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The Effect of Lo-Fi Music Therapy on Pain Intensity and Blood Pressure in Post-Operation Patients in Karsa Husada Batu Hospital

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ABSTRACT

Background: Pain is the most common complaint and the main problem in postoperative patients. Several non-pharmacological therapies can distract the postoperative patient's focus from pain, one of which is music therapy. Certain music genres can affect human physiology and psychology so that the patient's blood pressure is stable. Several genres of music can provide a therapeutic effect, one of which is lo-fi. Therefore, this study aimed to examine the effect of lo-fi music on pain intensity and blood pressure. ***Methods:*** This study uses a "quasi-experimental" method with a "pretest-posttest with control group design" approach. The treatment group received analgesic therapy and lo-fi music therapy, while the control group received only analgesic therapy. ***Results:*** There was a difference in pain intensity before and after lo-fi music therapy and analgesics with a significance of 0.001 ($p < 0.05$) in the treatment group and 0.046 ($p < 0.05$) in the control group. Unfortunately, in blood pressure, there was no significant difference before and after giving lo-fi music therapy with a significance of 0.161 ($p > 0.05$) in the treatment group and 0.556 ($p > 0.05$) in the control group. ***Conclusion:*** Giving lo-fi music therapy with a combination of analgesic therapy is more effective in reducing pain intensity than giving analgesic therapy alone and lo-fi music therapy and analgesic therapy do not affect systolic blood pressure.

Keywords: postoperative pain; lo-fi music; pain intensity; blood pressure

INTRODUCTION

Pain is an unpleasant sensory and emotional experience resulting from potential or actual tissue damage. (Reuben et al., 2013). Acute perioperative pain is inflammation secondary to tissue trauma and or direct nerve injury. Injured tissue releases local inflammatory mediators (prostaglandins) that cause oversensitivity to stimuli in the local area. (Patel et al., 2020). Incisional surgery, traumatic tissue injury, and manipulation of visceral structures can lead to inflammatory, neuropathic, and visceral pain mechanisms that are closely related to the pain that occurs during the post-surgical period. (Nurdiansyah, 2015).

Postoperative pain is the most common and major treatment problem for patients. More than 80% of patients undergoing surgery experience acute postoperative pain, and about 70% of patients experience moderate or severe pain. (Lin, C., Hwang, S., Jiang, P., & Hsiung, 2019).

Surgical procedures in the form of incisions, traumatic actions on body tissues, and manipulation of visceral structures can cause inflammatory mechanisms and neuropathic and visceral pain that are closely related to the pain that occurs during the postoperative period. (Nurdiansyah, 2015). Postoperative pain discomfort can activate the sympathetic nervous system, causing tachycardia and hypertension, which in turn increases the workload of the heart and oxygen consumption of the heart muscle. This may lead to myocardial infarction. (Sin & Chow, 2015).

In addition, to avoid inducing or aggravating pain, patients sometimes restrain their coughing and deep breathing, which may result in atelectasis. Patients will also minimize movement to change position on the bed and refuse ambulation to reduce pain, which will eventually lead to increased platelet adhesion, putting patients at risk of venous thrombosis and pulmonary embolism. (Sin & Chow, 2015). Persistent pain can harm physiological and psychological functions, such as hypoventilation, increased oxygen demand, delayed ambulation, and limitation of daily activities, which can develop into a chronic condition, disrupt sleep patterns, and increase anxiety and patient dissatisfaction. (Lin, C., Hwang, S., Jiang, P., & Hsiung, 2019).

According to data from the World Health Organization (WHO), the number of surgical patients has increased every year. In 2011, there were 140 million in all hospitals in the world, while in 2012 it increased to 148 million. In Indonesia alone in 2012, surgery reached 1.2 million people. (Parman, Rasyidah, A., Sutinah, Triyanto, 2019). The American Music Therapy Association (AMTA) defines music therapy as "the evidence-based and clinical use of music interventions to achieve individualized goals in a

professionally credentialed therapeutic relationship with an approved completed therapy program". (Yinger, 2018). According to Potter (2005), the type of music used in music therapy can be adjusted as desired, such as classical music, instrumental music, and slow music. (Nurdiansyah, 2015). Lo-fi music itself is grouped into the slow music category. " lo-fi " (Low fidelity) music has a beat tempo of about 60 - 80 bpm, lo-fi music itself describes a form of popular music with poor sound quality (the opposite of " hi-fi " or high fidelity) and other rough qualities because the recording is done in a "do-it-yourself / DIY " manner by amateur recorders on amateur equipment and novice music players but music fans like the uniqueness of such soothing music. (Richard-Lalonde et al., 2020; Thesis et al., 2014). Music that has a tempo ranging from 60 - 80 bpm can be used in music therapy to reduce pain intensity. (Richard-Lalonde et al., 2020).

