

Classical Music Therapy and Peppermint Aromatherapy to Reduce Pain Scores in Post-Craniotomy Patients

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ABSTRACT

Pain is a common problem experienced by post-craniotomy patients and may affect comfort, physiological stability, and recovery during intensive care unit (ICU) treatment. Pain management can be provided through pharmacological and non-pharmacological approaches. Classical music therapy and peppermint aromatherapy are non-pharmacological interventions that may promote relaxation and distraction from pain perception. Objective: This case study aimed to describe changes in pain scores among post-craniotomy patients after receiving classical music therapy and peppermint aromatherapy. Methods: This study used a descriptive case study design involving two post-craniotomy patients treated in the Cempaka ICU of Dr. Moewardi General Hospital, Surakarta. The intervention consisted of classical music therapy combined with peppermint aromatherapy inhalation for 15 minutes, twice daily, for three consecutive days. Pain was assessed before and after the intervention using the Critical-Care Pain Observation Tool (CPOT). Results: The CPOT score of Mr. P decreased from 5 on the first day to 0 on the third day, while the CPOT score of Mrs. R decreased from 6 on the first day to 3 on the third day. Conclusion: Classical music therapy and peppermint aromatherapy may help reduce pain scores in post-craniotomy patients as adjunctive non-pharmacological interventions in ICU nursing care.

Keywords: Classical Music Therapy; Pain; Peppermint Aromatherapy; Post-Craniotomy



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INTRODUCTION

According to the World Health Organization (WHO), road traffic injuries remain a major global public health problem, causing approximately 1.19 million deaths annually and leaving an estimated 20–50 million people with non-fatal injuries, many of whom sustain traumatic brain injuries that result in long-term disability. Road traffic injuries are also the leading cause of death among individuals aged 5–29 years worldwide, highlighting the substantial global burden of head injuries and the need for effective prevention and management strategies (1).

In Indonesia, head injury also represents a significant public health concern. Data from the Indonesian Ministry of Health indicate that the prevalence of injuries reached 9.2%, with

head trauma being one of the most frequently reported injuries requiring hospital treatment. Head injury is also the second most common clinical condition requiring hospitalization, with a Case Fatality Rate (CFR) of 4.37%, and it occurs more frequently in males, accounting for more than 60% of cases. In Central Java Province, the prevalence of head injuries in 2023 was recorded at 7.7%, predominantly affecting adult males (2).

Some cases of head injury with certain levels of severity require surgical intervention, such as craniotomy. However, this procedure often results in postoperative pain that can interfere with patient comfort and the recovery process. Studies have shown that post-craniotomy pain is generally moderate to severe, with approximately 80% of patients experiencing significant pain immediately after surgery and 25%–50% potentially developing chronic headaches several months following the procedure (3).

Craniotomy is a surgical procedure involving the removal of a portion of the skull to gain access to the cranial cavity. This procedure is used in the management of various serious conditions, including brain tumors, head injuries, and cerebrovascular circulation disorders, and should only be performed by competent healthcare professionals in accordance with established standards (4). Patients undergoing craniotomy commonly experience high-intensity pain that may persist for an extended period. Therefore, comprehensive pain management is required, including both pharmacological and non-pharmacological approaches. One non-pharmacological intervention that has been increasingly utilized is classical music therapy, which has been shown to promote relaxation and reduce pain perception. In addition, aromatherapy may serve as an alternative method for pain management. This approach utilizes essential oils extracted from plants, such as peppermint, lavender, and chamomile, which can stimulate calming physiological responses. Specifically, peppermint essential oil has analgesic and muscle-relaxant properties, making it a potentially effective intervention for reducing postoperative pain (5).

A study conducted by Selviano and Suparti implemented an intervention combining classical music therapy with peppermint aromatherapy administered through inhalation for 5–10 minutes while listening to Chopin's compositions (4). The findings demonstrated a significant reduction in mean pain intensity, decreasing from 6.14 before the intervention to 2.42 after therapy. Furthermore, a study by Nurhidayat et al. applied a combination of autogenic relaxation and peppermint aromatherapy inhalation in patients experiencing headaches. The intervention was administered twice daily for three consecutive days. The results indicated a reduction in pain scores among both subjects following the intervention (6).

