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The Effect of Combination of Healthy Sleep Education and Music Therapy on the Functional Status of Children with Cancer

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ABSTRACT

Introduction: Cancer refers to the uncontrolled growth and reproduction of abnormal cells in the body as a whole. Sufferers will experience physical and psychological disorders in the form of feelings of sadness and depression, which cause a loss of ability to live daily life. The prevalence of cancer patients on chemotherapy at Dr. M. Djamil Padang Hospital has increased from 135 in 2019 to 170 in 2020 (21% increase). The side effects of chemotherapy are sleep disturbances, fatigue, and decreased functional status. **Objective:** This study aims to determine the effect of the combination of providing healthy sleep education and music therapy on the functional status of children with cancer to minimize the side effects of chemotherapy. **Methods:** The research design was a quasi-experimental pre-post-test with the control group. The sample consisted of 60 children, who were divided into a control group (n = 30) and an intervention group (n = 30). Three consecutive days were devoted to the intervention. Measurement of functional status scores using the Activity Daily Living Barthel Index questionnaire. Differences in functional status scores of each group were tested with a dependent *T*-test, and differences in functional status between the control and intervention groups were tested with independent *T*-tests used in this study. **Results:** The results of statistical tests showed that there was a significant difference in the mean score of functional status before and after giving sleep education and music therapy between the intervention group and the control group ($p = 0.0005$). **Conclusion:** Combining healthy sleep therapy and music therapy can be an option for independent nursing care for children with cancer as a way to combat the side effects of chemotherapy.

Keywords: Cancer; Functional Status; Healthy Sleep Education; Music

INTRODUCTION

Non-communicable diseases are still a public health problem around the world. Every year, 17 million people die before the age of 70 from non-communicable diseases, and 86% of these premature deaths occur in low- and middle-income countries. Cancer is the second-leading cause of death after cardiovascular disease, with 9.3 million deaths from cancer (World Health Organization, 2022). Cancer is a disease caused by the growth of abnormal, malignant cells or tissues that grow rapidly and uncontrollably and can spread to other places in the patient's body (Kemenkes, 2019). Cancer does not only attack adults; children can also be at risk for developing cancer (Ningsih, 2015).

Based on data from the World Health Organization (WHO), every year, an estimated 400,000 children aged 0–19 suffer from cancer (World Health Organization, 2020). The highest estimated number of children suffering from cancer in Indonesia is 8,677. It is then followed by other Southeast Asian countries, namely the Philippines in second place with around 3,507 cases of childhood cancer, Vietnam with 2,806 cases, Thailand with 1,437 cases, and Malaysia with 1,126 cases of cancer in children (World Health Organization, 2020). Based on the results of basic health research, there was an increase in the prevalence of cancer in Indonesia from 1.4% in 2013 to 1.49% in 2018 (Riskesdas, 2018). Cancer in children in the city of Padang is increasing. Data from Dr. M. Djamil Padang Hospital in 2019 showed the number of cancer cases in children was 135 people, increasing to 170 cases in 2020 (Medical Records Section of RSUP Dr. M. Djamil, 2021), and about 160 children with cancer live in shelters during the process of undergoing cancer treatment.

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Cancer in children is different from cancer in adults. Unlike adult cancers, the development of cancer in children is not likely to be affected by environmental factors or occupational or lifestyle choices such as smoking or diet. Most childhood cancers are the result of errors in utero (in the womb) during the development of cells that create the body from a single egg or sperm. Only a small number of childhood cancers are caused by DNA (gene) changes that are passed from parents to their children. The classification of childhood cancer consists of leukemia, retinoblastoma, osteosarcoma, neuroblastoma, malignant lymphoma, and nasopharyngeal carcinoma. Among these types, leukemia or blood cancer is the most common cancer in children, which is around 25–30% (Indonesia Cancer Care Community, 2022).

However, the most common cancers in adults are more likely to affect the breast, lung, colon, prostate, and pancreas. The cause of cancer in children has not been ascertained, but some of the suspected risk factors are genetic factors, chemicals, viruses, and radiation (Cox *et al*. 2019). The high incidence of cancer in children must be supported by quality treatment. One of the treatments for cancer in children is chemotherapy. The effects of chemotherapy are pain, fatigue, sleep disturbances, nausea, vomiting, and physical, anxiety, and psychosocial problems (Kemenkes, 2019). So, the impact of music intervention on cancer-related anxiety is debatable; however, a meta-analysis findings showed a positive impact of music intervention in effectively managing anxiety during routine clinical treatments among cancer patients, encompassing chemotherapy, radiation therapy, and surgery without general anesthesia (Zang *et al*., 2023).

