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Effect of 4-7-8 Breathing Exercise on Anxiety in University Students: A Quasi-Experimental Controlled Study

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Abstract

Background: Anxiety is common among university students and may negatively affect academic performance and psychological well-being. Simple, safe, and self-administered non-pharmacological interventions are therefore needed, one of which is the 4-7-8 breathing exercise.

Objective: To examine the effect of the 4-7-8 breathing exercise on anxiety levels among undergraduate physiotherapy students.

Methods: This quasi-experimental pretest–posttest study with a non-randomized control group was conducted in October 2025 at a physiotherapy undergraduate program. A total of 110 students were recruited using purposive sampling and allocated into an experimental group (n=55) and a control group (n=55). The experimental group performed the 4-7-8 breathing exercise for 14 days with a duration of 2 minutes per session, while the control group received no intervention. Anxiety levels were assessed using the Zung Self-Rating Anxiety Scale. Data were analyzed using Wilcoxon signed-rank and Mann–Whitney U tests with a significance level of $p<0.05$.

Results: The experimental group showed a significant reduction in anxiety scores, with the median decreasing from 47 (IQR 45–51) at baseline to 30 (IQR 22–45) post-intervention ($Z=-6.230$; $p<0.001$; $r=0.84$). No significant change was observed in the control group ($p=0.108$). Post-intervention anxiety scores were significantly lower in the experimental group than in the control group ($Z=-6.846$; $p<0.001$; $r=0.65$).

Conclusion: The 4-7-8 breathing exercise is effective in reducing anxiety among university students and may serve as a practical non-pharmacological strategy for anxiety management in academic settings.

Keywords
Anxiety; Breathing Exercises; Relaxation Therapy; Young Adult

Introduction

University students are particularly vulnerable to psychological distress due to increasing academic, social, and personal demands. Anxiety is one of the most frequently reported mental health problems among students and has been shown to negatively affect academic performance, concentration, and overall psychological well-being.[1,2] Anxiety generally arises when individuals perceive internal or external demands as exceeding their coping capacity, resulting in persistent feelings of worry, fear, and physiological arousal.[3]

Academic-related stressors such as examinations, coursework deadlines, fear of academic failure, and low self-confidence are major contributors to anxiety among university students.[4] These stressors may trigger maladaptive emotional responses, particularly when students lack effective coping strategies. Anxiety is commonly characterized by psychological symptoms, including excessive worry and fear, as well as somatic manifestations such as muscle tension, palpitations, and restlessness.[5] The severity of anxiety varies across individuals, ranging from mild anxiety to severe anxiety and panic, which may significantly interfere with daily functioning and academic responsibilities.[6]

Globally, anxiety disorders affect more than 260 million individuals, with young adults representing one of the most affected age groups.[7] In Asian countries, anxiety prevalence is particularly high among university students, especially those in the final stages of their academic programs.[8] In Indonesia, national health surveys have demonstrated a marked increase in the prevalence of emotional mental disorders, including anxiety, rising from 6.0% in 2013 to 9.8% in 2018 among individuals aged over 15 years.[9] These findings highlight anxiety as a growing public health concern within the student population.

Given the high prevalence of anxiety and its potential long-term consequences, effective and accessible interventions are urgently needed. Non-pharmacological approaches are increasingly recommended as first-line strategies for managing mild to moderate anxiety due to their low risk of adverse effects and ease of implementation.[10] Relaxation-based interventions, particularly breathing exercises, have been widely applied to regulate autonomic nervous system activity and reduce psychological distress.[11] Deep breathing techniques are considered practical interventions because they are simple, low-cost, and can be performed independently without specialized equipment.[12]

One structured breathing technique that has gained attention is the 4-7-8 breathing exercise, which involves inhaling through the nose for four seconds, holding the breath for seven seconds, and exhaling slowly through the mouth for eight seconds. This technique was introduced by Andrew Weil and is designed to promote relaxation through parasympathetic activation.[13] Previous studies have demonstrated that breathing-based relaxation techniques may effectively reduce anxiety, stress, and physiological arousal across various populations.[11,14] However, evidence regarding the superiority of the 4-7-8 technique over other breathing methods remains inconsistent.[15]

Several studies have reported beneficial effects of the 4-7-8 breathing technique, either alone or in combination with other interventions, in reducing anxiety and stabilizing physiological parameters.[12,16] Conversely, other studies have found that the 4-7-8 technique does not produce significantly greater effects compared with alternative breathing strategies.[15] These inconsistencies indicate the need for further investigation, particularly within specific populations and academic contexts.