Although previous studies have demonstrated the effectiveness of classical music therapy combined with peppermint aromatherapy in reducing pain intensity, evidence regarding its application among post-craniotomy patients in intensive care settings remains limited. Most existing studies have focused on general postoperative patients or individuals with headache disorders, while research specifically involving critically ill post-craniotomy patients in the ICU is still scarce. The novelty of this case study lies in the implementation of a combined intervention consisting of classical music relaxation therapy and peppermint aromatherapy in post-craniotomy patients treated in an intensive care unit, with pain intensity evaluated repeatedly using the Critical Pain Observation Tool (CPOT) over three consecutive days. This study provides practical evidence regarding the feasibility of integrating complementary non-pharmacological interventions into nursing care for postoperative neurosurgical patients in critical care settings.

Based on a preliminary study conducted in the Cempaka Intensive Care Unit (ICU) at Dr. Moewardi Regional General Hospital, Surakarta, from February 9–11, 2026, it was found that some post-craniotomy patients continued to experience headaches during hospitalization. Interviews with nurses revealed that non-pharmacological interventions such as classical music therapy and peppermint aromatherapy had not yet been routinely implemented as complementary therapies for pain management. Therefore, this case study was conducted to describe changes in pain scores among post-craniotomy patients before and after receiving classical music therapy combined with peppermint aromatherapy.

The objective of this study was to determine the outcomes of implementing classical music therapy and peppermint aromatherapy in reducing pain intensity among patients following craniotomy surgery. The findings are expected to provide an alternative non-pharmacological intervention for pain management, enhance the quality of nursing care, and serve as a reference for future research.

METHODS

The method used in this scientific paper was a descriptive approach with a case study design and nursing process framework. This approach aimed to describe changes in pain intensity among post-craniotomy patients in the Intensive Care Unit (ICU) before and after the implementation of classical music relaxation therapy and peppermint aromatherapy. The subjects of this case study consisted of two patients admitted to the Cempaka ICU at Dr. Moewardi Regional General Hospital, Surakarta, Central Java, who met the following inclusion and exclusion criteria:

a. Inclusion Criteria

- 1) Patients who had undergone craniotomy surgery
- 2) Conscious patients
- 3) Patients who had been extubated
- 4) Aged between 18 and 56 years
- 5) Experiencing postoperative pain
- 6) Having adequate hearing and olfactory function
- 7) Willing to participate in the study by providing verbal and written informed consent

b. Exclusion Criteria

- 1) Patients with a history of allergy or adverse reactions to certain types of music
- 2) Hearing impairment
- 3) Olfactory perception disorders
- 4) Significant psychiatric disorders
- 5) Life-threatening medical conditions
- 6) Patients who were still receiving morphine analgesics

The intervention was administered for three consecutive days, with each session lasting 10–15 minutes and conducted twice daily. Patients' pain levels were assessed using the Critical Pain Observation Tool (CPOT) before and after each intervention. CPOT scores were classified into four categories: very severe pain (scores 7–8), severe pain (scores 5–6), moderate pain (scores 3–4), and mild pain (scores 0–2). The intervention consisted of classical music therapy and aromatherapy. The classical music used in this study comprised compositions by Frédéric Chopin, played through a smartphone device. In addition, aromatherapy was administered using peppermint essential oil extracted from plant sources and delivered through a portable diffuser.

