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Sedative music reduces anxiety and pain during chair rest after open-heart surgery

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Abstract

Open-heart surgery patients report anxiety and pain with chair rest despite opioid analgesic use. The effectiveness of non-pharmacological complementary methods (sedative music and scheduled rest) in reducing anxiety and pain during chair rest was tested using a three-group pretest–posttest experimental design with 61 adult postoperative open-heart surgery patients. Patients were randomly assigned to receive 30 min of sedative music ($N=19$), scheduled rest ($N=21$), or treatment as usual ($N=21$) during chair rest. Anxiety, pain sensation, and pain distress were measured with visual analogue scales at chair rest initiation and 30 min later. Repeated measures MANOVA indicated significant group differences in anxiety, pain sensation, and pain distress from pretest to posttest, $P<0.001$. Univariate repeated measures ANOVA ($P\leq 0.001$) and post hoc dependent *t*-tests indicated that in the sedative music and scheduled rest groups, anxiety, pain sensation, and pain distress all decreased significantly, $P<0.001$–0.015; while in the treatment as usual group, no significant differences occurred. Further, independent *t*-tests indicated significantly less posttest anxiety, pain sensation, and pain distress in the sedative music group than in the scheduled rest or treatment as usual groups ($P<0.001$–0.006). Thus, in this randomized control trial, sedative music was more effective than scheduled rest and treatment as usual in decreasing anxiety and pain in open-heart surgery patients during first time chair rest. Patients should be encouraged to use sedative music as an adjuvant to medication during chair rest.

Keywords: Anxiety; Postoperative pain

1. Introduction

Approximately 686,000 open-heart surgeries are completed each year in the United States (American Heart Association, 2002). As early as 8–12 h after surgery while still in the intensive care unit, patients are assisted to a sitting position in a chair (chair rest). Despite opioid medication, moderate to severe anxiety and pain have been reported during chair rest after cardiac surgery (Goodwin et al., 1999; Voss, 2001). Several investigators have found that intensive care patients (Chlan, 1998; White, 1992, 1999) who received sedative music experienced less anxiety than patients who received scheduled rest. However, other investigators have found that sedative music and scheduled rest together reduced anxiety and pain (Barnason et al., 1995; Bolwerk, 1990; Elliott, 1994; Zimmerman et al., 1988, 1996), and there was no clear advantage to either intervention. While these studies have found that sedative music and scheduled rest had positive effects on anxiety and pain in intensive care patients, the effects have not been examined in postoperative open heart patients during the first time in a chair, a maneuver that triggers an increase in

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anxiety and pain. Therefore, this study examined the effects of sedative music and scheduled rest on self-reported anxiety, pain sensation, and pain distress during 30 min of chair rest in postoperative open-heart patients.

Sedative music and scheduled rest were conceptualized as cognitive behavioral interventions that provide a way of coping with anxiety and pain (Turk and Okifuji, 1999). Thus, sedative music was expected to reduce anxiety and pain by creating a distraction or diversion of attention away from the anxiety and pain onto something more pleasant, and also to stimulate the relaxation response (Benson, 2000; Good et al., 1999, 2001). Scheduled rest was expected to reduce anxiety and pain by eliminating interruptions and reducing physical and mental work.

It was hypothesized that:

1. the sedative music group would report significantly less anxiety, pain sensation and pain distress after 30 min of chair rest than the scheduled rest group;
2. the sedative music group would report significantly less anxiety, pain sensation, and pain distress after 30 min of chair rest than the control (treatment as usual) group;
3. the scheduled rest group would report significantly less anxiety, pain sensation, and pain distress after 30 min of chair rest than the control (treatment as usual) group.

2. Methods

An experimental, pretest and posttest three-group design was used for this randomized clinical trial. A convenience sample of 62 patients was obtained from a surgical intensive care unit at a rural midwestern hospital over a period of 6 months in 2002. Eligibility criteria were first postoperative day following an open-heart surgery, morning chair rest ordered, stable condition, alert, oriented, able to follow commands, able to read, write, and understand English, at least 18 years of age, and no major hearing deficit. Patients were excluded from the study if a femoral arterial sheath remained in place after surgery, because 6–8 h of bed rest are needed to prevent hemorrhage after removal.

Nurses approached patients after surgery, and if they were interested, the investigator (first author) discussed participation in the study. Written informed consent was obtained, and participants were randomly assigned to the sedative music, scheduled rest, or control group using sealed envelopes with a varied block size prepared by the statistician. The investigator was blind to the block size and could not anticipate group assignment.

