Effect of music on power, pain, depression and disability

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Aim. This paper reports a study testing the effect of music on power, pain, depression and disability, and comparing the effects of researcher-provided music (standard music) with subject-preferred music (patterning music).

Background. Chronic non-malignant pain is characterized by pain that persists in spite of traditional interventions. Previous studies have found music to be effective in decreasing pain and anxiety related to postoperative, procedural and cancer pain. However, the effect of music on power, pain, depression, and disability in working age adults with chronic non-malignant pain has not been investigated.

Method. A randomized controlled clinical trial was carried out with a convenience sample of 60 African American and Caucasian people aged 21–65 years with chronic non-malignant pain. They were randomly assigned to a standard music group ($n = 22$), patterning music group ($n = 18$) or control group ($n = 20$). Pain was measured with the McGill Pain Questionnaire short form; depression was measured with the Center for Epidemiology Studies Depression scale; disability was measured with the Pain Disability Index; and power was measured with the Power as Knowing Participation in Change Tool (version II).

Results. The music groups had more power and less pain, depression and disability than the control group, but there were no statistically significant differences between the two music interventions. The model predicting both a direct and indirect effect for music was supported.

Conclusion. Nurses can teach patients how to use music to enhance the effects of analgesics, decrease pain, depression and disability, and promote feelings of power.

Keywords: chronic pain, depression, disability, nursing, power, randomized controlled trial

Introduction

Pain, depression, disability and feelings of powerlessness represent a pattern common to chronic non-malignant pain (CNMP) syndromes. Of patients with CNMP, those with back, neck and joint pain report the highest levels of pain, depression and disability (Hitchcock *et al.* 1994). Fear of pain leads to avoidance of family, social, recreational, and employment activities (Chibnall & Tait 1994, Taylor *et al.* 1998), and contributes to disability (Lin *et al.* 2003, Turner *et al.* 2004). Inability to manage pain effectively and perform usual activities lead to feelings of powerlessness (Rapacz

1992, Matas 1997, Miller 2000) and depression (Turner *et al.* 2004).

Although frequently prescribed, the usefulness of medications such as opioids, non-steroidal anti-inflammatory agents, muscle relaxants, neuroleptics and antidepressants, is limited by their adverse side effects (Lister 1996). Addition of a music-listening intervention may enhance the effects of analgesics, decrease depression and disability, and promote beliefs of personal power.

Background

Music has been found to be effective for the management of acute pain (Mullooly *et al.* 1988, Good & Chin 1998, Koch *et al.* 1998, Good *et al.* 1999, 2001), cancer pain (Zimmerman *et al.* 1989) and procedural pain (Menegazzi *et al.* 1991). However, only one quasi-experimental study (Schoor 1993) and one clinical trial have been reported that have examined the effect of music on CNMP (McCaffrey & Freeman 2003), and no music-CNMP studies have examined the effect of music on power, depression, or disability.

Schoor (1993), in a one-group, quasi-experimental study of the effect of music on pain in women with rheumatoid arthritis, found a statistically significant decrease in pain after a single 20-minute self-selected preferred music intervention. Lack of a control group and random selection were limitations of this study and differences between pretest and post-test scores may have been due to history, selection bias, or maturation (Polit & Beck 2004). McCaffrey and Freeman (2003) improved upon the work of Schoor (1993) in a two group randomized clinical trial with a sample of older men and women with osteoarthritis, and found that those who listened to a researcher-provided tape of classical relaxing music 20 minutes each day for 14 days had a statistically significant reduction in pain at all data points (day 1, day 7, and day 14), as compared to a control group who sat quietly for 20 minutes each day for 14 days.

Previous music-CNMP studies have limited their investigations to the effect of music on pain variables in primarily older, Caucasian samples. It is not known whether music has an effect on other CNMP variables, such as depression and disability, or if music has similar or different effects with younger CNMP patients. Although both Schoor (1993) and McCaffrey and Freeman (2003), each of whom used different types of music, found an effect for music on measures of pain, no previous studies have compared the effect of different music styles on measures of pain, depression, or disability in patients with CNMP.