Pain cessation mechanisms can be obtained through relaxation techniques, one example is music therapy. Physiologically listening to music can produce endorphin substances which are morphine-like substances supplied by the body that can reduce pain. (Lin, C., Hwang, S., Jiang, P., & Hsiung, 2019). Music can inhibit pain impulses with sound stimuli in the form of melody, rhythm, harmony, timbre, shape, and style that will be received by the ear and processed by the brain, which causes the stimulation of endorphin hormones that can inhibit the transmission of pain impulses in the central nervous system. In addition, listening to music using a headset is a safe, inexpensive, and non-invasive intervention, and this therapy has been studied in several surgical procedures. (Lin, C., Hwang, S., Jiang, P., & Hsiung, 2019). A study under the title "Effectiveness of Music Therapy, Guide Imagery and Guide Imagery with Music (GIM) Terhapap Pain Intensity in Patients After Sectio Caesarea Surgery" showed that music therapy can reduce pain intensity which is very significant than guide imagery and guide imagery with music (GIM), this proves that music therapy is more effective in reducing pain intensity. (Herdianto, 2018).

Based on preliminary studies and interviews with patients at RSU Karsa Husada Batu, a pain intensity scale was obtained for 5 respondents with a mean = of 7.2. And the number of patients undergoing surgical procedures in 2020/2021 was 1087 patients, and the most surgical procedures in December 2020 were Exploratory Laparotomy surgical procedures and Other Transurethral Prostatectomy surgical procedures.

Postoperative pain that does not disappear can harm physiology and psychology. Pain that is not resolved will hinder healing so patients who are hospitalized will stay longer and increase the cost of hospital care. (Nurdiansyah, 2015). In addition, relaxation techniques with music therapy can shorten the length of hospital stay, and reduce the anxiety of postoperative patients or those undergoing surgery.

Many types of non-pharmacological pain management are taught on health campuses, but only a few types of non-pharmacological management are applied in nursing services, such as relaxation techniques with deep breathing and distraction techniques. Many studies suggest that music therapy is effective in reducing pain intensity through certain rhythms.

METHOD

The research was conducted in the Matahari Room, Seruni Room, and Amaryllis Room of Karsa Husada Batu General Hospital. This research location was chosen because RSU Karsa Husada Batu is a teaching hospital. This type of research is quantitative research.

This research method uses "quasi-experimental" with "pretest-posttest with control group design". The intervention group received analgesic therapy and music therapy, while the control group only received analgesic therapy. In this design there are two groups studied, namely the subject is observed first before receiving the intervention, then observed again after the intervention has been given.

TABLE 1: Pretest-Posttest Control Group Design Scheme

Group	Pre-test	Treatment (X)	Post-test
KA	OKA_1	X_1	OKA_2
KB	OKB_1	X_2	OKB_2

Description:

OKA_1 : Pre-test of the intervention group
X_1 : Providing interventions in the form of analgesic therapy and music therapy
OKA_2 : Intervention group post-test
OKB_1 : Intervention group post-test
X_2 : Intervention in the form of analgesic therapy
OKB_2 : Post-test (the control group in the form of analgesic therapy)
KA : Intervention group
KB : Control group

The population in this study were all postoperative patients at RSU Karsa Husada Batu on July 7 - October 28, 2021. In this study, the sampling technique used non-probability sampling type consecutive sampling, namely the sample selection determines that subjects who meet the research criteria are included in the study until a certain period so that the number of respondents is met (Nursalam, 2017). The total sample to be taken is 36 respondents based on the total of the 2 groups (intervention and control).

The research instruments used in this study consisted of Standard Operating Procedures / SOP and Observation Sheets. There are 2 data analysis techniques used in this study, namely univariate and bivariate analysis. Univariate analysis is used to determine and identify dependent variables, namely pain intensity, and blood pressure before and after intervention in the form of frequency and percentage distribution tables. Bivariate analysis techniques used in this study are non-parametric tests (Wilcoxon and Mann Whitney) and parametric tests (Paired T-test and Independent T-test). The Wilcoxon test is a nonparametric hypothesis test method on paired samples with an ordinal data scale used to test the difference or influence between the pre and post-test of lo-fi music therapy intervention on reducing pain and blood pressure in the treatment group (KA) and in the control group (KB). While the Mann-Whitney Test is used to test the difference or influence of pre and post-tests with ordinal data scales on unpaired (independent) samples of giving lo-fi music on differences in pain in the treatment group (KA) and in the control group (KB). Then the Paired T-test is used to test parametric hypotheses on paired samples with a ratio data scale used to test the difference or influence between the pre and post-test of the intervention of giving lo-fi music therapy on lowering blood pressure in the treatment group (KA) and the control group (KB). While the Independent T-test is used to test parametric hypotheses on unpaired samples with a ratio data scale used to test unpaired samples on the provision of lo-fi music on differences in blood pressure in the treatment group (KA) and the control group (KB).