Several studies have shown that there is a significant relationship between sleep disturbances and fatigue in children with cancer during chemotherapy (Fernandes & Andriani, 2021; Hooke & Linder, 2019). Fatigue experienced by children with cancer has an impact on physical activity and their functional status. Functional status is a child's ability to perform specific tasks and consists of four distinct domains: physical, social, role, and psychological. Sleep quality is also significantly influenced by sleep duration and sleep onset latency (SOL). If the sleep latency was under 15 minutes, it was regarded as good; if it was beyond 60 minutes, it was considered terrible. A good night's sleep should last 6 to 9 hours. Limited functional status in children with cancer affects their ability to carry out daily physical activities, such as taking care of themselves, playing, and going to school (Sriasih, 2018).

Through several studies, the problem of the long-term therapeutic effects of cancer on children has been addressed, including song therapy and a combination of healthy sleep education, which have been used to alleviate children's psychological problems, independence, rehabilitation, management of pain, mastery of developmental skills, palliative care, and family problems (Standley & Hanser, 1995; Raphael *et al*., 2010). For children with cancer, song therapy is a non-pharmacological strategy for stabilizing functional status and assessing emotional intelligence. Singing or listening to songs is very beneficial for children. In addition to providing calm and uplifting effects, the collection of these tones can provide various benefits that are very positive for children's health and development.

Music therapy is quite useful in overcoming the effects of chemotherapy in cancer patients, so music therapy is recommended as a nursing intervention because of its great benefits in treatment, such as not requiring large costs, not having negative effects, and accelerating physical, psychological, social, and emotional recovery (Bilgiç & Acaroğlu, 2017). Thus, patient experienced a reduction in anxiety following music therapy (Rustam *et al*., 2018). So far, this research has only focused on children with cancer who are in hospitals, which is very limited. Research on interventions can be implemented in the patient's home. Side effects of cancer or cancer therapy can also occur when the child is at home and trigger a relapse, so the child must be treated again (Franco *et al.*, 2021). To address this problem, a research project must be conducted to devise interventions that can also be applied outside the hospital. This is so that the family can then continue the intervention at their respective children's homes. A halfway house is a temporary residence for children and their parents who are not far from the hospital to make it easier for patients to undergo cancer treatment. Children with cancer who live in shelters are children who are in the recovery stage and have the same problems related to the effects of chemotherapy as children who are hospitalized, so it is also necessary to pay attention to their condition (Ramanda, Milyartini, & Latifah, 2022).

Fedhila and her colleagues (2023) assessed how music therapy affected children with cancer's quality of

