Original Article

Effect of Music Therapy Intervention in Acute Postoperative Pain among Obese Patients

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Abstract

Background: Postoperative pain is an uncomfortable situation in the critical period of surgical recovery. Often, pain maybe increase stress response, abnormal vital sings and sleep disorders or maybe act as an appetite suppressant. Music therapy is described as non - pharmaceutical intervention to accomplish individualized patients' goals for hospital treatment.
Aims: To determine the effect of music therapy in postoperative pain among obese patients who underwent a major abdomen surgery.
Methodology: A prospective randomized clinical trial was conducted in a tertiary hospital, with a before and after intervention measurement. Data were collected from overweight or obese postoperative patients (n=87), who were randomly separated in two groups, the "music therapy" group (n1=45), and the "non - music therapy" group (n2=42 subjects). Visual Analogue Scale (VAS) was used for pain perception. The period of the study was 3 months (from Jan 2012 to March 2012).
Results: The patients in two groups had normal mean values in heart rate, respiration rate and SpO2, before and after the intervention, without any special abnormalities. Those patients who received music therapy, twice postoperatively, referred more decreased Δ-VAS score = -1.78 units (VAS after – VAS before: 2.64 - 4.42), in compare to the non-music patients group, which their Δ-VAS score was less decreased, only for -0.22 units (VAS after - VAS before: 3.76 - 3.98). From all study variables, only "Mean Arterial Pressure" and "VAS" were found to be affected by the music therapy intervention.
Conclusions: It seems that implementing music therapy in the acute postoperative period may be a useful intervention tool, in order to promote patients' comfort and more tolerable perception against pain. Nurses are able to use this method, in daily clinical practice as a supplementary tool with the standard combination of analgesics.

Keywords: music therapy; postoperative pain; obese patients; visual analogue scale.

Introduction

Pain is common response to surgery and can lead patients to delayed recovery in hospital, thereby adding unnecessarily to health care cost and poor satisfaction outcome (Agency for Health Care Policy and Research, USA, 1992). Pain mechanism has been introduced in the "open gate theory". It has been described that music stimulation maybe can occupy the pain gate (Melzack, 1965). Neuroanatomy and neurophysiology of pain and some possible nursing interventions are described in literature (Wentworth Dolphin, 1983). Postoperative pain is an unpleasant clinical response and can result in stress response, abnormal vital sings (increased blood pressure and tachypnea) and sleep disorders, or maybe act as an appetite suppressant [Good, Anderson & Ahn, 2005].

Music Therapy is the clinical and evidence-based use of music interventions to accomplish individualized goals. Research in music therapy supports its effectiveness in a wide variety of healthcare and educational settings. (Good, Anderson & Ahn 2005; American Music Therapy Association, 1998).

In spite of this fact, music therapy in not widely used in routine daily clinical practice as a tool of postoperative pain management. Nurses have carried out researches to determine the efficacy of music in pain management, demonstrating that the implementation of music therapy, could be beneficial for postoperative pain management. It belongs to non-pharmaceutical interventions and adds a positive impact on postoperative pain reduction, along with analgesics for greater postoperative relief without additional side effects (Cepeda et al., 2006; Nilsson, Unosson & Rawal, 2005; Good et al., 2005; Engwall & Duppils, 2009).

In obese patients, abdominal pain should be avoided more intensively as well because (due to obesity) it can further restrict ventilation and delay the postoperative ambulation. Also, the incision size is considered as an independent predictor of postoperative pain, and in obese patients, is often longer length, than normal patients for the same operation (Kalkmana, 2003).

There are several studies with music therapy intervention as a non-pharmaceutical method for postoperative pain management. Pain levels are measured by using pain scales such as the Visual Analogue Scale (VAS). Anxiety levels are measured by using anxiety scales such as the State-Trait Anxiety Inventory (STAI), which is an introspective psychological inventory. In literature, many studies report compare such findings before and after the music therapy intervention (Good et al., 2005; Engwall & Duppils, 2009; Kalkmana, 2003). In a quasi-experimental study of patients receiving spine surgery, the mean VAS score was found to be almost double score in the control group (2.1 - 5.1), compared with the mean VAS in the study - music therapy- group (0.8 - 2.0). In the same study, STAI score was not significantly changed after the surgery in both groups (Lin et al., 2011).