RESULT

The research data was collected at RSU Karsa Husada Kota Batu on May 20, 2021, to July 20, 2021.

(1) Wilcoxon Test Results Pre-Post Pain

TABLE 2: Wilcoxon Signed Ranks Test Results, Pre-Post Treatment Group

Permanence test	N	Mean Rank	Sum of Ranks	Z	P
Negative Rank	14	7.50	105.00	-3.397	.001
Positive Rank	0	0	.00		
Ties	4				

*Based on negative ranks

TABLE 3: Wilcoxon Signed Ranks Test Results Pre-Post Control Group

Permanence test	N	Mean Rank	Sum of Ranks	Z	P
Negative Rank	4	2.50	10.00	-2.000	.046
Positive Rank	0	.00	.00		
Ties	14				

*Based on positive ranks

(2) Results of the Intervention Group Pain Difference Test with the Control Group

TABLE 4: Mann-Whitney Test Results Pre-Test Treatment Group with Pre-Test Control Group

Group	N	Mean Rank	Sum of Ranks	Z	P
Experimental	18	17.44	314.00	-.694	.487
Control	18	19.56	352.00		

TABLE 5: Mann-Whitney Test Results Post-Treatment Group with Post-Control Group

Group	N	Mean	Sum of Ranks	Z	P
Experimental	18	13.17	237.00	-3.166	.002
Control	18	23.83	492.00		

(3) Results of Comparison of Blood Pressure Data in the Treatment Group and Control Group

TABLE 6: Paired T-Test Results of Pre-Post Systolic Blood Pressure of Treatment Group and Control Group

		Mean	N
Pair 1	TDS Pre-Test Treatment Group	120.72	18
	TDS Post Test Treatment Group	116.11	18
Pair 2	TDS Pre Test Control Group	120.28	18
	TDS Post Test Control Group	118.83	18

TABLE 7: Results of Paired T-Test on Pre-Post Systolic Blood Pressure of The Treatment Group and Control Group

Variable 1	Variable 2	t	df	Sig. (2-tailed)
TDS Pre-Test Treatment Group	TDS Post Test Treatment Group	1.152	17	.265
TDS Pre Test Control Group	TDS Post Test Control Group	.608	17	.551

TABLE 8: Results of Independent T-Test on Blood Pressure Pre-Test Treatment Group-Control Group and Post Test Treatment Group-C Control Group

		t	df	Sig. (2-tailed)
TDS Pre Treatment Group with Pre-Control Group	Equal variances assumed	.095	34	.925
	Equal variances not assumed	.095	32.498	
TDS Post Treatment Group with Post Control Group	Equal variances assumed	-.700	34	.489
	Equal variances not assumed	-.700	29.391	

DISCUSSION

In this study, there were 36 respondents with an age range of 21 - 42 years. Almost all respondents in this study were female, with 33 women and 3 men. There were 17 women and 1 man in the treatment group and 16 women and 2 men in the control group. The most common surgical procedure in this study was *"sectio caesarian"*. In Table 4 of the pre-test table of the treatment group, it is known that the frequency with the most data is 14 respondents (77.78%) with moderate pain and the frequency with the least data is 1 respondent (5.56%) with mild pain. While in the post-test of the treatment group, the frequency with the most data is known to be 9 respondents (50.00%) with mild pain and the frequency of the least data is 3 respondents (16.67%) with severe pain, while in the pre-test data of the control group, it is known that the frequency of the most data is 8 respondents (44.44%) with moderate pain and 3 respondents (16.67%) with mild pain. While in the control group post-test, it is known that the highest frequency of data is 10 respondents (55.56%) with moderate pain and the least frequency of data is 4 respondents (22.22%) with mild pain and 4 others (22.22%) with severe pain.

Acute perioperative pain is inflammation secondary to tissue trauma and or direct nerve injury. Injured tissue releases local inflammatory mediators (prostaglandins) that cause oversensitivity to stimuli in the local area. (Patel et al., 2020). Surgical actions in the form of incisions, traumatic actions on body tissues, and manipulation of visceral structures can cause inflammatory mechanisms and neuropathic and visceral pain that are closely related to the pain that occurs during the post-surgical period. (Nurdiansyah, 2015).

