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Effect of deep breathing relaxation on pain in postoperative orthopedic patients

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Abstract

Background: Postoperative orthopedic pain resulting from surgical trauma and inflammatory response is a major problem commonly experienced by patients. Despite pharmacological therapy, many patients continue to experience moderate to severe pain, necessitating complementary non-pharmacological interventions.
Purpose: To determine the effect of the deep breathing relaxation technique in reducing pain intensity among postoperative orthopedic patients.
Method: This study employed a quasi-experimental design with a non-equivalent control group. A total of 40 postoperative orthopedic patients participated, selected using total sampling. Pain was assessed using the Verbal Descriptor Scale (VDS). Univariate analysis was used to describe respondents' demographic characteristics, while bivariate analysis was performed using the Marginal Homogeneity test.
Results: Following the intervention, 80% of the intervention group (n=16) experienced decreased pain intensity, while the control group showed no change. The Marginal Homogeneity test revealed a statistically significant difference in pain levels between pre-intervention and post-intervention measurements ($p < 0.001$).
Conclusion: Deep breathing relaxation technique effectively reduces pain intensity in postoperative orthopedic patients. Implementation of this non-pharmacological intervention in routine postoperative care protocols is recommended to enhance multimodal pain management.

Keywords: Deep Breathing Relaxation; Pain; Postoperative Orthopedic Patients.

INTRODUCTION

Postoperative orthopedic patients undergo a recovery phase following surgical procedures on bones, joints, muscles, and surrounding tissues. These procedures frequently cause inflammation and pain. Unmanaged pain can lead to complications such as deep vein thrombosis (DVT), sleep disturbances, and delayed rehabilitation (Potter & Perry, 2005). Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage (Raja, Carr, Cohen, Finnerup, Flor, Gibson, & Vader, 2020).

According to Global Data Healthcare and the Global Surgical Market Report of 2024, approximately 30.5 million orthopedic procedures were performed globally, representing a 4.5% increase from the previous year, with the United States and China as the largest contributors. In Indonesia, the prevalence of fractures reached 5.5%, predominantly involving the lower extremities (Indonesian Basic Health Research, 2018). Fracture surgeries accounted for approximately 27.9% of all surgical procedures, with Central Java showing a fracture prevalence of 8.2%.Studies have shown that most orthopedic patients experience moderate to severe pain within the first 24 hours postoperatively, which adversely affects mobility, emotional stability, and healing (Gan, Habib, Miller, White, & Apfelbaum, 2014).

Despite analgesic therapy, 56–80% of patients experience moderate to severe pain within the first 24–48 hours postoperatively, with some experiencing persistent pain for extended periods. Inadequate postoperative pain management remains a significant clinical problem, with up to 80% of surgical patients

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experiencing acute pain and approximately 75% reporting moderate to severe pain intensity (Chou, Gordon, de Leon-Casasola, Rosenberg, Bickler, Brennan, & Wu, 2016).

Deep breathing relaxation technique has been shown to effectively reduce pain intensity in postoperative patients, with studies indicating that patients who perform deep breathing relaxation have lower risk of postoperative pain (Nugroho & Suyanto, 2023). Literature reviews indicate that deep breathing relaxation is effective, easy to implement, and can serve as a complementary approach to postoperative pain management. Slow breathing techniques can modulate pain perception through psycho-physiological mechanisms involving the autonomic nervous system (Zaccaro, Piarulli, Laurino, Garbella, Menicucci, Neri, & Gemignani, 2018). Relaxation techniques with guided imagery have also significantly improved physical and psychological symptoms including pain in clinical populations (Chen, Wang, Yang, & Chung, 2015).