To our knowledge there isn't any reported study with music therapy intervention against postoperative pain in obese patients.

Aims

To determine the effect of music therapy in postoperative pain among obese patients who underwent a major abdominal surgery. Can music therapy be used as a supplementary tool in postoperative pain management?

Methodology

A prospective randomized clinical trial was conducted in a tertiary university hospital. The trial included a study group and a control group too. It was a confirmatory study with pre-intervention and post-intervention measurements in both groups. Data were collected from overweight or obese postoperative patients (n=87), who were simply separated in two study groups, the "music therapy" group (n1=45), and the "non-music therapy" group (n2=42) subjects. The random selection algorithm was the following: during a typical surgical day, half of patients (the 1st and the 3rd patient) were included in the study group and the 2nd and the 4th were included in the control group. The following surgical day, the selection was done by the opposite row. The study period was 3 months.

Eligibility criteria for participants were the following: all patients should a) be aged between 18-70 years old (adults but not very elderly), b) be classified as overweight (Body Mass Index – BMI $\geq$ 25%), or obese (BMI $\geq$30%) according to the international classification adult obesity, published by WHO, and c) have been operated in the abdomen at the same day of music therapy intervention.

The “music therapy group” patients listened two times postoperatively music by earphones with orchestral classical track from MP3 USB stick, provided by researcher nurses. The first music intervention took place in the Post Anesthesia Care Unit (PACU) and the second in the surgical nursing ward, upon return from PACU. The duration of each music intervention was 30 minutes. The “non-music therapy group” patients were under routine nursing observation.Patients’ clinical parameters were measured two times (before and after intervention) in both groups. Parameters measured were Visual Analogue Scale (VAS) for pain assessment, Blood Pressure (Systolic SBP, Diastolic DBP), Mean Arterial Pressure (MAP), Respiratory Rate (RR) and Saturation per O_2 (SpO_2).

The VAS was used to measure pain. The VAS consists of a 10-cm horizontal line, is quick, easy to use and score, and provides a method in order to compare the findings to previous results. Another advantage of the VAS is that it provides ratio-level data, allowing more robust parametric statistical analysis (McCormack, Horne & Sheather, 1998; Jensen, 1986).

Ethical considerations

The study protocol has been reviewed by the appropriate local ethics review process, such as the University Hospital Ethics Committee and has therefore been performed in accordance with the ethical standards laid down in this University Hospital. There is a written permission of the hospital with No. 12635. All patients gave their informed consent prior to their inclusion in the study. Details that might disclose the identity of the subjects under the study are omitted.

Statistical Analysis

Data analysis was performed using SPSS version 20.0 (SPSS Inc., Chicago, IL, USA). The results were tabulated and analyzed using appropriate statistical techniques. Intergroup- and intragroup-comparisons of the study parameters were made with “Repeated Measures ANOVA”. For descriptive data statistics, mean and SD were used. $P<0.05$ was considered statistically significant for all tests.

A “Repeated Measures ANOVA” compares the mean differences between groups that have been split on within-subjects factors (also known as independent variables). The dependent variable is "Score" of tests (tests: VAS, SpO2, HR, RR, MAP), whilst the independent factors are the “Type of Therapy” (two levels: “music therapy” and “non-music therapy”) and the "Time" (two levels: “before” and “after”). The Repeated Measures ANOVA was applied to evaluate changes in the scores of any test.

