

The effects of music therapy on anxiety, pain and the amount of analgesics following coronary artery surgery

Müzik terapinin koroner arter cerrahisi sonrası anksiyete, ağrı ve analjezik miktarı üzerine etkileri

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ABSTRACT

Background: This study aims to investigate the possible effects of music therapy on the anxiety level, pain perception, and the amount of analgesics used during the intensive care unit and surgery unit stays of patients undergoing coronary artery surgery.

Methods: This randomized controlled study included a total of 68 patients (52 males, 16 females; mean age 61.6±10.7 years; range 28 to 75 years) who underwent coronary artery surgery with open heart surgery in Cardiovascular Surgery Department of a private hospital in Afyonkarahisar between March 2011 - October 2011. The patients were divided into two groups: 34 patients (25 males, 9 females; mean age 62.3±11.3 years; range 28 to 75 years) in the music group and 34 patients (27 males, 7 females; mean age 60.8±10.3 years; range 28 to 75 years) in the control group. Preoperative and postoperative data were collected using the Patient Identification Form, Patient Follow-up Form. The visual analog scale - pain, and the State-Trait Anxiety Inventory were used to assess pain and anxiety levels of the patients.

Results: The anxiety level of the music group was lower compared to the control group. However, there was no statistical significant difference (p=0.12 and p=0.09, respectively). The pain perception levels were statistically significantly lower in the music group, compared to the controls (p=0.001, p=0.002 and p=0.001, respectively). The amount of analgesics used was statistically significantly lower in the music group (p=0.001, p=0.001 and p=0.005, respectively).

Conclusion: Our study results show that music therapy reduces pain perception and the amount of analgesics during the intensive care unit and surgery unit stays of patients undergoing coronary artery surgery. Therefore, we recommend music therapy after coronary artery surgery.

Keywords: Anxiety; coronary artery surgery; music therapy; pain.

ÖZ

Amaç: Bu çalışmada, müzik terapinin koroner arter cerrahisi yapılan hastalarda yoğun bakım ve cerrahi servisi yatışı sırasında anksiyete düzeyi, ağrı algısı ve analjezik miktarı üzerindeki muhtemel etkileri araştırıldı.

Çalışma planı: Bu randomize kontrollü çalışmaya Mart 2011 - Ekim 2011 tarihleri arasında Afyonkarahisar'da özel bir hastanenin Kalp Damar Cerrahisi bölümünde açık kalp ameliyatı ile birlikte koroner arter cerrahisi yapılan toplam 68 hasta (52 erkek, 16 kadın; ort. yaş 61.6±10.7 yıl; dağılım 28-75 yıl) alındı. Hastalar iki gruba ayrıldı: müzik grubunda 34 hasta (25 erkek, 9 kadın; ort. yaş 62.3±11.3 yıl; dağılım 28-75 yıl) ve kontrol grubunda 34 hasta (27 erkek, 7 kadın; ort. yaş 60.8±10.3 yıl; dağılım 28-75 yıl). Ameliyat öncesi ve ameliyat sonrası veriler Hasta Kimlik Formu ve Hasta Takip Formu ile toplandı. Hastaların ağrı ve anksiyete düzeylerini değerlendirmek için sırasıyla Görsel Analog Ölçeği - Ağrı ve Durumluluk - Süreklilik Kaygı Envanteri kullanıldı.

Bulgular: Müzik grubunun anksiyete düzeyi, kontrol grubuna kıyasla daha düşüktü. Ancak, istatistiksel olarak anlamlı bir fark yoktu (sırasıyla p=0.12 ve p=0.09). Ağrı algı düzeyleri, kontrollere kıyasla, müzik grubunda istatistiksel olarak anlamlı düzeyde daha düşüktü (sırasıyla p=0.001, p=0.002 ve p=0.001). Kullanılan analjezik miktarı, müzik grubunda istatistiksel olarak anlamlı düzeyde düşüktü (sırasıyla p=0.001, p=0.001 ve p=0.005).

