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EFFECTS OF MUSIC LISTENING ON PREOPERATIVE STATE ANXIETY AND PHYSIOLOGICAL PARAMETERS IN PATIENTS UNDERGOING GENERAL SURGERY: A RANDOMIZED QUASI-EXPERIMENTAL TRIAL

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Abstract

Aim: The aim of the present study was to evaluate the effects of music on preoperative state anxiety and physiological parameters including heart rate, respiratory rate and mean systolic, and diastolic blood pressure in 60 patients undergoing general surgery. *Methods:* The study was designed as a randomized quasi-experimental trial. A total of 60 patients were allocated to two equal groups. Subjects in the trial group listened to non-vocal classical music through headphones for 20 minutes before entering the operating theater. State anxiety was measured by the State-Trait Anxiety Inventory (STAI), and the physiological parameters by pulse CO-oximeter (Masimo RAD-57C, Finland). The results obtained were finally analyzed by SPSS software version 16 using chi-square and t-tests. *Results:* There was an insignificant difference in demographic data between the two groups (p > 0.05), but before and after listening to music, a significant difference was observed in state anxiety (p < 0.01). *Conclusions:* Significant differences in both state anxiety and physiological parameters confirmed that music as a non-pharmacological intervention can be used as a complementary tool in nursing care.

Key words: music therapy, state anxiety, physiological parameters, non-pharmacological intervention.

Introduction

In the United States of America, some 23 million people undergo surgery each year, generally experiencing preoperative anxiety and pain (Bekhuis, 2009). When patients undergo surgery, anxiety and depression can affect their physical and mental states; reducing these preoperative complications results in positive effects on the wellbeing of patients and is likely to positively influence the outcomes of surgery (Giaquinto et al., 2006). A non-pharmacological intervention such as music can improve global and social functioning in schizophrenia and/or serious mental disorders, gait and related activities in Parkinson's disease, depressive symptoms, and quality of sleep (Kamioka et al., 2014).

Effects of music listening as a low-cost therapeutic tool can noticeably decrease pain and anxiety in various medical procedures (Abraham, Drory, 2014). Furthermore, music therapy can increase patient comfort and facilitate conservation of energy in acute inpatient settings (Gagner-Tjellesen et al., 2001). Patients receiving three non-pharmacological nursing interventions including relaxation, music, and the combination of relaxation and music plus patient-controlled analgesia (PCA) following gynecologic surgery had less pain than those who used PCA alone (Good et al., 2002). In their study on the effects of self-selected music, Pothoulaki et al. (2008) indicated that the control group scored substantially higher in state anxiety than the trial one and also experienced higher pain intensity in the posttest phase of the hemodialysis process.

Many articles have proven enormous favorable therapeutic effects of music reported by health care providers and patients in the 20th century (Cunningham et al., 1997). Dijkstra et al. (2010) stated that music listening leads to higher sedation

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scores in mechanically ventilated intensive care unit (ICU) patients, and an insignificant decrease in physiological responses.

The most important benefit of using music as a complementary tool in care programs is in controlling postoperative pain, due to the long period of treatment and negative influence of pain intensity on therapy success (Hsiao, Hsieh, 2009). A systematic review of managing procedural pain showed that non-pharmacological interventions including non-nutritive sucking, music, swaddling, positioning, olfactory and multi-sensory stimulation, kangaroo care and maternal touch lead to favorable effects on the reduction of motor activity, heart rate and respiratory rate and on the excitation state after invasive measures in preterm and term neonates (Cignacco et al., 2007). Music listening can significantly reduce anxiety, depression, pain, and fatigue in patients with cancer (Tsai et al., 2014).

In contrast, no significant difference was observed between group anxiety means and preoperative anxiety was not reduced in a study of the effects of music on elective, non-diagnostic surgery patients (Gaberson, 1995). Moreover, no significant effects of music listening on mean values of respiratory and heart rates, oxygen saturation and behavioral states of premature infants were reported (Alipour et al., 2013).

Given the above inconsistent data on the effects of music therapy, the present research was designed to evaluate the impact of music listening on preoperative state anxiety and physiological parameters in patients undergoing general surgery in an ICU of Shahid Beheshti hospital, Kashan city, Iran in 2014.

Aim

The aim of the present study was to evaluate the effects of music on preoperative state anxiety and physiological parameters including heart rate, respiratory rate and mean systolic and diastolic blood pressure in 60 patients undergoing general surgery.

Methods

Design

A randomized quasi-experimental trial was performed on patients undergoing general surgery in Shahid Beheshti hospital, Kashan city, Iran in 2014.