Mauchly's sphericity test examines the form of the common covariance matrix. A spherical matrix has equal variances and covariances equal to zero. The common covariance matrix of the transformed within-subject variables must be spherical, or the F tests and associated p values for the univariate approach to testing within-subjects hypotheses are invalid. If the Chi-square approximation has an associated p-value less than our alpha level, the sphericity assumption has been violated. For practical purposes, these issues are important only in helping us decide which output to use, and if the output should be adjusted. If we can use the univariate output, we may have more power to reject the null hypothesis in favor of the alternative hypothesis. However, the univariate approach is appropriate only, when the sphericity assumption is not violated. If the sphericity assumption is violated, then in most situations it is better off staying with the multivariate output.

An alternative way using the multivariate approach is to adjust the univariate test degrees of freedom. There are three different correction factors: the Greenhouse-Geisser Epsilon (G-G), the Huynh-Feldt Epsilon (H-F) and the Lower-bound (L-B). The G-G correction factor has been shown to be too conservative and is used when the study has small number of sample. With regard to the normality control of variables, studies have shown that for small and medium-sized samples, the deviation from normality has very little effect on the type I error. Moreover, Kolmogorov-Smirnof and Shapiro-Wilk criteria are particularly strict in the sense that one often refuse normality assumption. Then, a good solution is the graphical representations. In our case, approximate and based on the Normal Q-Q Plot and Detrended Normal Q-Q Plot, it was shown there was not violated univariate normality, in any of the variables.

Results

The study enrolled 87 patients, 45 in “music therapy” group (15 males, 30 females) and 42 in “non-music therapy” group (16 males, 26 females). Descriptive statistics of the study population and kinds of operations are shown in Table 1.

Table 1. Descriptive Characteristics of two study groups (Sex, Age, Body Mass Index and kind of operation).

	Music Therapy group				Non - Music Therapy group			
Sex	**N**	**Age** **Mean** *(years)*	**Standard Deviation**	**BMI %**	**N**	**Age** **Mean** *(years)*	**Standard Deviation**	**BMI %**
Male	15	43.13	12.54	40.80	16	44.81	9.97	44.20
Female	30	41.30	11.59	41.20	26	43.35	12.47	41.90
	Kind of operation			%	**Kind of operation**			%
	Sleeve gastrectomy			57.78	Sleeve gastrectomy			42.86
	Open cholecystectomy			31.11	Open cholecystectomy			42.86
	Open Inguinal Hernia Repair			6.67	Open Inguinal Hernia Repair			7.14
	Large bowel resection			4.44	Large bowel resection			7.14

Table 2. Outcome measurements between 2 groups "before" and "after" music therapy intervention.

		Non- Music therapy Group		**Music therapy** Group	
	units	Mean	Standard Deviation	Mean	Standard Deviation
HR - before	bpm	81.60	12.86	79.31	12.98
HR - after		**82.19**	**12.50**	**80.60**	**15.58**
RR - before	bpm	17.21	3.04	18.27	4.48
RR - after		**17.14**	**3.24**	**17.47**	**3.76**
SpO_2 - before	%	96.64	1.59	96.29	2.27
SpO_2 - after		**96.62**	**1.59**	**96.22**	**3.57**
MAP - before	mmHg	96.40	13.38	95.31	15.42
MAP - after		**96.48**	**12.81**	**92.04**	**14.23**
VAS - before	0-10	3.98	1.66	4.42	2.24
VAS - after		**3.76**	**1.39**	**2.64**	**1.90**

