e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(12); 831-835

Original Research Article

Effectiveness of Different Music-Playing Devices for Reducing Preoperative Anxiety

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Received: 10-10-2023 / Revised: 14-11-2023 / Accepted: 25-12-2023
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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to determine the anxiety-relieving effect of broadcast versus headphone music playing for patients awaiting surgery.

Methods: The present study was conducted Department of Physiology. To contrast the effect of music intervention in our study, control group was considered in addition to broadcasting and headphone groups.150 subjects were included in the study. It is required to assess patients' anxiety and pain on admission and each significant event such as surgery and procedure.

Results: There were no significant differences between the two groups in age, gender, waiting time, methods of anesthesia, or types of surgery. The mean anxiety score of the control group was significantly higher than that of the headphone group and the broadcast group. The average heart rates of the broadcast group, head- phone group and control group were not significantly different. Time-domain heart rate variability parameters in the broadcast group were all higher than those in the headphone and control groups, but the differences were not significant. There was significant difference in high frequency HR variability among the three groups.

Conclusion: Listening to music is effective for reducing the anxiety of preoperative patients. Such patient anxiety can be indicated by a decrease in VAS scores, and a decrease in the low- and an increase in the high-frequency parameters of HR variability. Both headphone and broadcast music are effective for reducing the preoperative patient's anxiety in the waiting room.

Keywords: Anxiety, Preoperative Surgery, Music therapy, Infection control

Introduction

Worldwide, an estimated 266–360 million surgical procedures are undertaken annually according to the WHO. [1] Surgical patients often suffer from preoperative anxiety and postoperative pain; recent data suggest that 75 per cent of patients facing surgery are anxious, despite anxiety-decreasing measures. [2,3] Preoperative anxiety can increase the level of postoperative pain [4] and, despite interventions to reduce postoperative pain, approximately 40–65 per cent of patients experience moderate to severe pain after surgery. [5,6]

Patients generally experience high levels of anxiety when hospitalized to undergo surgery and other invasive procedures. Anxiety is an emotional state consisting of a set of behavioral manifestations, which occurs in 11% to 80% of adult surgical clients prior to surgery regardless of the scope and extent of surgery. [7] In a quasi-experimental study conducted by Hamel (2001) [8] with 101 subjects prior to cardiac catheterization, music significantly reduced physiologic parameters. After listening to music, systolic blood pressure (BP) was lower than baseline measurements and the mean heart rate decreased after 20 min in the music group. Yung et al [9] (2002) also found significant reduction in systolic and diastolic BP and man heart rate following music interventions.

High levels of anxiety result in the activation of the autonomic nervous system and in negative physiological manifestations. [10-12] These manifestations slow down the healing process, decrease the immune response, and increase the risk of infection, postoperative complications, pain, morbidity, and mortality. [13] Preoperative anxiety might cause hemodynamic problems in the intraoperative period, increased analgesic need, and lower postoperative satisfaction of the patients in the postoperative period. [14] High levels of anxiety can complicate the administration of preoperative drugs, while negatively interfering with the induction of

anaesthesia and delaying recovery. [15] In surgical context, listening to music has an effect on blood pressure and pulse rate, and the classic music resulted in lowered blood pressure and heart rate. [16]

The aim of the present study was to determine the anxiety-relieving effect of broadcast versus headphone music playing for patients awaiting surgery.

Materials and Methods

The present study was conducted Department of Physiology, Patna Medical College, Patna Bihar, India for one year . To contrast the effect of music intervention in our study, control group was considered in addition to broadcasting and headphone groups.150 subjects were included in the study. It is required to assess patients' anxiety and pain on admission and each significant event such as surgery and procedure. The 150 subjects were distributed uniformly, 50 in the broadcast group, 50 in the headphone group and 50 in the control group.

The inclusion criteria were that the patient: (1) was conscious and aged 20–65 years, (2) had not consumed any medications for hypertension or heart disease, or caffeine, sedatives, or operative premedication, (3) had not been diagnosed with hearing impairment, visual impairment, arrhythmias, or heart disease, (4) stayed at least 25 min in the waiting area, and (5) was willing to participate in the study and signed an informed consent form.