life and how it affected their cardiorespiratory rates. Between April 1 and August 31, 2021, at the Bechir Hamza Children's Hospital in Tunis, they carried out a quasi-experimental study that included children receiving cancer treatment. Prior to and following each of the four weekly music therapy sessions, the kid or parent filled out the PedsQL Module Cancer French version 3.0 questionnaires. The heart and breathing rates of the infant were recorded prior to and following each session. Twenty kids, with an average age of 7 ± 4.5 years, were among them. The overall questionnaire score showed a rise in the median value from 57 [46; 70] to 72 [67; 85] (p < 10-3), with notable decreases in pain (p = 0.02), nausea (p = 0.009), anxiety associated with medical procedures (p = 0.009) and worry about the future (p = 0.005). They showed that following music therapy, there was a substantial drop-in heart rate and respiration (p < 0.05). They discovered that music therapy lowers children's cardiorespiratory rates, which lowers stress and improves the quality of life for these kids dealing with cancer. According to the González-Martín-Moreno *et al*. (2021) study, it has been demonstrated that music-based interventions increase the quality of life, self-esteem, and mental and physical states of pediatric and adolescent cancer patients while reducing anxiety, sadness, and sensations of perceived pain. Music therapy has been recognized as a meaningful intervention for addressing psychological challenges such as depression and anxiety commonly encountered by individuals undergoing cancer treatment (Eseadi, & Ngwu, 2023). In addition, it lowers blood pressure, pulse rate, and breathing rate while promoting the use of flexible coping mechanisms by the patients. Srikasih and co-researchers (2018) study was to look into how the combined music and sleep hygiene education (COMMASH-E) intervention affected the children with cancer who were staying in Indonesian temporary lodges in terms of their level of weariness, sleep quality, and functional status. They used a control group and a quasi-experimental pre-post-test design. Using a successive sampling technique, they gathered 58 children with cancer who were between the ages of 7 and 18; they then divided them into intervention and control groups, with 29 participants in each. While the control group received standard care, the intervention group underwent the COMMASH-E intervention. On days 1 and 4, the Barthel Index, the Sleep Problem in Children Scale, and Allen's Fatigue in Childhood Cancer Scale were used to measure fatigue, sleep quality, and functional status, respectively. For the data analysis, T-dependent and independent tests as well as Multivariate Analysis of Covariance (MANCOVA) tests were run. Following the COMMASH-E intervention, there were notable variations in fatigue, sleep quality, and functional status between the intervention and control groups. Nevertheless, the children's quality of sleep was influenced by the chemotherapy medications. It was discovered that COMMASH-E outperformed normal treatment in helping children with cancer feel less fatigued, have better sleep, and have a higher functional status.

Another study shows, it is pertinent to examine the effects of music therapy on alleviating depression and anxiety disorders among individuals with cancer. This is particularly relevant since many conventional cancer treatments carry potential side effects that could contribute to psychological disorders in patients (Islaeli, *et al.*, 2023). This study aims to determine the effect of the combination of providing healthy sleep education and music therapy on the functional status of children with cancer in shelter homes to combat the side effects of chemotherapy in Indonesia.

METHODOLOGY

Participants

This is quantitative research with a quasi-experimental design with a post-test with a control group. The study was conducted in July–September 2022. The population in this study were all children with cancer at the cancer children's shelter in the city of Padang. As part of the study, 60 children were divided into a control group (n = 30) and an intervention group (n = 30). Both groups were chosen by purposive sampling in accordance with the inclusion criteria, namely children with cancer who had undergone chemotherapy. There were respondents ranging in age from 4 to 12 years with stages of cancer 1 and 2, age 5 (10 respondents), age 8 (10 respondents), age 10 (10 respondents), and who were aware of the composition of mentis and exclusion (children hospitalized).

Instruments

The lyrics were made by researchers based on the results of preliminary studies obtained from the wishes and hopes of children with cancer. This song is named "Aku Anak Sehat" for intervention. The songs have been

tested and have obtained intellectual property rights or copyright from an official agency known as Direktorat Jenderal Kekayaan Intelektual (Kementerian Hukum dan HAM Republic Indonesia) with the number 000465139. The functional status scores were analyzed using the Activity Daily Living Barthel Index questionnaire, which consists of 10 items with a total score of 0 (total dependency) and 20 (total independent/independent) (Yi *et al.*, 2020; Ellul, Watkins, & Barer, 2011). This study utilized a questionnaire that was derived from a previous study. The questionnaire was slightly modified and re-validated by an epidemiologist, biostatistician, and public health specialist to be used by people living in Indonesia. A pre-test was done for 10 respondents to make sure the questions were understandable and not confusing. The questionnaire was distributed in the Indonesian language.

Data Collection

At the first meeting, the respondent or the patient's mother fills out and agrees to the informed consent that has been provided and undertakes the statements contained therein, including maintaining the confidentiality of the respondent's identity. Functional status questionnaire, providing healthy sleep education to parents, companions, and children once every 30–60 minutes, and giving sleep records to be filled in every day for 3 days. The music therapy session lasted 30 minutes and was played for 15 minutes before going to sleep with an MP3 player. On days 2 and 3, children were given instrumental music therapy for 30 minutes and played for 15 minutes before going to bed with an MP3 player and earphones. The application of healthy sleep techniques was followed according to education on day 1. Day 4: Filling out functional status questionnaires and collecting sleep diaries and music therapy observation sheets.

