sleep quality

There is growing evidence that deep breath relaxation was effective in reducing stress, improving sleep quality, and quality of life for healthcare workers (19, 20, 32). Several previous studies have looked at using guided imagery, relaxation, and deep breathing relaxation to overcome anxiety and stress (19, 20, 31). Ariga's study demonstrates the reduction of students' anxiety and stress about objective structured clinical exams (OSCE) by relaxing deep breathing; which study consisted of 40 undergraduate students and showed that relaxation through deep breathing at the moment of the exam can reduce students' anxiety and stress about OSCE exams (31).

Studies have found that mindful breathing significantly reduces anxiety and maintains stress levels among nursing students, especially during clinical practice (33, 34). Moreover, the study showed that students with greater mindfulness breathing relaxation may experience lower negative emotions and better sleep quality (23). Furthermore, Liu's study (19) showed the effectiveness of breathing relaxation training in improving sleep quality among nursing staff who practiced breathing relaxation for four weeks, 20 minutes of breathing relaxation training before sleep significantly reduce anxiety and improve sleep quality. Breath relaxation training can help people with stress, anxiety, depression, pain, and sleep disorders, alleviate psychological distress, and cope with their health-related conditions (15). Although several studies have described the effects of deep breath relaxation on stress and sleep quality, to date, addressing these issues remains important for first-time clinical practice nursing students. Therefore, deep breath relaxation can be prioritized when designing interventions to alter an individual's clinical practice stress, sleep quality, health, and well-being. The aim of this study was to investigate the effects of DBRT on clinical practicum-related stress and sleep quality among first-time clinical practice nursing students. This study hypothesized that two weeks of DBRT would significantly improve clinical practicum-related stress and sleep quality in first-time clinical practice nursing students.

2. Methods

2.1 Design

A quasi-experimental research design was used.

2.2 Sample and setting

All participants voluntarily participated in this study. A total of 107 students were enrolled in two classes of undergraduate nursing students from a medical university in Taiwan. Ninety-eight second-year nursing students (first-time clinical practice) were included in the data analysis. The students in the two classes were randomly assigned to the intervention group (IG; $n = 54$) and the control group (CG; $n = 53$) by flipping a coin, the heads were IG and tails being CG, tossing a coin to assign the IG and CG of the two classes; and IG performed DBRT. Neither the students nor the investigators were blinded to the intervention. Furthermore, to avoid mutual influence between IG and CG, avoid the Hawthorne effect, and avoid another layer of pressure, or bias, therefore, during the experiment, the researcher did not emphasize the study intervention but simply recorded the progress of the participants. The eligibility criteria for participation in this study were: (1) first-time clinical practice, (2) completion of a semester fundamental nursing course, and (3) passing the OSCE of fundamental nursing technical.

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OSCE examines nursing students for the necessary nursing knowledge and skills prior to clinical practice. Having basic nursing ability and passing OSCE are also very important competency assessments (35). Only after passing the OSCE are they eligible to enter clinical practice. After completing a semester of fundamental nursing courses and passing the OSCE in fundamental nursing technical, they were assigned to different medical and surgical units at the university-affiliated hospital and conducted a total of eight days of clinical practice within two weeks. Furthermore, the clinical practice workloads in the clinical units were similar. The exclusion criteria were: (1) the student has completed the fundamental nursing course in the current semester but fail to pass the OSCE, (2) the students suffered from mental or psychological distress.

2.3 Interventions

The DBRT was designed based on a before and after study by Liu et al (19), which performed DBRT to improve sleep quality among nursing staff who practiced diaphragmatic breathing relaxation training for four weeks, 20 minutes of training before sleep significantly improved sleep quality and anxiety. Additionally, this study also referred to the design of the Tai's pilot study (36), which conducted a 10-minute/day mindfulness body-scan breathing training for psychiatric depressive patients for a week-long. We designed and required that IG students perform the DBRT during the clinical practice period. In the clinical practice, students are assigned to surgical or internal medicine units based on their student identification (ID) number, with 6 or 7 students per unit. One week before clinical practice, the researchers provided DBRT instruction. Two well-trained clinical nursing teachers guided the IG to complete the 10-minute DBRT. In the comfortable classroom, clinical nursing teachers introduce themselves and ask students to relax. The participants then watched a “DBRT” coaching video, performed a 10-minute DBRT, and guided the participants to introspect their entire body from the little toe to the top of the head, accompanied by soft music. The teacher asked the students to repeat and demonstrate the DBRT to confirm that the students really understood and learnt the DBRT. During two consecutive weeks, participants in IG were asked to practice DBRT at home, at least 10 minutes once a day, gradually increase to more than 10 minutes, at least once per day, regardless of whether with or without accompanying music. To ensure that participants completed the DBRT, we asked them to verbally report daily when the DBRT started, ended and lasted; and recorded daily in the notes by the clinical nursing teacher. CG did not perform the DBRT and learnt as usual in clinical practice.

