GENIUS JOURNAL
general nursing science journal
e-ISSN: 2723-7729
Vol. 06 No. 01 PP. 9-18 E-ISSN 2723-7729

Effectiveness of Music and Art Therapy on Hemodynamic Status in Pediatric Cancer Patients Undergoing Chemotherapy

Shania Putri Lomboan[1], Susi Roida Simanjuntak[1], Lenny Gannika[1]
[1]*Department of Nursing, Universitas Sam Ratulangi, Indonesia*

Correspondence author: Susi Roida Simanjuntak
Email: susiroidasimanjuntak@unsrat.ac.id
Address: Bahu, Malalayang, Manado, Sulawesi Utara, Indonesia Telp. 081376276393
DOI: https://doi.org/10.56359/gj.v6i1.400

ABSTRACT

Introduction: Cancer in children is a major global health issue, with over 400,000 new cases annually. Pediatric cancer treatment often results in fatigue and psychological stress, which may influence hemodynamic status such as pulse, blood pressure, respiration, and oxygen saturation. Music and art therapy have emerged as supportive nursing interventions that may help stabilize these indicators.
Objective: This study aims to evaluate the effectiveness of combined music and art therapy on the hemodynamic status of pediatric cancer patients undergoing chemotherapy.
Method: This study used a descriptive case study design involving three pediatric cancer patients with varying diagnoses: Hodgkin's lymphoma, rectal adenocarcinoma, and ovarian clear cell carcinoma. The intervention consisted of simultaneous music and art therapy sessions administered for 15–20 minutes daily over three consecutive days. Hemodynamic indicators, including pulse rate, blood pressure, respiration rate, and oxygen saturation, were monitored before and after each session.
Result: All three respondents showed a consistent decrease in pulse rate over the three days of therapy, indicating reduced physiological stress. However, changes in other hemodynamic indicators, such as systolic and diastolic blood pressure, respiratory rate, and oxygen saturation, were inconsistent across the participants. Despite variability in clinical outcomes, verbal and observational feedback indicated positive emotional responses and improved engagement during therapy.
Conclusion: Music and art therapy interventions positively influenced the pulse rate of pediatric cancer patients, suggesting an impact on autonomic nervous system regulation. Although other hemodynamic parameters showed inconsistent changes, the interventions contributed to psychological comfort and may enhance the overall well-being of pediatric oncology patients. Further research with larger samples and extended intervention durations is recommended to confirm clinical significance.

Keywords: art, cancer, hemodynamic, music

Introduction

Cancer, as defined by the World Health Organization (WHO), refers to a group of diseases characterized by the uncontrolled growth and spread of abnormal cells, which can invade surrounding tissues and metastasize to other organs (WHO, 2018). Globally, cancer is a leading cause of mortality, including among children and adolescents. Each year, over 400,000 cases of pediatric cancer are diagnosed worldwide, with the majority occurring in low- and middle-income countries where access to quality healthcare remains limited (WHO, 2021).

The most common pediatric cancers include leukemia, central nervous system tumors, neuroblastoma, lymphoma, kidney tumors, and bone tumors (WHO, 2021). In Indonesia, Global Cancer Statistics report that approximately 11,156 children aged 0–19 years are diagnosed with cancer, with leukemia accounting for 3,880 cases (34.8%), followed by lymphoma (640 cases; 5.7%) and brain cancer (637 cases; 5.7%) (Globocan, 2020). Furthermore, the Indonesian Oncology Foundation estimates around 14,000 new pediatric cancer cases annually in the country (Yayasan Onkologi Indonesia, 2024).