Sonuç: Çalışma sonuçlarımız, müzik terapinin koroner arter cerrahisi yapılan hastalarda yoğun bakım ve cerrahi servisi yatışı sırasında ağrı algısını ve analjezik miktarını azalttığını göstermektedir. Bu nedenle, koroner arter cerrahisi sonrasında müzik terapiyi önermekteyiz.

Anahtar sözcükler: Anksiyete; koroner arter cerrahi; müzik terapi; ağrı.



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Coronary artery surgery is a major operation which may result in vital complications.^[1] It may also prolong the length of stay in the intensive care unit (ICU), thereby, increasing the treatment cost by 25%.^[2] In addition, coronary artery surgery can be the sole reason for stress on patient due to its nature of being a major surgery. High level of postoperative pain may also interfere with the patient's adherence to the treatment.^[3] Therefore, the patient should be instructed and encouraged to be engaged in treatment.^[4]

The music had been used for treating sleeping disorders to minimize the anxiety of surgery and pain of local anesthesia, since the times of Seljuk Dynasty and Ottoman Empire.^[5] It diverts the patient's focus and relaxes the muscles.^[1]

The music from the own culture of the patient is considered to be more effective. The perception of the patient of the music varies due to their education status, as well as social and cultural environment.^[6] The literature indicated that using Classical Turkish Music (Tune Hejaz and reed flute) may decrease the dose of sedative medication, minimize the anxiety, and pain perception,^[6,7] thereby, contributing to a more rapid healing process.^[8] The music acts as a source of distraction; it directs the patient's attention away from negative stimuli to pleasant and encouraging thoughts, which helps to reduce pain, stress, and anxiety.^[9]

To the best of our knowledge, there is a correlation between preoperative anxiety and acute pain on thoracic surgery.^[10] It is suggested that patients with high level of preoperative anxiety experience high level of pain and anesthesia after the surgery.^[11] The music also brings down the level of corticosteroids which increases during depression and stress.^[1] Due to its aforementioned effects, music therapy is recommended for patients in the ICU and surgery units to minimize the stress, anxiety, and the pain perception.^[1,7]

In this study, we aimed to investigate the effects of music therapy on the anxiety level, pain perception, and the amount of analgesics used during the ICU and surgery unit stays in patients undergoing coronary artery surgery.

PATIENTS AND METHODS

This randomized controlled study included a total of 68 patients (52 males, 16 females; mean age 61.6±10.7 years; range 28 to 75 years) who underwent coronary artery surgery with open heart surgery in Cardiovascular Surgery Department of a Private Hospital in Afyonkarahisar between March 2011 - October 2011. The patients were divided into two

groups: 34 patients (25 males, 9 females; mean age 62.3±11.3 years; range 28 to 75 years) in the music group and 34 patients (27 males, 7 females; mean age: 60.8±10.3 years; range 28 to 75 years) in the control group. The patients who had off-pump coronary artery surgery were excluded. All surgeries were performed by the same health care professionals. The medical histories of all patients were recorded. Inclusion criteria were as follows: minimum primary school education, vision and hearing disabilities, having no orientation issues on time and place, no drug addiction, no history of chronic diseases such as diabetes and chronic obstructive lung disease, no professional music training, no undefined psychological disorder, and chronic stable angina pectoris with a planned surgery and willingness to participate in this study. Obese patients having any possibility of mild or moderate level of depression^[12] and patients with the history of chronic disease such as high blood pressure were also excluded from the study, as these patients might had anxiety disorder.^[13] Randomization managed by taking the patients with odd numbers into the control group and with even numbers into the music group. Before recruitment, all patients were informed about the study and their consents were obtained. The written permission from the General Manager of the institution was also obtained. The study protocol was approved by the institutional ethics committee (2011-05).