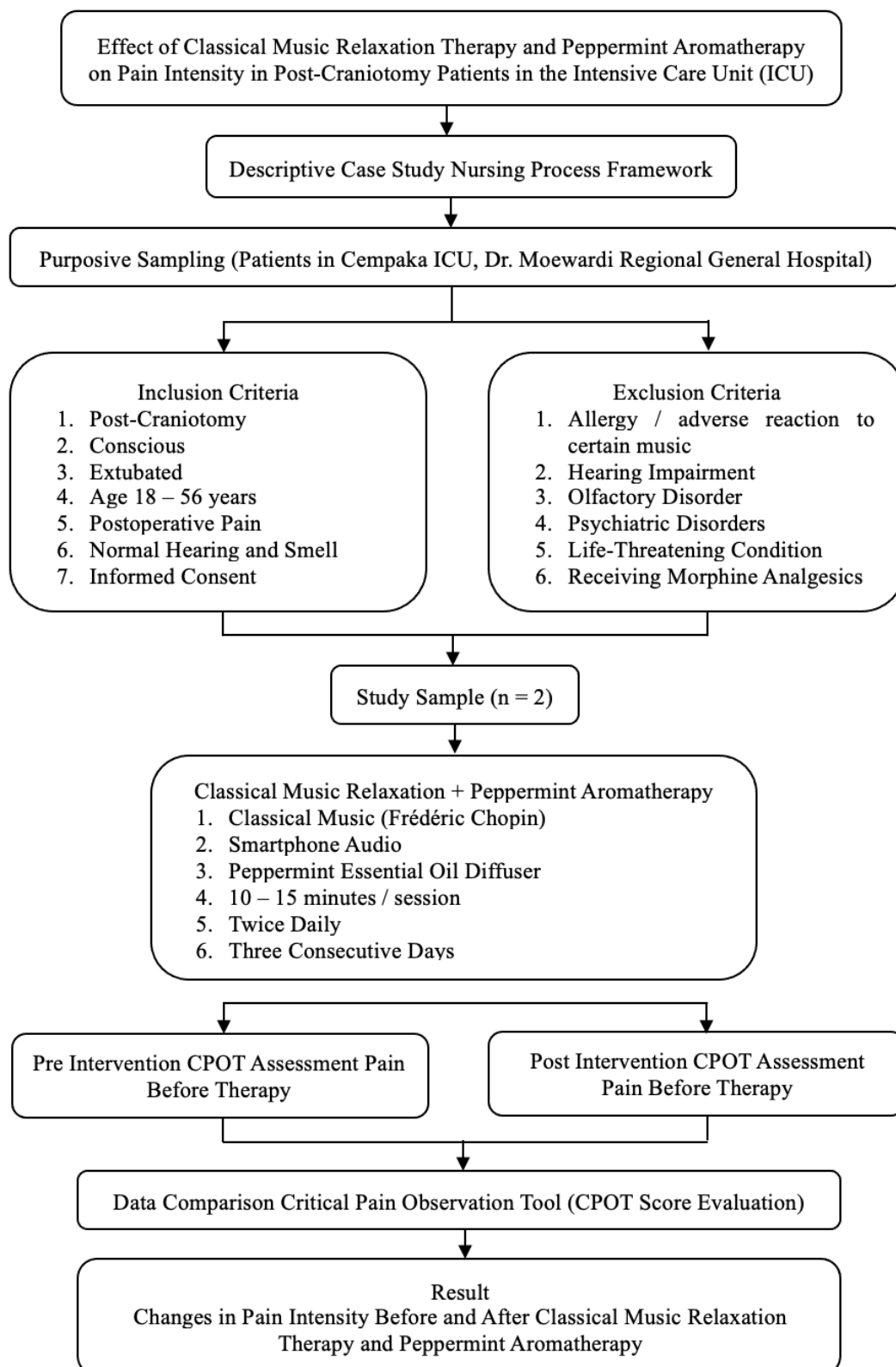


Figure 1. Research Stages Flowchart

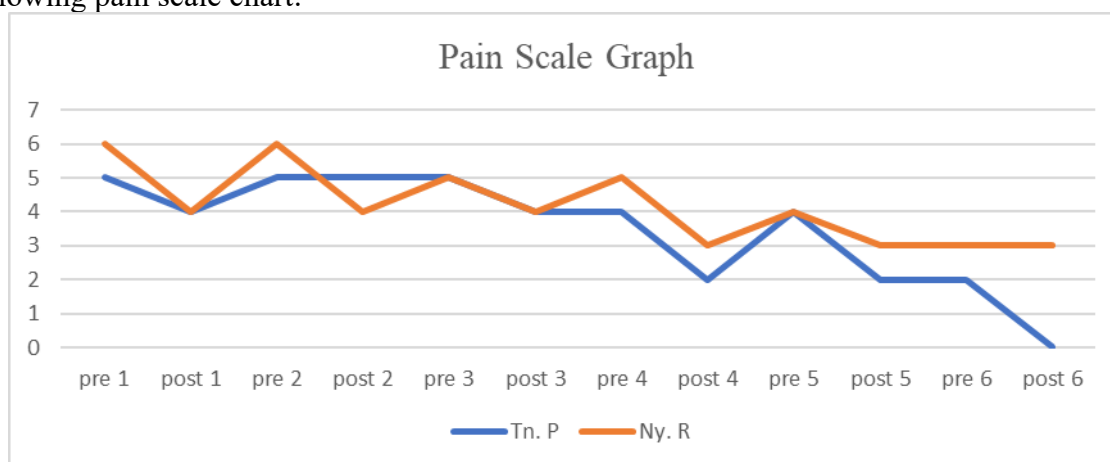
RESULTS

Table 1. Table Results of Pain Scale Changes Before and After the Intervention

Measurement Time	Mr. P		Mrs. R	
	Pre	Post	Pre	Post
Day 1				
Morning	5	4	6	4
Afternoon	5	5	6	4
Day 2				
Morning	5	4	5	4
Afternoon	4	2	5	3
Day 3				
Morning	4	2	4	3
Afternoon	0	0	3	3

The results of pain assessment using the Critical Pain Observation Tool (CPOT) in both respondents demonstrated a tendency toward decreasing pain scores from the first to the third day following the administration of classical music therapy and peppermint aromatherapy, although fluctuations were observed at certain measurement times. In Mr. P, a reduction in pain score was evident from the first day, with a decrease of 1 point during the morning assessment; however, no change was observed during the afternoon assessment. On the second and third days, the reduction became more consistent, particularly during the afternoon assessments, where the pain score decreased by up to 2 points. By the afternoon of the third day, the pain score had reached 0, indicating the absence of pain.

Similarly, in Mrs. R, the reduction in pain scores appeared more stable from the first day, with a decrease of 2 points observed during both morning and afternoon assessments. The decline continued through the second and third days, although no further reduction was noted during the afternoon assessment on the third day, resulting in a relatively stable pain score. Overall, classical music therapy and peppermint aromatherapy contributed to a gradual reduction in pain scores in both respondents, despite variations in individual responses at specific measurement times. A clearer illustration of the pain levels can be observed in the following pain scale chart:



Picture 1. Pain Scale Graph

DISCUSSION