The study

Aims

The aim of the study were to test the effect of music on levels of power, pain, depression and disability; to compare the effect of researcher-provided relaxing music choices with subject-preferred music, selected daily based on self-assessment; and to test the relationship between power and the combined dependent variable of pain, depression and disability.

Design

A Randomized controlled clinical trial was used to examine the following hypotheses: (1) Individuals with CNMP who use music an hour a day for 7 days will have more power, and less pain, depression and disability than those who do not use music; (2) Individuals with CNMP who use patterning music (PM) will have more power and less pain, depression, and disability than those who use a standard music (SM) and (3) There will be no differences in pain, depression, and disability between groups who use music and those who do not use music when power is statistically controlled.

Theoretical framework

Rogers' science of unitary human beings and Barrett's theory of power provided the theoretical framework for this study (Barrett 1986, Rogers 1990). Rogers describes human beings as energy fields, in continuous mutual process and integral with environmental energy fields, and characterized by pattern (Rogers 1970). Power is defined by Barrett (1986) as knowing participation in change, and is characterized by awareness, choices, freedom and involvement in making changes (Barrett & Caroselli 1998). In this model, music is a type of field patterning, pattern manifestations are an expression of the unitary human environmental energy field pattern (Cowling 1990, 1997), and the two music interventions represent two levels of knowing participation in change (power) (Figure 1).

Participants

A convenience sample ($n = 64$) of patients with CNMP was recruited over a 24-month period from 2001 to 2003, from pain clinics and a chiropractic office in northeast Ohio, USA. Four participants (6%) failed to complete the study: three were from the control group and one was from the PM group, resulting in a final sample of 60 participants.

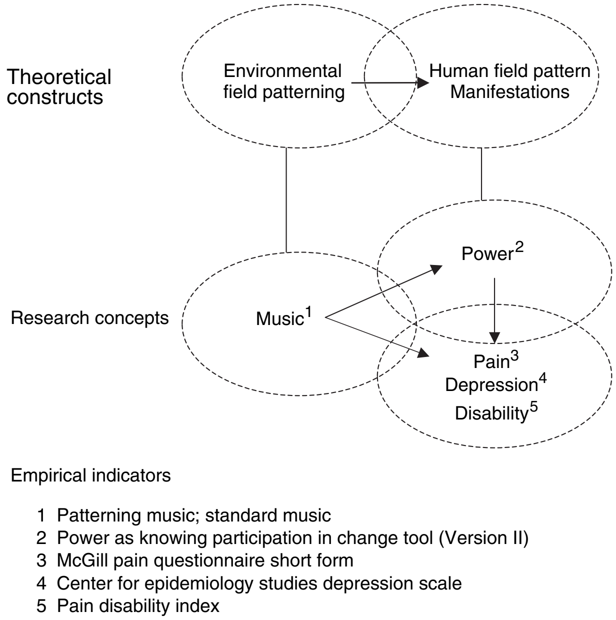

Figure 1 Conceptual and empirical structure.

Patients were eligible for this study if they were between the ages of 21 and 65; had back, neck, and/or joint pain for at least 6 months; were receiving at least one form of traditional medical or surgical pain management; and could speak, read and write English. They were not eligible to participate if they were deaf; had a diagnosis of alcohol or chemical dependency; had an altered mental status (confusion, hallucinations, or delusions) or cognitive impairment (inability to understand and follow directions, or inability to read and write) either by history or identified during initial patient contact; had a psychiatric diagnosis other than depression, or a self-report of suicidal ideation at the time of the initial interview; or had a diagnosis of cancer-related pain.

To ensure homogeneity between groups and to control for potential differences related to age, gender, race or duration of pain, stratified random assignment using the Min-8 program was used to assign participants randomly to one of three study groups (Zeller *et al.* 1997, Friedman *et al.* 1998).

Experimental interventions

The experimental interventions represented two levels of knowing participation in change (power), and included a PM and a SM intervention. Participants in the music groups used their assigned intervention for 1 hour a day for seven consecutive days, and all music was delivered through the same type of tape player and headset, which were provided by the researcher.