Provide students with DBRT and the procedures as follows:

Beginning (5minutes):

1. Performed at least 10 minutes of deep breathing exercises every night before going to bed.
2. Sit or lie on the bed in the most natural and relaxed position.

Relaxation (DBRT) (at least 10 minutes or > 10 minutes):

3. Close your eyes and focus on how you are feeling right now.
4. Try not to think about the past or the future. Focus on the here and now.
5. Pay attention to breathing, breathe slowly through your nose, and pay attention to the ups and downs of your chest.
6. When taking a deep breath, if you have distracting thoughts, you can open your eyes, rest for a while, and then resume DBRT.
7. Start with breathing, only focus on breathing, continue to do this for at least 10 minutes, and gradually increase to more than 10 minutes.

Ending (5minutes):

8. Close your eyes and focus on how you feel.
9. Relax the whole body (Table1).

2.4 Measurement

2.4.1 Demographic information form

The demographic information form included sex, age, and clinical practice unit.

2.4.2 Clinical Practice Stress Scale

The Clinical Practice Stress Scale (CPSS) was used to measure the perceived stress of nursing students in clinical practice (37). It measures the level and frequency of the stress in the clinical practice situation. The scale has 29 items divided into six

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Table 1. Intervention and procedures

Procedures	Intervention	
One week before clinical practice	1. Take the deep breathing relaxation technique. 2. Two well-trained clinical nursing teachers instructed the IG to complete the 10-minute deep breathing relaxation technique.	
Deep breathing relaxation technique (give students the following instructions)		
During a two-week period	Beginning 1. Performed at least 10 minutes of deep breathing exercises every night before going to bed. 2. Sit or lie on the bed in the most natural and relaxed position.	5 mins
	Relaxation (DBRT) 3. Close your eyes and focus on how you are feeling right now. 4. Try not to think about the past or the future. Focus on the here and now. 5. Pay attention to breathing, breathe slowly through your nose, and pay attention to the ups and downs of your chest. 6. When taking a deep breath, if you have distracting thoughts, you can open your eyes, rest for a while, and then resume DBRT. 7. Start with breathing, only focus on breathing, continue to do this for at east 10 minutes, and gradually increase to more than 10 minutes.	10 mins or > 10 mins
	Ending 8. Close your eyes and focus on how you feel. 9. Relax the whole body	5 mins

categories: the stress of taking care of patients (8 items); the stress of expectations from school faculty and hospital staff (6 items); the stress of homework and clinical workload (5 items); the stress of balancing peers and personal life (4 items); the stress of the clinical environment (3 items) and the stress of acquisition of professional knowledge and skill (3 items). Using a 5-point scale, from 0 (no) to 4 (always), the higher the total score of the stress on the scale, the greater the overall stress in clinical practice. In addition, scores for each subscale are standardized to 100, ranging from 0 to 100. The higher the score on each subscale, the greater the clinical practice stress in that category. The scale has good reliability and validity, with a Cronbach alpha coefficient of .89 (37).

2.4.3 Pittsburg Sleep Quality Index

Many studies have extensively used the PSQI to measure an individual's overall sleep quality over the past month (19, 20, 23). It consists of 19 items covering seven subcategories: subjective sleep quality, sleep latency, sleep efficiency, sleep disturbance, sleep deprivation, use of sleeping medications, and daytime dysfunction. Each item is scored from 0 to 3, and the total score ranges from 0 to 21; the higher the score, the worse the sleep quality. Additionally, a total score of 5 is the cut-off point, less than or equal to 5 means good sleep quality, and more than 5 means poor sleep quality (38). The Cronbach's α of the Chinese version of PSQI (CPQSI) was .83; in terms of validity, the CPSQI and the Sleep Quality Visual Analogue Scale (SQ-VAS) were significantly correlated (r = - .30, p = .043). CPSQI is a stable and sensitive measurement tool in Taiwan (39).