Table 3. Interaction of Music Therapy on not with each outcome measurement

Source		Type III-Sum of Squares	Df	Mean Square	F	Sig.
Heart Rate * Music Therapy	Sphericity Assumed	5.226	1	5.226	.163	.688
	Greenhouse-Geisser	**5.226**	**1.000**	**5.226**	**.163**	**.688**
	Huynh-Feldt	5.226	1.000	5.226	.163	.688
	Lower-bound	5.226	1.000	5.226	.163	.688
Resp Rate * Music Therapy	Sphericity Assumed	5.766	1	5.766	3.713	.057
	Greenhouse-Geisser	**5.766**	**1.000**	**5.766**	**3.713**	**.057**
	Huynh-Feldt	5.766	1.000	5.766	3.713	.057
	Lower-bound	5.766	1.000	5.766	3.713	.057
SpO2 * Music Therapy	Sphericity Assumed	.020	1	.020	.007	.931
	Greenhouse-Geisser	**.020**	**1.000**	**.020**	**.007**	**.931**
	Huynh-Feldt	.020	1.000	.020	.007	.931
	Lower-bound	.020	1.000	.020	.007	.931
MAP * Music Therapy	Sphericity Assumed	121.035	1	121.035	6.966	.010
	Greenhouse-Geisser	**121.035**	**1.000**	**121.035**	**6.966**	**.010**
	Huynh-Feldt	121.035	1.000	121.035	6.966	.010
	Lower-bound	121.035	1.000	121.035	6.966	.010
VAS * Music Therapy	Sphericity Assumed	26.552	1	26.552	69.606	.000
	Greenhouse-Geisser	**26.552**	**1.000**	**26.552**	**69.606**	**.000**
	Huynh-Feldt	26.552	1.000	26.552	69.606	.000
	Lower-bound	26.552	1.000	26.552	69.606	.000

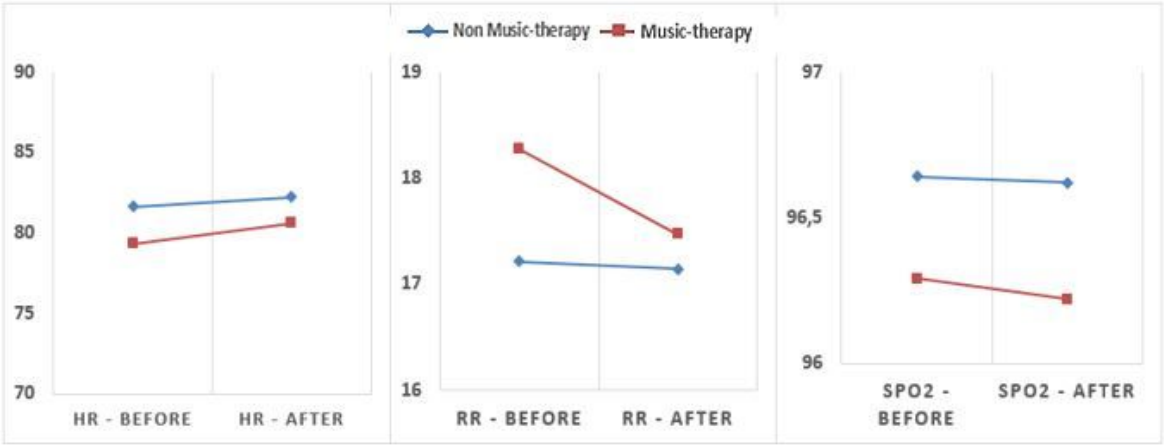

Figure 1. Estimated marginal means for HR, RR and SpO_2 before- and after- intervention for two study groups.

