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RESEARCH

The Effect of Music Listening on Anxiety Levels in Post-Subarachnoid Block Anaesthesia Patients

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ABSTRACT

Background: The patients' perioperative conditions can affect post-operative anxiety. Subarachnoid block anaesthesia can increase the incidence of post-operative anxiety. Methods to reduce post-operative anxiety are divided into pharmacological, with the administration of sedative drugs, and non-pharmacological, with holistic education, acupuncture, listening to music during surgery, and others
Objective: This study aims to observe the effect of listening to music on the anxiety level of surgical patients undergoing subarachnoid block anesthesia.
Methods: This study was a Randomized Controlled Trial (RCT), with an intervention group (n=50) listening to music after subarachnoid block during surgery and a control group (n=50) receiving standard routine anesthetic care. Anxiety assessment using the STAI score and vital signs were performed at 3 different times in both groups.
Results: There were no differences in patient characteristics between the two groups. Anxiety measurement in the reception room (X1) showed 37 patients (74%) and 31 patients (62%) with moderate anxiety in the intervention and control groups, respectively (p>0.05). There was no difference in patient anxiety levels between the two groups (p>0.05) in the operating room (X2). Post-operative anxiety measurement in the recovery room (X3) showed 43 patients (86%) with low anxiety in the intervention group, compared to 32 patients (64%) in the control group. Patients who listened to music during surgery had a lower level of post-operative anxiety compared to the control group (p=0.011). Post-operative vital sign measurements such as SBP, MAP, HR, and RR showed a significant difference and decrease in the intervention group compared to the control group
Conclusion: Listening to music can reduce post-operative anxiety in patients undergoing surgery with subarachnoid block, compared to patients receiving standard routine care

Keywords: Music, post-operative anxiety, regional anesthesia, subarachnoid block

INTRODUCTION

Patients awaiting surgical procedures often experience significant anxiety in anticipation of discomfort, uncertainty, and the health risks they are facing.[1] Anxiety is a warning signal that alerts a person to impending danger and allows them to take action to face the threat. Fear of surgical failure, lack of insight into the anesthetic method, the possibility of anesthetic risk, and anticipated pain during post-operative recovery contribute to anxiety.[2]

A review paper found that the rate of pre-operative anxiety in adult patients ranged from 11 to 80%2. Patient anxiety in the pre-operative period can increase the risk of post-operative anxiety by 2.6 times.[3] High levels of anxiety result in negative physiological manifestations, such as increased blood cortisol levels, increased blood pressure and heart rate, slower wound healing, decreased immune response, and increased risk of infection.[1] To reduce anxiety, there are several pharmacological and non-pharmacological techniques. Sedative and anxiolytic agents routinely given before surgery are part of pharmacological therapy. Drugs often used as sedative premedication include midazolam (>96% or the most common), fentanyl, and ketamine.[4] Sedative agents often have negative side effects such as drowsiness, respiratory depression, and can interact with other anesthetic agents, resulting in a longer recovery and discharge time for patients undergoing outpatient surgery.[1]

During the surgical procedure, patients undergoing subarachnoid block without sedation will be fully conscious and spontaneously breathing. The feeling of isolation in an unfamiliar environment, unusual visual and auditory stimulation such as the sound of monitor machines and surgical instruments, and the feeling of loss of control over their limbs will increase anxiety during surgery.[5]

Music has been used in various fields of medicine to meet the physiological, psychological, and spiritual needs of patients. In particular, the anxiolytic effect of music has been studied in several medical conditions, including surgical, cardiac, and oncology patients. From 26 previous studies, listening to music potentially has an advantage against pre-operative anxiety, as seen from a greater decrease in STAI score of 5.72 points (95% CI -7.27 – -4.17, p<0.00001) compared to the standard management usually applied [1]. A systematic review of 11 published manuscripts concluded that patients receiving music therapy showed a significantly greater decrease in systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate compared to patients who did not receive the intervention.[2,6]

In Indonesia, there are still few studies using non-pharmacological interventions to assess post-operative anxiety. This study aims to determine the effect of music intervention on the level of post-operative anxiety in patients undergoing elective surgery with subarachnoid block anesthesia compared to standard routine care, and its effect on the patient's physiological response.