Before the implementation of the non-pharmacological intervention, both respondents demonstrated relatively high levels of pain. The pain experienced by both patients was generally associated with their clinical conditions and the medical procedures performed during hospitalization. Subjectively, both respondents reported discomfort, throbbing sensations, and intermittent pain, which affected their ability to perform activities and obtain adequate rest. Objectively, physiological pain responses were observed, including facial grimacing, localization of pain, increased muscle tension, and changes in blood pressure and heart rate.

These findings are consistent with the statement of Srijaya and Maliya, who reported that postoperative pain is the most common complication experienced by patients following both major and minor surgical procedures and remains a major concern in inpatient care (7). The prevalence of postoperative pain is particularly high during the first 24–48 hours after surgery, with most patients experiencing mild to severe pain. Although pain intensity generally decreases over time, postoperative pain continues to represent a significant health problem that has not been completely resolved. Ningtyas et al. further explained that surgical procedures constitute a form of physical trauma for patients. Both anesthesia and surgical interventions may cause physiological disturbances that result in various symptoms, with pain being the most frequently reported complaint (8). Srijaya and Maliya also emphasized that postoperative pain not only causes discomfort but also affects the healing process, quality of life, and patient satisfaction with healthcare services. Uncontrolled pain may trigger physiological stress responses, such as increased blood pressure and heart rate, as well as disturbances in various body systems. Furthermore, inadequately managed pain may increase the risk of developing chronic pain after recovery (7).