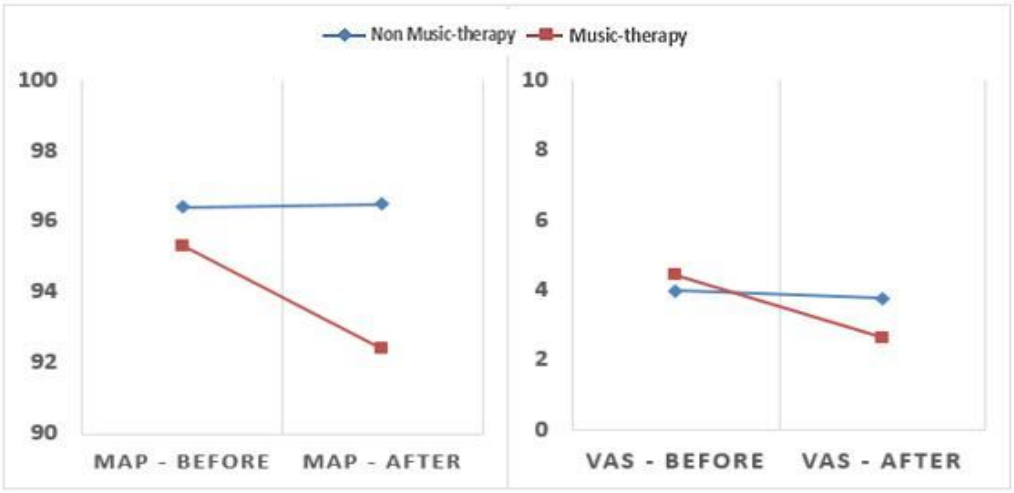

Figure 2. Estimated Marginal Means of MAP and V

The analgesic medication was the same at usual routine dosages for both study groups. The mean scores for measured variables: HR, RR, SpO2, MAP and VAS, at two time points "before" and "after" the intervention, for both study groups, are shown in Table 2. It seems, that patients in two study groups have normal mean values in HR, RR, SpO_2, before and after the intervention, without any considerable abnormalities.

In contrary, significant differences were observed in MAP between the two groups. MAP mean score in "music therapy group" before the intervention was 95.31mmHg (SD=15.42). After the music therapy intervention it decreased to 92.04mmHg (SD=14.23). On the other hand, in the "non-music therapy" group, first MAP measurement was 96.40mmHg (SD=13.38)

while the second was almost the same 96.48mmHg (SD=12.81).

The "VAS" mean score was 4.42/10 (SD=2.24) in "music therapy" group before the intervention and it decreased to 2.64/10 (SD=1.90) after the music therapy. In the "non-music therapy" group the VAS mean score before the intervention was 3.98/10 (SD=1.66) and almost the same 3.76/10 (SD=1.39) in the second measurement (Table 2).

Statistically, Mauchly's test of sphericity, of all variables, indicated that the assumption of sphericity was violated ($p<0.001$), and therefore, a Greenhouse-Geisser correction was used. For the three variables "HR", "RR" and "SPO_2" separately, there wasn't any statistical significant interaction with "Type of Therapy" (music therapy or not).

The Within-Subjects test indicates that,

- the interaction of "Type of Therapy" and "Heart Rate" is not significant [F (1, 5.266)=0.163, p=0.688)].
- the interaction of "Type of Therapy" and "Respiratory Rate" is not significant [F (1, 5.766)=3.713, p=0.057)].
- the interaction of "Type of Therapy" and "SpO2" is not significant [F (1, 0.020)=0.007, p=0.931)].

However, the interaction of "Type of Therapy" and "Mean Arterial Pressure" is significant [F (1, 121.035) = 6.966, p=0.010)]. Similar result was found for the interaction of "Type of Therapy" and "VAS" that is significant [F (1, 26.552) = 69.606, p<0.001)]. Table 3.

There were not found any significant differences for estimated marginal means for HR, RR and SpO2 before and after the intervention for two study groups Figure 1.

Figure 2 shows that the Within Subject test indicates a significant interaction between "Type of Therapy" and "MAP" values (p=0.010). In the same Figure, "MAP" values for "Non-music therapy" group are increasing, but for "Music therapy" group are decreasing over time. The significant interaction indicates that the values between two groups not only changing over time, but they are changing in different ways too.

Also, Figure 2 shows that VAS scores are decreasing in both groups, over time and the interaction of "Type of Therapy" and "VAS" measurements is significant (p<0.001). Significant interaction indicates that although VAS score is changing over time, nevertheless for music group is decreasing more rapidly.

The variable "Smoking or not" was examined if there was any positive or negative effect in postoperative pain perception. No significant statistical result was found (p=0,719).

Discussion

This study tried to determine the effect of music therapy as a non-pharmaceutical intervention and its potential result to postoperative pain relief. As a nursing interventional study, all measurements were done -before and after- the intervention, during nursing observation for the whole day of patients' operation. The study population was overweight or obese patients, who underwent a major abdominal surgery. Both groups have similar obesity rates.

During the postoperative period, aggressive pulmonary care and pain control, also an early ambulation is recommended to obese patients. Thus, it is a matter of evidence based practice, to reduce postoperative pain, as more as it can be reduced, by any method could be effective (Kalkmana, 2003).