Despite growing interest in breathing-based relaxation techniques, empirical evidence examining the effectiveness of the 4-7-8 breathing exercise among physiotherapy students in Indonesia remains limited. Physiotherapy students are exposed to substantial academic workloads and practical demands, which may increase their vulnerability to anxiety. To date, few controlled studies have specifically evaluated the impact of the 4-7-8 breathing technique on anxiety within this population.

Therefore, this study aimed to examine the effect of the 4-7-8 breathing exercise on anxiety levels among undergraduate physiotherapy students. It was hypothesized that students who practiced the 4-7-8 breathing technique would demonstrate a significant reduction in anxiety levels compared with those who did not receive the intervention. The findings of this study are expected to contribute to the evidence base for non-pharmacological anxiety management strategies in academic settings.

Methods

Study Design

This study employed a quantitative quasi-experimental design using a pretest–posttest approach with a non-randomized control group. The design was selected to compare changes in anxiety levels between an experimental group receiving the 4-7-8 breathing exercise and a control group that did not receive any intervention. Group allocation was conducted non-randomly based on participant availability and willingness to participate. To minimize potential contamination, participants in the control group were instructed not to engage in any additional relaxation or breathing techniques during the study period. Anxiety levels were measured twice in both groups, at baseline (pretest) and after completion of the intervention period (posttest).

Participants and Sampling

The study population consisted of 516 undergraduate students enrolled in the Bachelor of Physiotherapy Program at Universitas Muhammadiyah Surakarta. Sample size was calculated using Slovin's formula with a 10% margin of error, yielding a minimum required sample of 84 participants. Recruitment was conducted in October 2025 through announcements distributed via institutional WhatsApp groups. A total of 110 students met the eligibility criteria and consented to participate.

Purposive sampling was applied. Inclusion criteria were active undergraduate physiotherapy students in semesters 3, 5, or 7 who exhibited mild to severe anxiety based on screening results and were willing to participate. Exclusion criteria included a history of respiratory or cardiovascular disorders, current pharmacological treatment for anxiety, absence of anxiety symptoms, or refusal to participate.

Participants were allocated into an experimental group (n=55) and a control group (n=55). No participants withdrew during the intervention period, and all enrolled students completed both pretest and posttest assessments. Blinding was not implemented due to the nature of the intervention, which required direct instruction and active participation.

Intervention Procedure

The experimental group received the 4-7-8 breathing exercise intervention for a period of 14 consecutive days. The intervention was administered by the researcher, who had received prior training in the standardized 4-7-8 breathing protocol. During the initial session, participants were provided with an explanation of the purpose and benefits of the exercise, followed by a step-by-step demonstration and supervised practice.

Participants were instructed to perform the exercise independently twice daily, in the morning and evening, with each session lasting approximately 2 minutes. Adherence to the intervention was monitored daily through reminders and self-reported feedback delivered via a WhatsApp group. Periodic face-to-face check-ins were also conducted in the classroom to ensure correct technique execution and to maintain participant compliance.

The 4-7-8 breathing technique was performed in a seated position with the body relaxed and hands resting on the thighs. Participants were instructed to place the tip of the tongue against the ridge of tissue behind the upper front teeth and maintain this position throughout the exercise. The breathing cycle consisted of inhalation through the nose for four seconds, breath retention for seven seconds, and slow exhalation through the mouth for eight seconds.[13] The control group did not receive any intervention and only completed anxiety assessments at baseline and post-intervention.

Outcome Measure

Anxiety levels were assessed using the Zung Self-Rating Anxiety Scale, a standardized psychometric instrument developed to evaluate anxiety-related psychological and somatic symptoms over the previous week.[17] The Indonesian version of the scale has demonstrated satisfactory validity and reliability, with a reported validity coefficient of 0.85 and a Cronbach's alpha of 0.79.[18]

The Zung Self-Rating Anxiety Scale consists of 20 items, including 15 negatively worded items and 5 positively worded items. Each item is rated on a four-point Likert scale ranging from 1 (rarely or none of the time) to 4 (most or all of the time). Total raw scores range from 20 to 80, with higher scores indicating greater anxiety severity. Scores were categorized as normal (20–44), mild anxiety (45–59), moderate anxiety (60–74), and severe anxiety (75–80).[19] Anxiety assessments were conducted twice: one day before the intervention (H−1) and on day 14 after completion of the intervention (H+14). Data were collected using a controlled online questionnaire administered via Google Forms.

Statistical Analysis

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were used to summarize participant characteristics. Data normality was assessed using the Kolmogorov–Smirnov test. Because the data were not normally distributed, non-parametric tests were applied.

