Effect of music on anxiety, stress, and depression levels in patients undergoing coronary angiography

F. Moradipanah,[1] E. Mohammadi[1] and A.Z. Mohammadil[2]

تأثير الموسيقى على مستويات القلق والكَرب والاكتئاب لدى المرضى الذين يُجرى لهم تصوير الأوعية التاجيَّة

فرشتة مرادي بناه، عيسى محمدي، علي زاده محمدي

الخلاصـة: يُعَدُّ التحكم بالكَرب والقلق وبث الشعور بالارتياح بين المرضى من التحدِّيات التي يواجهها الأطباء أثناء القثطرة التاجيَّة. وتهدف هذه الورقة لعرض دراسة حالات وشواهد استقصت تأثير الموسيقى على مستويات القلق والكرب والاكتئاب الذي يعاني منه المرضى أثناء إجراء تصوير الأوعية التاجيَّة، وذلك باستخدام سلم قياس الاكتئاب والقلق والكرب الذي يتكون من 21 بنداً وقد أظهرت الفروق بين الأحراز المسجّلة قَبل وبعد التدخُّل أن هناك نقصاً يُعتَدُّ به إحصائياً في الأحراز الخاصة بالقلق لدى الرجال (قيمة الاحتمال 0.0006) وبالكَرب لديهم (قيمة الاحتمال 0.001) وبالاكتئاب لديهم (قيمة الاحتمال 0.02) في مجموعة التداخُل، ممن استمعوا إلى 20 دقيقة من الموسيقى التي تبعث على الاسترخاء، وذلك بالمقارنة مع مجموعة شاهدة ممن سمح لهم بالخلود للراحة لمدة عشرين دقيقة.

ABSTRACT Control of stress and anxiety and the promotion of comfort are challenges facing health practitioners involved in catheterization. The aim of this case–control study was to examine the effect of music on the levels of anxiety, stress, and depression experienced by patients undergoing coronary angiography, as measured by the 21-item Depression Anxiety Stress Scales. Differences in pre- and post-intervention scores demonstrated that there were significant decreases in mean scores of state anxiety (***P*** = 0.006), stress (***P*** = 0.001) and depression ***P*** = 0.02) in the intervention group, who listened to 20 minutes of relaxing music, as compared with the control group who had 20 minutes of bed rest.

Effets de la musique sur les niveaux d'anxiété, de stress et de dépression chez des patients subissant une angiographie coronarienne

RÉSUMÉ Le contrôle du stress et de l'anxiété et les mesures visant à assurer le confort sont des défis que doivent relever les professionnels de la santé concernés par le cathétérisme. L'objectif de cette étude cas/témoins était d'examiner les effets de la musique sur les niveaux d'anxiété, de stress et de dépression ressentis par les patients subissant une angiographie coronarienne, en les mesurant à l'aide de l'échelle DASS (***Depression Anxiety Stress Scales***) composée de 21 items. Les différences entre les scores avant et après l'intervention ont montré une baisse significative des scores moyens d'anxiété-état (***P*** = 0,006), de stress (***P*** = 0,001) et de dépression (***P*** = 0,02) dans le groupe qui avait écouté une musique relaxante pendant 20 minutes, par rapport au groupe témoin qui était simplement resté alité pendant 20 minutes.

[1]Department of Nursing, Tarbiat Modares University, Tehran, Islamic Republic of Iran (Correspondence to E. Mohammadi: mohamade@modares.ac.ir).
[2]Department of Social Medicine, Shahid Beheshti Medical Sciences University, Tehran, Islamic Republic of Iran.
Received: 20/11/06; accepted: 11/01/07

Introduction

Coronary angiography is a common invasive procedure for diagnosis of cardiovascular diseases which can be acutely stressful for many patients [*1*].

The current study investigated a safe and noninvasive nursing intervention [*2*] to reduce stress and anxiety in patients undergoing coronary angiography. Art, dance and music therapy are becoming an important part of complementary medicine. These creative arts therapies can contribute to all areas of health care and most psychological and physiological illnesses [*3*]. Music therapy is the therapeutic use of music and musical activities in the treatment of somatic and mental diseases. In the past few decades it has developed from a quasi-professional working field into an increasingly evidence-based treatment for various diseases [*4*]. Application of music therapy is based on Rogers' Science of Unitary Human Beings theory [*5*].