Postoperative pain is the most common and major treatment problem for patients. More than 80% of patients undergoing surgery experience acute postoperative pain, and about 70% of patients experience moderate or severe pain. (Lin, C., Hwang, S., Jiang, P., & Hsiung, 2019). The discomfort of postoperative pain can activate the sympathetic nervous system, causing tachycardia and hypertension, which in turn increases the workload of the heart and oxygen consumption of the heart muscle. This may lead to myocardial infarction. (Sin & Chow, 2015).

The American Music Therapy Association (AMTA) defines music therapy as "the evidence-based and clinical use of music interventions to achieve individualized goals in a professionally credentialed therapeutic relationship with an approved completed therapy program". (Yinger, 2018). According to Potter (2005), the type of music used in music therapy can be adjusted as desired, such as classical music, instrumental music, and slow music. (Nurdiansyah, 2015).

In this study, researchers used *lo-fi* music therapy to test whether the music could affect pain intensity and blood pressure. *Lo-fi* music itself is grouped into the slow music category. *"Lo-fi"* (Low fidelity) music has a beat tempo of about 60 - 80 bpm, lo-fi music itself describes a form of popular music with poor sound quality (the opposite of *"hi-fi"* or high fidelity) and other rough qualities because the recording is done in a *"do-it-yourself / DIY" way* by amateur recorders on amateur equipment and novice music players but music fans like the uniqueness of such soothing music. (Richard-Lalonde et al., 2020; Thesis et al., 2014). Music can inhibit pain impulses with sound stimuli in the form of melody, rhythm, harmony, timbre, shape, and style that will be received by the ear and processed by the brain, which causes the stimulation of endorphin hormones that can inhibit the transmission of pain impulses in the central nervous system. In addition, listening to music using a headset is a safe, inexpensive, and non-invasive intervention, and this therapy has been studied in several surgical procedures. (Lin, C., Hwang, S., Jiang, P., & Hsiung, 2019). Physiologically, listening to calm music can produce endorphin, which is a morphine-like substance supplied by the body that can reduce pain. (Lin, C., Hwang, S., Jiang, P., & Hsiung, 2019).

In this study, the results of data analysis on pain intensity before being given to the intervention group and control group were obtained. It is known that the pre-test pain intensity in the treatment group with the highest number is moderate scale pain with a total of 14 respondents (77.78%) and post-test pain intensity in the treatment group with the highest number is mild scale pain with a total of 9 respondents (50.00%). While the highest pain intensity in the control group pre-test was 8 respondents (44.44%) with moderate pain and the highest pain intensity in the control group post-test was 10 respondents (55.56%) with moderate pain.

Based on the results of statistical analysis on Table 2 It can be seen that the results of the Wilcoxon test on pre-post pain in the treatment group have a significant effect after being given lo-fi music therapy and analgesics, with a p-value (Asymp. Sig 2 tailed) 0.001 (p <0.05) with 14 negative ranks. While the results of Wilcoxon analysis on Table 3 The results of Wilcoxon analysis on pre-post pain in the control group also showed an effect with analgesic therapy, with a p-value (Asymp. Sig 2 tailed) 0.046 (p < 0.05) with 4 negative ranks. Thus, it can be concluded that the provision of lo-fi music therapy and analgesics in the treatment group is more effective in reducing postoperative pain intensity compared to the control group with analgesic therapy.

Blood pressure is a compressive force in all directions on all surfaces enclosed in blood vessels and the inner walls of the heart, occurs due to the force of heart pressure that pushes blood through blood vessels, peak pressure occurs when the ventricles contract and is called "systolic pressure". While diastolic pressure is the lowest pressure that occurs when the heart is at rest. (Novita Indra, 2015; Smeltzer et al., 2010). The mechanism of lowering blood pressure is generally associated with the stimulation of stretching vessels in baroreceptors in the carotid sinus, aortic arch, and large arteries of the neck and brain. (Novita Indra, 2015).

However, the decrease in blood pressure associated with sound stimulation (music) on ear mechanoreceptors is closely related to the secretion of hormones, especially the hormone endorphin which can change the mood and give a relaxing effect. Impulses received by the brain from music sound stimulation received through the ear, causing the hypothalamus to stimulate the pituitary gland (pituitary) to secrete the hormone endorphin which results in increased parasympathetic activity and decreased sympathetic activity in the spinal cord which ultimately causes a relaxing effect and vasodilation of blood vessels resulting in decreased blood pressure. (Novita Indra, 2015; Patton & Thibodeau, 2010; Smeltzer et al., 2010).

