



THE EFFECTIVENESS OF BINAURAL BEATS MUSIC THERAPY IN REDUCING ANXIETY LEVELS IN PRE UROLOGICAL SURGERY PATIENTS

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ABSTRACT

Preoperative anxiety is a psychological response often experienced by patients before undergoing surgical intervention and can lead to increased physiological responses such as heart rate, blood pressure, and stress hormones. This condition can disrupt patient stability and slow recovery. Therefore, an effective, safe intervention that minimizes side effects is needed to reduce this anxiety. One non-pharmacological intervention is binaural beats music therapy, which stimulates alpha and theta brain waves to increase relaxation and reduce sympathetic nervous system activity. This study aims to determine the effectiveness of binaural beats music therapy in reducing anxiety levels in preoperative urology patients at Ir. Soekarno Sukoharjo Regional General Hospital. The method used was an intervention in preoperative patients who received binaural beats music therapy for 30 minutes via a headset. Then, anxiety was measured using the Amsterdam Preoperative Anxiety and Information Scale (APAIS) before and after the intervention, with its validity and reliability confirmed through preliminary testing. The sample consisted of five patients selected through purposive sampling who met the following inclusion criteria: experiencing moderate to severe anxiety, being conscious and cooperative, having no hearing impairment, and being willing to participate in the intervention. The results showed that all patients experienced a decrease in anxiety scores after therapy. Three patients experienced a decrease in anxiety levels from moderate (14-18) to mild (9-12), while two patients experienced a decrease in anxiety levels from severe (23-21) to moderate (15-16). These findings suggest that binaural beats therapy is effective in helping reduce anxiety in preoperative patients, particularly those undergoing urological surgery.

Keywords: anxiety; APAIS; binaural beats; music therapy; preoperative

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INTRODUCTION

Surgery is an invasive procedure that involves opening the body part to be treated (Kasanova et al., 2021). This process can be traumatic and carries a high risk of complications, making preoperative, intraoperative, and postoperative preparation crucial for patient safety. The preoperative phase is a stressful time that can cause anxiety. Anxiety is a common emotional response experienced by patients before undergoing surgery. This condition arises in response to the uncertainty of the procedure, fear of anesthesia, possible postoperative pain, and concerns about the outcome of the surgery. Anxiety is a common psychological problem experienced by patients undergoing surgery, including urology patients. A recent meta-analysis conducted by Shebl et al. (2025) showed that approximately 60–80% of patients undergoing surgery experience preoperative anxiety, with levels varying from mild to severe.

Besides occurring globally, preoperative anxiety is also common among patients in Indonesia. Based on research conducted by Barus et al. (2024) at Santa Elizabeth Hospital Medan, of 49 preoperative patients, it was found that 49% of patients experienced moderate anxiety, 41% of patients experienced high anxiety, and 10% experienced mild anxiety. Another study conducted by Hudia et al. (2023) showed that 55% of preoperative patients experienced severe anxiety, and 44% of patients experienced mild anxiety. The continued high rate of preoperative anxiety is certainly

one of the problems frequently encountered in healthcare services, including in patients undergoing urological surgery and requiring special attention from healthcare professionals, especially nurses.

Physiologically, anxiety can trigger increased activity of the sympathetic nervous system, which can affect hemodynamic changes, such as increased blood pressure, pulse rate, and respiratory rate (Deynilisa et al., 2023). Furthermore, anxiety can also cause sleep disturbances, difficulty concentrating, and decreased mental readiness for medical procedures, potentially increasing post-operative complications (Korkmaz et al., 2024). If anxiety is not managed properly, this condition will not only affect the psychological aspects but can also impact the stability of the patient's physiological condition (Fisabili et al., 2025). Furthermore, this condition can also impact the recovery process during the perioperative period, including in urology patients undergoing invasive procedures such as prostate relaxation, lithotripsy, or other urinary tract surgical procedures.