METHODS

This study used a randomized controlled experimental design, with a comparative analysis of post-subarachnoid block patient anxiety scores in patients who listened to music and those who received routine care. This study received permission from the Ethics Committee of FK KMK UGM number No. KE/FK/1128/EC/2022 and the research permit letter from RSUP dr. Sardjito No. LB.02.01/XI.2.2/23715/2022.

Patients were screened according to inclusion and exclusion criteria. Patients who met the criteria were explained the research procedure and informed consent was obtained to participate in the study. If the patient agreed, they were asked to choose one of the 6 types of music used in the study, namely: piano, harp, jazz, synthetic, nature, and orchestra. The patient then underwent anamnesis and basic data recording. Patients were then randomly divided into 2 groups. The first group was the intervention group, where patients listened to music during surgery. The second group was the control group, which received standard routine care during surgery. The inclusion criteria for this study were: (1) Age 18-65 years, (2) ASA physical status I-II, (3) Willing to follow the

research procedure until the end, (4) Patients with GCS 15 (E4M6V5). The exclusion criteria for this study were: (1) Having a psychiatric disorder and being on medication, as recorded in the medical record. Examples of psychiatric drug classes include: typical & atypical antipsychotics, tricyclic antidepressants, SSRI/Selective Serotonin Reuptake Inhibitor, and others). (2) Having a history of drug dependence (sleeping pills, alcohol, narcotics, and psychotropics). (3) Having previously undergone subarachnoid block anesthesia. (4) Patients unwilling to listen to music during surgery (5) Having hearing impairment, as evidenced by a simple hearing test, namely the whisper test. Patients were dropped out of the study if they withdrew from participation as a research subject, converted to general anesthesia, or were admitted to the intensive care unit for post-operative care.

Patients in both groups underwent anxiety measurement with the STAI (State-Trait Anxiety Inventory) score and vital sign measurement with a calibrated device, at 3 different times. The first measurement was when the patient was in the GBST operating room reception area (X1). The second measurement was when the patient was in the operating room, 0 minutes after the subarachnoid block procedure (X2), and the last measurement was when the patient was 15 minutes in the recovery room, after the subarachnoid block procedure (X3). If the patient received sedation during surgery, the assessment was performed after a Ramsay score of ≤ 2 was obtained.

Data from the results of this study were recapitulated and analyzed using SPSS 26.0 software, and considered significant if $p < 0.05$. Characteristic data analysis was performed to determine the characteristics of each variable. Analysis was performed using the Chi-Square test for categorical data, and the unpaired T-test for numerical data. Data were presented in the form of counts and percentages. Anxiety level analysis used the Chi-Square test, and data were presented in the form of counts and percentages for each anxiety level. Secondary data in the form of SBP, DBP, MAP, HR, and RR were assessed with the unpaired T-test, and data were presented in the form of mean ± SD. Complication data were analyzed using the chi-square test, and presented in the form of counts and percentages. Bivariate analysis was performed on confounding variables, where categorical variables were tested with the Chi-Square and Fisher's exact test. Multivariate analysis was performed on variables that had a p-value result of < 0.25 in the bivariate analysis.

RESULT

A total of 122 patients met the inclusion criteria, 20 patients were excluded because they had a previous history of SAB anesthesia, and 2 patients were dropped out of the study (1 patient due to conversion to general anesthesia and 1 patient whose post-operative care was in the intensive care unit). Thus, there were 50 patients in the intervention group and 50 patients in the control group. Samples were taken sequentially from December 2022 to January 2023.

Subject Characteristics

Both groups had no significantly different age characteristics. In the intervention group, the highest number of subjects were in the 18-30 year and 51-60 year age categories (30%), and in the control group, the highest number of subjects were in the 51-60 year age category (54%). The proportion of female gender in both groups was greater than that of males, specifically 70% (35 patients) compared to 30% (15 patients) in the intervention group, and 84% (42 patients) compared to 16% (8 patients) in the control group. There were no significant differences in gender, age, education level, history of previous surgery, history of previous anesthesia, ASA physical status, and patient comorbidities.