Studies exploring the effectiveness of music therapy have produced different results. Some have indicated that music therapy reduced stress and anxiety in the patients [*6–10*], but others have found no effect of music intervention on post-procedural pain and anxiety, although music therapy improved the level of comfort in patients [*1,11*]. Gallagher et al. indicated that music therapy is invaluable in palliative medicine [*12*]. The existing studies are difficult to interpret since some of them provided conflicting results. Furthermore, most of the studies did not examine the levels of anxiety and stress on pre-operative patients, whereas much of the research over the past decades has shown that anxiety and stress levels are raised before surgery.

Therefore, the present study in the Islamic Republic of Iran examined the following question: Do patients undergoing coronary angiography who listen to music for 20 minutes have less stress, anxiety and depression prior to and after angiography than those who do not listen to music?

Methods

Study design

This study was a randomized controlled trial with a pre-intervention–post-intervention design with a music therapy intervention group ($n = 37$) and a control group ($n = 37$). The study was conducted as a randomized clinical trial to limit sampling errors. The study was conducted in 2005.

Sample

The study sample was patients who were scheduled for coronary angiography at a university hospital in Tehran. Patients who were undergoing angiography and met the inclusion criteria were invited to participate. All participants gave their informed consent prior to entering the study. Patients with the following characteristics were eligible for inclusion in the study: aged 40–60 years; scheduled for angiography for the first time; had no auditory deficits or psychological disorders; able to hear music; able to use a cassette player independently; and interested in listening to music. Using a wristwatch the Tick-Tock test was carried out to diagnose hearing impairments, and psychological disorders were detected by a neurologist. Patients were excluded from the study if they were receiving narcotic analgesics, antidepressants or antianxiety drugs, as these may decrease cognitive ability and inhibit the ability to use a cassette player, thereby diminishing accurate measurement of the independent variable. Furthermore, these drugs reduce stress, anxiety and depression, and might influence the exact measurement of the dependent vari-

able. Respondents were asked to document the use of analgesic agents administered in conjunction with the procedure.

By using Altman's nomogram, a sample size of 74 (37 patients in each group) was necessary to give the study 90% power to detect a clinical difference of 3 points with a standard deviation (SD) of 1 in each of the groups. A nonprobability convenience sample of 74 patients was obtained and participants were randomly allocated to the music intervention or control group depending on the admission date for angiography. Patients admitted on even-numbered days were allocated to the music group and patients admitted on odd-numbered days were assigned to the control group. It should also be noted that hospital admissions were offered randomly throughout the days of the week and there was no specific day allotted to certain patients. The nursing staff and the shift work system were not changed during the study period. Admissions to the catheterization laboratory were capped at 4 to 5 patients per day and patients were discharged 24 hours after completion of the procedure.

Data collection

The short-form of the Depression Anxiety Stress Scales (DASS-21) was used to measure the level of depression, anxiety and stress. DASS is a reliable and valid method of assessing features of depression, anxiety and stress in clinical and nonclinical groups. It includes items that measure symptoms typically associated with dysphoric mood (e.g. sadness or worthlessness). The DASS-21 consists of 21 items, 7 in each of the subscales: depression (DASS-21-D), anxiety (DASS-21-A) and stress (DASS-21-S), rated on a 4-point scale from 3 "applied to me very much or most of time" to 0 "did not apply to me". Antony et al.'s estimates of the reliability of the DASS-21 gave Cronbach alpha scores of 0.94, 0.87 and 0.91 for the depression, anxiety and stress sub-scales respectively [*13*]. Our computed values of Cronbach alpha were considered adequate with 0.94, 0.92 and 0.89 for depression, anxiety and stress respectively.

