

The effect of rhythmic movements on anxiety and fatigue of children with leukemia – a quasi-experimental study

Vliv rytmických pohybů na úzkost a únavu dětí s leukemií – kvaziexperimentální studie

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Summary

Background: Anxiety and fatigue disorder is one of the most common psychological distress disorders among children and adolescents with cancer. Anxiety and fatigue can be managed with sedatives and corticosteroids, but side effects include dizziness, drowsiness, and impaired thinking and judgment. Therefore, this study examined the effect of rhythmic movements on the anxiety and fatigue of children with leukemia. **Materials and methods:** This semi-experimental study was conducted on 7–12-year-old children admitted to the hematology department of Ali Bin Abitaleb Hospital in Zahedan, Iran, which were selected based on random sampling divided into intervention and control groups in 2023. Questionnaires of demographic information, anxiety and fatigue were completed in two stages pre-test and post-test for both groups. Then the data were analyzed by SPSS22 software. A significance level of less than 0.05 was considered. **Results:** The mean and standard deviation of fatigue and anxiety scores of children in both intervention and control groups were not significantly different before performing rhythmic movements ($P < 0.05$), but there was a significant difference after performing rhythmic movements ($P = 0.001$). **Conclusion:** Our findings suggest that rhythmic movements as an adjunctive therapy can be used to improve the quality of life and mental health of children with cancer and their families. In addition, the main goal is to improve the patient's general condition and help the patient achieve a better life. However, more research is needed to evaluate and investigate the complexity of the impact of rhythmic movements on mental health in children with leukemia.

Key words

leukemia – children – anxiety – fatigue – rhythmic movements

The authors declare that they have no potential conflicts of interest concerning drugs, products, or services used in the study.

Autoři deklarují, že v souvislosti s předmětem studie nemají žádné komerční zájmy.

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Souhrn

Východiska: Úzkostná a únavová porucha je jednou z nejčastějších psychických stresových poruch u dětí a dospívajících s nádorovým onemocněním. Úzkost a únavu lze zvládnout pomocí sedativ a kortikosteroidů, ale mezi vedlejší účinky patří závratě, ospalost a poruchy myšlení a úsudku. Tato studie proto zkoumala vliv rytmických pohybů na úzkost a únavu u dětí s leukemií. **Materiál a metody:** Tato semiexperimentální studie byla provedena na 7–12letých dětech přijatých na hematologické oddělení nemocnice Ali Bin Abitaleb v iránském Zahedánu, které byly v roce 2023 vybrány na základě náhodného výběru a rozděleny do intervenční a kontrolní skupiny. Dotazníky demografických údajů, úzkosti a únavy byly vyplněny ve dvou fázích před testem a po testu pro obě skupiny. Poté byla data analyzována pomocí softwaru SPSS22. Za hladinu významnosti byla považována hodnota nižší než 0,05. **Výsledky:** Průměr a směrodatná odchylka skóre únavy a úzkosti u dětí v intervenční i kontrolní skupině se před provedením rytmických pohybů významně nelišily ($p < 0,05$), ale po provedení rytmických pohybů byl zjištěn významný rozdíl ($p = 0,001$). **Závěr:** Naše zjištění naznačují, že rytmické pohyby jako doplňková terapie mohou být využity ke zlepšení kvality života a duševního zdraví onkologicky nemocných dětí a jejich rodin. Kromě toho je hlavním cílem zlepšit celkový stav pacienta a pomoci mu dosáhnout lepšího života. Je však zapotřebí dalšího výzkumu, který by zhodnotil a prozkoumal komplexnost vlivu rytmických pohybů na duševní zdraví dětí s leukemií.