Using a protocol developed by Hanser (1990) those in the PM group were asked to select upbeat, familiar, instrumental or vocal music to ease muscle tension and stiffness; slow, melodious and pleasant familiar instrumental or vocal music or sounds of nature to facilitate sleep and relaxation, or to decrease anxiety; upbeat, familiar, instrumental or vocal music to improve mood when feeling angry or depressed; and energetic, rhythmic, familiar, instrumental or vocal music to promote energy when feeling fatigued (Hanser 1990, Hanser & Thompson 1994). After the music was selected, the researcher transferred it from compact disc to four 60-minute tapes.

Participants in the SM group were offered a choice of one 60-minute relaxing instrumental music tape from a collection of five tapes (piano, jazz, orchestra, harp and synthesizer) used in several music and acute pain studies (Good 1995, Good & Chin 1998, Good *et al.* 1999). Those in the control group received standard care that did not include music intervention, and all participants kept a diary for 7 days.

Measures

Power, defined as knowing participation in change, was measured by the Power as Knowing Participation in Change Tool version II (PKPCT II) developed by Barrett and based on Rogers' principles of homeodynamics (Barrett 1986, Caroselli & Barrett 1998). The PKPCT II consists of four subscales that characterize power: awareness, choices, freedom, and a personal involvement in creating change. Participants rated themselves from 1 to 7 on a semantic differential scale by marking a point on a line between 52 bipolar pairs of adjectives. A total score was obtained by summing values for each of the four scales. Evidence of construct validity was reported by Caroselli and Barrett (1998), with a factor loading of 0·56–0·70 for the four concepts in the PKPCT. Matas (1997) reported an alpha reliability of 0·94 in a comparison study of healthy people and people with CNMP, and Malinski (1997) reported an alpha coefficient of 0·97 in a comparison study of depressed and non-depressed women. Alpha coefficients for the PKPCT II in the present study were $\alpha = 0{\cdot}96$ (pretest) and $\alpha = 0{\cdot}98$ (post-test).

Pain, defined as a unique subjective experience and described as a 'hurt' that persists for more than 6 months, was measured by the McGill Pain Questionnaire short-form (MPQ-SF) and a Visual Analogue Scale (VAS). The MPQ-SF was used for hypothesis testing and the VAS for descriptive purposes. The MPQ-SF consists of 15 descriptors from the McGill Pain Questionnaire Long Form (MPQ-LF). A total score for the MPQ-SF is obtained by summing scores for each of descriptor, ranked on an intensity scale of 0–3 (Melzack 1987). In previous pain studies, Kremer and Atkinson (1981) and Burchhardt (1984) reported evidence for the construct, concurrent and the predictive validity of the MPQ-LF and, in a group of comparison studies reported by Melzack (1987), the long and short forms of the MPQ demonstrated satisfactory correlation ($r = 0{\cdot}70–0{\cdot}92$). Alpha coefficients for the MPQ-SF in the present study were $\alpha = 0{\cdot}84$ pretest and post-test. The VAS consists of a 100-mm horizontal line with 'No Pain' at the left end of the line and 'Worst Pain Imaginable' at the right end of the line. Correlations in this study between the MPQ-SF and VAS at pretest were $r = 0{\cdot}44$ and at post-test was $r = 0{\cdot}52$.

Depression, defined as a unique emotional state expressed as feelings of sadness and an inability to enjoy life, was measured by The Center for Epidemiological Studies Depression scale (CES-D), developed by Radloff (1977). This measures the number and frequency of depressive symptoms in the past week. Participants responded to 20 items based on how frequently they experienced each symptom in the past week, and a total score was obtained by summing the rating for each of the 20 items. The CES-D has a reported alpha reliability of 0·81–0·84 by Radloff (1977) and 0·85 by Turk (1993) in studies of individuals with CNMP and depression. Validity of the CES-D is based on previous studies that have found a positive correlation between the CES-D and other measures of depression (Radloff 1977, Turk 1993). Alpha coefficients for the CES-D scale in the present study were $\alpha = 0{\cdot}89$ (pretest) and $\alpha = 0{\cdot}91$ (post-test).