The results of the maximum value of systolic blood pressure in the pre-test of the treatment group were 170.00 mmHg with an average systolic blood pressure of 120.72 mmHg, while in the post-test the maximum value of blood pressure was 150.00 mmHg with an average systolic blood pressure of 116.11 mmHg. In the pre-test of the control group, the maximum value of systolic blood pressure was 137.00 mmHg with an average systolic blood pressure of 120.28 mmHg, while in the post-test the maximum value of blood pressure was 140.00 mmHg with an average systolic blood pressure of 118.83 mmHg.

The parametric data analysis test requires data normality and homogeneity tests, for paired samples using the Kolmogorov-Smirnov test and unpaired samples using the Levene Test. Based on the results of the Kolmogorov-Smirnov data normality test, the test results between the pre-test systolic blood pressure and the post-test of the treatment group with the results (Asymp. Sig 2 tailed) 0.161 (p> 0.05), while the test results between the pre-test systolic blood pressure and the post-test of the control group obtained the results (Asymp. Sig 2 tailed) 0.556 (p> 0.05), from these two results it can be seen that the data is normally distributed. Based on the results of the Levene Test homogeneity test, the test results between the pre-test systolic blood pressure of the treatment group with the blood pressure of the control group and the post-test of the treatment group with the blood pressure of the control group are homogeneous. The results of the Levene Test statistical test obtained a pre-test significance of 0.997 and a post-test significance of 0.171 which is greater than the critical limit of the study (≥0.05) which means that the data tested is homogeneous.

Based on the results of the paired test on Table 6 It can be seen that the results of the pre-test systolic blood pressure test with the post-test of the treatment group obtained a sig value. (2-tailed) 0.265 (p value> 0.05), while the results of the pre-test systolic blood pressure test with the control group post-test obtained a sig value. (2-tailed) 0.551 (p value> 0.05). It can be concluded that the results of both Ho tests are accepted or there is no difference in the average systolic blood pressure of the pre-test-post test treatment group and the pre-test-post test control group.

Based on the results of the Independent T-test on
TABLE It can be seen that the results of the pre-test systolic blood pressure test of the treatment group with the control group obtained a sig value. (2-tailed) 0.925 (p-value> 0.05), while the post-test systolic blood pressure of the treatment group with the control group obtained a sig. (2-tailed) 0.489 (p-value> 0.05), which means that the results of this study accept Ho or there is no difference in pre-test systolic blood pressure between the treatment group and the control group and post-test systolic blood pressure between the treatment group and the control group.

LIMITATION

In theory, when patients experience pain, blood pressure will increase, if the pain is so disturbing that it is stressful and makes the secretion of the hormone cortisol in the body increase which causes blood vessels to narrow, but when the intensity of pain begins to decrease due to analgesic therapy or complementary therapy, stress will begin to disappear and blood pressure will begin to decrease. Lo-fi music therapy can stimulate the endorphin hormone which causes relaxation and a sense of comfort due to auditory distraction, this hormone can lower the respondent's blood pressure, when the body relaxes while listening to lo-fi music, blood pressure will gradually decrease due to loosening of blood vessels.

In this case, what plays a major role in blood pressure is the speed of heart pumping power, the cross-sectional area of blood vessels, blood volume, and viscosity of blood products. (Irawati, 2015; Wahyuni, 2013). Postoperative patients will experience a lot of bleeding and to replace the fluid, the surgical team will replace blood loss with crystalloid fluid therapy through intra-venous, which causes blood viscosity to be lower due to the loss of some blood products, especially hematocrit. Although the patient has received crystalloid fluid therapy, this is only limited to maintaining blood volume so that the patient does not experience hypovolemia shock.

Therefore, with a low enough viscosity, the heart works lighter in pumping blood throughout the body which causes blood pressure to always be within normal limits even though there is an increase in the hormone cortisol when the patient experiences pain. however, the hormone cortisol does not necessarily come out when the patient experiences pain, except in patients who experience unbearable pain.

Another thing that can affect the results of blood pressure measurements is *the human error* from the researchers themselves. Because when taking blood pressure data, researchers use a manual sphygmomanometer. The researcher is also a boxer where a boxer very often experiences minor head injuries due to sparring exercises that are carried out too often, this is what allows the results of blood pressure measurements to be inaccurate due to the sensitivity of the hearing nerves of the researcher himself decreasing.

CONCLUSION

There is a significant effect on postoperative patients on the provision of lo-fi music therapy and analgesic therapy on reducing postoperative patient pain, but unfortunately, the provision of lo-fi music therapy and music therapy does not have a significant impact on changes in blood pressure in postoperative patients.

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