The institutional review boards of the university and the hospital approved this study prior to the enrollment of patients. The planned sample size of 96 patients (30 per group plus 6 for attrition) was based on power analysis with an estimated medium effect size 0.33 (Cohen's *f*), power 0.80, alpha = 0.05 and repeated measures analysis of variance (Stevens, 2001). However, preliminary analyses after 62 patients were enrolled revealed significant group differences and large effect sizes for anxiety, pain sensation, and pain distress; thus data collection was concluded.

2.1. Experimental interventions

Sedative music was operationalized as music without lyrics and with a sustained melodic quality, with a rate of 60–80 beats per minute and a general absence of strong rhythms or percussion (Gaston, 1951; Good et al., 2000). The volume and pitch were controlled so that the music was heard comfortably. Participants who received sedative music selected a tape from a collection prior to chair rest by listening to a 30-s excerpt of each of the selections. The collection consisted of six types of music—synthesizer, harp, piano, orchestra, slow jazz, and flute. Good (1995) developed the selections on the first five tapes in consultation with a music therapist. The synthesizer tape included new age music, the piano tape included music popular in the United States from the 1940s to the 1980s, the orchestra tape was classical music, the harp tape included both popular and new age music, and the jazz tape was slow modern jazz (Good et al., 2000). A tape featuring American Indian flute music was added to provide a culturally acceptable selection for the American Indian population served at the hospital (DeRuyter, 2000; Good et al., 2000). The music has been shown to reduce the sensation and distress of postoperative pain up to 31% in abdominal surgical patients (Good et al., 1999) and also to reduce labor pain (Phumdoung and Good, 2003).

Participants in the sedative music group received instructions for using the music from the investigator, who read a prepared script directing them to listen and follow the music and allow the music to relax and distract. After the instructions were read, the participants listened to the selected music for 30 min as they sat in the chair using soft open-air headphones and a tape player (WM-EX 190 Cassette Walkman). The type of headphones used in this study allowed outside sounds to be heard by the participant.

Participants receiving scheduled rest were given instructions to sit quietly in the chair with their eyes closed and rest for 30 min (White, 1999). For both the sedative music and scheduled rest, the environment was enhanced to reduce stimuli and facilitate chair rest by unplugging the phone, closing the blinds, dimming the lights, closing the door, and posting a sign to prevent being disturbed by visitors and health care personnel. Participants in the control group sat in the chair and engaged in activities as usual for 30 min without intervention or environmental manipulation by the investigator.

For all three groups, the investigator stayed unobtrusively in the room behind the participant and documented interruptions such as visitors and nursing care and for the music group, reliable use of the music intervention. All participants were assisted to chair rest, which was defined as

sitting in a chair with a back elevation of 45–90 degrees and the lower extremities in either a dependent position with the feet resting on the floor or elevated on a foot rest.

2.2. Measures

Anxiety was defined as feelings of tension, apprehension, nervousness, and worry (Spielberger, 1983; Wewers and Lowe, 1990). Anxiety about chair rest was measured with a visual analogue scale (VAS), a 100-mm horizontal line anchored at either end by descriptive words (*not anxious about chair rest* to *most anxiety imaginable*). The participants were instructed to mark the line at the point representing the degree of their anxiety about chair rest. The VAS was scored by measuring in millimeters the distance from the side marked *not anxious about chair rest* to the edge of the mark made by the participant. Possible scores ranged from a minimum of 0 to a maximum of 100 mm.

Concurrent validity of the VAS to measure self-reported anxiety was demonstrated when scores on this instrument were compared to Spielberger's (1983) State Anxiety Inventory (SAI): a strong positive correlation was found between the SAI and the VAS in 56 critical care patients with unstable angina pectoris or acute myocardial infarction ($r=0.70$) (Elliott, 1993). In a pilot study for the current work, using 10 postoperative cardiac patients, the SAI and the VAS were moderately correlated ($r=0.41$) (Voss, 2001). Voss (2001) reported test–retest reliability correlations of $r=0.82$ for repeated measurements of anxiety using the VAS with these 10 cardiac surgery patients. The measurements were obtained at two points with a 15-min interval between them. This time frame was appropriate for testing transient anxiety because the patients were seated in a chair without any interventions.