Beyond physical illness, the cancer diagnosis and treatment process can significantly affect the overall quality of life of pediatric patients (Anggreini & Supit, 2022; Setiawan et al. 2022; Suharta et al. 2022). One of the most frequently reported complications during treatment is fatigue, which, if left unmanaged, may hinder therapy, compromise clinical outcomes, and diminish the well-being of the patient (Jiang et al., 2020). According to the Indonesian Nursing Outcomes Standards (Tim Pokja SDKI DPP PPNI, 2019), fatigue can be identified through vital sign changes such as increased heart rate, elevated blood pressure, arrhythmias, and elevated myocardial oxygen demand (Wiwik, 2019). Abnormal hemodynamic indicators—including blood pressure, pulse, respiration, and oxygen saturation—can lead to further physiological and psychological disturbances in children with cancer (Giordano, 2020). Therefore, appropriate nursing interventions are necessary to support and stabilize hemodynamic functions throughout treatment.

Music therapy has emerged as a promising nursing intervention to influence hemodynamic responses in pediatric patients. Previous research has demonstrated its effectiveness in reducing systolic blood pressure (Idyatul Hasanah & Simanjuntak, 2021) and pulse rates in critically ill children (Uggla et al., 2016; Hidayat et al. 2022). Music therapy is known to regulate emotional responses, reduce anxiety, alleviate fatigue, and improve quality of life in children with cancer (Lichtl et al., 2022; Lai et al., 2022).

Similarly, art therapy is another complementary intervention shown to improve physical, mental, and emotional well-being through creative expression. Studies report its effectiveness in reducing anxiety, depression, and fatigue, while enhancing quality of life in pediatric cancer patients (Jiang et al., 2020; Elimimian et al., 2020). A study by Dowla et al. (2019) found that 80% of cancer patients experienced an improvement in mood following participation in art therapy sessions.

Given the reported benefits of both music and art therapies, this study aims to explore their combined application in a clinical setting. To date, no research has investigated the integration of both interventions for pediatric cancer patients in the Estella Room of RSUP Prof. R. D. Kandou Manado. Therefore, the present study seeks to fill this gap by analyzing the effects of music and art therapy on the hemodynamic status of children undergoing chemotherapy.

Objective

This study aims to evaluate the effectiveness of combined music and art therapy on the hemodynamic status of pediatric cancer patients undergoing chemotherapy.

Method

This study employed a case study design involving three pediatric cancer patients who were undergoing chemotherapy. The participants had the following medical diagnoses: Hodgkin's Lymphoma, Rectal Adenocarcinoma, and Ovarian Clear Cell Carcinoma. The study was conducted in the Estella Room of Prof. Dr. R.D. Kandou General Hospital, Manado.

The intervention consisted of a combination of music therapy and art therapy, administered simultaneously over a period of three consecutive days. Each session lasted approximately 15–20 minutes. During the intervention, the children participated in art therapy by coloring illustrations on canvas using watercolors, while simultaneously listening to music of their own choosing through headphones. This dual-modality approach was designed to provide both sensory and emotional engagement, aiming to promote relaxation and improve hemodynamic stability during the treatment process.

Result

Case Overview 1

The first respondent, An J.P., is an 11-year-old male diagnosed with stage IIIB Hodgkin's Lymphoma in December 2023. At the time of the study, he was undergoing the first cycle of chemotherapy, on day 8 of treatment. During the initial nursing assessment, several clinical diagnoses were identified, including fatigue, anxiety, decreased family coping, and risk of infection.

Case Overview 2

The second respondent, An A.M., is a 16-year-old male diagnosed in August 2023 with adenocarcinoma of the distal one-third of the rectum. He has a medical history of hemorrhoidectomy and colostomy surgery. At the time of the study, he was undergoing the fifth cycle of chemotherapy, on day 12. During the nursing assessment, several clinical diagnoses were identified, including fatigue, chronic pain, anxiety, risk of bleeding, and risk of infection.

Case overview 3

The third respondent, An N.K., is a 15-year-old female diagnosed with clear cell carcinoma of the ovary in July 2023 and was undergoing the fourth cycle of chemotherapy on day 6 at the time of the study. Nursing assessment revealed several clinical diagnoses, including fatigue, anxiety, and risk of infection. Across all three respondents, fatigue emerged as a common nursing problem, with hemodynamic status identified as a key outcome to be monitored. After the implementation of music and art therapy interventions over a three-day period, changes in hemodynamic parameters were observed, providing insight into the effectiveness of these complementary therapies in supporting the management of fatigue in pediatric cancer patients.