Klíčová slova

leukemie – děti – úzkost – únavu – rytmické pohyby

Introduction

Despite remarkable advancements in disease treatment, chronic cancer remains the second leading cause of death among children aged 1–14 worldwide and the third leading cause in Iran [1–2]. Childhood leukemia, a type of blood cancer, accounts for 41% of malignancies in children aged less than 15 years old [3]. Leukemia, including acute lymphoblastic leukemia and acute myeloid leukemia, is a cancer where abnormal white blood cells are produced in the bone marrow [4].

Anxiety disorder is one of the most common psychological disturbances among children and adolescents with cancer, affecting approximately 25–35% of the pediatric cancer population, with reported rates of anxiety symptoms in the range 12–24% [5, 6]. Yardeni et al. (2020) believe that high levels of anxiety in children occur during the acute phase of treatment, specifically 4–17 weeks after diagnosis [6]. Symptoms of anxiety can include sweating, palpitations, restlessness, seeking reassurance, changes in thinking (perception, worry, concentration), and physical signs such as muscle tension or fatigue [7].

On the other hand, fatigue is considered a common symptom in children with leukemia [8].

A total of 60–90% of cancer patients report fatigue as one of the most common, distressing, and long-lasting side effects of cancer [9,10]. Cancer-related fatigue differs from the fatigue experienced by

healthy individuals [11]. Cancer-related fatigue is a subjective experience of tiredness or lack of energy that varies in terms of intensity, frequency, and duration, and it is not relieved by sleep or rest [11]. Cancer-related fatigue has a profound impact on the lives of patients. Compared to other cancer-related symptoms such as pain, depression, and nausea, it is more troublesome and has a greater negative impact on daily activities and quality of life [12]. According to reports, cancer-related fatigue is a profound disability as it leads to decreased mobility in cancer patients. Prolonged rest can result in muscle breakdown and loss of endurance. Fatigue affects the quality of life in cancer patients by up to 60% [13].

Both pharmacological and non-pharmacological interventions are available for managing anxiety and fatigue associated with cancer. Anxiety and fatigue can be alleviated with tranquilizers and corticosteroids, but they may cause side effects such as dizziness, drowsiness, and impairment in thinking and judgment [12]. Additionally, the often indeterminate level of anxiety can prevent individuals from receiving complete treatment. The use of anti-anxiety medications should be limited in cases where there is a high risk of addiction, such as in outpatient treatments [13]. Non-pharmacological complementary therapies, such as hypnosis, games, art, music, storytelling, relaxation techniques, and exercise, have become suitable solutions for reducing anxiety [12,13]. Chil-

dren with malignant diseases such as leukemia had a normal life before their illness, similar to their peers. They played with others and engaged in age-appropriate physical activities such as running, jumping, and cycling. However, hospitalization and intensive chemotherapy, often accompanied by radiotherapy and surgery, change the conditions for physical activity and significantly reduce children's daily life activities and exercise [14]. Study results indicate that the walking cycle of hospitalized children with cancer is almost 75% less than those in the control group, and even children with cancer who stay at home had nearly a 60% reduction in mobility [15]. Lack of physical activity can lead to short- and long-term complications and increase the burden of the disease [16]. In comparison with patients with other cancers such as brain or bone tumours, patients with leukemia show a lack of strength and side effects of chemotherapy induced by peripheral neuropathy. Finding activities for children with leukemia to encourage them to move and to be active is important for promoting physical activity. Physical activity, especially sports with music, is effective for reducing the psycho-social effects caused by the physical and psychological injuries of cancer. Today the practice of rhythmic movements which is known as Arabic sports includes a series of regular and coordinated movements with different rates that are done with music. The use of music along with

Tab. 1. Session descriptions.

