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RESEARCH ARTICLE

THE EFFICACY OF MUSIC INTERVENTIONS ON PAIN IN CANCER PATIENTS UNDERGOING THERAPEUTIC TREATMENT

***,[1]Seema Vinayak, [2]Farnaz Dehkhoda and [3]RohinVinayak**

[1]Seema Vinayak, Professor, Department of Psychology, Panjab University, Chandigarh, India
[2]Farnaz Dehkhoda, Ph.D Scholar, Psychology Department, Panjab University, Chandigarh, India
[3]RohinVinayak, MBBS Student, Dayanand Medical College and Hospital, Ludhiana, India

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ABSTRACT

Despite chemotherapy and radiation therapy as being effective in the treatment of cancer, like other therapies, they can cause some side effects, which may vary in each individual. Sometimes these treatment sessions cause pain that may decrease with time. But in some people, permanent nerve damage happens, which can cause severe symptoms after treatment. The study focused on measuring the effect of two types of music therapy on pain in blood cancer patients. 180 young adult (age range of 20-40 years) patients (with an equal number of males and females)with blood cancer who were undergoing chemotherapy or radiation therapy, were equally assigned to three groups randomly viz. two intervention groups (i.e. either active or receptive music therapy) and a control group. Participants were evaluated by McGill pain questionnaire visual analogue scale. Scores were obtained before and after the music therapy. Twenty sessions of active or receptive music therapy(with each session of 15-30 minutes) were applied on intervention groups whereas the control group received only routine medical treatment sessions. Results indicated significant differences in reduction in scores of pain from pre-therapy to post-therapy scores for both intervention groups as compared to no intervention group. Analyses of Covariance applied to compare these three independent groups revealed that active music therapy had the greatest impact on the reduction of pain as compared to the receptive music therapy group. The study has great implications for pain reduction in the patients undergoing the cancer treatment.

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INTRODUCTION

Cancer after cardio-vascular and cerebrovascular diseases is the third worldwide chronic disease that is increasing every year along with the growing technology and can become one of the most important reasons of death in humans (Gao, Chen, Lin and Han, 2015). On the other hand, advancement of science has lead to enhancing the percentage of cancer patient survivors and fighters in the world. But physical and psychological symptoms of cancer or side effects of cancer treatment, such as chemotherapy or radiation therapy can affect the life of oncology patients. One of the most annoying results of chemotherapy and radiation therapy is pain that can bother the patients after treatment for a long time. In cancer, pain can become part of each day of life, and it may cause the feeling of desperation and can lead to depression. So if the pain is not taken care of, consequently, the quality of life will decrease.

****Corresponding author: Seema Vinayak,***
Seema Vinayak, Professor, Department of Psychology, Panjab University, Chandigarh, India

Moreover, though there is medication for managing the pain, there are several psychological techniques that can be useful and can be used in conjunction with medication to effectively manage pain. According to Arora and Kurkure (2010), the working mechanism of music is that it acts as a distracter that can cause self control perception in patients, controlling the breathing and heart beats, endorphin release in body and relaxation, that can lead to counteract the pain. The distracting aspect of music can work as a moderator of pain by effecting onthe cognitive component as in the gate control theory of pain. It has been found that music can be used as a clinical intervention and it helps a patient in decreasing the pain perception by making relaxation, rhythmic breathing, controlling anxiety and changing the mood positively (Hilliard, 2003).

Review of literature

Researches found music therapy as an effective intervention for acute and chronic pain reduction (Guétin *et al.,* 2012; Roy, Lebuis, Hugueville, Peretz, and Rainville, 2012; Korhan, Uyar, Eyigör, Yönt, Çelik and Khorshid, 2013). Other studies also