We applied random table to divide numbers 1–30 to three groups to determine each day of a month to be 'headphone day,' 'broadcast day' or 'control day'. Subjects who were sent to the operating theater for surgery on 'headphone day' were assigned to the headphone group. The same rule was applied to recruit subjects into the broadcast and control groups.

Intervention

Considering the short stay of patient in the waiting area and time spent for HRV and VAS measuring, a 10-min music was prepared for intervention. The kinds of music chosen to play in this study were light music of folk songs or pop music, played at a tempo of 60–80 beats per minute and a volume of 50–55 db. The patients in the headphone group listened to music via an MP3 player. The headphone was put on when the subject agreed to participate. For the subjects in the broadcast group, they listened to music through an open speaker. The music was played from 07:00 to 15:00 on the broadcast day. When subjects entered the waiting area, they were asked about participating by permitting VAS and HR measurements. The control group did not listen to music, and were asked if they would participate by having VAS and HR measurements. Considering that music for the broadcast group was sent from open speaker which make every person in the same area can hear, we decide to use pre-selected standard 10 pieces of music repeatedly, randomly played and not allow participants to make choice. To prepare music for intervention, we firstly chose 40 pieces of music which meet the recommended criteria. Then, we had 10 preoperative patients to elect the top ten relax ones. All the 10 pieces of music were stored in a MP3 player or CD disk and played randomly. We employed both subjective and objective measures for anxiety in our study.

The Visual Analog Scale

We used a visual analog scale (VAS) instead of State- Trait Anxiety Inventory (STAI), which is used in most studies of anxiety. This decision was made out of three concerns. First, the 40-item STAI takes minutes to fill out. This could cause unnecessary strain for patients waiting for surgery in the waiting area of the operating room and make them more nervous. In contrast, the VAS takes only 5 s for the patient to communicate his/her anxiety level. Second, a patient can remain lying down and still respond to the VAS, while the patient might need to change his/her position to fill out the STAI questionnaire. Third, the VAS was routinely used in this hospital for pain and anxiety assessment. Subjects were used to responding to it.

Statistical Analysis

Data were first examined for completeness. Incomplete data or data with too many noise signals were deleted for data processing. Data analysis was performed with SPSS 15.0 (SPSS, Chicago, IL). The major statistical procedures applied were descriptive statistics, and Chi-squared test were applied to evaluate the background differences among the three groups. One way ANOVA test was applied to examine the different in VAS and HR variability parameters among the three groups. If a significant difference was identified, a Scheffe test was further applied to examine the paired difference. P value of $p < .05$ was deemed statistically significant.

Results

Table 1: Demographic and clinical characteristics of participants in the three

	Broadcast ($N = 50$)	Headphone ($N = 50$)	Control ($N = 50$)	p value
Age (years) [mean (SD)]	46.84 (12.48)	44.56 (16.64)	50.2 (15.65)	.142
Waiting (min) [mean (SD)]	21.19 (7.7)	23.65 (7.03)	22.48 (7.83)	.314
	n (%)	*n* (%)	*n* (%)	
Gender				.950
Male	23 (46)	24 (48)	22 (44)	
Female	27 (54)	26 (52)	28 (56)	
Previous surgery				
No	22 (44)	20 (40)	21 (42)	.512
Yes	28 (56)	30 (60)	29 (58)	
Anesthesia				.220
General	35 (70)	36 (72)	41 (82)	
Spinal	10 (20)	8 (16)	9 (18)	
Local	5 (10)	6 (12)	0 (0)	
Surgery type				.625
Orthopedics	9 (18)	5 (10)	6 (12)	
General	9 (18)	9 (18)	9 (18)	
Gynecology	15 (30)	11 (22)	14 (28)	
Urology	4 (8)	7 (14)	5 (10)	
Neurosurgery	4 (8)	6 (12)	8 (16)	
Other	9 (18)	12 (24)	8 (16)	

There were no significant differences between the two groups in age, gender, waiting time, methods of anesthesia, or types of surgery.