Pain assessment is an important aspect of nursing care, as pain is subjective and can only be evaluated based on patient self-report (Pasero & McCaffery, 2010). The Verbal Descriptor Scale (VDS) uses clear verbal descriptors to characterize pain intensity levels for patients (Hjermstad, Fayers, Haugen, Caraceni, Hanks, Loge, & European Palliative Care Research Collaborative, 2011). The VDS is a 4-point scale consisting of no pain, mild pain, moderate pain, and severe pain. This approach is particularly beneficial for patients who have difficulty using numerical or visual scales, making the VDS an effective, straightforward, and accurate instrument for pain assessment, especially in postoperative patients.

Deep breathing relaxation technique has been shown to reduce sympathetic nervous system responses, calm the nervous system, and alleviate both pain and anxiety. This technique is safe, easy to learn, requires no equipment, and can be incorporated into holistic postoperative patient care (Friesner, Curry, & Moddeman, 2006). Non-pharmacological interventions such as deep breathing relaxation have gained increasing attention in pain management research. Multimodal pain management strategies combining pharmacological and non-pharmacological approaches are essential to optimize postoperative outcomes (Chou et al., 2016). Deep breathing exercises activate the parasympathetic nervous system, reduce cortisol levels, and promote endogenous opioid release, thereby contributing to pain relief (Ma, Yue, Gong, Zhang, Duan, Shi, Wei, & Li, 2017).

However, limited evidence exists regarding the effectiveness of deep breathing relaxation in managing postoperative orthopedic pain. This study aimed to determine the effect of deep breathing relaxation technique on pain intensity among postoperative orthopedic patients.

RESEARCH METHOD

This study employed a quantitative research design using a quasi-experimental method with a Non-Equivalent Control Group Design, The study population consisted of postoperative orthopedic patients at Siti Khodijah Hospital, Pekalongan, totaling 40 individuals recruited through total sampling. The research instrument was the Verbal Descriptor Scale (VDS), a 4-point scale consisting of no pain, mild pain, moderate pain, and severe pain. Study results were analyzed using univariate analysis to determine frequency distributions and bivariate analysis using the Marginal Homogeneity test. Ethical approval from the Health Research Ethics Committee of Universitas Islam Sultan Agung Semarang (approval number 2147/A.1-KEPK/FIK-SA/XII/2025).

RESEARCH RESULTS

Table 1. Respondent Characteristics (N=40)

Variable	Intervention (n=20)	Control (n=20)
Age (n/%)		
(Mean ± SD) (Range) (Year)	(51.7±16.4)(18–75)	(54.8±15.6)(18–78)
Young adults (18–39 Years)	6/30.0	4/20.0

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Middle-aged adults (40–59 Years)	6/30.0	7/35.0
Older adults (≥ 60 Years)	8/40.0	9/45.0
Gender (n/%)		
Male	9/45.0	8/40.0
Female	11/55.0	12/60.0

Table 1 presents the demographic characteristics of respondents in both the control and intervention groups. In the control group, the average age was 54.8 years with a standard deviation of 15.6 years. Respondents ranged in age from 18 to 78 years, with the majority aged 60 years and above (45.0%, n=9). Most respondents were female (60.0%, n=12), and the largest age category was older adults. The distribution across age categories showed that young adults comprised 20.0% (n=4) and middle-aged adults comprised 35.0% (n=7).

In the intervention group, the average age was 51.7 years with a standard deviation of 16.4 years, ranging from 18 to 75 years. Similar to the control group, the majority of respondents were female (55.0%, n=11). The age distribution showed that young adults comprised 30.0% (n=6), middle-aged adults comprised 30.0% (n=6), and older adults comprised 40.0% (n=8), with older adults being the largest age category.