Following the administration of non-pharmacological interventions in the form of classical music therapy and peppermint aromatherapy, a reduction in pain intensity was observed in both respondents. Mr. P demonstrated a decrease in pain levels from the severe pain category on the first day to the absence of pain by the third day, whereas Mrs. R experienced a reduction from severe pain on the first day to moderate pain on the third day. This reduction was reflected in diminished subjective complaints, with patients reporting less dominant pain sensations and increased comfort. Objective improvements were also observed through CPOT assessments, including more relaxed facial expressions, reduced signs of restlessness and pain localization, softer speech patterns, and decreased muscle tension.

These findings indicate that the non-pharmacological interventions helped patients divert their perception of pain and reduce physiological stress responses. The therapies promoted relaxation, decreased sympathetic nervous system activity, and enhanced the release of endorphins, which function as the body's natural analgesics. These findings are supported by Esadella and Maryati, who reported that music therapy effectively reduced severe pain to mild pain levels (9). Similarly, Srijaya and Maliya found that peppermint aromatherapy contains menthol, which acts as a calcium channel antagonist capable of relieving smooth muscle spasms and reducing pain sensations (7). Selviano and Suparti further emphasized that combining classical music therapy with peppermint aromatherapy produces greater effects than using either intervention alone because of their complementary relaxation mechanisms (4).

A systematic review and meta-analysis conducted by Li et al. demonstrated that perioperative music therapy is effective in reducing pain and anxiety among postoperative

patients. Music induces relaxation by stimulating the autonomic nervous system and reducing physiological stress responses associated with pain. In addition, music serves as a cognitive distraction that shifts patients' attention away from painful sensations, thereby lowering pain perception. These findings support the results of the present study, which showed a reduction in pain levels following the administration of classical music therapy in both respondents (10).

The progression of pain levels in both respondents revealed meaningful changes before and after the intervention. Initially, both patients experienced pain that interfered with their comfort; however, gradual reductions in pain intensity were observed following repeated therapy sessions. These improvements were reflected in lower pain scores, enhanced ability to rest, and reports of feeling calmer and more comfortable, suggesting that the non-pharmacological interventions had positive effects on pain management. These findings have important implications for nursing practice, particularly in intensive care settings. The observed reduction in pain intensity suggests that classical music therapy combined with peppermint aromatherapy can be integrated as a complementary nursing intervention alongside pharmacological pain management. Because the intervention is simple, non-invasive, inexpensive, and easy to administer, ICU nurses may incorporate it into routine postoperative nursing care to enhance patient comfort, reduce anxiety, and support holistic recovery without increasing the risk of medication-related adverse effects.

Several factors may influence postoperative pain, one of which is sex. A study conducted by Keogh and Herdenfelt in 2002 reported that women tend to focus more attention on pain, resulting in greater pain perception (8). Other studies have suggested that women generally report higher pain intensity than men because of a combination of biological, psychological, and sociocultural factors. Biologically, hormones such as estrogen and progesterone may lower pain thresholds and influence pain receptor sensitivity, whereas testosterone in men may exert a protective effect against pain perception. Furthermore, the endogenous opioid system in women is often less effective in suppressing pain responses than in men. Psychologically, women tend to be more aware of bodily sensations and express pain more openly, whereas men often suppress pain expression due to gender role expectations. These factors contribute to women experiencing pain more rapidly, intensely, and subjectively than men (11). Recent evidence has further demonstrated that sex-related differences in postoperative pain are influenced not only by hormonal mechanisms but also by immune responses, central pain modulation, and psychosocial factors, which collectively increase the risk of greater pain intensity and chronic postsurgical pain among women. These findings suggest that sex should be considered an important factor in individualized postoperative pain assessment and management (12).