have shown the analgesic effect of music listening that cognitively and emotionally influence the patients by distraction from the pain, anxiety, memory evoked emotions and relaxation (Mitchell, Macdonald and Brodie, 2006; Juslin and Västfjäll, 2008; Wiech and Tracey, 2009; Bernatzky, Presch, Anderson and Panksepp, 2011; Salimpoor, Benovoy, Larcher, Dagher and Zatorre, 2011). Kwekkeboom (2003) compared the effects of music therapy and routine nursing care on pain in hospitalized patients and discovered that participants did not prefer usingthe headsets because it interfere withhearingthe instruction of doctors, and it leads to more anxiety. As anxiety and pain have direct effect on each other, it is better to don't use headset for patients. According to Frank (1985); Ezzone, Baker, Rosselet and Terepka (1998) and Bozcuk *et al*. (2006) music is useful to lessen treatment side effects such as pain in oncology patients. Mitchell *et al*. (2006) found that music therapy effectively increased patients' tolerance to pain and enhanced perceived control over pain. According to Akombo (2006) and Clark *et al*. (2006) music can be used as an intervention to increase pain management in cancer patients and they found that music therapy resulted in greater pain reduction than standard routine care. Clark *et al*. (2006) analyzed a subsequent analysis excluding his data resulted in a moderate effect of music on pain perception in 391 participants with cancer.

Two trials compared the effects of music to other interventions. Shaban, Rasoolzadeh, Mehran *and* Moradalizadeh (2006) by comparing progressive muscle relaxation method and receptive music therapy in 100 participants realized that muscle relaxation is showing more effectiveness in pain reduction than listening to music. In a meta-analysis research, Bradt, Dileo, Grocke, and Magill (2011) evaluated the effect of music therapy as intervention on psychological and physical problems in cancer. Results showed that music therapy, as an intervention is effective to improve anxiety, quality of life, mood, and pain by decreasing heart rate, respiratory rate, and blood pressure. Cholburi, Hanucharurnkul and Waikakul (2004) in a research has found that thirty minutes of patient-preferred music can reduce self-reported pain of hospitalized cancer patients. The review of available literature revealed there was a lack of studies which, compared active music therapy's effectiveness with receptive music therapy. It was hypothesized that effectiveness of active music therapy as compare to receptive music therapy and routine treatment will be the highest on pain of blood cancer patients, in male as well as female patients.

MATERIAL AND METHODS

Sample

Patients, who had been diagnosed with blood cancer for at least six months and were undergoing chemotherapy or radiation therapy and hospitalized, were identified for this study. The samples were drawn from all patients, meeting the inclusion criteria, those admitted for blood cancer chemotherapy or radiation therapy at hospitals in Gorgan city of Iran. 180 adult blood cancer patients (with equal number of male and female) who were receiving chemotherapy or radiation therapy were selected by purposive sampling and randomly assigned to three groups viz. two intervention groups (i.e. either active or receptive music therapy) and a control group. The participants were in the age range of 20 to 40 years old, undergoing chemotherapy or radiotherapy for as a minimum six months, not suffering from chronic psychological disorder and interested in playing guitar. Exclusion criteria were those who were sensitive about music voice and those were not interested in listening or playing the music.

Design

Participants completed McGill pain questionnaire visual analogue scale. Scores were obtained before and after the music therapy. Intervention groups received 20 sessions of active or receptive music therapy with each session of 15-30 minutes. The control group received only routine medical treatment. Type of music in receptive music therapy was pop music, which was preferred by patients and the instruments used in active music therapy was guitar.

Statistic Analysis

Keeping in view the objectives of study; the analysis of covariance (ANCOVA) were used; post hoc analysis (Bonferroni) were done. Besides, descriptive statistics viz. mean and standard deviation were applied.

Ethics

The privacy of the information revealed by the participants and hospitals were ensured and all the participants were informed about the nature of the investigation. The participants had the choice of leaving in any phase of research.

RESULTS

A between-groups analysis of covariance was used to compare the effectiveness of three different conditions on the pain among cancer patients. The independent variable was the type of intervention (control group, receptive music therapy, and active music therapy), and the dependent variable consisted of scores on the pain test administered after the intervention was completed, i.e. the post-test scores.