Primary Outcome

Anxiety measurements in the reception room (X1) and 0 minutes after subarachnoid block (X2) did not show a significant difference ($p=0.198$ and $p=0.091$). At both measurement times, the majority of patients were in the moderate anxiety level, in both the intervention and control groups. At measurement time X3, the highest anxiety was in the low category in the

Table 1. Demographic data of patients in the intervention and control groups

		Group				
	Intervention (N=50)		Control (n=50)			*p*
	n	%	n	%		
Age	18-30 years	15	30.0%	8	16.0%	0.092
	31-40 years	4	8.0%	2	4.0%	
	41-50 years	14	28.0%	9	18.0%	
	51-60 years	15	30.0%	27	54.0%	
	>60 years	2	4.0%	4	8.0%	
Sex	Male	15	30.0%	8	16.0%	0.096
	Female	35	70.0%	42	84.0%	
Education level	Elementary	10	20.0%	12	24.0%	0.698
	Junior High	10	20.0%	6	12.0%	
	Senior High	23	46.0%	23	46.0%	
	Bachelor and above	7	14.0%	9	18.0%	
Type of surgery	Digestive surgery	3	6.0%	1	2.0%	0.068
	Plastic surgery	1	2.0%	2	4.0%	
	Vascular surgery	1	2.0%	1	2.0%	
	Obsgyn	19	38.0%	32	64.0%	
	Oncology	1	2.0%	2	4.0%	
	Orthopedics	12	24.0%	10	20.0%	
	Urology	13	26.0%	2	4.0%	
ASA Physical Status	I	12	24.0%	11	22.0%	0.812
	II	38	76.0%	39	78.0%	
Surgical History	Yes	9	18.0%	14	28.0%	0.235
	No	41	82.0%	36	72.0%	
Anesthesia History	Yes	9	18.0%	14	28.0%	0.235
	No	41	82.0%	36	72.0%	
Comorbid						
Hypertension	Yes	11	22.0%	11	22.0%	1.000
	No	39	78.0%	39	78.0%	
Diabetes	Yes	9	18.0%	5	10.0%	0.249
	No	41	82.0%	45	90.0%	
Asthma	Yes	1	2.0%	1	2.0%	1.000
	No	49	98.0%	49	98.0%	
Alergy	Yes	3	6.0%	2	4.0%	1.000
	No	47	94.0%	48	96.0%	
Others	Yes	22	44.0%	31	62.0%	0.071
	No	28	56.0%	19	38.0%	

* ASA: American Society of Anesthesiologists

intervention group, with 43 subjects (86.0%), a result higher than the control group's 32 patients (64.0%), and this difference was statistically significant (p=0.011).

Table 2. Results of Post-Operative Anxiety (STAI Score) in Both Groups

		Group				
	Intervention		Control		P	
	n	%	n	%		
Anxiety level in the admission room (X1)	Low	13	26.0%	19	38.0%	0,198
	Moderate	37	74.0%	31	62.0%	
	High	0	0.0%	0	0.0%	
	Panic	0	0.0%	0	0.0%	
Anxiety level post-SAB (X2)	Low	13	26.0%	21	42.0%	0,091
	Moderate	37	74.0%	29	58.0%	
	High	0	0.0%	0	0.0%	
	Panic	0	0.0%	0	0.0%	
Anxiety level in Recovery Room (X_3)	Low	43	86.0%	32	64.0%	**0,011***
	Moderate	7	14.0%	18	36.0%	
	High	0	0.0%	0	0.0%	
	Panic	0	0.0%	0	0.0%	

*) SAB : Subarachnoid Block, STAI : State-Trait Anxiety Inventory

Secondary Outcomes

Vital signs at measurement times X1 and X2 did not show a significant difference between the two groups for each parameter (SBP, DBP, MAP, HR, RR). At measurement time X1, the mean MAP was 97.3±11.7 in the intervention group and 96.0±10.4 in the control group (p>0.05). Vital sign measurements at time X3 showed a significant difference between the two groups. SBP in the intervention group was 115.5±15.8,