2.5 Data collection

The data collection period was from January 10, 2021 to February 10, 2021. Data were collected at the end of the first semester and at the beginning of the second semester, the clinical placement lasted two weeks. One week before clinical practice, the Principal Investigator briefed all participants on the purpose and procedures of the study. Subsequently, informed consent was obtained from the participants. Then, students fill out the pre-test questionnaire, which is given in class, and took approximately 15-20

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minutes. When completing the pre-test questionnaire, the IG students are then directed to perform the DBRT. Finally, after the end of clinical practice, they received post-test questionnaires at the clinical practice unit.

2.6 Data analysis

The Statistical Package for Social Sciences (SPSS 26.0, for Windows) was used for data analysis. The power was .80 and the significance level was established at .05 (α = .05). Descriptive statistics, including frequency, mean, standard deviation (*SD*), and chi-square test were used to analyze sociodemographic data and the results of the structured questionnaire. The Shapiro-Wilk test and quantile-quantile plot normal distribution graph were used to visually inspect the generated histogram to examine the normality of the outcome variables. Changes in CPSS and PSQI scores between the pre-test and post-test within the groups were compared using the paired samples *t*-test. Furthermore, the differences between the groups before and after the intervention were tested using an independent *t*-test.

2.7 Ethical considerations

This study was approved by the Institutional Review Board of the Chung Shan Medical University Hospital (IRB No. CS1-20041). After confirming and fully understanding the purpose and procedures of the study, the participants signed an informed consent form. No student refused to participate at the beginning of the study, and all participation was voluntary. The data was encoded and securely stored by the researchers during the data entry process, and participant information was kept strictly confidential and only the researchers had access to the data. The rights of the participants were protected, and we informed them that they had the right to withdraw from the study at any time without any negative consequences.

3. Results

3.1 Demographic data, CPSS and PSQI of the participants at baseline

There are nine students who did not fully participate in the study due to some reasons: received

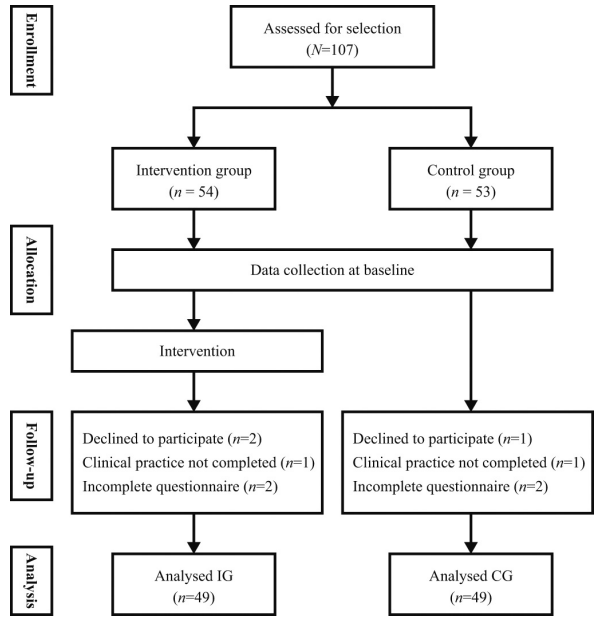


Fig 1. Flow chart of participants

surgery and dropped out (n = 2), three students declined to participate (n = 3), and four students did not complete the questionnaire (n = 4) (Figure 1); the overall response rate of the questionnaire was 91.6% (98/107). There were 50 (51.0%) students in the internal medicine unit and 48 (49.0%) students in the surgical unit (Table 2). The samples were normally distributed and the Shapiro-Wilk test did not show significant differences (p = .268). The mean CPSS score was 50.39 (± 20.40) for IG and 57.74 (± 20.85) for CG, indicating moderate levels of clinical practice stress, which were not significantly different at baseline (t = -1.765, p = .081). Subscales with a total score greater than 50 were: taking care of the patient (57.59 ± 21.45), homework and clinical workload (56.43 ± 22.46), acquisition of professional knowledge and skills (61.65 ± 23.83), and clinical environment (55.53 ± 24.96), respectively. The mean PSQI score was 9.53 (± 3.29) in the IG and 10.55 (± 4.09) in the CG, and there were no significant differences (t = -1.363, p = .176); moreover, the mean sleep hours were 6.98 (± 1.05) in the IG and 6.61 (± 1.11) hours in the CG, also did not show any significant differences (t = 1.690, p = .094). At baseline, 73.5% of the 98 students had poor sleep quality and 26.5% had good sleep quality. Furthermore, poor sleep quality was 67.3% (n = 33) in IG and 79.6% (n = 39) in CG, while good sleep quality