Disability, defined as the perceived effect of CNMP on normal role functioning (Chibnall & Tait 1994), was measured with the Pain Disability Index (PDI). Participants indicated, on an 11-point Likert scale, the degree to which pain interfered with their functioning in seven areas (family/home responsibilities, recreation, social activity, occupation, sexual behaviour, self-care and life-support activity). A total score for the PDI was calculated by summing the responses for each of the seven areas of functioning. The PDI has good reliability, with alpha values of 0·79 reported by Strong *et al.* (1994) and 0·87 by Tait *et al.* (1987). Support for the validity of the PDI in CNMP populations has been reported in studies by Cassidy *et al.* (1992), Chibnall and Tait (1994) and Herr *et al.* (1993). The alpha coefficients for the PDI in the present study were $\alpha = 0{\cdot}84$ (pretest) and $\alpha = 0{\cdot}88$ (post-test).

Data collection

After written informed consent was obtained, participants were randomly assigned to one of the three study groups. Demographic, health history and pain history data were collected; participants viewed a power-point presentation, developed by the researcher, explaining their assigned intervention; music selections were made by music group participants; and study questionnaires were completed. Participants received their study supplies, and were asked to begin their intervention (music groups) and/or begin keeping their diary (music and control groups) the following day (day 2), and to complete the second set of questionnaires (day 9) and return them either in person at the clinic or through the mail in addressed stamped envelopes provided by the researcher.

Ethical considerations

Approval for the study was obtained from Institutional Review Boards at each of the data collection sites. During initial interview, potential recruits received an oral description of the study and, if interested in participating, they were given a copy of the consent form. This was reviewed with them by the researcher, and they were given an opportunity to ask questions. Signed consent was obtained from all participants, data collection instruments did not contain any identifying data, and all results for this study were reported as aggregates.

Data analysis

Data were double entered into the Statistical Program for Social Sciences (SPSS), described by measures of central tendency and dispersion, and groups were compared on all major demographic, health history, and pain variables using ANOVA and chi-squared statistiscs. Univariate and multivariate techniques were used to test the research hypotheses. Assumptions for ANCOVA and MANCOVA were tested and met. Independence was met through the study design; univariate normality was assessed through examination of histograms, box plots, and Q–Q plots; multivariate normality and linearity were assessed by examining bivariate scatter plots (Mertler & Vannatta 2002); and the Box's Test of Equality of Covariance Matrices was used to test the null hypothesis that observed covariance matrices of dependent variables were equal across all groups ($F = 1{\cdot}75$, $P = 0{\cdot}106$). Levene Test was used to test the null hypothesis that error variance of dependent variables was equal across all groups, and this assumption was met for pain [F (1,58) $= 1{\cdot}29$, $P = 0{\cdot}260$]; depression [F (1,58) $= 0{\cdot}321$, $P = 0{\cdot}573$] and disability [F (1,58) $= 0{\cdot}182$, $P = 0{\cdot}671$]. Finally, to examine the assumption of homogeneity of regression hyperplanes, a custom MANCOVA was conducted. No statistically significant interactions were found, and slopes of regression hyperplanes were found to be equal.

Results

Demographics

The sample ($n = 60$) consisted of 18 participants in the PM group, 22 in the SM group and 20 in the control group. Sample characteristics are summarized in Table 1. The sample included primarily African American (60%), female (77%), participants ranging in age from 26 to 64, with a mean age of 49·68 (SD = 9·01). The duration of time in which participants reported living with CNMP ranged from 6 months to 30 years, with a mean of 6·5 years (SD = 6). Thirty-five per cent ($n = 21$) of participants were married, 80% ($n = 48$) had at least a high school education and 65% ($n = 39$) reported a yearly family income of < $20,000 per year. Only 18% ($n = 11$) were employed. Of those not working (82%), over half reported that they were receiving disability benefits. Most (87%) reported that their pain was not job related and, of those who did report their pain as job related ($n = 8$), only two said that they had filed a worker's compensation claim. Most participants ($n = 43$; 72%) reported that the initial cause of their pain was unknown, and over half ($n = 34$; 57%) reported that they had never been given a diagnosis related to their pain. Of those who were aware of their diagnoses, many reported more than one pain-related diagnosis, with osteoarthritis being reported most often ($n = 22$). A summary of all reported pain related diagnoses is presented in Table 2.