Within-group comparisons of anxiety scores before and after the intervention were conducted using the Wilcoxon signed-rank test. Between-group comparisons of anxiety scores were analyzed using the Mann–Whitney U test. Effect sizes were calculated using the r statistic to quantify the magnitude of the intervention effect. Statistical significance was set at $p<0.05$, and results were reported as median values with interquartile ranges (IQR).

Ethics Statement

This study was approved by the Health Research Ethics Committee of the Faculty of Health Sciences, Universitas Muhammadiyah Surakarta (Ethical Approval No. 1704.3/A.3-III/FIK/VII/2025). Prior to data collection, all participants received a complete explanation of the study objectives, procedures, potential benefits, and risks. Written informed consent was obtained electronically from all participants. Participant confidentiality was strictly maintained, and all data were used solely for research purposes.

Results

A total of 110 undergraduate physiotherapy students participated in this study, consisting of 55 students in the experimental group and 55 students in the control group. All participants completed the study, and no dropouts were recorded. The minimum required sample size based on Slovin's formula was 84 participants; therefore, the final sample size exceeded the minimum requirement.

Participant Characteristics

The demographic characteristics of participants are presented in Table 1. The majority of participants were female (80.0%), and most were aged between 21 and 23 years (61.8%).

Table 1. Participant Characteristics (n = 110)

Characteristic	Frequency (n)	Percentage (%)
Sex		
Male	22	20.0
Female	88	80.0
Age (years)		
18–20	42	38.2
21–23	68	61.8

Distribution of Anxiety Levels

Table 2 presents the distribution of anxiety levels in the experimental group before and after the intervention. At baseline, most participants in the experimental group reported mild anxiety (89.1%). After the intervention, the majority of participants were classified as having no anxiety (67.3%).

Table 2. Anxiety Level Distribution in the Experimental Group (n = 55)

Anxiety Level	Pretest n (%)	Posttest n (%)
No anxiety	0 (0.0)	37 (67.3)
Mild anxiety	49 (89.1)	18 (32.7)
Moderate anxiety	5 (9.1)	0 (0.0)
Severe anxiety	1 (1.8)	0 (0.0)

Table 3 shows the distribution of anxiety levels in the control group. No substantial changes were observed between pretest and posttest measurements.

Table 3. Anxiety Level Distribution in the Control Group (n = 55)

Anxiety Level	Pretest n (%)	Posttest n (%)
No anxiety	0 (0.0)	4 (7.3)
Mild anxiety	48 (87.3)	45 (81.8)
Moderate anxiety	7 (12.7)	6 (10.9)
Severe anxiety	0 (0.0)	0 (0.0)

Within-Group Comparisons

In the experimental group, Wilcoxon signed-rank test results demonstrated a significant reduction in anxiety scores following the 4-7-8 breathing exercise. The median anxiety score decreased from 47 (IQR 45–51) at pretest to 30 (IQR 22–45) at posttest ($Z = -6.230$; $p<0.001$), with a large effect size ($r = 0.84$).

Table 4. Comparison of Anxiety Scores in the Experimental Group

Measurement	Median (IQR)	Z	p-value	Effect size (r)
Pretest	47 (45–51)	−6.230	<0.001	0.84
Posttest	30 (22–45)			

In the control group, no significant difference was observed between pretest and posttest anxiety scores. Median scores remained unchanged at 47 (IQR 45–51) ($Z = -1.608$; $p = 0.108$), with a small effect size ($r = 0.22$).

Table 5. Comparison of Anxiety Scores in the Control Group

Measurement	Median (IQR)	Z	p-value	Effect size (r)
Pretest	47 (45–51)	−1.608	0.108	0.22
Posttest	47 (45–51)			

Between-Group Comparisons

Baseline comparison using the Mann–Whitney U test showed no significant difference in anxiety scores between the experimental and control groups prior to the intervention, indicating comparable baseline conditions ($Z = -0.021$; $p = 0.983$).

Table 6. Baseline Anxiety Score Comparison Between Groups

Group	Median (IQR)	Z	p-value	Effect size (r)
Experimental	47 (45–51)	−0.021	0.983	0.002
Control	47 (45–51)			

Post-intervention analysis demonstrated a significant difference between groups. The experimental group exhibited significantly lower anxiety scores compared with the control group ($Z = -6.846$; $p<0.001$), with a large effect size ($r = 0.65$).