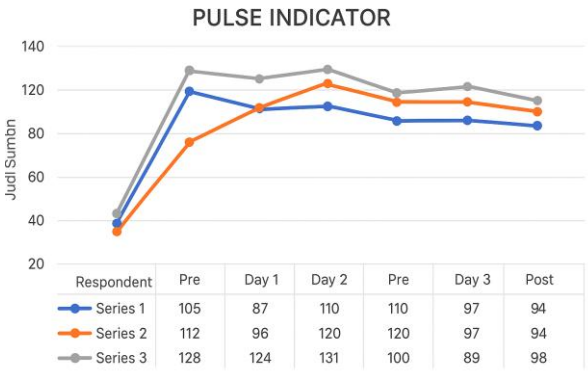

Figure 1. Pulse Indicator

Figure 1 illustrates a consistent decrease in pulse rate over the course of three days across all three respondents following the intervention. In respondent An J.P., the pulse rate decreased from 105 beats per minute (bpm) to 87 bpm on the first day, from 110 bpm to 104 bpm on the second day, and from 107 bpm to 98 bpm on the third day. Respondent A.M. showed a decrease from 112 bpm to 96 bpm on the first day, from 120 bpm to 102 bpm on the second day, and from 97 bpm to 94 bpm on the third day. Similarly, respondent An N.K. experienced a reduction from 128 bpm to 124 bpm on the first day, from 131 bpm to 100 bpm on the second day, and from 120 bpm to 98 bpm on the third day. These results suggest a positive trend in pulse regulation potentially influenced by the combined music and art therapy interventions.

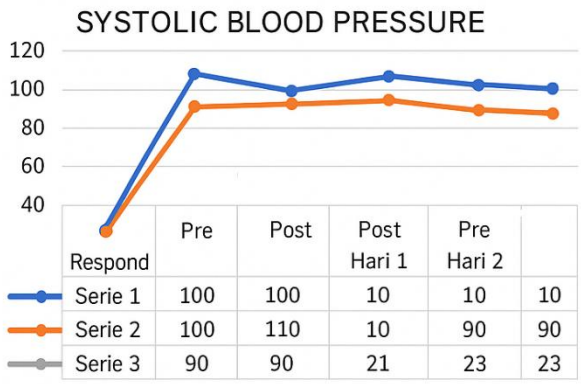

Figure 2. Systolic blood pressure indicators

Figure 2 shows that there was no consistent daily decrease in systolic blood pressure among the three respondents following the intervention. In respondent An J.P., a decrease of 10 mmHg was observed on the first and third days, while no change occurred on the second day. For respondent A.M., there was no change in systolic blood pressure on the first and third days; however, a 10 mmHg decrease was recorded on the second day. In contrast, respondent An N.K. experienced an increase of 10 mmHg on the first day, no change on the second day, and a decrease of 10 mmHg on the third day. These findings indicate that while some improvements in systolic blood pressure were observed, the changes were not consistent across all days or participants, suggesting that additional factors may have influenced the outcome beyond the scope of the intervention.

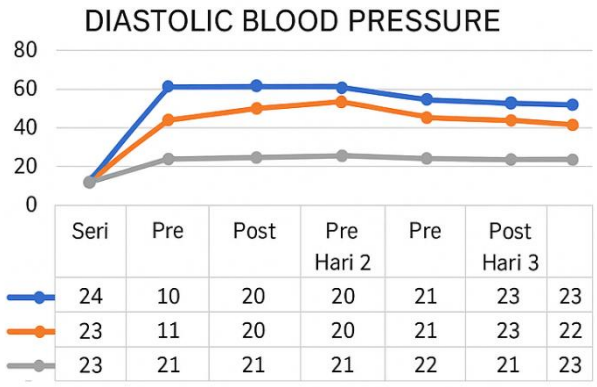

Figure 3. Diastolic blood pressure indicators

From Figure 3, it can be observed that there is no consistent decrease every day in diastolic blood pressure indicators in the three respondents.