In nursing practice, anxiety management is an essential part of holistic care. Nurses play a crucial role in helping patients manage anxiety through various appropriate interventions, such as health education, emotional support, relaxation techniques, and complementary therapies. With the development of patient-centered healthcare approaches, non-pharmacological interventions are also increasingly being developed as safe, easy-to-implement, and side-effect-free support methods. One currently developing intervention is music therapy, specifically binaural beats. Binaural beats are a form of auditory stimulation delivered to each ear at different frequencies, causing the brain to process them as a single new frequency (Ingendoh et al., 2023). This mechanism, known as brain entrainment, is the process of synchronizing brain waves with specific sound stimuli that can affect a person's psychological state. This stimulation has been reported to increase relaxation, improve sleep quality, enhance focus, and help reduce anxiety.

Several studies have demonstrated the effectiveness of binaural beats in improving an individual's psychological well-being. Research by Lee et al. (2024) showed that exposure to binaural beats was associated with improved sleep quality and greater relaxation. Furthermore, research by Yang et al. (2025) found that binaural beat therapy can help regulate the autonomic nervous system, which plays a key role in controlling stress and anxiety responses. Other studies have also shown that the use of binaural beats can significantly reduce anxiety in various populations and help reduce stress levels in nursing students (Wahyuni et al., 2020). Although several studies have shown that binaural beats have the potential to reduce anxiety levels and increase relaxation, research on the application of this therapy in pre-operative patients, particularly urological surgery patients, is still limited. Therefore, this study was conducted to determine the effectiveness of binaural beat music therapy on anxiety levels in pre-operative urological patients.

METHOD

This research is an Applied Scientific Work that uses a case study approach and involves direct patient intervention. Implementation activities were carried out at Ir. Soekarno Sukoharjo Regional General Hospital on September 22–27, 2025. The subjects in this study were five patients who would undergo urological surgery in the pre-operative phase and experienced anxiety. Subjects were selected using purposive sampling based on patients who met the following criteria: moderate to severe anxiety, consciousness, cooperation, no hearing impairment, and willingness to participate in the intervention. The instrument used in this study was the Indonesian version of the Amsterdam Preoperative Anxiety and Information Scale (APAIS), which was found to be valid and reliable by Perdana et al. (2020). The reliability test showed Cronbach's alphas of 0.825 for the anxiety subscale and 0.863 for the information needs subscale, indicating that the instrument is suitable for measuring preoperative anxiety. The intervention consisted of binaural beats music therapy with theta frequencies, played to both ears once for 30 minutes using a headset, before surgery. Data collection involved measuring anxiety scores using the APAIS scale before the intervention. Next, patients were given binaural beat music therapy for 30 minutes. After the intervention was completed, patients were given a 5-minute break to rest, then anxiety scores were remeasured after

the intervention. In addition, researchers observed patient responses subjectively and objectively immediately after the intervention, including facial expressions, tension levels, ability to rest, and patient statements about feelings of anxiety. The data were then analyzed descriptively by comparing anxiety scores before and after the intervention.

RESULT

The respondents in this study comprised 5 patients undergoing urological surgery: Mr. A (45 years old), Mr. L (52 years old), Mr. S (60 years old), Mr. E (55 years old), and Mr. T (39 years old). Based on age distribution, most respondents (80%) were in the adult age range, and 1 respondent (20%) had entered old age. By gender, all respondents were male (5 respondents, 100%). The level of education of respondents showed that 2 respondents (40%) had a high school education, namely Mr. A and Mr. E, 1 respondent (20%) had a diploma education, namely Mr. S, 1 respondent (20%) had an elementary school education, and 1 respondent (20%) had a junior high school education, namely Mr. T. Viewed from occupation, there were 2 respondents (40%) who worked as self-employed, namely Mr. A and Mr. E, 2 respondents (40%) as private workers, Mr. L and Mr. T, and 1 respondent (20%) works as a laborer, namely Mr. S. Based on marital status, all respondents (100%) are married. Based on the medical diagnosis, the respondents consisted of 3 patients (60%) with Benign Prostatic Hyperplasia (BPH), namely Mr. L, Mr. S, and Mr. E, as well as 2 patients (40%) with urinary tract stones, namely Mr. A and Mr. T. The surgical procedures performed included 3 patients (60%) undergoing Transurethral Resection of the Prostate (TURP) and 2 patients (40%) undergoing lithotripsy or stone removal surgery.