When asked the location of their pain, nearly all participants ($n = 54$; 90%) described it as affecting multiple parts of their bodies. Pain was described as continuous ($n = 57$; 95%) and radiating ($n = 47$; 78%), and most participants ($n = 53$; 88%) reported pain affecting lower back, legs, knee joints and feet. On a 0–10 verbal rating scale, worst pain scores ranged from 6 to 10 (mean = 9·35, SD = 0·962) and usual pain scores ranged from 3 to 10 (mean = 5·91, SD = 2·81).

Table 1 Demographics

	Group assignment				Group differences			
Variable	PM ($n = 18$)	SM ($n = 22$)	Control ($n = 20$)	Total ($N = 60$)	χ^2	F	d.f.	P value
Age* in years, mean (SD)	50·9 (10·8)	47·9 (7·1)	50·6 (9·3)	49·7 (9·0)		0·711	2, 57	0·496
Pain duration* in years, mean (SD)	5·3 (3·3)	8·4 (7·9)	5·4 (5·2)	6·5 (6·0)		1·88	2, 57	0·161
Gender*, n (%)								
Male	4 (6·7)	3 (5·0)	7 (11·7)	14 (23·3)	2·69		2	
Female	14 (23·3)	19 (31·7)	13 (21·7)	46 (76·7)				
Race*, n (%)								
AA	11 (18·3)	13 (21·7)	12 (20·0)	36 (60·0)	0·02		2	
Caucasian	7 (11·7)	9 (15·0)	8 (13·3)	24 (40·0)				
Education, n (%)								
< High school	4 (6·7)	3 (5·0)	5 (8·3)	12 (20·0)	9·85		8	
High school	7 (11·7)	5 (8·3)	9 (15·0)	21 (35·0)				
< 2 years college	3 (5·0)	2 (3·3)	3 (5·0)	8 (13·3)				
2–4 years college	2 (3·3)	8 (13·3)	3 (5·0)	13 (21·7)				
> 4 years college	2 (3·3)	4 (6·7)	0 (0)	6 (10·0)				
Marital status, n (%)								
Married	5 (8·3)	9 (15·0)	7 (11·7)	21 (35·0)	8·31		10	
Divorced	7 (11·7)	6 (10·0)	3 (5·0)	16 (26·7)				
Separated	0 (0)	2 (3·3)	2 (3·3)	4 (6·7)				
Widowed	1 (1·7)	0 (0)	2 (3·3)	3 (5·0)				
Single with SO	3 (5·0)	1 (1·7)	2 (3·3)	6 (10·0)				
Single w/o SO	2 (3·3)	4 (6·7)	4 (6·7)	10 (16·7)				
Yearly income, n (%)								
< 20,000	11 (18·3)	16 (26·7)	12 (20·0)	39 (65·0)	8·84		10	
20–40,000	6 (10·0)	3 (5·0)	5 (8·3)	14 (23·3)				
40,001–60,000	0 (0)	1 (1·7)	2 (3·3)	3 (5·0)				
60,001–80,000	0 (0)	1 (1·7)	0 (0)	1 (1·7)				
80,001–100,000	0 (0)	1 (1·7)	1 (1·7)	2 (3·3)				
> 100,000	1 (1·7)	0 (0)	0 (0)	1 (1·7)				

PM, patterning music; SM, standard music; AA, African American; SO, significant other; w/o, without.
*Minimizing variable.

Table 2 Pain diagnosis by group

Variable	Study groups PM (n = 18)	SM (n = 22)	Control (n = 20)	Total (N = 60)	Group differences (d.f. = 2) χ^2	P value
Osteoarthritis	6 (10·0)	6 (10·0)	10 (16·7)	22 (36·7)	2·45	0·293
Herniated disc	4 (6·7)	6 (10·0)	6 (10·0)	16 (26·7)	0·30	0·861
Rheumatoid arthritis	3 (5·0)	4 (6·7)	5 (8·3)	12 (20·0)	0·48	0·785
Degenerative join disease	3 (5·0)	5 (8·3)	3 (5·0)	11 (18·3)	0·47	0·792
Fibromyalgia	4 (6·7)	4 (6·7)	2 (3·3)	10 (16·7)	1·08	0·584

Values are given as n (%).
PM, patterning music group; SM, standard music group.