Table 3. Vital signs data in both groups

		X1	X2	X3	ΔX1X2	ΔX1X3	ΔX2X3
SBP	Intervention	132.5±20.1	123.8±22.4	115.5±15.8	8.7± 11.2	16.9±10.6	8.3±10.5
mean±SD	Control	130.8±16.3	119.5±18.1	123.6±13.7	11.4±13.4	7.24±10.4	-4.1±14.1
	P	0.651	0.288	**0.008***	0.277	**0.001***	**0.001***
DBP	Intervention	79.7±9.4	70.2±10.1	68.9±9.8	9.5±8.9	10.7±9.9	1.2±8.5
mean±SD	Control	78.6±9.4	69.4±13.6	71.6±9.7	9.2±11.7	7.0±9.7	-2.2±10.4
	p	0.575	0.746	0.181	0.893	0.064	0.076
MAP	Intervention	97.3±11.7	88.1±13.0	84.5±10.5	9.2±8.2	12.8±7.8	3.6±7.3
mean±SD	Control	96.0±10.4	86.1±13.6	88.9±9.9	9.9±10.0	7.1±7.8	-2.8±9.9
	p	0.571	0.460	**0,032***	0.697	**0,001***	0.001*
HR	Intervention	86.4±9.9	84.0±9.8	74.8±8.5	2.4±9.9	11.6±8,6	9.4±8.4
mean±SD	Control	90.2±7.4	84.9±9.1	80.5±9.4	5.3±8.5	9.7±9,4	4.4±7.3
	P	0.055	0,941	**0.002***	0.119	0.283	**0,002***
RR	Intervention	19.5±0.9	19.6±1.0	16.7±1.2	-0.2±1.3	2.8±1.5	2.9±1.5
mean±SD	Control	19.7±0.9	20.0±0.9	19.5±1.0	-0.3±0.8	0.2±1.2	0.5±1.2
	p	0.326	0.060	**0,001***	0.522	**0.001***	**0.001***

SD : standard deviation. SBP : Systolic Blood Pressure, DBP : Diastolic blood pressure. X1 : Measurement in the admission room, X2 : Measurement 0 minutes after SAB, X3 : Measurement 15 minutes after operation is complete, Δ represents the difference between each measurement time

Tabel 4. Bivariate Test of Factors Affecting Patient Anxiety Post-Subarachnoid Block

		Post operative anxiety (X3)				
	Low		Moderate		p	
	n	%	n	%		
Sex	Male	17	73.9%	6	26.1%	0.891
	Female	58	75.3%	19	24.7%	
Age	18-30 years	17	73.9%	6	26.1%	0.953
	31-40 years	3	50.0%	3	50.0%	
	41-50 years	19	82.6%	4	17.4%	
	51-60 years	33	78.6%	9	21.4%	
	>60 years	3	50.0%	3	50.0%	
Education level	Elementary	14	63.6%	8	36.4%	0.594
	Junior High	14	87.5%	2	12.5%	
	Senior High	35	76.1%	11	23.9%	
	Bachelor and above	12	75.0%	4	25.0%	
ASA Physical Status	I	17	73.9%	6	26.1%	0.891
	II	58	75.3%	19	24.7%	
Surgical History	Yes	17	73.9%	6	26.1%	0.891
	No	58	75.3%	19	24.7%	
Anesthesia History	Yes	17	73.9%	6	26.1%	0.891
	No	58	75.3%	19	24.7%	
Music Genre	Harp	2	100.0%	0	0.0%	0.621
	Jazz	5	71.4%	2	28.6%	
	Nature	5	100.0%	0	0.0%	
	Orchestra	8	100.0%	0	0.0%	
	Piano	23	82.1%	5	17.9%	
Hypertension	Yes	17	77.3%	5	22.7%	0.780
	No	58	74.4%	20	25.6%	
Diabetes	Yes	10	71.4%	4	28.6%	0.745
	No	65	75.6%	21	24.4%	
Asthma	Yes	1	50.0%	1	50.0%	0.439
	No	74	75.5%	24	24.5%	
Alergy	Yes	3	60.0%	2	40.0%	0.596
	No	72	75.8%	23	24.2%	
Others	Yes	40	75.5%	13	24.5%	0.908
	No	35	74.5%	12	25.5%	
Type of surgery	Digestive surgery	3	75.0%	1	25.0%	0.632
	Plastic surgery	2	66.7%	1	33.3%	
	Vascular surgery	2	100.0%	0	0.0%	
	Obsgyn	40	78.4%	11	21.6%	
	Oncology	1	33.3%	2	66.7%	
	Orthopedics	15	68.2%	7	31.8%	
	Urology	12	80.0%	3	20.0%	