Table 1.

Respondent characteristics (n= 5)

No	Patient Initials	Age	Gender	Education	Employment	Marital Status	Medical Diagnosis	Surgical Procedure
1	Mr. A	45 y/o	Male	Senior High School	Self employed	Married	Urolithiasis	Lithotripsy
2	Mr. L	52 y/o	Male	Diploma	Privat employed	Married	BPH	TURP
3	Mr. S	60 y/o	Male	Elementary school	Laborer	Married	BPH	TURP
4	Mr. E	55 y/o	Male	Senior High School	Self employed	Married	BPH	TURP
5	Mr. T	39 y/o	Male	Junior High School	Privat employed	Married	Urolithiasis	Lithotripsy

Table 2.

Preoperative anxiety scores pre and post intervention

No	Patient Initials	APAIS Score Pre	Category	APAIS Score Post	Category	Change
1	Mr. A	16	Moderate	10	Mild	Down 6 point
2	Mr. L	18	Moderate	12	Mild	Down 6 point
3	Mr. S	21	Severe	15	Moderate	Down 6 point
4	Mr. E	23	Severe	16	Moderate	Down 7 point
5	Mr. T	14	Moderate	9	Mild	Down 5 point

The study results showed that all pre-urology surgery patients who received binaural beats music therapy showed a decrease in anxiety levels, as measured using the APAIS scale. Before the intervention, three patients were in the moderate anxiety category with scores of 14–18, while the other two patients were in the severe anxiety category with scores of 21–23. After being given therapy, there was a decrease in anxiety scores in all patients. Two patients who were previously in the moderate anxiety category experienced a decrease to mild anxiety, namely Mr. A (16 to 10) and Mr. L (18 to 12). Another patient with moderate anxiety, namely Mr. T, also experienced a decrease to mild anxiety with a score of 14 to 9. Meanwhile, two patients who were initially in the severe anxiety category experienced a decrease to moderate anxiety, namely Mr. S from a score of 21 to 15 and Mr. E from a score of 23 to 16. The largest decrease in score occurred in Mr. E, with a difference of 7 points, while the other patients experienced decreases of 5–6 points. Based on post-intervention interviews, most patients reported feeling calmer, more comfortable, and better

prepared for surgery after listening to binaural beat music therapy. Objectively, patients appeared more relaxed, less anxious, and more cooperative, and some were able to rest better. These results indicate that binaural beats music therapy has a positive impact on reducing preoperative anxiety levels in patients, both subjectively through patient statements and objectively through changes in APAIS scores.

DISCUSSION

Based on the research results, the majority of respondents were adults (80%). This is consistent with the characteristics of urology patients, who are generally over 40 years of age. Age influences preoperative anxiety levels, with younger patients tending to have higher anxiety levels, although older adults remain at risk due to physical conditions and comorbidities (Demirci, 2024). All respondents were male, in line with the predominance of urology cases. Research shows that male patients can still experience anxiety, especially regarding upcoming invasive procedures (Ölçücü et al., 2021). The respondents' varying educational levels, with a predominance of secondary education, also influenced patients' understanding of surgical procedures. Higher education is associated with lower anxiety levels and better acceptance of interventions (Madhumitha et al., 2025). The results of applying binaural beats music therapy to five pre-urology surgery patients showed a decrease in anxiety scores in all respondents. Before the intervention, most patients were in the moderate to severe anxiety category, characterized by feelings of fear, tension, difficulty resting, and frequent concerns about the surgical procedure. After therapy, all patients experienced a decrease in APAIS scores, moved to a lighter category, and reported subjective improvements, such as feeling calmer, more comfortable, and better prepared for surgery.

