Advances in Social Science, Education and Humanities Research, volume 521
Proceedings of the First International Conference on Health,
Social Sciences and Technology (ICoHSST 2020)

Effect of Instrumental Music Therapy on Pain Scale of Patient Post Major Surgery

1st Julianus Yudhsitira Tan
Siloam Sriwijaya Hospital
Palembang, Indonesia
Email: julianusy@gmail.com

2nd Dheni Koerniawan
Nursing Science
Health Science Faculty of Musi Charitas Catholic University
Palembang, Indonesia
Email: koerniawan314@gmail.com

Corrensponding author: julianusy@gmail.com

***Abstract*-- Globally two hundred million major surgeries occur each year and forty one percent patients experience postoperative pain. Inadequate postoperative pain management causes many patients to have complications. Music therapy as a non-pharmacological management can help reduce pain by increasing endorphins release to inhibit transmission of pain. This study aimed to determine effect of music therapy on pain scale of post major surgery. This study uses quasi-experimental method with nonequivalent control group design on fifty respondents by purposive sampling which is divided into two groups. Respondents in the intervention group received music therapy for fifteen minutes while the control group received standard therapy. The pretest and posttest pain scales of both study groups were measured using the Numeric Rating Scale. The data analysis of this research was conducted using t test. Majority of respondents were young adults, female, and had no surgery history. Significant differences occurred on posttest pain scale between intervention and control group. Music therapy has an effect on reducing pain scale so it is advisable to use in post major surgery patients.**

Keywords—Music Therapy: Pain Post Major Surgery; Effect of Music Therapy.

I. INTRODUCTION

Globally, each year there are 234 million major surgeries with a ratio of every 25 people there is one person experiencing major surgery [1]. The majority of causes are traumatic injuries (63 million surgeries), cancer treatment (31 million surgeries), and pregnancy complications (10 million surgeries) [2]. The Ministry of Health of the Republic of Indonesia said that at least 11% of the burden of world disease can be overcome with surgery; therefore the case of surgery is quite high considering the importance of these actions.

Generally, surgeries are carried out to save lives, prevent disability, or complications [3], but successful surgeries are also capable of causing disability and death due to complications from invasive actions carried out [4]. These complications include pain, fever, atelectasis, venous thromboembolism, wound infection, nausea and vomiting [5].

Postoperative pain will occur in 41% of patients postoperatively on the first day postoperatively [6]. with an average pain scale of postoperative patients as measured by the Numeric Rating Scale (NRS) of 5 on the first day postoperatively [7]. Postoperative pain is classified as acute pain, because it has a sudden onset [8], lasts ≤ 3 months, and disappears when the wound heals [9] [10]. Pain that is not treated will cause activity disruption, decreased immune response, prolonged wound healing, increased stress, increased treatment costs and chronic pain [11]. Rosen et al. in 298 patients assessed for pain using NRS on 48 hours, 7 days, and 3 months postoperatively, found that there was a significant moderate correlation ($r = 0.642$; $p < 0.001$) between the pain scale ≥ 4 postoperatively at 48 hours with the ability to return to activity within one week which bad [12]. The study shows that postoperative pain must be treated as early as possible and have adequate management to prevent future obstacles to patient activity.

Pain as a multidimensional experience can be inhibited by applying the Gate Control theory [13] through an ascending and descending control system that stimulates the body to close the gate of pain in the gelatinous substance. Pharmacological management usually causes poor postoperative pain management. This occurs because pharmacological

management has half-life and harmful side effects, such as respiratory depression and increased bleeding time [14] [15]. Good pain management must be done with integrative medicine, which is a combination of pharmacological management and non-pharmacological management, Non-pharmacological management is divided into four groups, namely physical modalities (warm or cold compresses, massage), cognitive methods (music therapy, guided imaginary), biological therapy (aromatherapy), and energy therapy (reiki, yoga, tai chi) [16]. Music therapy is a non- pharmacological management that provides a relaxing effect [17] and analgesics through increased release of endorphins that inhibit neurotransmitters in the transmission of pain from the spinal cord to the brain in various clinical situations [8] if given for at least 15 minutes using earphones [18].

Study Ozer et al. in 87 post-heart surgery patients with a unique Turkish music treatment chosen by the patient to be listened to for 30 minutes using earphones with a volume of 50-60 decibels (dB), a significant difference in the posttest pain scale (p <0,0001) between the intervention groups (X= 1.20) with the control group (X = 2.20) [19]. This study proves that music therapy can provide a significant analgesic effect in patients after heart surgery.