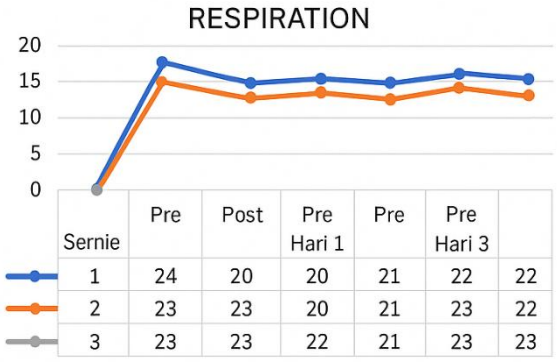

Figure 4. Breathing Indicator

From Figure 4, it can be observed that there is no consistent decrease every day in respiratory indicators in the three respondents. Respiratory indicators in the first respondent had a consistent change in breathing decline occurred every day An J.P who was diagnosed with hodgkin's lymphoma, while the second and third respondents did not have a decline every day.

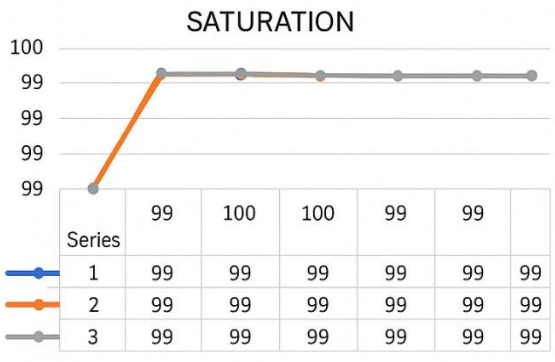

Figure 5. Saturation Indicator

From Figure 5, it can be observed that there is no consistent decrease every day in the saturation indicator in the three respondents. oxygen saturation increased in the first respondent only on the first day, the second respondent's oxygen saturation increased every day. The third respondent's oxygen saturation increased on the first and third day.

Discussion

The results of this study indicate that music and art therapy interventions have a notable impact on hemodynamic indicators, particularly pulse rate. A consistent reduction in pulse was observed across all three respondents following the intervention. These findings align with the study by Putri et al. (2023), which demonstrated a decrease in pulse rate after a single session of music therapy in pediatric leukemia patients. Similarly, Kobus et al. (2022) reported a reduction in pulse rate among 83 pediatric patients experiencing chronic pain after music therapy. Supporting evidence also comes from Uggla et al. (2016), who found a decrease in pulse rate among chronically ill children following music-based interventions. Pulse rate is closely linked to anxiety, as somatic manifestations such as increased heart rate often reflect autonomic nervous system dysregulation (Rajiv et al., 2011). Koelsch (2014) suggests that music exerts a down-regulatory effect on hypothalamic activity, which may contribute to the clinical reduction in pulse rate.

In contrast, changes in systolic blood pressure were inconsistent. While some reductions were observed, they did not occur daily or across all participants. These results are consistent with findings by Idyatul Hasanah & Simanjuntak (2021), who noted a decrease in systolic blood pressure in pediatric leukemia patients following music therapy, although the changes were not statistically significant. Similarly, Kurniawan et al. (2019) observed reductions in blood pressure among palliative cancer patients receiving self-selected music therapy, but without clinically meaningful impact. On the other hand, Mir et al. (2021) reported a consistent decrease in blood pressure after administering music therapy five times a week for four weeks. The inconsistencies in this study may be attributed to the varying medical diagnoses of the respondents, the limited duration of the intervention (only three days), and the fact that music therapy was administered only once per day.