Preoperative and postoperative data were collected using the Patient Identification Form and Patient Follow-up Form. The visual analog scale (VAS) - pain, and the State-Trait Anxiety Inventory (STAI-S and STAI-T) were used to assess pain and anxiety levels of the patients, respectively. The Patient Identification Form consists of 20 items to identify the socio-demographic characteristics of the patients, which can influence the pain perception and the anxiety levels of the patients.

The Patient Follow-up Form was originally developed to identify the pain perception of the patients in the ICU and surgery unit, medical therapy given and the other applications used pre-, intra-, and postoperatively. The VAS was used to define the pain level. It is a 100 mm length ruler which is drawn vertically or horizontally starting with "No pain" and ending with "Intolerable pain".^[14] The STAI-S and STAI-T scales which were developed by Spielberg et al., and translated into Turkish by Öner and Le Compte (1985), was used to assess the anxiety level of patients.^[15] All patients in both groups received standard preoperative and postoperative care according to the protocols developed by the cardiovascular surgeons and nurses. Analgesia was standardized for all patients. All patients received opioid (tramadol

HCL 100 mg), non-steroidal anti-inflammatory drugs (NSAIDs) (dexketoprofen trometamol 50 mg), and paracetamol 500 mg.

The patients in the music group were administered the Patient Identification Form and STAI-S and STAI-T scales one day before coronary artery surgery. Initially, all patients were informed about the Turkish Classical Music and Turkish Folk Music (verbal and instrumental music) under the guidance of Afyon Kocatepe University State Conservatory Music Department. The music was selected according to the patient's preference in the music group. Volume of music was kept at 50-60 dB using Mp3 headphones for one hour 30 minutes before the patients were taken to the operation, once for 30 minutes in the ICU, and every day for 30 minutes in the ward, until discharge. The researcher kept recording the all readings carefully during the whole intervention period. The music volume was set to a pleasant level based on the subjective verbal feedback and facial expressions of the patient. During the first 24 hours of the ward stay, the STAI-S and STAI-T scales were applied once more. The patients' pain perceptions in the ICU were evaluated. The pain perception and the pain level within the last 24 hours were also evaluated within two days after the operation until discharge by daily visits. The STAI-S and STAI-T scales were repeated within the last 48 hours before discharge (5-7th day). Meanwhile, no complications were seen in any patients. The same procedure was also carried out for the control group.

Statistical analysis

The statistical analysis was carried out under the guidance of Afyon Kocatepe University Biostatistics

Department. The data were analyzed using the PASW for Windows version 18.0 software program (SPSS Inc., Chicago, IL, USA). The data were expressed in number, mean, and percentage. The chi-square, Fisher's exact test, and Mann-Whitney U test were used to analyze the data. A *p* value of <0.05 was considered statistically significant. Power analysis was used to determine the power of the results of the study.

RESULTS

There were no statistically significant differences in the demographic characteristics between the two groups. Demographic characteristics of the music and control groups are shown in Table 1. More than one-half of the participants in the music and control groups were males (control 79.4%, music 73.54%) and almost all of them were married (control 91.2%, music 94.1%). The majority of the participants had completed their primary school education in both groups (control 82.4%, music 76.5%).

The STAI-S and STAI-T scores of anxiety levels of the patients in the music group at various time points were lower than the controls; however, it did not reach statistical significance ($p>0.05$) (Table 2).

A total of 73.5% of the patients in the music group and 79.4% of the controls had feeling of pain perception in the ICU. It also, 20.6% of the patients in the music group and 76.5% of the controls experienced pain in the surgery unit, indicating a high level of statistically significant difference ($\chi^2=21.254$; $p<0.05$) between the groups (Table 3).