Table 1. Descriptive Statistics. Means, Standard Deviations for Group Differences on pain

Group		Mean	Std. Deviation	N
Receptive music therapy	Male	6.9667	2.41380	30
	Female	5.7000	1.91455	30
	Total	6.3333	2.25243	60
Active music therapy	Male	5.7333	2.49044	30
	Female	3.9333	1.91065	30
	Total	4.8333	2.38048	60
Control group	Male	8.6000	2.37225	30
	Female	8.2667	2.13240	30
	Total	8.4333	2.24263	60
Total	Male	7.1000	2.67342	90
	Female	5.9667	2.65825	90
	Total	6.5333	2.71845	180

The participant's scores on the pre-intervention administration of the pain visual analog scale were used as the covariate in this analysis and the difference in three groups was statistically non-significant on this (F=2.006, p=0.138). Preliminary checks were conducted to ensure that there was no violation of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes, and reliable measurement of the covariate. Table-1 showed descriptive statistics of three groups.Table-2 reported that the main effect of the groups

(active music therapy, receptive music therapy and control group) was significant (F=69.57). The main effect of gender, and two way interaction was not found to be significant. Results show that both types of music therapy had a significant impact on pain among cancer patients as there was significant changes from pre-test scores to post-test scores in both music intervention groups. Post hoc analysis further revealed a significant difference between the three groups (Table 3), also represented graphically (Figure 1).By the using multiple comparisons post-hoc Bonferroni test, differences are statistically significant (p<0.01). Active music therapy was the most effective as compared to the receptive music therapy and control condition in reduction of pain in blood cancer patients (Table 3, Figure 1).

Table 2. Tests of Between-Subjects Effects

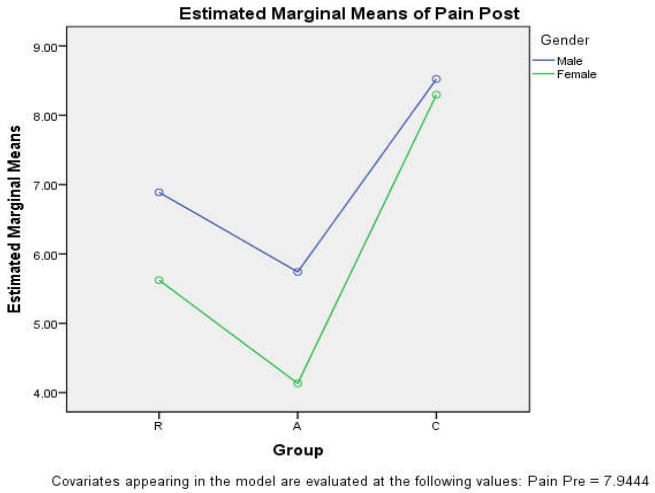
Source	Type III Sum of Squares	Df	Mean Square	F-Value	P-value
Group	368.199	2	184.099	69.573	.000**
Gender	48.002	1	48.002	18.141	.000**
Group * Gender	15.528	2	7.764	2.934	.056
Pain Based	398.287	1	398.287	150.517	.000**
Error	457.780	173	2.646		
Total	9006.000	180			

R Squared = .654 (Adjusted R Squared = .642)
**p-value<0.01= highly significant

Table 3. Pairwise Comparisons, Post-Hoc Multiple Comparisons

Group		Mean Difference	Std. Error	P-Value	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Receptive music therapy	Active music therapy	1.318**	.297	.000	.599	2.037
	Control group	-2.154**	.297	.000	-2.872	-1.435
Active music therapy	Receptive music therapy	-1.318**	.297	.000	-2.037	-.599
	Control group	-3.472**	.297	.000	-4.190	-2.753
Control group	Receptive music therapy	2.154**	.297	.000	1.435	2.872
	Active music therapy	3.472**	.297	.000	2.753	4.190