Most participants were prescribed a combination of medications for management of their pain. Chi-Squared tests were conducted for the major pharmacological agents and the only statistically significant difference between groups was related to use of antidepressants. However, ANOVA demonstrated no statistically significant differences between those who were prescribed antidepressants and those who were not for any of the dependent variables (power F (1, 58) = 0·000, P = 0·996; pain F (1, 58) = 0·144, P = 0·706; depression F (1, 58) = 0·302, P = 0·585; disability F (1, 58) = 0·125, P = 0·725).

Group differences

Music groups demonstrated an increase in power from time 1 to time 2 (Table 3). Adjusted mean showed more power in the music groups than the control group, with small differences between the control group and both the PM group (8%) and the SM group (5%).

Both music groups reported less pain than the control group at post-test. Differences in pain, measured by the MPQ-SF demonstrated a 20% reduction in pain in both music groups and a 2% increase in the control group from pretest to post-test. Examination of adjusted mean showed 19% less pain in the PM group and 21% less pain in the SM group compared to the control group. VAS scores decreased from pretest to post-test, with a 12% decrease in the PM group, a 16% decrease in the SM group, and a 1% increase in the control group (Table 4).

Depression scores decreased from time 1 to time 2 for the music groups, with a 23% decrease in the PM group and a 15% decrease in the SM group (Table 5). Examination of adjusted mean showed that the PM group had 25% less depression than the control group, and the SM group had 19% less depression than the control group at post-test.

Table 3 Mean, standard deviation and adjusted mean for power

Group	n	Pretreatment power scores Mean (SD)	Post-treatment power scores Obtained, mean (SD)	Adjusted mean
Patterning music	18	273·50 (45·03)	285·89 (46·01)	260·41
Standard music	22	230·27 (64·23)	237·18 (67·38)	254·23
Control	20	243·35 (50·51)	236·60 (65·20)	240·78
Total	60	247·60 (56·54)	251·69 (64·09)	

Table 4 Mean, standard deviation and adjusted mean for pain

Group	n	Pretreatment pain scores Mean (SD)	Post-treatment pain scores Obtained, mean (SD)	Adjusted mean
McGill Pain Questionnaire Short Form				
Patterning music	18	24·44 (8·80)	19·61 (6·31)	18·71
Standard music	22	21·63 (9·50)	17·36 (12·10)	18·36
Control	20	22·10 (10·90)	22·50 (11·14)	23·00
Total	60	22·63 (9·70)	19·75 (10·40)	
Visual Analogue Scale				
Patterning music	18	6·43 (1·49)	5·65 (1·69)	5·95
Standard music	22	7·20 (1·54)	6·04 (2·41)	5·84
Control	20	6·99 (1·98)	7·07 (1·58)	7·01
Total	60	6·90 (1·69)	6·27 (2·01)	

Table 5 Mean, standard deviation and adjusted mean for depression

Group	n	Pretreatment depression scores Mean (SD)	Post-treatment depression scores Obtained, mean (SD)	Adjusted mean
Patterning music	18	24·67 (10·73)	19·11 (8·25)	19·82
Standard music	22	24·82 (13·05)	21·14 (12·27)	21·72
Control	20	27·05 (11·96)	27·85 (13·36)	26·57
Total	60	25·52 (11·88)	22·77 (12·02)	

Table 6 Mean, standard deviation and adjusted mean for disability

	Pretreatment disability scores		Post-treatment disability scores	
Group	*n*	Mean (SD)	Obtained, mean (SD)	Adjusted mean
Patterning music	18	38·56 (11·17)	37·00 (11·82)	37·26
Standard music	22	39·86 (19·06)	34·68 (20·99)	33·74
Control	20	37·95 (14·57)	40·85 (15·42)	41·66
Total	60	38·83 (15·31)	37·43 (16·75)	

Both music groups had lower mean disability scores at time 2 than at time 1, with the PM group having a 4% decrease and the SM group having a 13% decrease (Table 6). In contrast, the control group had a 7% increase in disability. When adjusted mean were examined the PM group had 9% less disability and the SM group had 18% less disability than the control group at post-test.