Table 2: HRV and Anxiety Score comparison of three groups

	Broadcast (B)	Headphone (H)	Control (C)	p
	Mean (SD)	Mean (SD)	Mean (SD)	
VAS score	4.6 (1.4)	5.0 (2.5)	6.4 (1.4)	<.001
HR	71.5 (10.5)	75.5 (12.4)	73.7 (10.4)	.12
Mean NNI (ms)	842.8 (122.2)	802.8 (142.8)	820.4 (114.6)	.17
SDNN (ms)	40.2 (29.6)	33.6 (25.1)	34.9 (19.5)	.32
rMSSD (ms)	28.0 (37.3)	23.3 (18.2)	22.6 (16.0)	.36
TP (ms^2)	1064.6 (2055.5)	1204.0 (3180.8)	884.6 (1082.2)	.72
%LF	54.6 (19.2)	56.2 (17.3)	62.8 (15.3)	.007
%HF	44.2 (18.2)	42.8 (17.3)	35.5 (15.3)	.008
LF/HF	1.8 (1.7)	1.8 (1.4)	2.6 (2.1)	.02

The mean anxiety score of the control group was significantly higher than that of the headphone group and the broadcast group. The average heart rates of the broadcast group, head- phone group and control group were not significantly different. Time-domain heart rate variability parameters in the broadcast group were all higher than those in the headphone and control groups, but the differences were not significant. There was significant difference in high frequency HR variability among the three groups.

Discussion

Pre-operative anxiety is among the most unpleasant experiences associated with surgery. An unfamiliar environment, loss of control, perceived or actual physical risk, dependence on strangers, separation from family and friends [17], the threat of death, and possible postoperative complications are factors that may cause patients to feel anxious in the waiting area before surgery. [18] The waiting period is also the time during which patients are most likely to imagine any potential danger they may face. [19,20] Preoperative anxiety is characterized by subjective, consciously perceived feelings, of apprehension and tension accompanied by autonomic nervous system arousal, which cause physical and psychological changes, including changes in heart rate, blood pressure, and respiratory rate, as well as feelings of pressure, fear, and uncertainty. [21]

Given the potential effects of anxiety, there are strategies to limit patient anxiety and improve comfort levels when waiting for surgical and invasive procedures. It has been reported that even though doctors usually provide anxiolytics or sedatives for patients, most still feel anxious. [22] There were no significant differences between the

two groups in age, gender, waiting time, methods of anesthesia, or types of surgery. The mean anxiety score of the control group was significantly higher than that of the headphone group and the broadcast group.

The average heart rates of the broadcast group, headphone group and control group were not significantly different. Time-domain heart rate variability parameters in the broadcast group were all higher than those in the headphone and control groups, but the differences were not significant. There was significant difference in high frequency HR variability among the three groups. Similar findings have also been reported in the literature. Buffum et al (2006) [23] conducted a randomized control trial of 170 patients waiting for vascular angiography procedures using a boom-box style music player, and the result showed statistically significant differences in anxiety reduction between the experimental group and the control group. In addition, Kaemph and Amodei (1989) [24] found a significant decrease in anxiety among outpatients awaiting arthroscopic procedures for the group exposed to music played on an audiocassette player a foot away. Our research also showed that anxiety in the broadcast group was significantly lower than that of the control group. This evidence indicates that when headphones are not available or not appropriate, speakers can be an effective substitute. The anxiety reliving effect was also indicated by a change in part of the heart rate variability parameters. Our frequency-domain analysis showed that LF and HF were statistically different among the broadcast group and the control group ($p < 0.01$). HF in the broadcast group was markedly higher than that in the control group, indicating a greater modulation of HF by the parasympathetic nervous system in the broadcast group than that in the control group upon listening to music. HF in the headphone group was also higher than that in the control group. Moreover, our findings that LF in the broadcast group was significantly lower than the control group indicates there was less tension of the sympathetic nervous system in the broadcast group. LF in the headphone group was also lower than that of the control group.

Conclusion

Listening to music is effective for reducing the anxiety of preoperative patients. Such patient anxiety can be indicated by a decrease in VAS scores, and a decrease in the low- and an increase in the high-frequency parameters of HR variability. Both headphone and broadcast music are effective for reducing the preoperative patient's anxiety in the waiting room.

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