The mean pain intensity scores of the groups are shown in Table 4. There was a statistically significant difference in the mean pain intensity scores of the

Table 1. Demographic characteristics of patients

Variables	Control group (n=34)			Music group (n=34)		
	n	%	Mean±SD	n	%	Mean±SD
Mean age (years)			60.8±10.3			62.3±11.3
Gender						
Female	7	20.6		9	26.5	
Male	27	79.4		25	73.5	
Education status						
Primary school	28	82.4		26	76.5	
Secondary school	6	17.6		7	20.6	
University	–	–		1	2.09	
Marital status*						
Married	31	91.2		32	94.1	
Single	3	8.8		2	5.9	

SD: Standard deviation; * Fisher's exact test.

Table 2. The mean anxiety scores of patients

	Control group		Music group		Z	p
	Mean±SD	Mean±SD	Mean±SD	Mean±SD		
STAI-T preoperative	53.3±8.0	50.7±6.0	50.7±6.0	50.7±6.0	1.17*	0.24**
STAI-S preoperative	43.9±6.8	42.6±5.3	42.6±5.3	42.6±5.3	0.87*	0.38**
STAI-S after ICU	40.2±6.5	38.1±5.1	38.1±5.1	38.1±5.1	1.55*	0.12**
STAI-S pre-discharge	41.4±7.2	39.0±6.6	39.0±6.6	39.0±6.6	1.65*	0.09**

SD: Standard deviation; STAI: State-trait anxiety inventory; * Mann-Whitney U test; ** p<0.05; ICU: Intensive care unit.

music and control groups (p<0.05). In addition, we found that the power of the results was considerably high according to the power analysis (Table 4).

The physiological variables on admission, during the ICU and surgery unit stay, and before discharge were found to be within normal ranges. The mean peripheral capillary oxygen saturation (SpO₂) values of the control group on admission and of the music group during the ICU stay were found to be statistically significantly increased (p<0.05). However, there was no statistically significant difference in other variables on admission, during the ICU and surgery unit stay, and before discharge between the groups (p>0.05) (Table 5).

The opioid and NSAID use is shown in Table 6. The amount of opioids and NSAIDs used for the music group was statistically significantly lower (p<0.05). The amount of intramuscular NSAIDs used in the music group was also statistically significantly lower (p<0.05 1-β=0.949). There was a statistically significant difference in paracetamol use between both groups (p>0.05) (Table 6).

DISCUSSION

There is a high risk of preoperative anxiety and fear of death on patients who are scheduled for coronary artery surgery.^[16] Therefore, the nursing on patient includes identifying the reasons of stress

and the anxiety of the patients and applications to minimize these factors.^[4] Several studies in various departments of health care have shown that music has a positive impact on anxiety.^[7,17] In the present study, we observed that situational anxiety scores of the patients in both groups from preoperative until discharge were lower, indicating no statistically significant difference. Anxiety might exert negative effects by increasing the level of pain perception. Anxiety leads to muscle tension and thus enhanced pain intensity.^[4] Therefore, anxiety and the pain levels of the patients who are scheduled for coronary artery surgery should be evaluated before and after surgery by the health care professionals and necessary care and treatment should be applied.^[18] Although it is not statistically significant, lowering the anxiety level is also considered to prevent postoperative complications (i.e. hypoxia, atelectasis, pneumonia, postoperative atrial fibrillation, prolonged stay at ICU and ward) caused by pain.^[24] However, these findings differ from those reported by Twiss et al.^[19] who reported a statistically significant difference in the anxiety scores among the subjects in the music group and control group (p=0.022). Devare et al.^[20] also showed that music therapy after coronary artery surgery reduced the anxiety level of the patients. Similarly, in a meta-analysis, Hole et al.^[21] demonstrated that music therapy reduced the anxiety level of the patients after the operation.

Table 3. Pain assessment of patients

	Control group (n=34)		Music group (n=34)		χ ²	p
	n	%	n	%		
Intensive care unit pain						
Yes	27	79.4	25	73.5	0.327*	0.567**
No	7	20.6	9	26.5		
Surgery unit pain						
Yes	26	76.5	7	20.6	21.254*	0.001**
No	8	23.5	27	79.4		

* Chi square test; ** p<0.05.