The music group was given a tape player and a music cassette which was prearranged by the researcher; all the participants affirmed that they took pleasure from music. The 20-minute tape consisted of 3 relaxing pieces of music: "*Canon in D*" composed by Johann Pachelbel; the theme from "*Love story*" played by Richard Clayderman and "*Dance of the iguana*" by Stevan Pasero. All the 3 pieces of music had 70–80 beats per minute and were based on slow and steady rhythms. The most relaxing music had a tempo of approximately 60–80 beats per minute [*14*]. The tape was played through earphones from a cassette player.

The patients were required to arrive at the hospital at least 1.5 hours before the angiography procedure. Before angiography, all participants completed the pre-intervention DASS-21. Then participants in the music group were asked to sit in a comfortable bed and avoid any distractions such as reading, speaking on the telephone, listening to the radio or watching television. They were instructed to listen to the 20-minute music tape and then complete the post-intervention DASS-21. Instead of the music intervention, the control group was asked to sit in a relaxed position in a quiet comfortable bed for 20 minutes and avoid distractions including telephones, radio and television; however they were allowed to read newspapers, books or magazines. After 20 minutes of music or 20 minutes of bed rest all participants completed the post-intervention DASS-21 before undergoing angiography. After the angiography, all participants repeated the pre-intervention DASS-21 immediately after transferring to

the recovery ward. Then the music group listened to the same music tape and repeated the post-intervention DASS-21, while the control groups had 20 minutes of bed rest before repeating the post-intervention DASS-21.

Patient's stress, depression and anxiety levels might be influenced by sudden changes in haemodynamics and psychological status. Therefore, while participants were receiving needed routine care, any homodynamic and psychological changes affecting the patient's stress, depression and anxiety levels were observed and if there was excessive emotional tension or unpleasant news the patient was excluded from the study.

Because some physicians informed their patients about the angiography results and this could have influenced the level of stress, anxiety and depression, we added a question about whether the patient had received the result of the angiography test, and if so, whether the test result was normal or abnormal.

Ethical considerations

Ethical approval for the study was obtained from the institutional review board to ensure protection of human subjects. All participants gave written informed prior to their participation.

With respect to patient's confidentiality, numbers were used to identify participants rather than names. Participants were informed that their participation was voluntary, they had the right to withdraw at any time without needing to give a reason and that their care would not be affected whether or not they took part.

Data analysis

Data were analysed using *SPSS*, version 11. The independent sample *t*-test and chi-squared tests were calculated to determine any significant differences in the demographic distributions of the 2 groups.

For each patient, the pre-intervention score was subtracted from post-intervention score and the mean values of the resulting scores were calculated to verify if these mean values were significantly different between the intervention and control groups. The pre-intervention group mean scores were also compared to the post-intervention group mean scores to determine if there was a difference between the group mean test scores. *t*-tests were conducted to determine whether there was a significant difference between pre- and post-intervention scores of individuals in both groups before and after angiography.

Results

The difference in the distribution of demographic characteristics between the 2 groups was not statistically significant (Table 1). The control and music groups had the same mean age: 50.6 (SD 7.1) years versus 50.6 (SD 5.8) years. There was no significant difference in the sex distribution (15 men and 22 women in the control group and 22 men and 15 women in the music group).

The findings and *t*-test results are summarized in Table 2 for the control and intervention groups before and after angiography. Before angiography, descriptive statistics showed that the pre-intervention mean scores were similar in the music intervention group and the control group for stress [11.35 (SD 4.31) versus 11.00 (SD 4.94)], for anxiety [6.83 (SD 4.14) versus 6.81 (SD 4.29)] and for depression [6.59 (SD 4.55) versus 5.86 (SD 4.19)]. The post-intervention mean scores after the music intervention, however, were lower in the music group than the control group for stress [6.16 (SD 4.98) versus 8.7 (SD 4.89)],

Table 1 **Demographic characteristics of patients in the music intervention and control (no intervention) groups**