*significant if p<0,2, ASA: American Society of Anesthesiologists

Tabel 5. Side effects of subarachnoid block anesthesia in each group

	Groups		p
	Intervention	Control	
PONV	0	0	-
Headache	0	0	-
Shivering	0	0	-
Hypotension	0	0	-
Hemorrhage	0	0	-
Backpain	0	0	-
Multiple puncture	0	1 (2%)	1.000

PONV : post operative nausea and vomiting

which was lower than SBP in the control group at 123.6±13.7, and this result was statistically significant (p=0.008). MAP in the intervention group was 84.5±10.5, which was lower than the control group at 88.9±9.9 with p=0.032, HR was lower in the intervention group compared to the control group (74.8±8.5 vs 80.5±9.4, p=0.002), and RR was lower in the intervention group compared to the control group (RR 16.7±1.2 vs 19.5±1.0, p=0.001).

The comparison of vital sign changes between measurement times X1 and X2 (ΔX1X2) did not show significant results in all categories (SBP, DBP, MAP, HR, and RR). This contrasts with the results of vital sign change comparison when compared with post-operative measurement times, where ΔX1X3 and ΔX2X3 showed significant results in several categories. There was a significant change in the difference in MAP; the intervention group experienced a decrease of 12.8±7.8 mmHg, while the control group experienced a decrease of 7.1±7.8 mmHg (p=0.001).

Similarly, for RR and MAP, there was a significant difference in the change in RR and MAP between the intervention and control groups (p=0.001 and p=0.001). There was no significant difference in the change in DBP and HR between the two groups (p>0.05). The comparison of the difference in SBP, MAP, HR, and RR in the intervention group at time X2 and X3 (ΔX2X3) also showed similar results, where the intervention group experienced a greater decrease compared to the control group with significant results (p<0.05).

From Table 4, it was found that confounding factors: age, sex, education, ASA physical status, history of surgery, history of anesthesia, type of music, comorbidity, and type of surgery did not have a statistically significant effect on postoperative anxiety (p>0.25), thus multivariate testing was not performed.

Table 5 shows 1 incidence (2%) of multiple punctures during anesthesia in the control group. No incidences of PONV, headache, shivering, hypotension, hemorrhage, or back pain were found in either group.

DISCUSSION

Demographic data showed that the two groups were largely homogeneous based on the demographic data in Table 1, which included sex, age, education level, ASA physical status, history of previous surgery, history of previous anesthesia, surgical procedure performed, and patient comorbidities. Therefore, the research results from the two groups can be compared and are not influenced by these factors.

Primary Outcome

Patient anxiety levels were measured at 3 time points: X1 (in the receiving room), X2 (0 minutes post-subarachnoid block), and X3 (15 minutes after the surgery was completed). The measurement results concluded that there was a statistically significant difference in the level of postoperative anxiety (X3) in the intervention group compared to the control group. In Table 2, at time points X1 and X2, there was no difference in patient anxiety levels (p>0.05).

The patient anxiety level at time point X1 mostly fell into the moderate anxiety category, both in the treatment group (37 subjects, 74.0%) and the control group (31 subjects, 62.0%). This result is consistent with similar research, where the mean STAI score of patients showed moderate anxiety in both groups, with the mean score in the intervention group being 59±7.52, while in the control group it was 58.94±5.592.

A significant difference (p=0.011) was found between the anxiety levels of the two groups at measurement time point X3. In the intervention group, the number of patients with low anxiety levels was 43 (86%), and 7 (14%) with moderate

anxiety levels, compared to the control group, where the number of patients with low anxiety levels was 32 (64%), and 18 (36%) with moderate anxiety levels.

Another study compared patient anxiety levels between 2 groups: one given 2mg midazolam sedation before the procedure and one listening to music during the procedure, in patients undergoing ESWL with local anesthesia. The group listening to music had a lower STAI score at the end of the procedure (30.33±3.18 vs 39.8±4.12) compared to the group receiving midazolam sedation before the procedure.[7]

Previous research showed similar results, where listening to music could reduce postoperative anxiety in the intervention group (STAI score 59.0 to 31.2, p=0.026), while in the control group, no significant change in anxiety score was found compared to the preoperative value (STAI score 58.94 to 58.78, p=0.164).[2] A systematic review of 26 studies (2051 participants) found a mean reduction in STAI score of 5.72 (95% CI -7.27 to -4.17, p<0.000001) in the group of patients who listened to music, compared to the group receiving routine care.[1] An integrative review of 11 studies conducted by Pittman showed that music was able to reduce preoperative anxiety in patients undergoing cardiac catheterization, breast biopsy, gastrointestinal procedures, vascular angiography, and various surgical procedures.[8]