Table 4. Endured pain levels of patients

	Control group	Music group	Z	p	1-β
	Mean±SD	Mean±SD			
Intensive care unit					
VAS pain	6.5±2.6	4.0±2.4	3.28*	0.001**	0.982***
Surgery unit					
VAS pain (day 1)	3.7±3.3	1.2±2.2	3.16*	0.002**	0.890***
VAS pain (day 2)	3.4±3.3	0.5±1.4	3.71*	0.001**	0.999***
VAS pain (day 3)	2.9±2.8	0.4±1.5	4.01*	0.001**	0.999***

SD: Standard deviation; * Mann-Whitney U test; ** p<0.05; *** Power analysis; VAS: Visual analog scale.

Furthermore, varying outcomes on several studies can be attributed to the possible differences in culture, education status, ongoing low/high anxiety levels of patients, protocols of information systems and the duration of music therapy.

The pain endured by the patient after coronary artery surgery can affect the quality of life of the patient. Therefore, establishment of an effective pain management system after coronary artery surgery would help early mobilization of the patient and minimize the

cost and the time spent at the hospital. To achieve this, the pain level of the patient should be evaluated^[4] in which nurses play a critical role for this evaluation.^[22] While there are studies showing that music therapy has positive results on postoperative pain of coronary artery surgery patients, some other studies point out that the use of music has no effect on such patients.^[1,4,9]

The present study showed that music therapy after surgery reduced the pain among coronary artery surgery patients. Intake of analgesics would

Table 5. Comparison of physiological variables

Physiologic parameters	Control group	Music group	Z	p
	Mean±SD	Mean±SD		
On admission				
Systolic blood pressure (mmHg)	121.2±16.5	113.4±15.6	1.44	0.150
Diastolic blood pressure (mmHg)	75.3±10.5	70.0±9.8	1.70	0.089
Heart rate (min)	77.2±7.1	79.9±4.9	1.62	0.105
Respiratory rate (min)	21.1±1.7	21.5±1.4	1.10	0.273
SpO ₂ (%)	95.4±2.5	93.6±3.4	2.02	0.043*
Mean 4-hour ICU stay after extubated				
Systolic blood pressure (mmHg)	126.7±12.7	121.3±10.8	1.65	0.099
Diastolic blood pressure (mmHg)	63.7±8.6	62.1±8.7	0.60	0.552
Heart rate (min)	91.1±10.4	91.4±11.0	0.28	0.783
Respiratory rate (min)	17.4±1.0	17.7±1.4	0.94	0.350
SpO ₂ (%)	96.9±1.8	97.5±2.1	2.12	0.034*
Surgery unit				
Systolic blood pressure (mmHg)	127.1±22.8	123.6±16.9	0.57	0.558
Diastolic blood pressure (mmHg)	72.0±13.6	69.0±13.2	0.51	0.608
Heart rate (min)	91.1±14.0	91.5±15.6	0.10	0.922
Respiratory rate (min)	20.7±2.0	21.0±1.7	0.45	0.650
SpO ₂ (%)	93.5±4.3	95.0±4.5	1.85	0.064
Pre-discharge				
Systolic blood pressure (mmHg)	119.4±15.9	113.8±12.3	1.50	0.135
Diastolic blood pressure (mmHg)	73.2±8.1	70.0±8.5	1.37	0.171
Heart rate (min)	85.7±8.9	86.1±10.2	0.71	0.478
Respiratory rate (min)	20.8±1.5	21.0±1.2	0.76	0.449
SpO ₂ (%)	92.2±4.0	93.4±3.7	1.39	0.163

SD: Standard deviation; SpO₂: Peripheral capillary oxygen saturation; * Mann-Whitney U test; p<0.05; ICU: Intensive care unit.