Meeting	Session description
1	Initially, after the introduction, friendly conversations with children were conducted. The children were then asked to give their full name, age, and any experience of rhythmic movements. If the answer was positive, they were asked to implement it. To prepare for the first exercise, a warm-up exercise was performed. The first exercise was this: the children spread their legs to the size of their shoulders, put their hands on their waists as if they were No. 8, and then slowly moved their shoulders up and down. The children then rotated to the right by lifting their shoulders up and down and repeated the exercise when they turned left.
2	The movement in question was explained to the children. The children slowly took their steps back and forth, then moved one hand to the right and the other to the left. Then they raised their hands and threw them down.
3	In the first 5 min of the session, the second session was repeated. Then the children raised their hands and turned to the right and left [17].
4	We asked the child to imagine that there were a lot of dandelions in space that had to be caught in a rhythmic motion (double stroke). In the first move, raise the right hand to grab the dandelion, and second, raise the left hand and take the dandelion.
5	We asked the child to imagine flying and coordinate hand movements like a bird would fly [18].
6	Sessions 1–5 were repeated.

the fun nature of these sports causes people to like this kind of sport more than ever. As rhythmic movements have a variety of auditory, visual and tactile stimuli, and their emphasis on the social and psychological aspects of children, this type of movement has a multifaceted effect on children and provides conditions for every child to use it based on his/her ability. As these characteristics have movement and rhythm, it is important for children to enjoy it. The rhythmic movements show the inner emotions or feelings of the children; the emotions that cannot be expressed. Some parents reported that some medical teams didn't spend much time on physical activities for children with cancer. The interventions for reducing anxiety and fatigue can be treated in hospitals along with medical care. Most of these effective interventions can be useful for children with cancer. This research is done to understand the real and useful effects of rhythmic movements on anxiety and fatigue and by use of these results; the nursing intervention is used to control anxiety and fatigue more effectively in children and young adults. Moreover, the rhythmic movements are less expensive and safer and can be done in hospital playrooms. The health care specialists should promote the importance of regular physical activity among children with cancer.

Materials and methods

Study design

The presented study is a quasi-experimental study with a pre-test-post-test design in Zahedan City, Iran, in 2021.

Study participants and sampling

The participants were selected using available sampling from children aged 7–12 with leukemia undergoing chemotherapy at the hematology department of Ali Ibn Abi Talib Hospital of Zahedan in 2023 who met the inclusion criteria. The selected children were randomly assigned to control and intervention groups through red and green cards. The inclusion criteria were having an 8–12-year-old child with leukemia, receiving at least two rounds of chemotherapy, not suffering from mental disability, hearing or vision impairment, or any other chronic disease, not taking anti-anxiety and anti-depressant medications or any other drugs that disrupted the child's normal functioning and the amount of white blood cells should be in the range 10,000–50,000. The exclusion criteria were the death or poor health condition of the patient.

Data collection tool and technique

The data in the study were collected using a demographic information questionnaire, Revised Children's Manifest

Anxiety Scale (RCMAS), and Fatigue Severity Scale (FSS). The questionnaires were completed for all children by parents in the two groups.

Then, after the pre-test, the samples of the intervention group were placed in groups of 3–5 people due to the COVID-19 situation.

In the intervention group, light rhythmic movements with music were done in the playroom of the hematology department between 10 and 11 am, for 30 min, on 3 alternate days for 2 weeks, separately for girls and boys, before chemotherapy so that the child is not nauseous.

The intervention was carried out in the form of raising and lowering the shoulders, very slow steps forward and backwards and the opposite movement of the hands up, grabbing a dandelion, simulating the movement of birds flying with music.

The details of the six sessions are given in Tab. 1.

The scales of children's obvious anxiety and fatigue were completed by interview 2 weeks later as a post-test.

The exercises were done in groups. In this way, the movements were performed by the researcher and the children must coordinate their movements with the researcher and the group at the same time. It should be noted that

Tab. 2. Frequency distribution of the demographic information on hospitalized children.