Hypothesis tests

The effect of music on power between the two music groups combined vs. the control group was examined with ANCOVA, controlling for pretest (baseline) levels of power. Statistically significant differences (F (1, 57) = 4·09, P = 0·048, η^2 = 0·067) were found between the combined music groups and no-music control group. However, ANCOVA demonstrated no statistically significant difference between the PM group and the SM group (F (1, 37) = 0·851, P = 0·362, η^2 = 0·022).

Multivariate analysis of covariance was conducted to determine the effect of music on pain, depression and disability. MANCOVA demonstrated statistically significant differences between the combined music groups and no-music control group on the multivariate dependent variable (Wilks' Λ = 0·737, F (3, 53) = 6·29, P = 0·001, multivariate η^2 = 0·263, observed power = 0·954). Follow-up ANCOVA showed statistically significant differences between the music and no-music groups for pain on the MPQ-SF (F (1, 55) = 10·766, P = 0·002, observed power = 0·90; depression F (1, 55) = 12·733, P = 0·001, observed power = 0·94 and disability F (1, 55) = 5·385, P = 0·024, observed power = 0·63). However, MANCOVA demonstrated no statistically significant differences between the PM and SM groups for the combined dependent variable (Wilks' Λ = 0·897, F (3, 33) = 1·267, P = 0·302, multivariate η^2 = 0·103, observed power = 0·31).

Examination of power as a possible mediating variable was contingent upon establishing three essential relationships: (1) between music and power, (2) between music and the combined dependent variable of pain, depression, and disability and (3) between post-test power and the combined dependent variable of pain, depression and disability. The first two relationships were established in the previous analysis. MANCOVA was used to determine if post-test power predicted the combined dependent variable of pain, depression and disability. The fixed factor for this analysis was post-test power [to convert post-test power scores into categorical data, a mean item score was computed by dividing the total score by 52 (number of items). The mean item score for the PKPCT post-test was 4·80. Therefore, post-test PKPCT scores were classified as low if the mean item score was <4, moderate if the score was between 4 and 5, and high if the score was >5]. Post-test scores for the combined dependent variable were examined after controlling for differences in pretest scores. Post-test power was found to statistically significantly predict the combined dependent variable [Wilks' Λ = 0·762, F (6, 104) = 2·523, P = 0·025, multivariate η^2 = 0·127, observed power = 0·821], with most of the variance explained by the effect of power on depression [F (2, 54) = 7·558, P = 0·001, η^2 = 0·001]. However, the effect of power on pain and disability separately was not found to be statistically significant.

To determine whether power was a mediating variable, the MANCOVA from the first hypothesis was rerun, adding post-test power as a covariate, and the difference between the combined groups who used music and the control group remained statistically significant [Wilks'Λ = 737, F (3, 52) = 6·191, P = 0·001, multivariate η^2 = 0·263, observed power = 0·951]. This analysis did not support power as a mediating variable. However, it did support the model for this study, which posited both direct and indirect effects for music.

Additional findings

To monitor adherence, participants were asked to record in their diaries the time at which they started and stopped their music intervention each day, and to identify any interruptions they experienced during their intervention. Adherence was defined as completion of 60 minutes of the intervention with or without interruptions. The adherence rate was 82%, with higher adherence for the PM group (87%) than the SM group (77%); however, this difference was not statistically significant (χ^2 = 8·97, d.f. = 12, P = 0·706).

Data were collected during an exit interview related to the usefulness of the diary, helpfulness of the music, and intent to continue using the music intervention. A total of 47 (78%) of the 60 participants completed the exit interview, with 14 of 20 in the control group (77%) and 33 of 40 in the music groups (83%).

What is already known about this topic

- Listening to a tape of self-selected preferred music for 20 minutes has been shown to reduce perceptions of pain for women with rheumatoid arthritis during and after the intervention.
- Listening to a researcher-provided tape of classical music for 20 minutes a day for 2 weeks has been shown to reduce perceptions of pain in older men and women with osteoarthritis.

What this paper adds

- Listening to self-selected music and researcher-provided music for 1 hour over a period of 7 days increased feelings of power, and decreased pain, depression, and disability for African American and Caucasian men and women with chronic back, neck, and/or joint pain.
- Music interventions increased feelings of power, and post-test feelings of power predicted post-test depression scores, but not post-test pain or disability scores.
- Perceptions of depression may be more responsive to interventions that facilitate power than perceptions of pain and disability.