Preliminary study data at Private Hospital on April 17, 2017 showed that major surgery cases from January 2017 to March 2017 were quite high although they fluctuated every month, i.e. 167, 141, and 169. The results of interviews with anesthesiologists and two inpatient nurses about postoperative pain management, it is known that intravenous drip analgesic NSAIDs and deep breathing relaxation are integrative management of pain that are often given, but music therapy has never been given and standard operational procudure for music therapy have not been provided. This description shows the case of major surgery is quite high in the hospital can result in patients experiencing pain and its complications, music therapy can be an option for non-pharmacological pain management.

II. RESEARCH METHODOLOGY

This research was conducted using a quasi-experimental method in the Adult Inpatient Room at Private Hospital on April 18 to May 12, 2017. Samples were taken by purposive sampling and calculated using the formula Hsieh et al. [20] as follows:

Equation 1. Formula for sample size

$$n = \left(Z_{1-\alpha/2} + Z_{1-\beta}\right)\left[P1(1-P1)\beta^2\right]$$

A sample of 50 respondents was divided into 25 respondents in the control group and 25 respondents in the intervention group. Research respondents were selected based on several criteria, namely post-operative major patients on the first day who were already in the inpatient room, fully aware, aged 20-64 years, willing to participate in the study, not experiencing verbal and visual impairment, and following the treatment time until finish.

Intervention group respondents in this study were given standard therapy plus piano instrumental pop music with a tempo of 60-80 beats per minute for 15 minutes using 50-60dB volume headphones as measured using a sound level meter, while the control group was only given standard therapy. The research data obtained by interview and using an observation sheet containing the identity of respondents and pain measurement tools, namely NRS (0-10) [21] to measure the pretest-posttest pain scale.

III. RESULTS AND DISCUSSION

A. Respondent's Characteristics

Table 1. Respondent Characteristics

Variable	Group *Intervention*		*Control*		*Total*	*%*
	F	%	f	%		
Age						
Middle adulthood	16	64	7	28	23	46
Young adult	9	36	18	72	27	54
Gender						
Male	11	45	7	28	18	36
Female	14	56	18	72	36	64
Sugery history						
Yes	4	16	6	24	10	20
No	21	84	19	76	40	80

The results of the characteristics of respondents' analysis showed that the majority of study respondents were in the age range of 20-39 years or young adults (54%) were female (64%) without a history of surgery (80%). When viewed from each group, young adulthood is the majority of the characteristics of the control group while middle adulthood is the majority of the characteristics of the intervention group. The number of respondents in the intervention group is

middle adulthood (male = 10 respondents; female = 6 respondents) due to the majority of the types of operations performed are orthopedic operations, while the number of respondents in the control group is young adults (male = 4 respondents; female = 14 respondent) because the operation is obstetrics-gynecology.

The case of orthopedic surgery, which is the cause of the majority of middle age as respondents in intervention group, is supported by the study of Natasia et al. [22] of 107 hospitalized respondents who had fractures at the Santa Elisabeth Hospital, Medan, with the result that 57.9% of fracture cases were caused by accidents, 55.1% occurred in middle-aged adult males, and 63.6% of respondents underwent surgery as a form of medical management. According to the Indonesian Ministry of Health, the number of orthopedic surgery cases in middle adulthood is caused by the high number of accidents in the top 10 causes of orthopedic surgery [23]. Middle adulthood (40-64 years) entering productive age (15-64 years) is a time when many activities are carried out which causes risky behavior such as accidents to occur.

The number of young adult respondents (20-39 years old) in the control group who underwent obstetric-gynecological surgery was also included in the productive age group, which was 15-64 years. According to Rosdahl & Kowalski, productive age is the age where many pregnancies occur, especially in women in their 20s because the risk of maternal and infant morbidity occurs mostly in adolescent and over 35 years old women [24].

Researchers assume the number of young adult respondents who become research respondents, especially the control group with the majority of obstetric-gynecological operations occurring to avoid the risk of infant and maternal morbidity that can occur if the age is too young or old. Unlike the intervention group, the number of orthopedic operations in middle adulthood and the absence of a history of surgery is caused by high risk behavior due to the many activities carried out to meet one's needs.