Pain was defined as an unpleasant sensory and affective experience. Pain sensation has been defined as the intensity of unpleasant physical perception of discomfort, while pain distress is the emotional distress associated with the sensation (Good, 1996; Johnson, 1973). Pain sensation and pain distress were measured with dual VAS scales. These were 100 mm horizontal lines with anchors of *no sensation of pain* and *most pain sensation imaginable* and *no pain distress* and *most pain distress imaginable*. The scales were marked and scored in a manner similar to the anxiety VAS scales with the same range, from 0 to 100 mm.

The construct validity of pain sensation and pain distress was supported by Johnson (1973), who found that patients could differentiate between them during induced ischemic pain. In a recent study, Good et al. (1999, 2001) compared Johnson's (1973) numeric rating scales (NRS) to VAS scales for pain sensation and distress and found high correlations, between $r=0.85$ and 0.92 for pain sensation and $r=0.91$ and 0.92 for pain distress, at five time points (Good et al., 2001). Test–retest reliability of the VAS measures of pain sensation and distress with postoperative cardiac patients ($N=10$) was established at two time points during chair rest, $r=0.66$ and 0.84, respectively (Voss, 2001).

2.3. Procedure

To reduce the potential for bias, the participants were in private rooms in the intensive care unit and did not have an opportunity to discuss their involvement in the study with each other. In addition, a standardized protocol was followed, and all participants were tested for the same amount of time during the morning hours.

Prior to chair rest, the investigator read instructions for completing the VAS scales to each participant, to assure consistency in administration of the instructions. The staff nurses assisted the participant to a sitting position with legs over the side of the bed for 1–2 min. The participant performed ankle exercises, followed by a pivot transfer to a chair. The participant's personal care needs (i.e. coughing, oxygen administration, hydration) were met prior to the testing period. After being positioned in the chair, the participant completed the VAS scales for anxiety about chair rest, pain sensation, and pain distress. Each VAS scale was presented to the participant individually and took 30–60 s to complete. In the sedative music and scheduled rest groups, the investigator recorded eye opening and body movements. After 30 min of chair rest, participants completed the posttest VAS scales for anxiety about chair rest, pain sensation, and pain distress. In addition, the investigator asked the participants in both intervention groups questions about their experiences with the interventions.

3. Results

Ninety-five patients were assessed for eligibility for the study between June and November 2002 (see Fig. 1). Twenty-seven patients (28%) did not meet the inclusion criteria, and six patients (6%) refused to participate. Sixty-two patients were randomized to receive sedative music (music group), scheduled rest (rest group) or treatment as usual (control group). Although all patients who were enrolled completed the study (see Fig. 1), one participant in the music group was identified as an outlier for extreme pain and mild respiratory distress and was dropped from the analyses. The analyses were by intention to treat with 19/20 in the music group, 21/21 in the rest group, and 21/21 in the control group.

The final sample ($N=61$) had a mean age of 63 years, SD 13, and the majority were male (64%). Although most patients were white ($N=53$, 87%), eight (13%) were American Indian. Most ($N=49$, 80%) had undergone coronary artery bypass grafting (CABG) procedures. Other surgical procedures included valvular repair (14%), replacement of pulmonary homograft (2%), resection of atrial myxoma (2%), and resection of a right coronary artery