When asked if the diary had helped them *understand* their pain better, most participants ($n = 31$, 66%) responded 'Yes'. However, 15 (32%) did not think the diary was helpful in understanding their pain and one had no opinion. When asked if the diary helped them *manage* their pain, 23 (49%) responded 'Yes', while 16 (34%) responded 'No' and eight (17%) had no opinion.

When participants in the music groups were asked if music was helpful for managing pain, two-thirds ($n = 22$, 67%) responded 'Yes', six (18%) responded 'No' and two (6%) said they were unsure. Three respondents did not answer this question. When asked if they would continue to use music, two-thirds ($n = 22$, 67%) responded 'Yes', five (15%) responded 'No' and six stated that they were unsure. No statistically significant group differences were found between the two music groups related to helpfulness of music or plan to continue using music.

Discussion

Our results showed a statistically significant effect for music, with the two music groups combined having more power, and less pain, depression, and disability than the control group. No statistically significant differences were found between the two music groups, and power was not found to be a mediating variable. Power was found to be a predictor of the combined dependent variable, which supported the model that posited a direct effect for music on power, and both a direct and indirect effect for music on the combined dependent variable of pain, depression and disability. However, as most of the variance for the combined dependent variable was attributed to the effect of power on depression, this may indicate that feelings of depression are more responsive than perceptions of pain and pain-related disability to interventions that facilitate power.

Findings for the effect of different types of music were consistent with those of both Schoor (1993), who used self-selected preferred music, and McCaffrey and Freeman (2003), who used a single researcher-provided tape of relaxing instrumental music. Our findings extend knowledge by showing that different types of music not only decreased pain intensity, but also decreased the frequency of depressive symptoms and perceptions of pain-related disability in patients with CNMP.

Study limitations

The major limitation in this study was the relatively small sample size. Although, observed power to detect a difference between combined music groups and the control group was strong, observed power to detect a difference between the two music groups was not. There were unexpected similarities between the two music groups. Those in the PM group most frequently chose music to decrease muscle tension or stiffness, or to facilitate sleep or relaxation; and SM music was developed to help patients relax and be distracted from pain. In addition, most participants in the PM group chose to listen to music while resting in bed or in a chair, as the SM group was asked to do. Low statistical power related to sample size and similarities between the two music interventions may have contributed to the inability to find any statistically significant differences between the two music groups for any of the dependent variables, resulting in a possible Type II error (Polit & Beck 2004).

Homogeneity of the sample limits the ability to generalize findings to the larger CNMP population. Although the sample in this study consisted of nearly equal numbers of African American and Caucasian participants, no other ethnic groups were represented in the sample, and the effect of music on individuals with CNMP from different ethnic groups is unknown.

Conclusion

Chronic non-malignant pain remains a major health problem and, in spite of using pharmaceutical agents, patients continue to report high levels of unrelieved pain. Chronic non-malignant pain syndromes are characterized by low levels of power and high levels of pain, depression and disability. Music is safe, inexpensive, and easy for nurses to teach patients to use. Music alters patterns of pain, depression and disability associated with CNMP; and music interventions that are self-administered can facilitate power. In addition, self-administered music interventions allow patients freedom to schedule their music intervention at times when it is most convenient, and perhaps at times when it is most needed. Nurses should be aware of potential age, cultural, ethnic and gender differences in music preferences, and encourage patients to talk about types of music that brings enjoyment and how it makes them feel. Specific music selections or types of music may have different effects for different people, and may have different effects for the same person at different times. A variety of different music selections and styles, some with lyrics and some without, were found to be effective in this study. Nurses can help patients with CNMP identify and use music they enjoy as a self-administered complementary intervention to facilitate feelings of power, and to decrease perceptions of pain, depression and disability.

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Author contributions

SS and MG were responsible for the study conception and design and drafting of the manuscript. SS performed the data collection and data analysis. SS and MG obtained funding and provided administrative support. SS and MG provided statistical expertise. MG made critical revisions to the paper. MG supervised the study.

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