Statistical Analysis

To analyze the differences in pre-test and post-test scores of functional statuses, each group was tested with a dependent *T*-test, and differences in functional status between the control and intervention groups were tested with an independent *T*-test with a significance level of $p < 0.05$ and a 95% confidence level.

Ethical Clearance

This study was approved by the Research Ethics Committee, Faculty of Applied Science, Lincoln University College, Malaysia No. LUC.FAS/2022/EA/204, on 16th June 2021.

RESULTS

It is known that the average functional status score in the intervention group before giving sleep education and music therapy was 13.07 with a standard deviation (SD) of 1.70. After giving sleep education and music therapy, it was 15.77 with a standard deviation of 2.14. The mean value of the difference is 2.70. The results of the statistical test showed a *p*-value of 0.0005 ($p<0.05$) (Table 1), meaning that there was a significant difference in functional status scores before and after giving sleep education and music therapy in the intervention group.

Table 1: Differences in Mean Scores of Functional Status of Children with Cancer between The Intervention Group and Control Group before and after Giving Healthy Sleep Education and Music Therapy

Variable	Group	*n*	Pre-Test		Post-Test		*p*-value
			mean	SD	mean	SD	
Functional Status	Intervention	30	13.07	1.70	15.77	2.14	0.0005
	Control	30	12.73	1.61	12.90	1.42	0.166

**SD: Standard deviation*

The average score of functional status in the control group before giving sleep education and music therapy in the intervention group was 12.73 with a standard deviation of 1.61, and the average score of functional status in the control group after the intervention group was given sleep education and music therapy was 12.90 with a standard deviation of 12.90. The mean value of the difference is 0.17. The results of the

statistical test showed a *p*-value of 0.166 ($p > 0.05$), meaning that there was no significant difference in the control group's functional status scores before and after giving sleep education and music therapy in the intervention group.

It is known that the average difference in functional status scores between the intervention group and the control group is 2.87. The results of the statistical test showed a *p*-value of 0.0005 ($p<0.05$) (Table 2), meaning that there was a significant difference in functional status scores before and after giving sleep education and music therapy to children with cancer between the intervention group and the control group.

Table 2: Differences in the Mean Scores of Functional Statuses of Children with Cancer between the Intervention Group and the Control Group After Being Given Healthy Sleep Education and Music Therapy

Functional Status	*n*	Mean	SD	*p*-value	Average Difference
Intervention	30	15.77	2.14	0.0005	2.87
Control	30	12.90	1.42		

DISCUSSION

Technological advances are currently growing rapidly, including in the health sector, including the development of knowledge about pediatric nursing interventions. The effects of cancer treatment, especially chemotherapy, have negative effects during the treatment period, both cognitively, physically, and psychologically, which can reduce the quality of life of children (Astuti, Yayah, & Nurhaeni, 2021). One of the side effects of chemotherapy in children with cancer can be functional status disorders, which might impact the child's ability to perform daily tasks. To overcome these results, supporting therapy is needed, one of which is a combination of healthy sleep education and music therapy (Sriasih, 2018).

This study found that there was a significant difference in functional status scores before and after giving sleep education and music therapy to children with cancer between the intervention group and the control group ($p = 0.0005$). The results of this study supported Sriasih's (2018) research on the functional status of cancer children after providing sleep education and music therapy to children (7–18 years old) with cancer between the intervention group and the control group ($p<0.05$).

In this study, non-pharmacological interventions, including providing healthy sleep education and music therapy, have been shown to improve the quality of children's sleep so that children can adopt healthy sleeping habits not only in a shelter but also at home or in the hospital (Fernandes, 2020).

Nguyen and his colleagues (2010) carried out research on music therapy to reduce pain and anxiety in children with cancer undergoing lumbar puncture via randomized clinical trials. The primary outcome was the pain score, and the second was heart rate, blood pressure, respiratory rate, and oxygen saturation measured before, during, and after the procedure. Anxiety scores were measured before and after the procedure. Open interview Questions are conducted in conjunction with the completed procedure. The results showed lower pain scores, heart rate, and respiration in the music group during and after lumbar puncture. Lower anxiety scores on music groups before and after the procedure. Findings from interviews confirmed quantitative results through children's descriptions of positive experiences, including reduced pain and fear.