Variables	Intervention group frequency, %	Control group frequency, %	P-value*
age	8.20 ± 1.09	8.48 ± 1.10	0.26
number of children	2.30 ± 0.96	2.35 ± 0.94	0.81
disease duration	1.58 ± 0.92	1.75 ± 1.13	0.46
number of chemotherapy sessions	13.08 ± 7.32	12.70 ± 7.44	0.82
age of diagnosis of pediatric disease	6.63 ± 1.59	6.77 ± 1.52	0.7
amount of haemoglobin	9.23 ± 0.62	9.28 ± 0.56	0.98
gender			0.26
• male	17 (42.5)	22 (55)	
• female	23 (57.5)	18 (45)	
place of residence			0.35
• city	17 (42.5)	13 (32.5)	
• rural area	23 (57.5)	27 (67.5)	
the child's education			0.16
• first class	13 (32.5)	11 (27.5)	
• second class	14 (35)	7 (17.5)	
• third class	7 (17.5)	14 (40)	
• fourth class	6 (15)	8 (20)	
history of rhythmic movements			0.10
• no activity	32 (80)	37 (97.5)	
• with activity	8 (20)	3 (7.5)	
type of treatment for children with leukaemia			0.74
• drug therapy	35 (87.5)	34 (85)	
• other treatments	5 (12.5)	6 (15)	
ethnicity			0.65
• Baloch	22 (55)	24 (60)	
• Sistani and others	18 (45)	16 (40)	

*Chi-square test

the researcher was trained by the sports group before the intervention. The data collected in this study were codified and analyzed by SPSS software (version 22). First, the data were summarized using descriptive statistics including frequency, mean, percentage, and standard deviation. The Shapiro-Wilk tests were used to test the assumption of data normality. To compare the pre- and post-intervention scores of the participants in each group, the paired samples t-test was used. Moreover, the mean scores of the participants in the intervention and

control groups were compared using the independent samples t-test. The chi-square test was also used to compare the qualitative variables between the two groups. Data analysis was performed at the significance level of 0.05 ($P = 0.05$).

Ethical consideration

This paper is an excerpt from a master's thesis in pediatric nursing approved by the Ethics Committee of Zahedan University of Medical Sciences with the code IR.ZAUMS.REC.1399.076. Written consent was obtained from participants.

Results

As shown in Tab. 2, the mean age of the children in the intervention and control groups were $8/20 \pm 1/09$ and $8/48 \pm 1/10$ years, respectively, implying that the children in the two groups were not significantly different in terms of age. As can be seen in the table below, 57.5% of the children in the intervention and 45% of the children in the control groups were girls, and the two groups were completely homogeneous in terms of gender. Overall, no significant inter-group difference was found in terms

Tab. 3. The descriptive statistics for the level of anxiety reported by the participants in the two groups.

Groups	Pre-intervention scores	Post-intervention scores	Mean difference	P-value**
intervention	22.5 ± 2.93	14.75 ± 5.79	7.50 ± 3.34	0.001
control	21.90 ± 3.07	2.86 ± 22.17	1.45 ± 0.27	0.69
P-value*	0.6	0.001	0.001	

* independent samples t-test, ** paired samples t-test

Tab. 4. The descriptive statistics for the level of fatigue reported by the participants in the two groups.

Groups	Pre-intervention scores	Post-intervention scores	Mean difference	P-value**
intervention	4.68 ± 1.14	2.55 ± 1.06	2.12 ± 1.72	0.001
control	4.88 ± 1.13	1.05 ± 4.58	1.43 ± 0.3	0.19
P-value*	0.43	0.001	0.001	

Source of changes	Size of the impact	Significance level	F	Average squares	Degree of freedom	Total squares	Exam ability
pre-test	0.002	0.71	0.13	1.15	1	1.15	0.06
group	0.48	0.001	72.14	82.00	1	82.00	1
error rate				1.13	77	87.51	
total					80	1,185	

* independent samples t-test, ** paired samples t-test

of demographic and clinical indicators (Tab. 2).