B. Effect of Music Therapy

Table 2. Effect of Music Therapy

Variable	N	Mean ± SD	SE	p-value
Control	**25**	**5 ± 0.764**	**0.153**	**0.000**
Intervention	**25**	**4.04 ± 0.735**	**1.147**	

Postoperative pain is an unpleasant sensation due to the process of perception in the brain of pain impulses sent by damaged tissue. The mechanism of the experience of normal pain starts from the process of transduction, where damaged tissue releases pain impulses and causes inflammation that triggers the release of neurotransmitter to increase the transmission of pain impulses. Transmission of pain impulses is divided into three segments, namely from the peripheral to the spinal cord through the nerve fibers of the nociceptors, the process in the dorsal horn, and transmission to the thalamus, limbic system, and cerebral cortex to be perceived. Pain perception will be done by several parts of the brain, where the reticular formation and somatosensory system will be activated so that localization and characterization of pain occur. In addition, the activated limbic system will provide an emotional response in feeling and responding to pain, and stimulates periaqueductal gray (PAG) to release the neuromodulator as the body's natural response to inhibit pain.

Independent t-test was conducted to determine the difference in posttest pain scale in postoperative patients between the control and intervention groups, where the result was a significant difference between the posttest pain scales of the two groups (p = 0,000). This result is shown by the difference in mean ± SD of the control group (5 ± 0.764) which is greater than the intervention group (4.04 ± 0.735).

This result is supported by the Cigerci study [25] of 68 respondents (34 respondents in the intervention group and 34 respondents in the control group) after open heart surgery at the Afyonkarahisar hospital with typical Turkish classical music therapy for 30 minutes found a significant difference between the posttest pain scale in the intervention group and the control group (p = 0.001).

Another study that also supports the results of this study is Santhna (2015) of 40 respondents (20 intervention group respondents and 20 control group respondents) postoperative total knee replacement by convenience sampling at Malaysia, with instrumental, classical, romantic, and natural sounds that were freely chosen by respondents 4 times a day showed significant differences (p = 0.00) between the control group's posttest pain scale (X = 26.8) with intervention group (X = 14.2) [26].

The effect of music therapy in reducing pain occurs due to a combination of musical elements (tempo, melody, and harmony) with a person's physiological and / or psychological conditions [27] [28]. The three elements of music therapy will provide an emotional response to affect one's soul, spirit, and body through auditory stimulus that is processed by the auditory

cortex and limbic system in the brain. This emotional response will increase the production of endorphins from the amygdala and hypothalamic stimuli with a form of relaxation response such as an increase in s-oxytocin and a decrease in s-cortiso [29].
An increase in s-oxytocin due to music therapy will help reduce anxiety and make the body more relaxed because of an increase in one's happiness [30]. The happiness is due to the response to calm and rest in the brain from melodies that play slowly and slow tempo (60-80 per minute) that is listened to [31].

In addition to increased feelings of happiness and a more tolerant perception of pain, the effect of other emotional responses to music therapy is to increase endorphins. Increased production of endorphins by PAG in the brainstem and spinal cord stimulated by the amygdala will close the gate of pain in the gelatinous substance. This closure occurs through a descendant control system that inhibits neurotransmitters in the transmission of pain impulses to the thalamus, limbic system, and cerebral cortex through the spinoreticular tract and the spinothalamic tract from the spinal cord [32] Increased endorphins, feelings of happiness, and tolerance to pain from emotional responses to the body by music therapy, as a companion to the standard therapy (pharmacology) of pain given after surgery, will make postoperative pain experienced more controlled so that the pain scale decreases significantly.

IV. CONCLUSION

The episode of pain will be further reduced if integrative pain management is given. This is done because generally, pharmacological (analgesic) management has become a standard procedure for reducing pain, but the reduction in pain will be more significant when combined with alternative complementary therapies, as evidenced by the results of this study. One alternative complementary therapy that can be used and proven effective for shortening pain episodes is instrumental music therapy given for 15 minutes using headphones.