Table 7. Post-Intervention Anxiety Score Comparison Between Groups

Group	Median (IQR)	Z	p-value	Effect size (r)
Experimental	30 (22–45)	−6.846	<0.001	0.65
Control	47 (45–51)			

Discussion

This study demonstrated that the 4-7-8 breathing exercise significantly reduced anxiety levels among undergraduate physiotherapy students. Participants in the experimental group experienced a substantial decrease in anxiety scores after 14 days of intervention, whereas no significant change was observed in the control group. These findings suggest that the 4-7-8 breathing exercise may serve as an effective non-pharmacological approach for anxiety reduction in academic settings.

The present results align with previous studies reporting that structured breathing and relaxation techniques can effectively reduce anxiety by modulating autonomic nervous system activity.[11,12] Breathing exercises are known to promote parasympathetic dominance, leading to reductions in physiological arousal associated with anxiety, such as increased heart rate, muscle tension, and rapid breathing.[13] The large effect size observed in the experimental group further supports the clinical relevance of the intervention.

The effectiveness of the 4-7-8 breathing technique observed in this study is consistent with prior research conducted among student and clinical populations. Studies have shown that the 4-7-8 breathing method, either alone or combined with other relaxation modalities, can significantly reduce anxiety and stress levels.[12,16] In contrast, the absence of significant changes in the control group supports the assumption that the observed improvements were attributable to the intervention rather than natural adaptation or measurement effects.

Nevertheless, previous literature has reported inconsistent findings regarding the superiority of the 4-7-8 breathing technique compared with other breathing methods.[15] These discrepancies may be explained by differences in study populations, intervention duration, frequency of practice, and outcome measures. In the present study, the intervention was conducted consistently for 14 consecutive days with daily monitoring, which may have contributed to the robust effects observed.

From a physiological perspective, the 4-7-8 breathing technique is believed to reduce anxiety by enhancing parasympathetic activity and inhibiting sympathetic nervous system responses. Controlled slow breathing has been associated with increased gamma-aminobutyric acid (GABA) activity, an inhibitory neurotransmitter that plays a critical role in anxiety regulation.[20] Enhanced GABA activity may lead to reductions in cortisol and catecholamine release, resulting in decreased heart rate, respiratory rate, and overall physiological tension.[13,21] This mechanism provides biological plausibility for the anxiety-reducing effects observed in this study.

The demographic characteristics of the participants may also have influenced the findings. The majority of participants were female and aged between 21 and 23 years, a group previously identified as being more vulnerable to anxiety due to developmental, hormonal, and psychosocial factors.[9,22] Female students, in particular, may experience heightened emotional sensitivity and stress reactivity, which could explain the high baseline anxiety levels observed.[12]

Despite the positive findings, several limitations should be acknowledged. First, the non-randomized allocation of participants may have introduced selection bias, potentially affecting internal validity. Although baseline anxiety scores were comparable between groups, unmeasured factors such as motivation or stress coping styles may have influenced outcomes. Second, anxiety was assessed solely using a self-report questionnaire, which may be subject to response bias. Objective physiological measures such as heart rate variability or cortisol levels were not included. Third, the relatively short intervention duration limits conclusions regarding long-term effectiveness.

Future research should address these limitations by employing randomized controlled designs, incorporating objective physiological indicators, and extending follow-up periods to evaluate sustained effects. Comparative studies examining the 4-7-8 breathing technique against other breathing strategies, such as diaphragmatic breathing or box breathing, may also help identify the most effective intervention for anxiety management among students. Overall, the findings of this study contribute to the growing body of evidence supporting breathing-based relaxation techniques as practical, low-cost, and accessible interventions for reducing anxiety in university populations.

Conclusion

This study demonstrated that the 4-7-8 breathing exercise is effective in reducing anxiety levels among undergraduate physiotherapy students. Participants who practiced the 4-7-8 breathing technique for 14 consecutive days exhibited a significant decrease in anxiety scores, whereas students in the control group showed minimal change. Moreover, post-intervention anxiety levels in the experimental group were significantly lower than those observed in the control group, indicating a meaningful effect of the intervention.

These findings suggest that the 4-7-8 breathing exercise may serve as a practical and accessible non-pharmacological strategy for anxiety management in academic environments. The technique is simple, safe, low-cost, and can be performed independently, making it suitable for integration into student mental health promotion programs.

However, the quasi-experimental design with non-randomized group allocation and the use of self-reported anxiety measures limit causal inference. Additionally, the short duration of the intervention restricts conclusions regarding long-term effectiveness. Future studies should employ randomized controlled designs, incorporate objective physiological indicators, and evaluate longer intervention periods to confirm and extend these findings.

Author Contribution

Vivin Dwi Febriyanti: Conceptualization, Methodology, Data curation, Investigation, Formal analysis, Writing—original draft.
Isnaini Herawati: Conceptualization, Methodology, Supervision, Validation, Writing—review and editing.