Ningtyas et al. further stated that patients who focus their attention on pain may experience increased pain perception. Greater attention is associated with higher pain intensity, whereas distraction is associated with reduced pain responses (8). This finding is consistent with the study by Meşe and Sarıtaş, which demonstrated that peppermint oil inhalation effectively reduced pain and anxiety levels among patients following lumbar discectomy. Peppermint aromatherapy works by stimulating the limbic system, which regulates emotions and pain perception, thereby promoting relaxation and improving patient comfort during recovery. In addition, music therapy can divert patients' attention away from painful sensations, resulting in lower pain perception and anxiety levels (13).

Nascimento et al. reported that inhalation aromatherapy is an effective complementary intervention for reducing acute pain, including postoperative pain. The analgesic effect is achieved through the inhalation of volatile essential oil compounds, which stimulate olfactory receptors and transmit neural signals to the limbic system, an area of the brain involved in regulating emotions, stress responses, and pain perception. This neurophysiological pathway promotes relaxation, decreases emotional distress, and enhances pain tolerance, thereby contributing to improved postoperative recovery. In addition, aromatherapy is considered a safe, non-invasive, and low-cost intervention that can be easily integrated into routine nursing care as an adjunct to pharmacological pain management (14).

Furthermore, pain reduction in post-craniotomy patients may also be influenced by sensory distraction mechanisms generated by the combination of classical music and peppermint aromatherapy. Classical music with a slow tempo promotes relaxation through activation of the parasympathetic nervous system, helping stabilize heart rate, blood pressure, and muscle tension. This relaxed state reduces patients' focus on pain sensations experienced during postoperative recovery. Peppermint aromatherapy also provides refreshing and calming effects through its menthol content, which acts on the limbic system and enhances patient comfort during hospitalization (15) (16).

The findings of this study are also supported by the Gate Control Theory, which explains that relaxing stimuli such as music can inhibit the transmission of pain impulses to the brain. When patients listen to soothing music, their attention is diverted, resulting in reduced pain perception. Consequently, patients become more relaxed, experience less anxiety, and achieve better rest quality. Reduced anxiety indirectly contributes to lower pain intensity among postoperative patients (17). These findings are consistent with the scoping review conducted by Rahman et al., which concluded that music therapy reduces postoperative pain by stimulating endorphin release, decreasing stress hormone levels, and activating the pain modulation mechanism described in the Gate Control Theory. Through these neurophysiological responses, music therapy inhibits nociceptive signal transmission, promotes relaxation, and enhances patient comfort during the postoperative recovery period. From a scientific perspective, these findings strengthen the evidence supporting the application of complementary and integrative nursing interventions in postoperative pain management. The results also reinforce the relevance of Gate Control Theory in explaining the mechanisms through which non-pharmacological interventions influence pain perception. Consequently, this study contributes to the growing body of evidence-based nursing literature advocating the integration of music therapy and aromatherapy into clinical nursing protocols (18).

Dong et al. reported that music therapy among patients undergoing cardiac surgery reduced pain and anxiety while improving physiological parameters such as heart rate and blood pressure. Music provides a calming effect that helps patients relax during recovery. The reduction in anxiety indirectly contributes to lower pain perception because psychological conditions are closely associated with the intensity of pain experienced by patients (19).

Similarly, Chen et al. demonstrated that music listening is a safe and effective intervention for critically ill patients, significantly reducing anxiety and improving physiological outcomes in the ICU (20). In addition, Li et al. reported that perioperative music therapy effectively decreases postoperative pain and anxiety by promoting relaxation and modulating emotional responses to painful stimuli. Together, these findings support the

present study, in which both respondents appeared more relaxed and experienced reduced pain following the intervention (10).

Nurhayati and Febriyanti demonstrated that the combination of music therapy and peppermint aromatherapy significantly reduced pain intensity while promoting relaxation and comfort among patients. The complementary effects of these interventions help patients manage pain more effectively by creating a calming environment and reducing emotional distress. These findings support the present study, in which the combination of classical music therapy and peppermint aromatherapy contributed to decreased pain intensity and improved patient comfort following craniotomy surgery (21).