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Table 2. Demographic data, CPSS and PSQI of the participants at baseline

Variable	All (*n* = 98)	IG (*n* = 49)	CG (*n* = 49)		
	Frequency *n* (%) / M ± SD			*t*/*χ2*	*p*
Age	19.89 ± 0.97	19.84 ± 0.87	19.94 ± 1.07	- .517	.606
Sex					
Male	24 (24.5)	14 (14.3)	10 (10.2)	.883a	.347
Female	74 (75.5)	35 (35.7)	39 (39.8)		
Unit					
Medical ward	50 (51.0)	28(57.1)	22(44.9)	1.470a	.225
Surgical ward	48 (49.0)	21(42.9)	27(55.1)		
CPSS	54.06 ± 20.85	50.39 ± 20.40	57.74 ± 20.85	-1.765	.081
Taking care of patients	57.59 ± 21.45	54.85 ± 22.59	60.33 ± 20.10	-1.269	.207
Expectations from school faculty and hospital staff	44.64 ± 19.77	40.56 ± 18.22	48.72 ± 20.59	-2.078	.040
Homework and clinical workload	56.43 ± 22.46	53.98 ± 23.12	58.88 ± 21.75	-1.080	.283
Balancing peers and personal life	41.39 ± 22.46	37.24 ± 22.57	45.54 ± 21.80	-1.850	.067
Acquisition of professional knowledge and skill	61.65 ± 23.83	59.69 ± 24.85	63.61 ± 22.87	-.811	.419
Clinical environment	55.53 ± 24.96	52.55 ± 25.86	58.50 ± 23.90	-1.183	.240
PSQI	10.04 ± 3.72	9.53 ± 3.29	10.55 ± 4.09	-1.363	.176
Sleep hours	6.80 ± 1.09	6.98 ± 1.05	6.61 ± 1.11	1.690	.094
Sleep Quality					
Poor (PSQI >5)	72 (73.5)	33(67.3)	39(79.6)	1.885a	.170
Good (PSQI≤5)	26 (26.5)	16(32.7)	10(20.4)		

[a] Chi-square test
IG = intervention group; CG = control group; M = mean; SD = standard deviation; CPSS = clinical practice stress scale; PSQI = Pittsburgh sleep quality index.
Note.
IG = Intervention group (deep breathing relaxation technique)
CG = Control Group

was 32.7% (*n* = 16) in IG and 20.4% (*n* = 10) in CG, there were no significant difference in sleep quality between the two groups at baseline ($\chi 2$ = 1.885, *p* = .070) (Table 2).

3.2 Differences in CPSS and PSQI scores before and after DBRT intervention within groups

The results of the paired *t-tests* are shown in Table 3. There was a significant difference within the groups. In the IG, significant changes occurred in CPSS, PQSI, and sleep hours (*t* = 7.861, *p* < .000; *t* = 3.934, *p* < .000; *t* = 2.943, *p* = .005, respectively), the post-test CPSS and PQSI scores in the two groups had improved significantly. Furthermore, significant differences in CG were observed in CPSS, PSQI and sleep hours (*t* = 4.308, *p* < .000; *t* = 4.997, *p* < .000; t = 2.281, *p* < .027, respectively). The subscales of CPSS with a significant difference in the IG were:

Table 3. Differences in CPSS and PSQI scores before and after DBRT intervention within groups