Table 2. Marginal Homogeneity Test of Pain Scale

Pain Scale	Effect of Deep Breathing Relaxation Technique					
	Intervention (Pre-test & Post-test)		Control (Pre-test & Post-test)		Intervention & Control (Post-test)	
	n	%	n	%	n	%
Decreased	16	80.0	0	0.0	28	70.0
Unchanged	4	20.0	20	100.0	12	30.0
Increased	0	0.0	0	0.0	0	0.0
p-value	<0.001		1.000		<0.001	

Table 2 presents pain scale changes following the intervention. The intervention group showed significant pain reduction, with 80.0% (n=16) reporting decreased pain and 20.0% (n=4) unchanged ($p < 0.001$). In contrast, the control group demonstrated no change, with 100.0% (n=20) remaining unchanged ($p = 1.000$). Between-group comparison revealed that 70.0% (n=28) experienced pain reduction compared to 30.0% (n=12) unchanged, with a statistically significant difference ($p < 0.001$) confirming the intervention's effectiveness

DISCUSSION

This study demonstrated that deep breathing relaxation technique had a significant effect on reducing pain intensity in postoperative orthopedic patients. The Marginal Homogeneity test yielded $p < 0.001$, indicating a statistically significant difference in pain scores before and after the intervention. These findings suggest that deep breathing relaxation technique is effective in alleviating pain. From a theoretical standpoint, deep breathing relaxation works through physiological mechanisms that reduce sympathetic nervous system activity, decrease muscle tension, and improve tissue oxygenation, thereby reducing pain perception (Busch, Magerl, Kern, Haas, Hajak, & Eichhammer, 2012). This technique may also stimulate endorphin release and analgesic neurotransmitters such as serotonin, which are involved in pain modulation and mood regulation, resulting in patients reporting lower pain levels following deep breathing relaxation intervention

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(Kwekkeboom, Wanta, & Bumpus, 2008). This evidence is consistent with the concept of non-pharmacological analgesia reported in nursing and pain physiology literature.

Supporting literature indicates that these results are consistent with numerous previous studies confirming that deep breathing relaxation technique significantly reduces pain intensity in patients undergoing orthopedic surgery, particularly in fracture cases and other orthopedic surgical procedures. Studies have shown that relaxation techniques including deep breathing significantly reduced pain intensity in postoperative patients, with meaningful changes in pain scores following relaxation technique application ($p < 0.05$), reinforcing this technique's effectiveness in the postoperative context (Rejeh, Heravi-Karimooi, Vaismoradi, & Jasper, 2013). Experimental studies investigating deep breathing exercises in postoperative patients reported that the intervention group experienced greater pain scale reduction compared to the control group, indicating that deep breathing contributes to pain management following surgery (Friesner et al., 2006). Furthermore, studies have shown that relaxation techniques including deep breathing helped reduce acute pain experienced by patients, demonstrating that this technique is effective as a simple and direct non-pharmacological approach to pain reduction (Good, Stanton-Hicks, Grass, Anderson, Lai, Roykulcharoen, & Adler, 2001). Research has also shown that relaxation with guided imagery significantly improved physical symptoms including pain in clinical populations, supporting the efficacy of relaxation-based interventions (Chen et al., 2015).

The consistency of these findings with theoretical frameworks can be explained by various nursing and pain physiology textbooks, which state that deep breathing relaxation technique is one of the effective non-pharmacological interventions for pain reduction, including in postoperative orthopedic patients. Potter and Perry (2005) explain that deep breathing exercises can stimulate the parasympathetic nervous

focus more effectively on following breathing instructions optimally. Furthermore, respondents were in physiologically stable condition and were not experiencing hunger, which is important since hunger may trigger discomfort, increase physiological stress, and potentially exacerbate pain perception. This conducive environmental setting contributed to maximizing the parasympathetic relaxation response, system, thereby reducing stress response, alleviating muscle tension, and suppressing pain perception through physiological relaxation mechanisms that patients may experience immediately following intervention administration. In postoperative patients, including those undergoing orthopedic surgery, deep breathing exercises can help reduce pain by improving pulmonary ventilation, enhancing tissue oxygenation, and relieving muscle spasms that frequently exacerbate postoperative pain, making this technique effective even when performed in a single session (Brunner & Smeltzer, 2010).