Recent Indonesian evidence supports the use of peppermint aromatherapy as a complementary intervention for pain management. A scoping review by Hidayat et al. found that inhaled peppermint aromatherapy consistently reduced post-cesarean pain intensity when combined with routine postoperative care or relaxation techniques. Peppermint essential oil contains menthol, which produces a cooling sensation and promotes relaxation, thereby helping patients tolerate postoperative pain more effectively. The review also emphasized that peppermint aromatherapy is inexpensive, non-invasive, and easily integrated into nursing interventions without interfering with pharmacological analgesics (22).

Additional evidence from Indonesia demonstrated that peppermint aromatherapy may provide meaningful analgesic benefits when incorporated into multimodal non-pharmacological interventions. Wahyuningrum et al. reported that peppermint aromatherapy combined with acupressure significantly reduced pain intensity during the active phase of labor. The authors suggested that peppermint inhalation promotes relaxation and decreases pain perception, while the complementary use of acupressure further enhances pain modulation through different physiological mechanisms. These findings indicate that peppermint aromatherapy can contribute to pain reduction when integrated with other complementary nursing interventions (23).

Recent evidence also supports the use of inhalation aromatherapy containing peppermint as part of perioperative pain management. Chelly et al. investigated the effects of a peppermint aromatherapy blend in patients undergoing total hip arthroplasty and found that aromatherapy contributed to improved postoperative comfort and reduced pain perception, particularly among patients with high preoperative anxiety. The authors suggested that inhaled essential oils help modulate psychological responses associated with pain, thereby complementing standard analgesic therapy and enhancing postoperative recovery. These findings indicate that peppermint-containing aromatherapy may serve as a beneficial adjunctive intervention for postoperative pain management (24).

Additional evidence from a randomized clinical trial conducted by Parvizi et al. demonstrated that peppermint essential oil is a safe complementary intervention during the postoperative period. Although the reduction in postoperative pain did not reach statistical significance, patients receiving peppermint essential oil experienced better postoperative comfort and a significantly lower incidence of nausea compared with the control group. The authors suggested that peppermint aromatherapy may provide supportive benefits by promoting relaxation and improving the overall recovery experience, particularly when combined with other non-pharmacological interventions. These findings further support the feasibility of incorporating peppermint aromatherapy into comprehensive postoperative nursing care as an adjunct to standard pain management (25).

The results of this study also have practical implications for healthcare institutions and patients. Hospitals may consider incorporating classical music therapy and peppermint aromatherapy into standard postoperative nursing care protocols, particularly in intensive care units, to complement pharmacological pain management strategies. Wider implementation of these interventions may improve patient satisfaction, promote faster recovery, and optimize nursing services while minimizing dependence on analgesic medications. For patients and their families, this approach offers a safe and accessible complementary strategy that may enhance comfort during the postoperative recovery process.

The combination of classical music therapy and peppermint aromatherapy may serve as an effective complementary nursing intervention for postoperative pain management. This non-pharmacological approach is relatively safe, simple, non-invasive, and cost-effective, making it feasible for implementation in intensive care settings. In addition to helping reduce pain perception, the intervention may promote relaxation, enhance patient comfort, and support holistic nursing care by addressing both physical and psychological aspects of recovery. Therefore, classical music therapy combined with peppermint aromatherapy can be considered a valuable adjunct to comprehensive pain management for post-craniotomy patients.

CONCLUSION

Based on the implementation of classical music therapy and peppermint aromatherapy in two post-craniotomy patients treated in the Cempaka Intensive Care Unit (ICU) at Dr. Moewardi Regional General Hospital, Surakarta, a reduction in CPOT scores was observed after the intervention was administered for three consecutive days. Mr. P's CPOT score decreased from 5 to 0, while Mrs. R's CPOT score decreased from 6 to 3. These findings indicate that classical music therapy combined with peppermint aromatherapy has the potential to reduce pain responses in post-craniotomy patients as a complementary non-pharmacological intervention within nursing care. However, these results cannot be generalized due to the limited number of participants and the descriptive case study design employed in this study.

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