Variable	IG (n = 49)					CG (n = 49)				
	pre-test	post-test				pre-test	post-test			
	M ± SD	M ± SD	Standard error	t	p	M ± SD	M ± SD	Standard error	t	p
CPSS	50.39 ± 20.40	26.20 ± 6.832	3.077	7.861	< .001	57.74 ± 20.85	44.85 ± 9.19	2.993	4.308	< .001
Taking care of patients	54.85 ± 22.59	38.20 ± 12.32	3.221	5.168	< .001	60.33 ± 20.10	58.23 ± 12.20	3.037	.693	.492
Expectations from school faculty and hospital staff	40.56 ± 18.22	16.84 ± 8.07	2.853	8.317	< .001	48.72 ± 20.59	31.12 ± 13.53	3.222	5.463	< .001
Homework and clinical workload	53.98 ± 23.12	27.45 ± 13.15	3.539	7.496	< .001	58.88 ± 21.75	49.39 ± 16.60	3.563	2.663	.011
Balancing peers and personal life	37.24 ± 22.57	32.65 ± 9.48	3.330	1.379	< .001	45.54 ± 21.80	45.03 ± 18.97	3.734	.137	.892
Acquisition of professional knowledge and skill	59.69 ± 24.85	44.22 ± 15.13	4.037	3.834	.174	63.61 ± 22.87	62.25 ± 12.85	3.623	.375	.709
Clinical environment	52.55 ± 25.86	21.43 ± 13.60	3.947	7.886	< .001	58.50 ± 23.90	37.93 ± 20.34	3.781	5.442	< .000
PSQI	9.53 ± 3.29	6.44 ± 1.19	0.462	3.934	< .001	10.55 ± 4.09	6.09 ± 1.67	0.531	4.997	< .001
Sleep hours	6.98 ± 1.05	7.71 ± 3.09	0.183	2.943	.005	6.61 ± 1.11	7.90 ± 3.04	0.228	2.281	.027

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taking care of patients, expectations from school faculty and hospital staff, homework and clinical workload, balancing peers and personal life, and clinical environment (all $p < .001$); moreover, the subscales with a significant difference in the CG were: expectations from school faculty and hospital staff ($p < .001$), homework and clinical workload ($p = .011$), and clinical environment ($p < .000$) (Table 3).

3.3 Differences in CPSS and PSQI scores after DBRT intervention between the two groups

Since Table 2 shows a significant difference in the "expectations of school staff and hospital staff," this result may affect subsequent CPSS comparisons. That is, the difference in CPSS between the two groups may not be due to the intervention of DBRT but to the teacher, so this variable was statistically controlled before analysis. However, after controlling for " expectations from school faculty and hospital staff", the results still showed that there were significant differences in CPSS between the two groups. The comparison of CPSS, PSQI, and sleep hours between the two groups is shown in Table 4. Independent *t*-tests indicated a significant difference in CPSS between the groups ($t = -11.403$, $p = .000$). Furthermore, PSQI and sleep hours were not significantly different ($t = 1.183$, $p = .240$; $t = -.297$, $p = .767$, respectively). It should be noted that the sleep hours of the IG and CG students increased by 0.73 and 1.29 hours, respectively. Among 98 students, 75.5% ($n = 37$) of IG and 77.6% ($n = 38$) of CG had poor sleep quality, while 24.5% ($n = 12$) of IG and 22.4% ($n = 11$) of CG showed good sleep quality; the chi-square test did not show significant difference ($\chi 2 = .057$; $p = .812$), indicating that there was no difference in sleep quality between the two groups after intervention (Table 4).

4. Discussion

This study aimed to determine the effect of DBRT

Table 4. Differences in CPSS and PSQI scores after DBRT intervention between the two groups

Variable	All (n = 98)	IG (n = 49)	CG (n = 49)		
	post-test				
	M ± SD	M ± SD	M ± SD	$t/\chi 2$	p
CPSS	35.52 ± 12.36	26.20 ± 6.832	44.85 ± 9.19	-11.403	< .001
Taking care of patients	48.22 ± 15.81	38.20 ± 12.32	58.23 ± 12.20	-8.084	< .001
Expectations from school faculty and hospital staff	23.98 ± 13.20	16.84 ± 8.07	31.12 ± 13.53	-6.347	< .001
Homework and clinical workload	38.42 ± 18.54	27.45 ± 13.15	49.39 ± 16.60	-7.250	< .001
Balancing peers and personal life	38.84 ± 16.06	32.65 ± 9.48	45.03 ± 18.97	-4.114	< .001
Acquisition of professional knowledge and skill	53.23 ± 16.65	44.22 ± 15.13	62.25 ± 12.85	-6.354	< .001
Clinical environment	29.68 ± 19.11	21.43 ± 13.60	37.93 ± 20.34	-4.718	< .001
PSQI	6.27 ± 1.45	6.44 ± 1.19	6.09 ± 1.67	1.183	.240
Sleep hours	7.80 ± 3.05	7.71 ± 3.09	7.90 ± 3.04	-0.297	.767
Sleep Quality		Frequency (%)		.057[a]	.812
Poor (PSQI >5)	75 (76.5)	37 (75.5)	38 (77.6)		
Good (PSQI≤5)	23 (23.5)	12 (24.5)	11 (22.4)		

