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Music listening alleviates anxiety and physiological responses in patients receiving spinal anesthesia

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ABSTRACT

Objective: The aim of this study was to explore the effects of listening to music on the anxiety levels and physiological responses of surgical patients receiving spinal anesthesia.
Methods: An experimental design was used in the study with an experimental group (n = 50) and a control group (n = 50). The experimental group received 30 min of musical intervention and routine nursing care in the Post-Anesthesia Care Unit (PACU) while the control group received only routine nursing care.
Results: The study found significant differences in both anxiety and physiological indices between the two groups. The mean score of the State-Trait Anxiety Inventory (STAI) in the study group decreased from a pre-test score of 59.0 to a post-test score of 31.20 ($t = 28.63$, $p < 0.001$). Physiological indices such as heart rate ($t = 2.61$, $p = 0.012$), respiration rate ($t = 2.29$, $p = 0.026$), systolic blood pressure ($t = 2.30$, $p = 0.026$), and diastolic blood pressure ($t = 3.02$, $p = 0.004$) decreased significantly as well. Control group was not seeing significant changes from pre-op values.
Conclusion: Listening to music while in the recovery room may decrease the level of anxiety in surgical patients receiving spinal anesthesia. The results of this study can serve as a reference for PACU nurses in utilizing music listening programs to achieve the goal of holistic care.

1. Introduction

In Taiwan, there are over 420,000 patients each year who undergo surgery using anesthesia.[1] Most of these operations utilized spinal anesthesia. Anxiety is an emotional human reaction. It is a vague uneasy feeling of discomfort or dread accompanied by an autonomic response, or a feeling of apprehension caused by anticipation of danger. It is an alert signal that warns an individual of impending danger and enables them to take measures to deal with the threat.[2,3] Surgery itself causes severe anxiety to the patient and fear of the unknown remains the major reason for anxiety.[4] The fear of surgical failure, the lack of awareness of anesthesia methodology, the possible risks of anesthesia, and the expected pain during post-operative recovery all contribute to anxiety.[5] Without proper management, these stress responses will hamper the health and post-operative recovery of patients.[6]

A review paper on the rate of pre-operative anxiety cites variations from 11% to 80% in adult patients.[7] Spinal anesthesia injects an anesthetic into the spinal fluid through a subarachnoid injection in order to induce the loss of sensation from waist to toes for anywhere between four and six hours.[8] Throughout the procedure, the patient is fully conscious and breathes on his/her own. The lack of awareness during the anesthesia procedure, the potential risk, and the expectation of post-operative pain all contribute to the induction of anxiety and fear.

Research articles revealed that listening to music can effectively reduce both pre-operative anxiety and post-operative pain.[9,10] Music listen contained delightful beats and melodies to help individuals who wanted to achieve a peaceful state; the goal being to ease the patient's discomfort and maintain and promote body and mind health.[11]

Music consists of pitch, rhythm, and timbre or tone color. It was pointed out that different types of music had different effects on stress. Listening to classical music was more relaxing than listening to rock and roll, so it was more suitable for music therapy. However, the effects of music therapy varied based on one's personal expe-

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rience as well as cultural and religious beliefs.[12] Therefore, when nurses provided music therapy, personal preference, familiarity, and acceptability of patients were considered to avoid eliciting an unpleasant memory or emotion.[10] When individuals listened to their favorite types of music, it increased the secretion of ß-endorphin, induced pleasant emotions, and resulted in reduced pain.[13] High-pitched music elicited stress, while low-pitched, slow-paced, orchestral, harmonious music, and music beats that were similar to a human heartbeat (60–80 beat/min) left people feeling relaxed and had good therapeutic effects when listening for at least 30 min.[14] Maximum volumes at 60 dB helped to relax and relieve stress.[15] Therapeutic environments were better in quiet and relatively secluded spaces. Music equipment used were mainly wall-mounted speakers, portable stereos, or mp3 player. The use of headphones enhanced the focus of a patient on the music and avoided disturbing others nearby.[16]

A systematic review of 11 research papers concludes that patients receiving musical therapy show a significantly greater decrease in systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) compared to those not without musical therapy.[17] Studies show that music can reduce respiration frequency, heart rate, blood pressure, pain, lessen tension, relieve anxiety, decrease mental perception of horrible thoughts, and increase finger temperature.[9,10,18] Patients left with the sense that overall examination time was shorter.[19]

Musical therapy is a safe, drug-free treatment that reduces patients' anxiety and pain.[20] The general effectiveness of musical therapy has been supported by many articles, but its effects on patient anxiety after spinal anesthesia have not yet been addressed. In this study, musical therapy was found to be effective in reducing tension and guiding the thoughts of a patient recovering from spinal anesthesia, as well as providing warm feelings.