Listening to music is one of the non-pharmacological interventions that can be given to reduce perioperative anxiety. In this study, Piano music was the most frequently chosen type of music to listen to during surgery, with 28 patients (56%), followed by Orchestra (8 patients, 16%), Jazz (7 patients, 14%), Nature (5 patients, 10%), and Harp (2 patients, 4%). Music therapy is highly dependent on the patient's personal choice, familiarity, and acceptance of the music, so it is recommended that music therapy be tailored to the patient2. In this study, not all patients in the control group were familiar with other types of music, so Piano music was the most chosen.

Secondary Outcome

This study showed a significant difference in SBP, MAP, HR, and RR postoperatively (X3) in the intervention group compared to the control group (p<0.05). Music intervention was proven to reduce the physiological response related to anxiety found in patients. Listening to music during surgery can reduce HR by 2.77, based on a meta-analysis of 16 studies conducted by Bradt (MD -2.77, 95% CI -4.76 to -0.78, p=0.006)1. A study by Bringman found no significant difference in postoperative HR between the group listening to music (mean 67, SD 11) and the group given preoperative midazolam (mean 68, SD 10). However, this study concluded that listening to music has the same sedative effect as the group given midazolam, because the intervention group was not given preoperative sedative drugs9. In this study, a significant decrease in HR of 9.4±8.4 was found in the intervention group compared to 4.4±7.3 in the control group.

A meta-analysis of 11 papers conducted by Loomba et al. investigated the effect of music on hemodynamic profiles. This study concluded that music therapy can significantly reduce SBP, DBP, and HR compared to the control group in various clinical settings, including the preoperative period, and this is directly related to the reduction of anxiety in patients6. Compared to the control group, the group of patients who listened to music had a greater reduction in SBP, DBP, and HR.

In another study, it was found that music could reduce SBP (t=2.3, p=0.026), DBP (t=3.02, p=0.004), HR (t=2.62, p=0.012), and RR (t=2.29, p=0.026) postoperatively in the group that listened to music. The control group did not experience a significant change in vital signs compared to the preoperative measurement.[2]
In Table 4, a bivariate test was performed on factors that could be confounders during the study, where these factors were proven to affect postoperative anxiety in previous studies. From the bivariate test results, factors such as: age, sex, education level, ASA physical status, history of surgery, history of anesthesia, type of music, comorbidity, and type of surgery did not affect postoperative anxiety (p<0.25).[2]

A study by Eberhart et al. showed that there are three independent factors for preoperative

anxiety: female sex, negative anesthesia experience, and positive anesthesia experience. This study used the APAIS score to assess anxiety. Female sex and negative anesthesia experience were associated with a higher level of anxiety, while positive anesthesia experience was associated with a lower level of anxiety10. Another study showed that perioperative anxiety tends to increase with increasing education level and decrease with increasing age, although this has not been proven significantly.[11]

Higher anxiety levels were also found to be associated with a history of cancer (OR=2.26), smoking (OR=7.47), psychiatric disorders (OR=5.93), negative future perception (OR=2.30), moderate to intense depressive complaints (OR=3.22), and ASA category III (OR=3.41). The duration of surgery was not specifically linked to postoperative anxiety.[3] This study has limitations, namely that most subjects underwent simple surgical procedures with low-risk factors, and there were patients who underwent brachytherapy procedures, thus undergoing the procedure in a different location and atmosphere than those undergoing surgery in the central surgical building.

CONCLUSION

From this study, it can be concluded that the intervention of listening to music in patients undergoing surgical procedures with subarachnoid block anesthesia has a lower level of postoperative anxiety compared to patients undergoing standard routine care.

Suggestion

Further research is needed with all research subjects undergoing surgery in the central surgical building, so that the intervention can be given to patient groups with higher risk factors. In this study, listening to music during surgery showed positive results on patient anxiety, so it can be a suggestion for hospitals to provide non-pharmacological interventions in the form of listening to music to patients undergoing surgery with subarachnoid block anesthesia.

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