Sample

The *simple random sampling* method was used. The inclusion criteria for the study were being fully awake, being literate, being in a stable hemodynamic condition, not taking anxiolytic medications, and

having no history of surgery. Patients with *STAI* scores higher than 20 were enrolled in the trial.

Data collection

After obtaining patients' agreement to participate, the researchers introduced themselves to the patients, explained the trial objectives and assured the participants that their information would confidentially be kept, without mentioning their names. Then necessary explanations were provided concerning the examination and questionnaires. Afterwards, consent forms were signed by the subjects. The sample size was calculated using the *sample size formula*, with a 95% confidence interval and 80% power. Then, using *simple random sampling*, the participants were allocated to two groups, the trial (n = 30) and control (n = 30) groups (Mandel et al., 2007). Patients undergoing surgery on even and odd days were allocated to the trial and control groups, respectively. Demographic data (marital status, age, gender, level of education, and beliefs about surgery) were collected and preoperative state anxiety was measured by the *STAI*. It is a psychological inventory based on a 4-point *Likert scale* and consisting of 40 questions on a self-report basis. The *STAI* measures two types of anxiety; state anxiety, or anxiety about an event (anxiety absent and anxiety present), and trait anxiety, or anxiety level (anxiety absent and anxiety present) as a personal characteristic. Higher scores are positively correlated with higher levels of anxiety (Roemmler-Zehrer et al., 2014). It has 20 items to evaluate trait anxiety and 20 for state anxiety. State anxiety items include: "I am tense; I am worried" and "I am calm; I feel secure" Trait anxiety items include: "I worry too much over something that really does not matter" and "I am content; I am a steady person" All items are rated on a 4-point scale (e.g. from "almost never" to "almost always"). Higher scores indicate greater anxiety. *STAI* anxiety measurement is known to be good scientific evidence and it is noted as a standardized trial; the surveillance of this questionnaire was approximately estimated at 88% (LaMontagne, 1984). Also, high reliability and validity of the *STAI* was reported among urology patients (Quek et al., 2004). The *STAI* is appropriate for those who have at least a sixth-grade reading level (Spielberger et al., 1983). All of the patients filled out the questionnaire with the help of the researchers.

Physiological parameters including respiratory rate, heart rate and blood pressure were measured in the two groups by pulse CO-oximeter (Masimo RAD-57C, Finland), and recorded in the medical charts by nurses. Before undergoing general surgery (e.g., appendectomy, colon cancer surgery,

cholecystectomy, hemorrhoidectomy, laparoscopic colon resection, laparoscopic and open ventral hernia repair and laparotomy) were moved to a quiet room. Then, those in the trial group listened to non-vocal classical music played together with nature sounds (e.g., sea, rain, and water) through headphones connected to an MP3 player (Sony Walkman MP3 Player NWZ-E385, Japan) for 20 minutes. The volume of music played was 50-60 dB (Alipour et al., 2013). The room conditions were the same for both groups in terms of humidity (30% to 45%), temperature (23ºC to 26ºC) and light (dim light was used). The state anxiety and physiological responses of the two groups were measured after finishing listening to music in the trial group. Apart from music, no other relaxation techniques were used in either group.

Data analysis

The results were finally analyzed by SPSS software version 16 using chi-square and independent t-tests with a significance level of 0.95.

Results

Twenty-one patients in the trial group and 26 controls were married. The mean ages were 37 and 39 years in the trial and control groups, respectively. In the trial group, 18 patients were female, as compared with 14 female controls. As for education level, 15 patients in the trial group and 12 controls had a degree.

Table 1 Demographic data of the trial and control groups

Items	Trial group (n = 30)	Control group (n = 30)
Marital status		
Married	21 (70%)	26 (86.66%)
Single	9 (30%)	4 (13.34)
Age		
18-35	14	12
35-50	12	12
50-65	1	3
over 65	3	3
Mean ± SD	37 ± 2.63	39 ± 2.72
Gender		
Male	12 (40%)	16 (54%)
Female	18 (60%)	14 (46%)
Level of education		
Degree	15 (50%)	12 (40%)
Lower	15 (50%)	18 (60%)
Beliefs (about surgery)		
Positive	11 (36.7%)	9 (30%)
Negative	19 (63.3%)	21 (70%)

In the trial group, 19 patients had negative beliefs about surgery, and so had 21 controls. Also, there was a direct correlation between negative beliefs (about surgery) and *STAI* grades higher than 20 (r = + 0.4, p < 0.05). Insignificant differences were observed in the demographic data between both groups (Table 1).