Characteristic	Control group (*n* = 37)		Intervention group (*n* = 37)	
	Mean	**SD**	**Mean**	**SD**
Age (years)	50.6	7.1	50.6	5.8
Duration of disease (months)	15.2	15.1	12.2	14.9
Daily use of music (min/day)	49.4	62.4	69.4	80.2
	No.	**%**	**No.**	**%**
Sex				
Male	15	40.5	22	59.5
Female	22	59.5	15	40.5
Marital status				
Married	330	89.2	4	10.8
Single	31	83.8	6	16.2
Literacy				
Illiterate	12	32.4	12	32.4
Diploma and below	22	59.4	20	54.0
Higher education	3	8.1	5	13.5
History of hospitalization				
Yes	29	78.4	27	73.0
No	8	21.6	10	27.0

Because of rounding, not all percentages total 100.
SD = standard deviation.

for anxiety [4.13 (SD 3.81) versus 6.10 (SD 3.71)] and for depression [4.40 (SD 4.42) versus 5.02 (SD 3.79)]. These differences in mean values of pre- to post-intervention changes between both groups before angiography were statistically significant: for stress (P = 0.001), for anxiety (P = 0.006) and for depression (P = 0.02). Anxiety, depression and stress scores among the music group were significantly reduced pre- to post-intervention, while the control group reported about the same level of pre-intervention and post-intervention stress, anxiety and depression on the DASS-21 administered before angiography.

After angiography, mean scores for stress, anxiety and depression were lower in both groups and these were similar comparing the music intervention and control groups (Table 2). The results of the *t*-test showed no statistically significant differences between the music and control groups with respect to the changes between pre- and post-intervention mean scores on the stress (P = 0.14), anxiety (P = 0.94) and depression (P = 0.48) scales.

The data showed no relationship between the demographic characteristics of the groups and the stress, anxiety and depression levels (data not shown).

The results showed that the group that was informed of the angiography results experienced lower stress, anxiety and depression levels than the group that was not informed. There was a significant difference between the informed group and the non-informed group in the mean scores after angiography for stress (t = –2.4, df =

orted DASS-21 pre-and post-intervention scores in the music intervention and control (no intervention) giography

rol up (SD)	Intervention group Mean (SD)	Before angiography Pre-/post-comparison t-test[a]	P-value	Difference in means	Control group Mean (SD)	Intervention group Mean (SD)	After angiography Pre- /post-comparison t-test[a]	P-value	Difference in means
		–3.51	0.001	–2.89			–1.49	0.14	–0.81
4.94)	11.35 (4.31)				5.89 (5.15)	3.91 (4.44)			
4.89)	6.16 (4.98)				5.54 (4.43)	4.37 (4.32)			
		–2.83	0.006	–2.00			–0.06	0.94	–2.70
4.29)	6.83 (4.14)				4.32 (4.23)	2.83 (3.55)			
3.71)	4.13 (3.81)				3.81 (3.23)	2.35 (2.46)			
		–2.37	0.02	–1.35			–0.69	0.48	0.29
4.19)	6.59 (4.55)				4.72 (5.00)	4.05 (4.75)			
3.79)	4.40 (4.42)				4.67 (3.59)	3.70 (3.55)			

nxiety Stress Scales; SD = standard deviation.

72, $P = 0.01$), anxiety ($t = –2.67$, d.f = 72, $P = 0.01$) and depression ($t = –1.9$, df = 72, $P = 0.05$). Also, the groups informed of the angiography results (normal or abnormal reports) had the same stress and anxiety in the study period. Although there was no significant difference between the group receiving normal results and the group receiving abnormal results in the mean scores after angiography for stress ($t = 1.92$, df = 31, $P = 0.06$, $n = 33$) and anxiety ($t = 1.1$, df = 31, $P = 0.27$, $n = 33$), there was a significant difference in depression ($t = 2.15$, df = 31, $P = 0.04$, $n = 33$).

Overall, the findings from both the music and control groups showed that the group that received the music intervention experienced a decrease in stress, anxiety and depression levels before undergoing cardiac angiography, whereas those without music did not. Conversely, after the angiography procedure, no significant differences were apparent between the groups in the 3 measured parameters of the DASS-21.

Discussion

The purpose of this study was to examine the effect of music as a nursing intervention on the levels of anxiety, stress, and depression experienced by patients undergoing a coronary angiographic procedure.

Our results revealed positive out-