[a] Chi-square test

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on clinical practice stress and sleep quality among nursing students in first-time clinical practice. A total of 49 IG students underwent DBRT during a two-week fundamental nursing clinical practice. The results of this study suggest that DBRT may help reduce stress and increase sleep hours in IG students. The CPSS subscales showed significant differences, with positive changes within the IG groups, showing improvement in clinical practice stress. In this study, the paired sample *t*-test showed significant differences in sleep quality and sleep hours within the group, indicating that all students had improved sleep quality and sleep hours after clinical practice. However, the independent *t*-test did not show significant differences in sleep quality and sleep hours between groups. Furthermore, even considering that PSQI scores for IG and CG were significant difference in their post-tests, there was insufficient evidence to conclude that DBRT affected sleep quality and increased sleep hours in this study.

4.1 The effect of DBRT on clinical practice stress

Consistent with the first hypothesis of this study, after two weeks of DBRT, the first-time clinical practice nursing students made significant progress in CPSS scores, including taking care of patients, expectations from school faculty and hospital staff, homework and clinical workload, balancing peers and personal life, acquisition of professional knowledge and skill, and clinical environment. Furthermore, the post-test CPSS scores of the IG students were significantly reduced after the intervention; there were significant differences in CPSS between IG and CG, suggesting that 10-minute DBRT may be effective in reducing students' stress levels in clinical practice, this finding corroborates the findings of other studies (15, 22). DBRT is an effective method to help regulate autonomic nervous systems and to reduce stress. A systematic review of studies by Hopper et al. (24) showed that a 10-20-minute DBRT intervention had a positive effect in reducing physical and psychological stress. According to the literature, some studies have also shown that DBRT is an effective method for helping regulate autonomic nervous systems and mental states (18, 40). Furthermore, DBRT reduces respiratory rate to promote the oxygen exchange, cortisol secretion, and neurohumoral transmission, contributing to reduce stress. Therefore, after undergoing the DBRT intervention, stress improved significantly (18, 19, 40). The findings of this study were consistent with previous studies showing that DBRT may help relieve students' stress in clinical practice (19, 23). In addition, the CPSS measured after clinical practice in this study may be the change brought about by the maturation effect and the impact on internal validity. That is, maturation may threaten the internal validity of findings (41). Internal validity or maturation effects may be due to learning effects or testing effects (also known as practice effects) leading to improved post-test performance because participants are already familiar with certain aspects of the experiment (42). Clinical practice is also a form of learning; thus, the results of this study may be due to possible learning effects. It is recommended that researchers conduct pilot studies to help address internal validity issues (43).

4.2 The effect of DBRT on sleep quality

Herein, the results of this study provide that DBRT has a positive effect on the quality of sleep of nursing students and sleep hours within groups, but did not affect between groups. Therefore, the second hypothesis, which was partially supported, showed that a 10-minute daily DBRT may not be enough to have a significant effect on sleep quality in this study. Research suggests that DBRT is a useful non-pharmacological treatment for improving sleep quality(27). DBRT is a technique that produces relaxation based on mind-body integration and has been shown to have a positive impact on sleep quality(19). It is not easy to develop good sleep habits; people with a sleep disturbance/problem are the least likely to develop good sleep habits in a short period of time (44). For nurses or nursing students, there are also reasons for the worsening of sleep quality due to the increase in the number and duration of shifts, peer-related problems, the high demands of patients and their families, the workload, and uncertainty of treatment, thus reducing the actual duration of sleep, the habitual and sleep efficiency for nurses and nursing students (7). To have good sleep quality, we recommend that people develop a healthy state of mind, regular work and rest, and establish a stable sleep pattern. Furthermore, there