Table 6. Type and amount of analgesics

Analgesic	Intensive care unit						Surgery unit							
	Control group		Music group		Z	p	1-β	Control group		Music group		Z	p	1-β
	n	Mean±SD	n	Mean±SD				n	Mean±SD	n	Mean±SD			
Opioid† (IV/IM)	27	3.3±2.3	20	1.6±0.9	3.18	0.001*	0.976**	1	2.0±0.0	–	–	1.63		
NSAI‡ (IM)	34	7.6±3.2	34	4.0±1.9	4.55	0.001*	0.999**	19	7.0±3.4	29	4.5±2.2	2.82	0.005*	0.949**
Paracetamol§ (PO)	–	–	–	–				15	6.1±3.0	6	4.2±1.3	1.42	0.15	

SD: Standard deviation; IM: Intramuscular; IV: Intravenous; NSAID: Nonsteroidal antiinflammatory drug; PO: Peroral; * Mann-Whitney U test; p<0.05; † Tramadol hydrochloride 100 mg/2 cc IV/IM; ** Power analysis; ‡ Dexametopfen Trometamol 50 mg/2 cc vial IM; § Paracetamol 500 mg tablet peroral.

not affect this finding, since the control and music groups received the same analgesics. This finding is also consistent with other studies which examined the effects of music on pain in patients undergoing cardiac surgery.^[3,4,9] Several studies revealed decreased pain levels in the music group among open heart surgery patients.^[4,9] Mirbagher Ajorpaz et al.^[23] investigated the effects of instrumental music on postoperative pain in open heart surgery patients using VAS to measure pain. The authors found that music group had a positive effect on patient’s perception of pain (p=0.04). Similarly, Kshetry et al.^[3] showed that pre- and post-treatment pain scores significantly decreased in the complementary alternative medical therapy group on the first (p=0.01) and second (p=0.038) postoperative days.

Moreover, one of the most critical complications of coronary artery surgery is pressure on air circulation due to pulmonary dysfunction.^[24] The main goal of the care and treatment after coronary artery surgery is recovery of the patient from anesthesia, extubation, and assisting the patient for natural spontaneous respiration.^[24] Coughing and deep breathing frequency drastically decrease due to the sternotomy and chest drains-related pain after extubation. Music therapy is applied by nurses during a painful condition to maintain and improve the physical and mental health thanks to its easy-to-use application.^[24] In our study, the mean SpO₂ value of the music group patients in the ICU was statistically significantly increased (p<0.05). It was associated with the application of music, which also decreased the pain and anxiety levels and, thus, further assisted the respiratory system to return normal. These results are consistent with the previous findings, indicating that music therapy increased the value of SpO₂ values.^[4,9]

In addition, analgesics yield 80 to 85% effectiveness, when used on time and at an appropriate dose in acute and chronic pain management.^[25] Therefore, analgesics are recommended to be administered on a regular

basis before the pain starts.^[25] In the current study, there was a statistically significant difference in the amount of opioids (p=0.04, p<0.05) and NSAIDs (p=0.02, p<0.05) during the ICU stay between the groups. During the surgery unit stay, the amount of NSAIDs (p=0.05, p<0.05) statistically significantly reduced in the music group. The use of analgesics was also evaluated in several studies. Sendelbach et al.^[8] found no differences in the use of opioids and length of stay between the groups. Similarly, in his randomized controlled study, Nilsson^[1] demonstrated no difference in pain and the amount of analgesics between the groups. However, Engwall et al.^[26] reported significantly lower cumulative consumption of opioids in the music group, compared to the controls. In all these studies, the postoperative music group required less morphine after one hour in the music therapy groups, compared to the controls.

One of the limitations of this study is that it was done at only one hospital with a small sample. The second limitation, on the other hand, is that the measurable parameters of anxiety were not analysed.

In conclusion, when used in combination with conventional pharmacological interventions, music therapy reduces pain perception and the amount of analgesics during the intensive care unit and surgery unit stays of patients undergoing coronary artery surgery. Therefore, we recommend music therapy after coronary artery surgery, as an invaluable non-pharmacological pain management strategy.

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