The provision of healthy sleep education in this study was combined with music therapy. Children are given five choices of slow-tempo songs, such as lullabies. Lullaby sleep music and nature relaxation music to accompany sleep using an MP3 player and earphones for 30 minutes/day given for 3 days and played for 15 minutes before starting to sleep at night. Several studies related to the benefits of music therapy in providing a comfortable atmosphere and helping to balance the body's physiological systems have been carried out, but not many have been associated with fatigue in cancer children (Mofredj *et al.*, 2016; Götte, Taraks, & Boos, 2014; Barry *et al.*, 2010). Therefore, researchers believe that listening to music before bed can help children relax, feel comfortable, and be calm so that they can be distracted from fatigue and have optimal rest.

This can be seen from the results of the analysis of the music observation sheet: most children are consistent in listening to music that is played 15 minutes before the child starts sleeping. Children say they sleep better and are more refreshed when they wake up in the morning. As seen from the music observation sheet, there is also no tendency to choose one type of music; children listen to music with a different code each day. Despite this, the five selected tracks all share one common feature, namely a slow tempo and soothing melodies.

Children with cancer have a sleep delay of only 10 minutes prior to starting therapy, and they frequently wake up at night from fatigue and joint pain. Children with cancer have a sleep latency of 45–50 minutes and a sleeping length of 6–8 hours a day, compared to a sleep duration of just 3-5 hours a day after receiving treatment. There are several factors associated with the functional status of children with cancer, including their age, gender, education, diagnosis, duration of diagnosis, and nutritional status. The age factor negatively impacts children with cancer's functional status and fatigue. Higher fatigue scores and lower functional status were observed for younger children (Allenidekania *et al*. 2017). The decline in a child's functional status occurs as a form of compensation for the body losing energy. Efforts to save energy can be made by sorting out activities that children must do and those that can be helped by parents. Therefore, it is necessary to increase the knowledge of parents to overcome these problems.

Children's requirements for rest and sleep may be met, their physical health can be improved, and their energy levels can be better prepared for activities with the aid of music therapy and healthy sleep education. The claim made by Ferguson and Sheldon (2013) that everyone requires sleep to sustain physical and mental health supports this. According to Barrera, Rykov, & Doyle's study (2002), it has been demonstrated that there was a significant improvement in children's assessment of their feelings from before to after music therapy. Parents feel improvement in playing performance after music therapy in pre-school children and adolescents but not in school-age children. Qualitative analysis of children's and parents' comments shows the positive impact of music therapy on child well-being. Polat and co-researchers (2015) determined that post-test anxiety size decreased to the pre-test size for all age groups, and the difference between them was found to be statistically very significant ($p<0.05$). $p<0.05$ is the standard level of significance. The findings of this study, which are consistent with previous studies, support the opinion that therapeutic music may have a positive effect on hospitalized pediatric oncology patients. Cheung and his colleagues (2019) studied the efficacy of musical training on psychological outcomes and quality of life in Chinese pediatric brain tumor survivors. They found that there is a main effect that is statistically significant for the group intervention with a higher score on quality of life compared to the control group for 52 intervention weeks with a *p*-value of 0.049 (ANOVA test). While the *p*-value of quality of life using the Tukey test obtained values T1=0.983; T2=0.054; T3=0.000.

The study's recommendations for healthy sleep education give parents and kids knowledge on how to control sleep, break negative sleep patterns, lessen sleep disruptions, increase sleep quality and motivate the body to move about (Hatipoglu *et al*. 2018; Hendon & Bohon, 2008; Heryyanoor *et al*. 2019; Yu, 2010; Jepsen, Haahr, & Jørgensen, 2019; Johnson *et al*. 2021).

In this study, it was found that the intervention of a combination of healthy sleep medication and music therapy had an impact on improving the functional status of children. By implementing this intervention, children's needs for sleep and rest will be met, improving their energy levels and physical health. This intervention can be a solution for parents to improve the functional status of children with cancer.

CONCLUSION

Healthy sleep education and music therapy improve the functional status of children with cancer. Therefore, the results of this study can be applied in a halfway house to overcome the side effects of chemotherapy. Giving a combination of healthy sleep therapy and music therapy can be a choice for independent nursing care for children with cancer.

Conflict of Interest

The authors declare that they have no competing interests.

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