A significant difference in state anxiety before and after listening to music was observed (p < 0.01). After listening to music, state anxiety shifted from 39.1 ± 4.21 to 31.11 ± 3.10. The mean heart and respiratory rates and systolic blood pressure levels are presented in Table 2.

Table 2 State anxiety and physiological parameters with standard deviations in the trial group

Physiological parameters	Before listening to music	After listening to music	p value
State anxiety	39.1 ± 4.21	31.11 ± 3.10	0.002
Heart rate (per minute)	73.55 ± 3.1	70.46 ± 1.3	0.11
Respiratory rate (per minute)	20.33 ± 1.5	20.26 ± 1.6	0.06
Mean systolic blood pressure (mmHg)	101.50 ± 1.3	88.57 ± 2.1	0.04

The state anxiety levels and physiological parameters of the control group are shown in Table 3.

Table 3 State anxiety and physiological parameters with standard deviations in the control group

	1st measurement	2nd measurement after 20 minutes with no intervention	p value
Anxiety state	41.38 ± 6.19	43.13 ± 5.32	0.81
Heart rate (per minute)	75.44 ± 2.1	76.51 ± 2.4	0.80
Respiratory rate (per minute)	20.43 ± 2.2	20.47 ± 1.5	0.32
Mean systolic blood pressure (mmHg)	94.54 ± 2.3	97.59 ± 2.4	0.13

Discussion

As seen in Table 2, the state anxiety and blood pressure levels were reduced, with more significant reduction being observed in state anxiety. These findings are consistent with a study by Chang and

Chen (2005). Positive effects of music listening on anxiety were obtained in a study performed on health-related outcomes in cardiac rehabilitation (Mandel et al., 2007). Music therapy improved executive function and overall emotional adjustment, and lessened depression, sensation seeking and anxiety in brain-injured patients (Thaut et al., 2009).

Music therapy can be considered as a supportive treatment in medical practice used to decrease anxiety and stress in females with breast cancer undergoing chemotherapy (Bulfone et al., 2009). Our results are generally in agreement with the above studies. The present study showed a statistically significant difference in blood pressure levels between the trial and control groups, but insignificant differences in heart and respiratory rates.

A significant decrease in systolic and diastolic blood pressure brought about by music therapy provided to mechanically ventilated ICU patients were reported by Almerud and Petersson (2003); this is consistent with the presented findings. Cooke et al. (2005) stated that in limited time periods, music listening had enormous effects on clinical practice where patients wait for and undergo invasive investigations or procedures. On the other hand, insignificant effects of music listening on anxiety and/or pain levels in patients under electrophysiological examinations were shown in a study by Abraham and Drory (2014); however, most of them felt a positive effect and preferred to hear music. Despite insignificant fluctuation in systolic or diastolic blood pressure in patients with knee osteoarthritis undergoing joint lavage, lower heart rate and perioperative anxiety levels with higher tolerability as a result of music therapy were reported in a study by Ottaviani et al. (2012). Our findings are in contrast with the results of Abraham and Drory (2014) and Ottaviani et al. (2012). Rosary prayer and yoga mantras resulted in striking, powerful, and synchronous increases in existing cardiovascular rhythms and significantly increased baroreceptor reflex sensitivity (Bernardi et al., 2001).

Bradt et al. (2013) found remarkable effects of music listening on systolic blood pressure, heart and respiratory rates, quality of sleep, and pain in patients with coronary heart disease and a significant effect on their anxiety levels, especially in those with myocardial infarction.

Music therapy had a considerable effect on the reduction of stress hormone levels, physiological responses, acute procedural pain, and anxiety in patients undergoing port catheter placement procedure (Zengin et al., 2013). Findings of the aforementioned studies were consistent with the results of the present study. In conclusion, music therapy can be effective in reducing state anxiety, depression, blood pressure, and pain; it can also be used as a supportive treatment to improve the quality of sleep.

Conclusion

Results of the present study indicated that music can be used as a non-invasive therapeutic intervention to reduce preoperative state anxiety and physiological parameters in patients undergoing general surgery. Moreover, music therapy is a less time-consuming, easily available and cheap method with no complications in comparison with pharmacological treatments. We suggest that the effects of music listening are investigated in patients undergoing various types of surgery using a larger sample size. The limitations of the study were a small sample size and use of one genre of music.

Ethical aspects and conflict of interest

The protocol was designed in accordance with the ethical principles of the Helsinki Declaration (World Medical Association, 2002). Kashan University of Medical Sciences Ethics Committee considered the project to fall outside its mandate. The nurses were given a verbal lecture and written information about the goals and approach of the project, and then they declared to help the researchers to do the study. All of the authors certify that there is no conflict of interest.

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