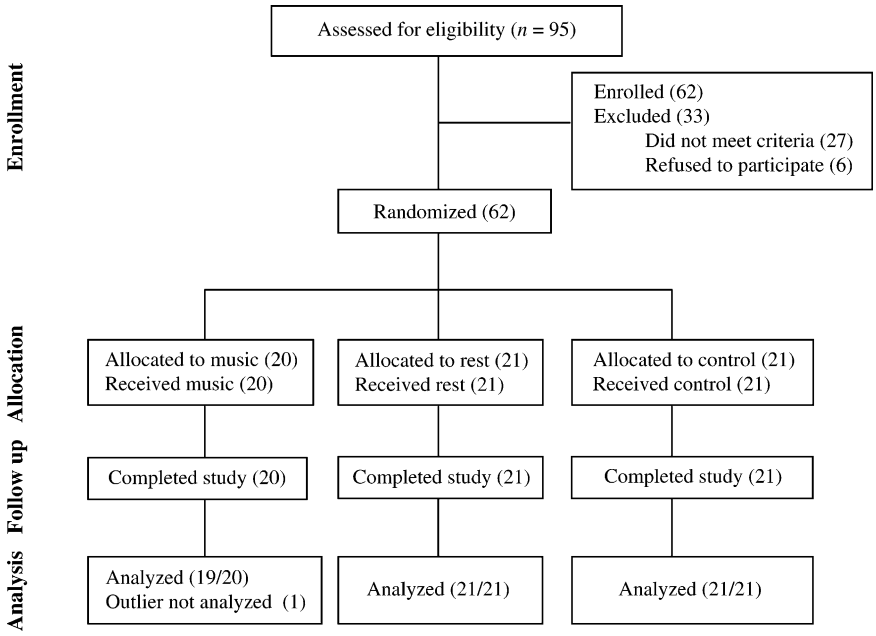

Fig. 1. Intent to treat. Flow diagram of the progress through the phases of the randomized trial (i.e. enrollment, intervention allocation, follow-up, and data analysis). There was one outlier removed from the music group.

aneurysm (2%). Chest tubes were removed in nearly three-fourths prior to chair rest, $N=44$, 72%. Only a few reported previous use of music for relaxation ($N=7$, 11%). There were no significant differences between the three groups on any of these characteristics. Morphine equivalents administered in the three groups are described in Table 1. The mean morphine equivalents administered within 4 h of chair rest was 16.4 (SD 9.2) for the sample. No significant difference was found between the three groups for morphine equivalents administered in the 4 h prior to chair rest. There were also no significant associations between potential confounding variables (age, gender, race, surgical procedures, prior use of music for relaxation, and morphine equivalents) and baseline anxiety, pain sensation, or pain distress. Therefore, these variables were not used as covariates.

3.1. Dependent variables and baseline differences

Mean pain sensation and distress were moderate in all three groups at pretest with wide standard deviations; all three symptoms decreased in the music and rest groups, but became mild only in the music group at posttest (Table 2).

Table 1
Mean morphine equivalents ($N=61$)

	Sedative music ($N=19$)		Scheduled rest ($N=21$)		Control ($N=21$)	
	M	SD	*M*	SD	*M*	SD
Morphine equivalents	18.2	8.6	15.4	9.2	15.8	9.9

Morphine equivalents received within the 4 h prior to chair rest.

In the music group, the standard deviations decreased by half at posttest, but they remained wide in the rest and control groups.

Baseline anxiety, pain sensation, and pain distress were all positively significantly correlated (anxiety and pain sensation, $r=0.37$, $P=0.01$; anxiety and pain distress, $r=0.53$, $P=0.01$; and pain sensation and pain distress, $r=0.83$, $P=0.01$), so MANOVA was used; there were no significant overall differences at baseline. However, univariate ANOVA indicated significantly more anxiety in the music group, $F(2, 58)=3.43$, $P=0.04$, though no differences in pain sensation or pain distress.

3.2. Hypothesis testing

Because the assumption of homogeneity of regression for MANCOVA was not met (i.e. the interaction of group

Table 2
Means of anxiety, pain sensation, and pain distress ($N=61$)

Variable	Sedative music ($N=19$)		Scheduled rest ($N=21$)		Control ($N=21$)	
	M	SD	*M*	SD	*M*	SD
Anxiety						
Pretest	63	21	47	28	43	24
Posttest	13	9	33	26	48	32
Pain sensation						
Pretest	47	25	49	25	46	25
Posttest	19	13	40	28	45	27
Pain distress						
Pretest	55	29	49	29	44	25
Posttest	15	13	38	31	49	28

Mean pretest and posttest scores as measured on visual analogue scales with ranges from 0 to 100 mm.

Table 3
Post hoc comparison from pretest to posttest ($N=61$)

Scores	Group	Paired differences		t	df	P	95% Confidence interval	
		M	SD				Lower	Upper
Anxiety	Music	50	23	9.58	18	<0.001*	38.6	60.4
	Rest	14	18	3.70	20	0.001*	6.2	22.3
	Control	−5	23	−0.89	20	0.383*	−14.6	5.9
Pain sensation	Music	28	22	5.30	18	<0.001*	16.5	38.1
	Rest	9	15	2.67	20	0.015*	1.9	16.0
	Control	1	23	0.25	20	0.806*	−9.1	11.6
Pain distress	Music	40	34	5.08	18	<0.001*	23.1	55.7
	Rest	11	17	2.90	20	0.008*	3.0	18.2
	Control	−5	20	−1.04	20	0.312*	−13.8	4.6

Bonferroni's adjustment for multiple comparisons (*$P<0.017$).