2. Methods

2.1. Research design and participants

This is an experimental research design. The sample size was estimated by the G-power 3.010 software with the following selection parameters: power = 0.8; $\alpha = 0.05$; effect size = 0.3; two-tailed test; estimated total sample size of 84. In considering intention to treat, a total of 100 samples were selected and randomly assigned to either the experimental (n = 50) or the control (n = 50) group. The inclusion criteria were patients who: (1) were receiving spinal anesthesia for the first time; (2) were over 20 years of age with no vision or hearing impairments; (3) were conscious, literate, and able to communicate in Mandarin or Taiwanese; and (4) had completed and signed the consent form after being thoroughly informed of the purpose of the study. Patients who could not fill out the inventory themselves were vocally questioned by the researcher who filled out the inventory on their behalf for consistency. The exclusion criteria were patients who: (1) received local or general anesthesia; or (2) experienced changes in condition when they underwent spinal anesthesia or surgery.

2.2. Intervention

The purpose of the study was explained and signed consent forms were obtained when patients arrived in the operating room waiting area. The researcher explained the study procedure and played 30 s of music from six categories of music: nature, piano, harp, orchestral, jazz, and synthetic. After completion of the pre-operative research questionnaires, including basic patient information and the STAI, patients were sent to an operating room for surgery.

After surgery, patients were sent to the PACU for post-operative care. For both groups, baseline levels of the physiological indices were collected from patients laying down in a supine position before any potential music intervention. Physiological indices included heart rate, respiration rate, and blood pressure. For the experimental group, in addition to normal nursing care, patients listened to soothing music of their choice for 30 min, using mp3 player and over-ear headphones to reduce outside interference, at a volume of the patient's preference (about 30 dB). Physiological indices were recorded every five minutes, while STAI was measured again after completion of music listening. For the control group, all the procedures were the same as the experimental group, except they did not receive the music intervention. Room temperature was controlled at 21–23 °C.

2.3. Ethical considerations

This study was approved by the institutional review board (No: 102-2028C) of a medical center. The researchers disclosed the purpose of the study, the research methods, and other precautions to the participants and their families prior to their participation. The participants' rights and privacy were protected throughout the study. Each participant completed a consent form, and had the right to withdraw from the study at any given time for any given reason.

3. Research tools

3.1. Demographic data

Demographic data were collected from the patients' medical records. These included gender, birth date, marital status, education, religion, and occupation, as well as diagnostics, number of operations, their surgical site, and their experience with anesthesia.

3.2. State-trait anxiety inventory (STAI)

The Chinese version of State-Trait Anxiety Inventory (STAI) was translated from the original STAI designed by Spielberger.[21,22] Each inventory contains 20 questions which are answered by rating on a scale of one to four. The total score of each inventory ranges from 20 to 80 and the anxiety level is positively correlated with the score. Scores of 20–39 indicate a low level of anxiety, 40–59 indicate mid-level anxiety, 60–79 indicate high-level anxiety, and scores of 80 indicate panic status.[22] STAI was used in the clinical evaluation and research and is highly reliable, especially in studying the effects of music intervention on reducing anxiety.[4,11,23]

3.3. Physiological indices

Physiological indices were recorded using a Philips V26C physiological signal monitor; indices measured included respiration rate, heart rate, and blood pressure. The Philips V26C contained four components: processor, monitor, keyboard, and modules. The processor was the center of this monitoring system. The signals collected from the modules were sent to the processor for analysis and then presented in the monitor. Heartbeat transmission was in the range of 30–300 per minute, accuracy was ±0.5%; respiration range was 1–200 breaths per minute, systolic blood pressure measuring range was 30–275 mmHg, diastolic blood pressure measuring range was 10–220 mmHg, and the mean pressure measuring range was between 20 and 260 mmHg with an accuracy of ±3 mmHg. Physiological indices were recorded by the researchers using a self-designed table.