**p-value<0.01= highly significant



DISCUSSION

This study examined the effectiveness of music intervention on cancer patients' pain, who, were undergoing radiation therapy or chemotherapy. Findings of current study are congruent with other studies which identified that music may help to relieve pain that may be caused by cancer itself or by cancer treatment, and these supporting the hypothesis. Sahler *et al*. (2003) found that blood and marrow transplantation patients reported that their pain and nausea significantly decreased after receiving music therapy sessions twice a week. In the present study, two types of music therapies were used and pain reduction was studied. And according to participant reports, after 20 sessions of music therapy their pain significantly reduced. As appreciation of music depends on cultural background and there is variety of musical styles in each part of the world, listening to music can emotionally engage by an individual attracting and holding attention, especially if individual's relationship with the song is strong. By this research, receptive music therapy applied by mp3 player (patients prefer pop music) and active music therapy (in which patients are involved in playing guitar and singing) is effective in relief from the pain, changing the perception of pain, and raise the control feelings over pain in blood cancer patients. Clark *et al*. (2006) claimed when participants have this option to select the music, which is playing, it can increase relief from pain and reduce perception of pain. Besides the benefits of listening to favorite preferred music and playing music, the nature of the music has also been shown to be important in enhancing how emotionally engaging it is for patients. Mitchell *et al*. (2006) found that, patient-preferred music listening greatly increased patients' tolerance to pain and enhanced perceived control over pain. Music can reduce pain in several process such as: serve as a distracter, giving the patient a sense of control, causing the body to release endorphin to counteract pain, relaxes a person by slowing their breathing and heart beat. Present study findings are in line with results of research by Powers (2002) researches, which showed that music cause analgesia, especially when the patients preferred song or music used in therapy. Although the mechanism behind analgesic effect of music is not investigated yet, but Bernatzky *et al*. (2011); Hauck *et al*. (2013) suggested that music influence cognitively and emotionally on patients and effect on their pain perception. According to Frank (1985); Ezzone (1998) and Bozcuk (2006); music is useful to lessen treatment side effects such as pain in oncology patients.

Music has culturally and scientifically been recognized as an effective motivator of emotions and a modulator of mood (Baumgartner, Lutz, Schmidt *and* Jäncke, 2006; Juslin *and* Västfjäll, 2008; Fritz *et al.,* 2009; Bernatzky *et al.,* 2011), and on the other hand, changed in emotions and mood can be effective in pain reduction (Tommaso *et al.,* 2008; Villemure and Bushnell, 2009). It is not yet clear about the specific mechanisms of music therapy which help to reduce pain,

however according to the evidences, the intrinsic and extrinsic factors of the music can influence indirectly on the pain via cognitive and emotional mechanisms (Bernatzky, Presch, Anderson and Panksepp, 2011; Roy *et al.,* 2012; Hauck, Metzner, Rohlffs, Lorenz and Engel, 2013). The mechanism of analgesic feature of musicis releasing the neurotransmitters such as dopamine that cause the regulation of autonomic system (Salimpoor *et al.,* 2011). In the another study, Huang *et al*. (2010) showed the effectiveness of music therapy in which the participants listened to patients preferred music and found improvement in pain reduction significantly ($P < 0.001$). with mechanisms of distraction, reward (Kringelbach, 2005), reappraisal and expectation of pain relief (Wiech, Ploner and Tracey, 2008) was found. The music styles listened by the participants in this study was pop music. There is a cultural belief that classical music is better to reduce pain than any other type, which was probably started or exacerbated by the so-called "Mozart effect" that is not even related to pain perception (McKelvie and Low, 2010). The findings of this recent study contribute to existing knowledge of the effectiveness of music therapy as an intervention to decrease pain of cancer patients undergoing chemotherapy or radiation therapy.

Research Limitations and Suggestions

In music therapy there are some risks that may occurrence to the nature of these types of interventions, and although researchers attempt to decrease it, it will still remain as the risk of bias. The music therapist has to be present in the therapeutic sessions, so both the therapist and patients cannot be blinded and it effects the completing assignments. As the participants are not in blinded situation in the intervention, it can lead to bias when therapist ask them to report and explain about subjective outcomes such as pain (Bradt *et al.,* 2011). Other limitation was the therapy duration that was less than one month and just 20 sessions. However, there is a need to check whether the effect of music therapy is sustainable or will give better results after follow-up or not. The advantages of the present investigation are large number of participants involved in research, applying and comparing two types of music therapy interventions.

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