Deep breathing relaxation modulates pain through activation of the descending pain inhibitory system and endogenous opioid release, enabling patients to experience pain intensity (Wells, Collier, Posey, Morgan, Auman, Strittmatter, Magalhaes, Adler-Neal, McHaffie, & Zeidan, 2020). Reduced sympathetic activity through controlled deep breathing can decrease pain sensitization and create a homeostatic state conducive to pain perception reduction. Non-pharmacological interventions such as deep breathing relaxation are strongly recommended in the early postoperative phase because they are safe, easy to implement, and provide analgesic effects without adverse effects, making them effective even when administered on a single occasion (Oshodi, 2007). Accordingly, these study results align with theories and evidence stating that deep breathing relaxation technique has a strong physiological basis and can significantly reduce postoperative pain.

The success of this study in reducing pain scores in postoperative orthopedic patients through deep breathing relaxation technique was supported not only by theoretical foundations and prior research, but also by environmental conditions and respondent readiness at the time of intervention administration. During the intervention, deep breathing relaxation technique was performed in a calm setting with minimal distractions, supported by a comfortable room environment with controlled temperature through air conditioning, enabling respondents to reducing sympathetic activity, and facilitating more rapid achievement of a relaxed state in respondents.

A comfortable and safe environment is an important factor in the success of non-pharmacological interventions, as a calm atmosphere can reduce anxiety, alleviate muscle tension, and enhance the effectiveness of relaxation techniques in modulating pain perception (Schaffer & Yucha, 2004).

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With the support of these conditions, respondents were able to perform deep and regular breathing, which subsequently improved tissue oxygenation, promoted peripheral blood flow, and stimulated endorphin release as endogenous analgesics. Therefore, the significant pain reduction following a single administration of deep breathing relaxation technique in this study not only reflects the intervention's effectiveness itself, but also demonstrates that implementing the relaxation technique under optimal environmental conditions with respondents' basic needs fulfilled plays a crucial role in the success of pain management in postoperative orthopedic patients.

CONCLUSION

This study demonstrated that the baseline characteristics of respondents in both the intervention and control groups were relatively comparable in terms of sample size, age range, sex, and type of orthopedic surgical procedure undergone, rendering the two groups suitable for comparison. Prior to the intervention, the majority of patients in both groups continued to experience postoperative pain of considerable intensity, indicating that pain constitutes the primary concern in postoperative orthopedic patients. Following the administration of the deep breathing relaxation technique, the intervention group exhibited a meaningful change in the form of a reduction in pain level, characterized by a shift in pain category toward a milder level compared to the pre-intervention condition. The results of the analysis also confirmed the presence of a strong and significant association between the administration of the deep breathing relaxation technique and the reduction in pain level, with the direction of the association indicating that the application of deep breathing relaxation contributed to the decrease in patients' pain. It can therefore be concluded that the deep breathing relaxation technique is effective and exerts a significant influence in reducing pain levels in postoperative orthopedic patients, and can be recommended as a non-pharmacological intervention in nursing practice.

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REFERENCES

Busch, V., Magerl, W., Kern, U., Haas, J., Hajak, G., & Eichhammer, P. (2012). The effect of deep and slow breathing on pain perception, autonomic activity, and mood processing—an experimental study. *Pain Medicine*, *13*(2), 215-228.

Chen, S. F., Wang, H. H., Yang, H. Y., & Chung, U. L. (2015). Effect of relaxation with guided imagery on the physical and psychological symptoms of breast cancer patients undergoing chemotherapy. *Iranian Red Crescent Medical Journal*, *17*(11), e31277.

Chou, R., Gordon, D. B., de Leon-Casasola, O. A., Rosenberg, J. M., Bickler, S., Brennan, T., ... & Wu, C. L. (2016). Management of Postoperative Pain: a clinical practice guideline from the American pain society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' committee on regional anesthesia, executive committee, and administrative council. *The journal of pain*, *17*(2), 131-157.