and pretest anxiety was significant, $P=0.002$), a repeated measures MANOVA was used in the statistical analyses. This showed a significant interaction effect (group by time) on the three dependent variables taken together (anxiety, pain sensation, and pain distress), Wilks' Lambda, $F(6, 112)=10.36$, $P<0.001$, partial $\eta^2=0.36$, observed power 1.0. The univariate repeated measures ANOVA also indicated interaction effects for each of the three dependent variables, anxiety, $F(2, 58)=33.78$, $P<0.001$, partial $\eta^2=0.54$, pain sensation, $F(2, 58)=8.46$, $P=0.001$, partial $\eta^2=0.23$, and pain distress, $F(2, 58)=16.70$, $P<0.001$, partial $\eta^2=0.37$, observed power 1.0. Post hoc pretest to posttest comparisons using dependent t-tests with Bonferroni's adjustment for multiplicity are shown in Table 3. The music and rest groups both reported significantly less anxiety, pain sensation, and pain distress at posttest than at pretest ($P<0.017$). No significant pretest to posttest difference was found in the control group.

To test posttest group differences, independent t-tests were conducted using separate variance estimates and Bonferroni's adjustment. This post hoc strategy was chosen over Tukey's pairwise method because of significant heterogeneity of variance in the dependent measures at posttest. The music group reported significantly less anxiety, pain sensation, and pain distress after 30 min of chair rest than either the rest group or the control group ($P<0.017$). Therefore, Hypotheses 1 and 2 were supported (Table 4). However, the rest group did not report significantly less anxiety, pain sensation, or pain distress than the control group. Thus, Hypothesis 3 was not supported.

3.3. Additional findings

Anecdotal notes were made by the investigator during data collection and interviews were conducted with the patients in the music and rest group after data collection ended. Most participants (16 of 19) in the music group remained quiet with eyes closed during the 30 min. In contrast, the patients who received scheduled rest shifted position (9 out of 21), opened their eyes occasionally (13 out of 21), and reported hearing noises from the hallway (6 out of 21) during the 30 min of rest. When interviewed later, nearly half (47%) of the music group reported using the sedative music to both relax and distract while sitting in the chair; nearly half used it just to relax (47%); and only a few used it for distraction alone (6%). Among patients in the music group, all five American Indians selected the flute music, while White patients selected among the other five selections (orchestra, $N=4$; slow jazz, $N=3$; harp, $N=3$; piano, $N=2$; and synthesizer, $N=2$). No adverse events (e.g. fatigue, psychological discomfort) occurred for any of these patients from either interventions or completing the VAS scales.

Table 4
Post hoc comparisons between posttest means ($N=61$)

Score	Group comparisons	Differences		t	df	P	95% Confidence interval	
		M	SE				Lower	Upper
Anxiety	Music vs rest	20	6.1	−3.24	25.5	0.003*	−32.3	−7.2
	Music vs control	35	7.4	−4.64	23.7	<0.001*	−49.4	−18.9
	Rest vs control	15	9.1	−1.59	40.0	0.121*	−32.7	3.9
Pain sensation	Music vs rest	21	6.8	−3.00	29.4	0.006*	−34.2	−6.3
	Music vs control	26	6.6	−3.88	30.0	0.001*	−39.1	−12.2
	Rest vs control	5	8.4	−0.64	40.0	0.527*	−22.4	11.7
Pain distress	Music vs rest	23	7.5	−3.05	27.7	0.005*	−38.3	−7.5
	Music vs control	34	6.9	−4.87	29.2	<0.001*	−47.8	−19.6
	Rest vs control	11	9.2	−1.17	40.0	0.248*	−29.5	7.8

Degrees of freedom adjusted for unequal variance. Bonferroni's adjustment for multiple comparisons was used. *$P<.017$.

4. Discussion

The clinical significance or the magnitude of the difference between groups for these findings is evident in the consistent graded effect between the three groups on all posttests (i.e. music > rest > control). Following chair rest, patients in the music group had 72% less anxiety, 57% less pain sensation, and 69% less pain distress than the control group who received the chair rest as usual (Table 5). Further, patients in the music group had 59% less anxiety, 51% less pain sensation, and 60% less pain distress than patients who received scheduled rest. Thus, sedative music had a large effect when compared to both usual chair rest (Cohen's $d > 1.0$) and scheduled rest (Cohen's $d > 0.90$). Scheduled rest did not result in significantly less anxiety and pain sensation or pain distress than chair rest as usual, but differences were in the expected direction with small to medium effects (Cohen's $d = 0.20$–0.45).