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were significant differences in sleep quality and sleep hours within the group in this study, indicating that all students' sleep quality and sleep hours increased after clinical practice; in other words, the sleep problem had improved. In terms of sleep in the IG and CG, this may be due to the teaching strategies used prior to clinical practice, including the introduction of preclinical practice and arrangement of clinical practice schedule in our curriculum. In terms of results, this study showed that students experienced a reduction in clinical practice stress after clinical practice, which may be related to a well-defined clinical practice plans, good teaching skills of teachers, good interaction with nursing staff, good patient relationships, group oral presentations, and cooperative learning may help increase student self-confidence, thereby reducing clinical practice stress(3, 44). Additionally, this may be related to the unique learning process and mechanism of nursing education in clinical practice programs. Clinical practice contributes to the development of nursing competencies such as clinical technical competencies, skill ability, professional knowledge, critical thinking, and nursing care ability. Clinical practice is the core of nursing education, and the unique learning mechanism of nursing education improves the self-confidence of students, thus reducing clinical practice stress and further increasing their sleep hours (45, 46). Furthermore, an integrative review showed that the majority of researchers (17 studies) supported various teacher-led behavioral interventions and specific teacher-student interaction strategies as they were somewhat effective in reducing anxiety among nursing students in clinical settings (47). Therefore, it is reasonable to speculate that teacher-guided behavior may also reduce clinical practice stress and improve sleep problems.

4.3 The fidelity to the DBRT was based on self-report

In this study, the researcher did not use any related instruments or devices (such as smart watches) to collect objective data and improve the validity of the study. This study used self-reporting to record DBRT time to assess compliance and relied on self-report to determine, for more precise results, an e-monitoring instrument could be used to measure DBRT with the specified frequency and duration. Objective measurements for research have grown enormously, and an increasing number of devices and methods are available; whether using just a single electronic monitor or a combination of multiple electronic monitors, most electronic monitors have been scientifically evaluated for precision and accuracy. The advantages of electronic monitoring can improve measurement methods exhibiting high precision and accuracy, especially in determining an individual's physical activity. Objectively process and visualize the collected data to enhance the research validity of the investigation (48)

4.4 Study limitations

This study was not a randomized clinical trial (RCT) design, and was not rigorously-enough controlled to attribute any measured changes to the intervention alone. Since it was a quasi-experimental study, the two classes were not strictly randomly selected; toss a coin to divide the two classes into IG and CG. Furthermore, since the clinical practice units were organized according to the student ID number, the students in the same unit had IG and CG; therefore, in the same clinical unit, some students performed DBRT and others did not. Participants were not blinded to the intervention process, which may lead to bias in the research results. Therefore, the conclusions drawn from this study must be interpreted with caution. Another limitation of this study was that the fidelity to the DBRT was based on self-report. It is not easy to verify that participants in the IG are indeed performing DBRT at the specified frequency and duration. Furthermore, we were unable to confirm that the CG participants did not perform DBRT during the study period. It is difficult to clearly show how to handle the fidelity of students performing DBRT beyond the supervision of the researcher. Therefore, to efforts to eliminate potential bias by blocking the interaction between IG and CG, we strongly recommend that future studies employ rigorous RCTs, and recruit more participants from different nursing schools to examine the effectiveness of DBRT for first-time clinical practice nursing students on clinical practice stress and sleep quality.

4.5 Recommendations for practice and research

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DBRT is a self-directed practice that focuses on the here and now and can be done anytime, anywhere, and in any situation to help manage daily stress. To help students reduce clinical practice stress and improve sleep quality, clinical nursing teachers can guide students to perform DBRT in group meeting during clinical practice.

Further efforts in nursing research can develop appropriate interventions measures to improve sleep quality and establish sleep quality standards in clinical practice among nursing students. Clinical practice stress and sleep quality can serve as key outcome indicators of nursing clinical practice quality. Overall, further research is needed to continue to develop the evidence base on the effectiveness of DBRT. Well-designed studies, such as RCTs with sufficiently large sample sizes, are recommended. The longitudinal study design may include data reflecting the positive effects of DBRT on reducing stress and improving sleep quality over time. Additional outcome variable measures must also be considered to assess the effect of DBRT, such as physiological (respiration rate, pulse rate, and blood pressure), and psychological (anxiety and depression) aspects.

5. Conclusion

This study found that DBRT may improve the clinical practice stress and increase the sleep hours of nursing students during clinical practice, but the improvement of sleep quality was not as good as expected, and the quality of sleep in clinical practice is still poor. The study does shed light on the role DBRT may play in helping students manage stress and improve sleep hours, but more research is needed to determine if this is the case. To help students reduce the clinical practice stress, teachers can guide students to perform DBRT. Although there was no significant difference in sleep quality, DBRT could still be prioritized for inclusion in the nursing clinical practice curriculum when designing interventions to modify stress and sleep quality in individual clinical practice.

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Ethical approval

Chung Shan Medical University Hospital (IRB No. CS1-20041).

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Conflict of interest

The author(s) declare that they have no competing interests.

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