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Conflict of Interest Statement

The author declares no conflict of interest.

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Ethics Statement

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References

1. Homaedi R, Mafruhah, Yuliana AT. Profile of students with dual roles as students and workers. Shine J Bimbing Konseling. 2022;2(2):125–137.
2. Savitri PAC, Swandi NLID. Anxiety interventions among university students: a literature review. Psikobuletin. 2023;4(1):42–54.
3. Fransiska EA, Putri TH, Ligita T. Factors influencing academic anxiety levels among university students. J Keperawatan. 2023;16:87–94.
4. Bamber MD, Morpeth E. Effects of mindfulness meditation on college student anxiety: a meta-analysis. Mindfulness (N Y). 2019;10(2):203–214.
5. Susilo TEP, Eldawaty. Anxiety levels among students during undergraduate thesis completion. Onsila J Ilm BK. 2021;4(2):105–113.
6. Anggraeini N. Anxiety levels among third-year diploma nursing students facing competency examinations. J Pendidik Keperawatan Indones. 2018;1(2):131–[pages not available].
7. Fadhilah GZN, Saputra RA, Wibowo AH. Detection of anxiety disorder levels using the random forest method. J Fak Tek UMT. 2024;13(1):38–47.
8. Indriyati, Herawati VD, Sutrisno, Putra FA. Effect of complementary therapy using Quran recitation on anxiety levels among final-year students during the COVID-19 pandemic. Health Sci Pharm J. 2021;6(3):103–109.
9. Supratih I, Hasneli Y, Woferst R. Effectiveness of morning Al-Ma'tsurat recitation therapy on student anxiety during practical examinations. J Penelit Perawat Prof. 2023;5(2):591–600.
10. Brito RA, Viana SMNR, Beltrao BA, Magalhaes CBA, Bruin VMS, Bruin PFC. Pharmacological and non-pharmacological interventions to promote sleep in intensive care units: a critical review. Sleep Breath. 2019;24(1):25–35.
11. Wijayanti SA, Sarwili I, Rukiah N. Combination of 4-7-8 deep breathing relaxation and bergamot essential oil aromatherapy on stress reduction among nursing students. [Journal title not indexed]. 2025;[volume not available]:4137–4150.
12. Karangan DA, Endarwati T, Purwanti NS. Effect of combining 4-7-8 deep breathing relaxation and classical music on anxiety levels in preoperative patients with spinal anesthesia. J Teknol Kesehat. 2024;20(1):9–16.
13. Pandekar PP, Thangavelu PD. Effect of 4-7-8 breathing technique on anxiety and depression in patients with moderate chronic obstructive pulmonary disease. Int J Health Sci Res. 2019;9(5):[pages not available].
14. Verawaty K, Widiastuti SH. Effect of deep breathing relaxation techniques on anxiety levels. J Keperawatan Cikini. 2020;1(1):16–21.
15. Marchant J, Khazan I, Cressman M, Steffen P. Comparing the effects of square, 4-7-8, and six breaths-per-minute breathing on heart rate variability, carbon dioxide levels, and mood. Appl Psychophysiol Biofeedback. 2025;50(2):261–276.
16. Zahra RC, Dewi E, Marumpy N. Foot reflexology and 4-7-8 breathing exercise as supportive therapy to reduce anxiety and stabilize vital signs in ICU patients. J Ber Ilmu Keperawatan. 2023;16(2):320–328.
17. Setyowati A, Chung MH, Yusuf A. Development of a self-report anxiety assessment tool for adolescents: Indonesian version of the Zung self-rating anxiety scale. J Public Health Afr. 2019;10(1):4.
18. Safariyah E, Danismaya I, Lidiyawati H, Akbar RA. Correlation between preoperative anxiety and increased blood glucose levels in patients with diabetes mellitus. KnE Life Sci. 2021:553–563.
19. Tripriantini SI, Oktavia N, Emaliyawati E. Anxiety levels among high school students who are victims of cyberbullying. J Keperawatan BSI. 2019;7(2):11–19.
20. Mutawarudin. Deep breathing techniques for anxiety management. Islamix Guid Couns J. 2022;2(2):32–40.
21. Streeter CC, Gerbarg PL, Brown RP, Scott TM, Nielsen GH, Owen L, et al. Thalamic gamma-aminobutyric acid level changes in major depressive disorder after a 12-week Iyengar yoga and coherent breathing intervention. J Altern Complement Med. 2020;26(3):190–197.
22. Amalia W, Abdilah H, Tarwati K. Anxiety levels among final-year professional nursing students. [Journal title not available]. 2023;3(10):3326–3337.