Independent t-tests showed that the mean and standard deviation of anxiety scores of children with leukemia were not significantly different between the intervention and control groups before the intervention ($P = 0.6$). However, after performing rhythmic movements, the mean and standard deviation of the anxiety score in the intervention group was significantly lower than in the control group ($P = 0.001$). The mean of changes in children's anxiety in the intervention group (-7.50 ± 3.34) was significantly higher than the control group (0.27 ± 1.45) ($P = 0.001$) (Tab. 3).

The results of the study showed that the mean and standard deviation of fatigue score in the intervention group decreased significantly from 4.68 ± 1.14 to 2.55 ± 1.06 ($P = 0.001$). The control

group changed from 4.88 ± 1.13 to 4.58 ± 1.05 ($P = 0.19$).

The results of the independent t-test showed that the mean and standard deviation of fatigue scores of the children in the intervention and control groups did not differ significantly before performing the rhythmic movements ($P = 0.43$) but this difference was diverse after the rhythmic movements ($P = 0.001$).

Also, the mean and standard deviation of reduction in fatigue score in the intervention group (-2.12 ± 1.72) was significantly higher than the control group (-0.3 ± 1.43) ($P = 0.001$). According to the results of the Shapiro-Wilk test (Sig = 0.1, Sig = 0.978) and Levine ($F = 0.66$, $P = 0.25$), there were necessary conditions for covariance analysis. The results of the analysis of the covariance test to control the significant effect of pre-test scores showed that the mean fatigue score of hospitalized leukemia

patients in the two groups after the intervention was significantly different ($P = 0.001$) (Tab. 4).

Discussion

The results of the presented study showed that rhythmic movements reduced the anxiety of children with leukemia. In this regard, the results of the study by Ebadinejad et al. (2017) showed that rhythmic movements as a non-pharmacological intervention reduced mild anxiety in children with cancer [17].

In another study, Salihu et al. (2021) showed that dance interventions significantly reduced symptoms of depression, stress, and anxiety [18]. These results are in line with the results of the presented study. It should be noted that there are differences between rhythmic movements and dance, and in the presented study, the intervention was of the type of rhythmic movements. How-

ever since these studies emphasized the effect of non-pharmacological interventions on anxiety and the dance therapy intervention is in the category of art therapy interventions, the results of the mentioned studies can be considered consistent with the results of the presented study. The results of the presented study emphasized the effect of rhythmic movements on reducing the fatigue of children with leukemia. In the presented study, rhythmic movements were performed with music, so we will review some studies that have investigated music therapy on fatigue in cancer patients. A systematic review by Rennie et al. showed that music therapy, both as a stand-alone treatment and when used in combination with other pharmacological and non-pharmacological methods, has a generally beneficial effect on several physiological and psychological aspects of cancer [19].

Also, the results of the study by Ho et al. showed a significant improvement in stress, pain and fatigue in breast cancer patients. This study stated that there is potential clinical value of dance therapy in reducing pain and can be included as part of integrated cancer care as prevention in the initiation of radiotherapy [20]. Considering the effect of music therapy on psychological problems including fatigue of cancer patients, it can be said that the findings obtained in the above studies are consistent with the presented study. However, there are differences between these studies – including the target population and implementation method – and the presented study.

Conclusions

The results of the presented study emphasized the effect of rhythmic movements on the anxiety and fatigue of children with leukemia. Rhythmic movements as an integrated form of psychotherapy can improve the physical and

mental condition of children with cancer. Overall, our findings suggest that rhythmic movements as an adjunctive therapy can be used to improve the quality of life and mental health of children with cancer and their families. In addition, the main goal is to improve the patient's general condition and help the patient achieve a better life. However, more research is needed to evaluate and investigate the complexity of the impact of rhythmic movements on mental health in children with leukemia.

Limitations

Incorrect implementation of the intervention by children who tried to patiently and repeatedly explain to the children and ask them to perform the intervention as correctly and completely as possible.

Informed consent: All patients signed an informed consent form.

Authors' contribution: All authors discussed the results and contributed to the final manuscript.

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