Regarding the method of intervention and the kind of music selection, several studies suggest that passive music listening via headphones is the better way of intervention. Literature suggests that researcher-selected music is most effective in reducing anxiety and is better to be without versing, so this method was adopted in this study (McCormack, Horne & Sheather, 1998; Gooding, Swezey & Zwischenberger, 2012).

In the present study, patients who received music therapy twice postoperatively, revealed a decreased pain score Δ-VAS= -1.78 units (VAS after – VAS before: 2.64 - 4.42), in compare to the non-music group, which their Δ-VAS score was less decreased, only -0.22 units (VAS after - VAS before: 3.76 - 3.98).

From all study variables, only "VAS" and "MAP" were found to be significantly affected by the music therapy intervention. These are the major findings that could be compared with other published studies. In a randomized clinical trial with two different study groups of operated obese patients (laparoscopy Vs open abdominal operation), it was reported a mean VAS score postoperatively in the first hours of 4.2/10 and 5.2/10 respectively The level of pain the scale of

0-10 is considered as moderate in both studies despite of the difference of 1 unit. In addition, Δ-VAS was decreased less than -1 unit during the first day, but not so much as decreased in the present study in the music therapy group (Δ-VAS: -1.78) (Nguyen, 2001). However, music therapy seems to have an added value if combined with the routine pain medication management.

In a Swedish study between three patient groups with aim to determine whether a) music, or b) music in combination with therapeutic suggestions and c) compared with a third control group, could improve the postoperative recovery in PACU, it was found that pain intensity (VAS) was significantly lower in the two study groups, compared with the control group. So, it was demonstrated that music in the early postoperative period has a beneficial effect on patients' experience of analgesia (Nilsson et al., 2003). These findings are quite similar to this study. On the other side, in the same study it was found higher oxygen saturation in study group compared with the control group. However, the present study didn't confirmed any significant difference regarding oxygen saturation.

Another study suggests that both the intraoperative and postoperative music therapy may decrease postoperative pain, compared with a third non-music group. Music therapy postoperatively may also reduce anxiety and morphine consumption. In the same study, it was not found any significant difference in Blood Pressure, Heart Rate and SpO_2 between the groups (Nilsson, Unosson & Rawal, 2005). The present study confirmed these findings, but only for HR and SpO_2. On the other side, it was found a great statistical difference in mean Blood Pressure and a marginally not statistical difference in Respiratory Rate between two groups.

Similar results were reported in a study about the effect of music on early postoperative pain, anxiety, and hemodynamic profile in cesarean section surgery. It seems that vital signs HR, RR and the saturation are not affected significantly from the music intervention (Ebneshahidi, 2008).

Similarly to the present study, a study in Concord USA with two nursing interventions, during the postoperative period in surgical wards (guided imagery, music therapy) showed that both intervention groups have significant positive effects in postoperative pain management for patients who were operated in abdominal area (Laurion & Fetzer, 2003).

Another study that measured immediate effects on pain using VAS (before- and after- for five tests with 20min intervals in the first 2 days) showed significant pain relief in relation to the compared intervention of patients' that they were taught for pain management (Good et al., 2010).

In conclusion, it seems that implementing music therapy in the acute postoperative period may be a useful intervention tool, in order to promote obese patients' comfort against acute pain. Nurses are able to use this method in daily clinical practice in obese patients, which they should obtain to an early ambulation and a quick respiratory system recovery. It is effective and maybe has a supplementary role with the standard combination of analgesics. Regarding the vital signs, more normalized blood pressure and maybe breathing rate values are definitely contributing to a better and a more safe recovery period. This kind of study should be expanded in a larger patient population and for longer length of postoperative observation in order to determine the total pain relief and the total necessary music interventions.

Place where the work was carried out: University Hospital of Heraklion, Crete, Voutes, Heraklion, Crete, Greece P.O. Box 1352 – P.C. 71500

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