Respiratory rate improvements were more apparent in respondent An J.P., diagnosed with Hodgkin’s lymphoma, who showed a gradual but clinically insignificant decrease in respiratory rate over the three sessions. Respondents A.M. and N.K. did not exhibit consistent reductions in respiratory rate. These findings are in line with research by Nashruddin & Wiwin (2021), which showed non-significant reductions in respiratory frequency among pediatric ICU patients receiving music therapy. The lack of change may be due to the fact that interventions in this study were administered when children were in stable conditions and not scheduled for invasive procedures. However, a separate study by Efiandi et al. (2023) demonstrated the effectiveness of Mozart music therapy in reducing respiratory rate in pediatric leukemia patients prior to infusion.

Oxygen saturation levels showed no consistent improvement across the three respondents. This outcome is similar to that of Nashruddin & Wiwin (2021), who also found no significant change in oxygen saturation following music therapy. This may be due to the

absence of respiratory distress in the study population, which limited the scope for improvement in this parameter.

The therapeutic effects of music may be explained by its influence on emotional regulation and autonomic nervous system activity. According to Tsai et al. (2014), music can reduce psychological distress and fatigue by guiding the body toward a relaxed physiological state. Kume (2017) adds that these physiological changes help relieve muscle tension and mental fatigue, while Gao (2020) emphasizes music's role in promoting better sleep and overall mental well-being in children with cancer. The mechanism by which music affects the human body includes the stimulation of the auditory nerve, which then transmits signals to the temporal lobe's auditory cortex. This stimulation activates the autonomic nervous system and limbic system, which are responsible for emotional regulation (Lestari, 2015; Suryana, 2012). The subsequent release of endorphins and nitric oxide promotes relaxation, reduces heart rate, and contributes to vascular tone regulation.

In addition to music therapy, art therapy was administered to all three respondents. This intervention involved coloring on canvas using watercolors. The children reported feelings of happiness and increased focus, and parents noted that the children appeared enthusiastic and engaged during the sessions. These findings are supported by Dowla et al. (2019), who reported that 80% of cancer patients felt happier after participating in art therapy. Similarly, Jiang et al. (2020) found that art therapy significantly reduced anxiety, depression, and fatigue, while improving quality of life in cancer patients. According to Burth (2004), the calming effects of art therapy are mediated through the release of endorphins during periods of relaxation, which activate the limbic system and promote emotional well-being.

Based on these findings, it can be concluded that the combination of music and art therapy serves as a valuable complementary intervention in pediatric cancer care. These non-pharmacological therapies offer emotional, psychological, and physiological benefits and may enhance the overall treatment experience for children undergoing chemotherapy.

Conclusion

Music and art therapy interventions in pediatric cancer patients have demonstrated effectiveness in maintaining stable hemodynamic parameters, as indicated by consistent daily changes in pulse rate. However, other physiological indicators, including systolic and diastolic blood pressure, oxygen saturation, and respiratory rate, did not show consistent daily reductions following the interventions over the three-day period. Based on these findings from the case study, it is anticipated that the results will contribute valuable insights into the application of music and art therapy in pediatric oncology. Further research is warranted to evaluate the effects of these interventions over extended durations and within cohorts of patients with homogeneous cancer diagnoses.

Acknowledgement

Not applicable.

Authors' contribution

Each author contributed equally in all the parts of the research. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Conflict of interest

The researchers stated that there is no conflict of interest related to the implementation and publication of the results of this research. The entire research process, from planning, data collection, analysis, to report preparation, was carried out independently without any influence or pressure from any third party. A commitment to research ethics is upheld throughout the research process, ensuring transparency, accuracy and honesty in reporting results. Respondents' participation was voluntary with informed consent, and their confidentiality and privacy were maintained in accordance with applicable research ethics standards. With this statement, researchers hope that the research results can be trusted and used as a valid reference for the development of science and health practices related to ethnomedicine and reproductive health.

Ethical consideration

Not applicable.

Funding

This research is not funded by any party and is not intended for any financial gain.

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