Preoperative anxiety is a very common condition in patients undergoing surgery. Globally, preoperative anxiety has a relatively high prevalence and is influenced by various factors such as fear of the procedure, anesthesia, pain, and uncertainty about the surgical outcome (Lami et al., 2025). This condition can lead to increased autonomic nervous system activity, characterized by tension, restlessness, and disturbed rest, as seen in the patient's responses before the intervention in this study (Yang et al., 2025). Music therapy has long been recognized as an effective non-pharmacological intervention for reducing anxiety. Research by Apriliano and Suryani (2024) demonstrated that music therapy significantly reduced patient anxiety before general anesthesia. Similar findings were reported by Widiawati and Cusmari (2023) and Lusiana et al. (2023), who stated that binaural beats music therapy can help calm patients, reduce tension, and improve mental readiness before surgery. These results align with this study's findings, in which patients appeared more relaxed, less anxious, and able to rest after the intervention.

Specifically, binaural beats operate differently from regular music because they stimulate two distinct sound frequencies in each ear, thereby influencing brainwave activity through brain entrainment (Ingendoh et al., 2023). Research by Ölçücü et al. (2021) on male patients undergoing cystoscopy and ureteral stent removal showed that listening to binaural beats significantly reduced anxiety levels and pain scores compared to the control group. This confirms that binaural beats can provide a significant relaxation effect in patients undergoing invasive medical procedures. The results of this study are also supported by a recent study showing that binaural beats therapy is effective in reducing preoperative anxiety. Research conducted by Demirci (2024) demonstrated a significant reduction in anxiety in patients undergoing endoscopic procedures after being given binaural beats therapy compared to a control group that received no intervention. Similar results were also found by Madhumitha et al. (2025) in periodontal surgery patients, indicating that this therapy is effective as a non-pharmacological intervention to reduce anxiety before invasive procedures. Furthermore, Olbrich et al. (2025) reported that simple binaural beats relaxation was effective in reducing anxiety in preoperative patients under general anesthesia.

Binaural beats music therapy can also improve concentration and reduce anxiety. This clearly indicates that binaural beats music therapy not only affects cognitive function but also the emotional

state of pre-operative patients (Venkatesan et al., 2025). Furthermore, the relaxing effect of binaural beats is also related to the regulation of the autonomic nervous system. Research by Yang et al. (2025) shows that exposure to binaural beats can help balance nervous system activity, thereby reducing the stress response. This is in line with the findings of Wahyuni et al. (2020), who reported a significant reduction in stress following a similar intervention. This condition was evident in patients in this study who reported feeling calmer and more rested after the therapy was administered.

The benefits of binaural beats have also been studied in various other clinical conditions. Daengruan et al. (2021) demonstrated that music therapy with binaural beats had a positive effect on patients with depression, while Yang et al. (2024) reported improvements in emotional well-being in older adults with depressive symptoms. Zhang et al. (2025) also highlighted the potential of this therapy as part of a complementary approach to treating psychological disorders. A systematic review by Shamsi et al. (2024) even showed that brain entrainment through binaural beats can influence pain perception and stress responses. Overall, the reduction in anxiety scores across all patients in this study indicates that binaural beats therapy positively impacts the psychological well-being of preoperative patients. The resulting relaxation effect helps patients become calmer, more cooperative, and better prepared for surgery. This reinforces the notion that binaural beats therapy can be an effective, safe, and easily implemented complementary nursing intervention to reduce anxiety in preoperative patients.

CONCLUSION

The conclusion of this study indicates that binaural beats music therapy is effective in helping reduce pre-operative anxiety levels in patients and provides a relaxing effect characterized by increased calm, comfort, and preparedness for surgery. This intervention also demonstrates that a non-pharmacological approach can be an effective, safe, and easily implemented alternative in nursing practice to support holistic care. However, this study also has several limitations, including a relatively small sample size and a case study design without a control group, both of which limit the generalizability of the results.

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