REFERENCES

[1] Forward Programme. World Health Organization. World Alliance For Patient Safety. 2008.
[2] Zhang MM, Al CL, Duan YR. WHO The Second Global Patient Safety Challenge: Safe Surgery Saves Lives. Chinese J Evidence- Based Med 2008;8:65–6.
[3] Kemenkes Ri. Pembedahan Tanggulangi 15% Penyakit Dunia. 2015.
[4] Subiston. C. Buku Ajar Bedah Subiston. 2011.
[5] T H. Buku Praktik Klinik (Medsurg Notes Nurse's Clinic Pocket Guide). N.D.
[6] Sommer M, De Rijke JM, Van Kleef M, Kessels AGH, Peters ML, Geurts JWJM, Et Al. The Prevalence Of Postoperative Pain In A Sample Of 1490 Surgical Inpatients. Eur J Anaesthesiol 2008;25:267– 74. Https://Doi.Org/10.1017/S0265021507003031.
[7] Ciğerci Y, Özbayir T. The Effects Of Music Therapy On Anxiety, Pain And The Amount Of Analgesics Following Coronary Artery Surgery. Turkish J Thorac Cardiovasc Surg 2016;24:44–50. Https://Doi.Org/10.5606/Tgkdc.Dergisi.2016.12136.
[8] Black JM HJ. Keperawatan Medikal Bedah: Manajemen Klinis Untuk Hasil Yang Diharapkan. 2014.
[9] Lewis SL, Bucher L, Heitkemper MM HM. Medical Surgical Nursing: Assessment And Management Of Clinical Problem 2017.
[10] Smeltzer SC, Bare BG, Hinkle JL CK. Brunner & Suddarth's Textbook Of Medical Surgical Nursing. 2010.
[11] Zakiyah A. Konsep, Dan Penatalaksanaan Dalam Praktik Keperawatan Berbasis Bukti. Jakarta: Salemba Medika 2013.
[12] Rosén HI, Bergh IH, Odén A, Mårtensson LB. Patients´ Experiences Of Pain Following Day Surgery - At 48 Hours, Seven Days And Three Months. Open Nurs J 2011;5:52–9. Https://Doi.Org/10.2174/1874434601105010052.
[13] Fundamentals Of Nursing: Theory, Concepts And A. Fundamentals Of Nursing: Theory, Concepts, And Applications. 2007.
[14] Hole J, Hirsch M, Ball E, Meads C. Music As An Aid For Postoperative Recovery In Adults: A Systematic Review And Meta- Analysis. Lancet 2015;386:1659–71. Https://Doi.Org/10.1016/S0140- 6736(15)60169-6.
[15] Fundamentals Of Nursing: Theory, Concepts And A. Fundamentals Of Nursing: Theory, Concepts, And Applications. 2015.
[16] Hinkle JL CKB& S. Textbookof Medical Surgical Nursing. 13th Ed. Philadelphia 3014.
[17] Ignatavicius DD WM. Medical Surgical Nursing 2016.
[18] Potter PA PA. Fundamental Keperawatan. 2010.
[19] Özer N, Karaman Özlü Z, Arslan S, Günes N. Effect Of Music On Postoperative Pain And Physiologic Parameters Of Patients After Open Heart Surgery. Pain Manag Nurs 2013;14:20–8. Https://Doi.Org/10.1016/J.Pmn.2010.05.002.
[20] Hsieh FY, Block DA, Larsen MD. Kasenarztliche Bundesvereinigung: Grunddaten Zur Vertragsarztlichen Versorgung 2008A Simple Method Of Sample Size Calculation For Linear And Logistic Regression. Stat Med 1998;17:1623–34.
[21] Aziato L, Dedey F, Marfo K, Asamani JA, Clegg-Lamptey JNA. Validation Of Three Pain Scales Among Adult Postoperative Patients In Ghana. BMC Nurs 2015;14:1–9. Https://Doi.Org/10.1186/S12912- 015- 0094-6.
[22] Natasia C, Hiswani, Jemadi. Karakteristik Penderita Fraktur Pada Lansia Rawat Inap Di Rumah Sakit Santa Elisabeth Medan Tahun 2011-2012 2012.
[23] Kementrian Kesehatan RI. Profil Kesehatan Indonesia 2012. 2013.
[24] Rosdahl CB KM. Textbook Of Basic Nursing. 2012.
[25] Ciğerci Y ÖT. The Effects Of Music Therapy On Anxiety, Pain And The Amount Of Analgesics Following Coronary Artery Surgery 2016.
[26] Santhna LP, Norhamdan MY DM. The Effectiveness Of Music Therapy For Postoperative Pain Control Among Total Knee Replacement Patients. Med Health 2015;10:66–79.
[27] Hole J, Hirsch M, Ball E MC. Music As An Aid For Postoperative Recovery In Adults N.D.
[28] Natalina D. Terapi Musik Bidang Keperawatan 2013.
[29] Nilsson U. The Anxiety- And Pain-Reducing Effects Of Music Interventions: A Systematic Review. AORN J 2008;87. Https://Doi.Org/10.1016/J.Aorn.2007.09.013.

[30] Nilsson U. Soothing Music Can Increase Oxytocin Levels During Bed Rest After Open-Heart Surgery: A Randomised Control Trial. J Clin Nurs 2009;18:2153–61. Https://Doi.Org/10.1111/J.1365 2702.2008.02718.X.
[31] Nilsson U. The Effect Of Music Intervention In Stress Response To Cardiac Surgery In A Randomized Clinical Trial. Hear Lung J Acute Crit Care 2009;38:201–7. Https://Doi.Org/10.1016/J.Hrtlng.2008.07.008.
[32] Musik PRT. Mengenal Terapi Musik [Internet]. Holist. 2011.