Friesner, S. A., Curry, D. M., & Moddeman, G. R. (2006). Comparison of two pain-management strategies during chest tube removal: relaxation exercise with opioids and opioids alone. *Heart & lung*, *35*(4), 269-276.

Gan, T. J., Habib, A. S., Miller, T. E., White, W., & Apfelbaum, J. L. (2014). Incidence, patient satisfaction, and perceptions of post-surgical pain: results from a US national survey. *Current medical research and opinion*, *30*(1), 149-160.

Good, M., Stanton-Hicks, M., Grass, J. A., Anderson, G. C., Lai, H. L., Roykulcharoen, V., & Adler, P. A. (2001). Relaxation and music to reduce postsurgical pain. *Journal of advanced nursing*, *33*(2), 208-215.

Hjermstad, M. J., Fayers, P. M., Haugen, D. F., Caraceni, A., Hanks, G. W., Loge, J. H., ... &

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European Palliative Care Research Collaborative (EPCRC. (2011). Studies comparing numerical rating scales, verbal rating scales, and visual analogue scales for assessment of pain intensity in adults: a systematic literature review. *Journal of pain and symptom management*, *41*(6), 1073-1093.

Indonesian Basic Health Research (2018). *Laporan Nasional Riskesdas 2018*. Kementerian Kesehatan Republik Indonesia. Retrieved from :https://repository.badankebijakan.kemkes.go.id/id/eprint/3514/1/Laporan%20Riskesdas%202018%20Nasional.pdf

Kwekkeboom, K. L., Wanta, B., & Bumpus, M. (2008). Individual difference variables and the effects of progressive muscle relaxation and analgesic imagery interventions on cancer pain. *Journal of pain and symptom management*, *36*(6), 604-615.

Ma, X., Yue, Z. Q., Gong, Z. Q., Zhang, H., Duan, N. Y., Shi, Y. T., ... & Li, Y. F. (2017). The effect of diaphragmatic breathing on attention, negative affect and stress in healthy adults. *Frontiers in psychology*, *8*, 234806.

Nugroho, R. K., & Suyanto, S. (2023). Meta-analisis pengaruh pemberian teknik relaksasi napas dalam terhadap rasa nyeri pada pasien post operasi. *Jurnal Penelitian Perawat Profesional*, *5*(3), 1039-1048.

Oshodi, T. O. (2007). The impact of preoperative education on postoperative pain. Part 2. *British journal of nursing*, *16*(13).

Pasero, C., & McCaffery, M. (2010). *Pain Assessment and Pharmacologic Management-E-Book: Pain Assessment and Pharmacologic Management-E-Book*. Elsevier Health Sciences.

Potter, P. A., & Perry, A. G. (2005). *Fundamentals of nursing* (Vol. 3). St. Louis, MO: Mosby.

Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., ... & Vader, K. (2020). The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. *Pain*, *161*(9), 1976-1982.

Rejeh, N., Heravi-Karimooi, M., Vaismoradi, M., & Jasper, M. (2013). Effect of systematic relaxation techniques on anxiety and pain in older patients undergoing abdominal surgery. *International journal of nursing practice*, *19*(5), 462-470.

Schaffer, S. D., & Yucha, C. B. (2004). Relaxation & pain management: the relaxation response can play a role in managing chronic and acute pain. *AJN The American Journal of Nursing*, *104*(8), 75-82.

Wells, R. E., Collier, J., Posey, G., Morgan, A., Auman, T., Strittmatter, B., ... & Zeidan, F. (2020). Attention to breath sensations does not engage endogenous opioids to reduce pain. *Pain*, *161*(8), 1884-1893.

Zaccaro, A., Piarulli, A., Laurino, M., Garbella, E., Menicucci, D., Neri, B., & Gemignani, A. (2018). How breath-control can change your life: a systematic review on psycho-physiological correlates of slow breathing. *Frontiers in human neuroscience*, *12*, 409421.

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