The large effects for those who used sedative music may be attributable to having something more pleasant to concentrate on or something to distract their minds from the pain and help them relax their bodies. Without the sedative music, those in the scheduled rest group had much smaller reductions in anxiety and pain (Table 3). Patients who received usual chair rest experienced anxiety and pain that did not change significantly from baseline.

The current study is consistent with the findings from previous studies that sedative music was more effective than scheduled rest or usual treatment in reducing anxiety in moderately to highly anxious patients in intensive care (Bolwerk, 1990; Chlan, 1998; White, 1992, 1999). In addition, Good et al. (1999) found that abdominal surgical patients ($N = 500$) who used music had less pain sensation (ES 0.17–0.23, Cohen's d) and distress (ES 0.19–0.25, Cohen's d) after 15 min of rest in bed and after 10 min in bed following ambulation on postoperative days 1 and 2. However, the effect sizes were larger in the current study than in the study by Good et al. (1999).

The postoperative patients in the current study had moderate to high anxiety prior to sedative music or scheduled rest, and both interventions significantly decreased anxiety. Thus, these interventions appear effective in patients with moderate to high anxiety. Studies that have not found significant effects on pain (Heiser et al., 1997; Heitz et al., 1992; Mullooly et al., 1988; Taylor et al., 1998) or have found mixed results (Good and Chin, 1998) had small sample sizes with inadequate power to detect significant differences. The lack of significant findings in some studies may have been related to the suddenness of pain experienced during chest tube removal (Broscious, 1999) or upon awakening from surgery (Mullooly et al., 1988; Taylor et al., 1998), when patients may have had difficulty focusing on the music intervention. Experts have suggested that sedative music is more effective if the patient is able to concentrate on the intervention (Broscious, 1999; Good et al., 1999). In the current study, chair rest provided an opportunity for patients to concentrate on the sedative music for 30 min, which may have contributed to its effect.

The findings support the study's conceptual framework. Sedative music, a cognitive–behavioral intervention, provided the patient with a more adaptive way of responding to anxiety and pain (Turk and Okifuji, 1999). Although patients in the scheduled rest group had a quiet, uninterrupted period with less motor and mental work than patients who received chair rest as usual, scheduled rest was not as effective as a cognitive–behavioral intervention, perhaps because patients continued to focus on their anxiety and pain.

4.1. Study limitations

The study involved only patients who had open-heart surgery in a rural hospital setting. Also, factors such as previous experience with open-heart surgery (or any surgery), previous pain experiences, chronic pain, and preoperative state anxiety were not measured or controlled, and these may have affected the results. Finally, the investigator remained in the room during the 30 min for all groups to unobtrusively obtain data on interruptions and the reliability of music intervention use, and this may have affected patient responses.

4.2. Implications for future research and clinical use of music therapy

Future research should continue to test the effects of music for patients with anxiety and pain. In addition, research is needed on the optimal length for a music session and the effect of repeated sessions on postoperative anxiety and pain.

Table 5
Clinical significance of sedative music and scheduled rest

Groups	Anxiety		Pain sensation		Pain distress	
	ES	% Less	ES	% Less	ES	% Less
Music < control	1.06	72	0.96	57	1.19	69
Music < rest	0.76	59	0.73	51	0.73	60
Rest < control[a]	0.45	30	0.20	12	0.38	22

Clinical significance is the magnitude of difference between the groups. ES, Effect size; % less, the percent less posttest anxiety and pain in the intervention groups (music or rest). Observed effect size was calculated by Cohen's d (the difference between posttest means divided by the pooled standard deviation).
[a] Differences were not statistically significant for the comparison between the rest and control groups.

From a clinical perspective, sedative music is low risk, and it is therefore recommended as an adjunct to pain medication to relieve anxiety and pain during chair rest for postoperative cardiac patients. Music should be of a sedative quality, and patients should be offered a choice of music that includes culturally appropriate selections. Scheduled rest has been used in some clinical settings as a way to reduce the anxiety and pain of chair rest, but in this study, it was no more useful than usual care.

4.3. Summary

In conclusion, these findings strongly support the use of sedative music in combination with pharmacological treatment to reduce anxiety and pain during early activities such as chair rest after open-heart surgery. In this study, anxiety, pain sensation, and pain distress were significantly less in the patients who received sedative music. Health care providers should feel confident in using music for post-operative open-heart patients and should try it with other patients to decrease anxiety and pain.

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