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Physical activity and quality of life in children treated for leukaemia

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Aleksandra Kowaluk, Marek Woźniewski

Department of Rehabilitation in Internal Medicine, Faculty of Physiotherapy,
University School of Physical Education in Wrocław, Wrocław, Poland

Abstract

Introduction. Childhood cancer treatment is aggressive and may lead to a significant limitation of physical activity as well as deterioration of children's quality of life. Anticancer treatment, though it saves health and life, also leads to problems resulting from the lack of sufficient physical activity. The aim of the study was to assess the level of the physical activity and quality of life in children undergoing leukaemia treatment and examine if there was a correlation between these two.
Methods. Anonymous surveys were conducted. The quality of children's lives was assessed with the KIDSCREEN-10 questionnaire. The level of physical activity was determined with the use of questions from the Health Behaviour in School-aged Children (HBSC) questionnaire.
Results. A study group of 30 children undergoing stationary leukaemia treatment and a control group of 30 healthy children were examined. None of the treated children made a physical effort lasting at least 60 minutes a day; 77% of them did not perform any intense physical effort. All the children undergoing leukaemia treatment showed malaise and low quality of life. No correlation was observed between the level of physical activity and life quality among the oncologically treated children.
Conclusions. Children treated for leukaemia had a low level of physical activity and life quality. They did not undertake any form of physical activity contributing to the improvement of parameters of exercise capacity. There was no correlation between the level of physical activity and life quality in children treated for leukaemia.
Key words: children, quality of life, physical activity, leukaemia

Introduction

Childhood cancer treatment is aggressive and may lead to a significant limitation of physical activity as well as deterioration of children's quality of life. The long-term treatment process affects the physical and psychological sphere of children's lives [1].

Oncologically treated children show a significantly lower level of total physical activity. They spend the majority of their free time in a sitting position, which results from side effects of oncological therapy, such as general fatigue, nausea, pain, sarcopenia, osteopenia, impaired pulmonary function, cardiotoxicity, and malnutrition. These symptoms lead to difficulties in participating in the daily physical activities and sports activities that were practiced before the disease [2, 3].

The oncological treatment process also generates psychological problems. Frequent hospitalizations, limited contact with peers, and remaining only in the company of adults impair a child's socialization process. The experience of social isolation and the lack of belonging to the community often increase the child's sense of separateness and alienation. At the same time, excessive attention of parents and caretakers increases the feeling of anxiety [4, 5]. The results of research by Moody et al. [6] also prove that children suffering from cancer experience loneliness, pain, no pleasure in eating, the feeling of disability, and fear for their health and future. Consequently, oncologically treated children have a worse quality of life.

Oncological therapy side effects significantly affect the children's ability to undertake physical activity. During the illness, the mobility of children is limited. They spend most of their free time in beds because they are connected to medical devices. They also feel fatigue and unpleasant adverse effects of the therapy [2, 7].

Physical activity improves physical fitness and cognitive functions, as well as contributes to the reduction of disease-related fears [8]. Until recently, children with cancer have been advised to lead a well-balanced life and avoid physical efforts. This caused the appearance of a vicious circle phenomenon where the exhaustion and decrease of physical capacity resulting from the disease and its treatment were escalated by a sedentary lifestyle. Currently, physical activity is recommended at every stage of cancer treatment though it still remains an underestimated component of prophylaxis and therapy [9, 10].

There is not enough scientific research devoted to the influence of cancer treatment on physical activity and children's quality of life. However, the assessment of physical activity level and the quality of life is of considerable importance while creating a rehabilitation plan for children undergoing cancer treatment. The aim of the study was to assess the level of the physical activity and quality of life in children undergoing leukaemia treatment and examine if there was a correlation between these two factors.

It was hypothesised that the level of physical activity and the quality of life in children undergoing leukaemia treatment were low and that there was a correlation between the low level of physical activity and the low quality of life.

Correspondence address: Aleksandra Kowaluk, Katedra Rehabilitacji w Chorobach Wewnętrznych, Akademia Wychowania Fizycznego, al. I.J. Paderewskiego 35, 51-612 Wrocław, Poland, e-mail: aleksandra.kowaluk@awf.wroc.pl

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Subjects and methods

Subjects

The research was conducted in the Department of Bone Marrow Transplantation, Children Oncology and Haematology of the Medical University Clinical Hospital in Wrocław, as well as at the Junior High School No. 4 in Głogów. The research involved a group of 60 children aged 11–15 years. The study group consisted of 30 children undergoing leukaemia treatment in hospital. The control group comprised 30 healthy children (Tables 1, 2).

Experimental protocol

In both groups, anonymous questionnaire surveys with the use of traditional hardcopy forms were conducted.

Children's quality of life was assessed with the KIDSCREEN-10 questionnaire. The questionnaire contains 4 questions about physical and mental health, 1 question about relationships with parents, 1 question about relationships with peers, 2 questions about autonomy, and 2 questions about school. The KIDSCREEN-10 questionnaire is assumed to be a one-dimensional index. It is also referred to as the child's mental health index.

The level of physical activity was determined with the use of questions from the *Health Behaviour in School-aged Children* (HBSC) questionnaire, from the part concerning health behaviours. Questions were related to behaviours connected with physical activity in the previous 7 days. The Moderate to Vigorous Physical Activity (MVPA) index, i.e. the number of days per week during which the children performed physical exercise lasting at least 60 minutes, was assessed. In addition, the frequency of physical exercises apart from school activities, i.e. the number of hours during free time spent on large physical efforts leading to general fatigue (breathlessness, increased sweating), was established. The questionnaire also included 3 questions regarding the time spent on watching television and using the computer.

Statistical analysis

Statistical analysis was performed by means of the R 3.2.3 program, whose source code is published under the terms of the GNU GPL licence. In order to demonstrate the significance of the statistical differences in the results of the KIDSCREEN-10 questionnaire, assessing the quality of life, between the study group and the control group, the Fisher test was used. The Mann-Whitney U test was applied to assess the significance of the statistical differences in the results of the HBSC questionnaire, assessing physical activity, between the examined groups. The correlation of the individual responses from the KIDSCREEN-10 and HBSC questionnaires in the study group was estimated with the Spearman's rank correlation coefficient. Statistically significant correlations were determined at the significance level of $\alpha = 0.05$. Statistically significant results are values in which the test probability p was satisfied by the inequality of $p < 0.05$.

Ethical approval

The research related to human use has been complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the authors' institutional Ethics Committee.

Informed consent

Informed consent has been obtained from all individuals included in this study and their parents.

Results

The groups were comparable in the number of subjects, age, sex, body mass, and body height. The average age of children in the study group was 13 years. The study group consisted of 30 children: 13 girls and 17 boys undergoing stationary leukaemia treatment in hospital. The majority of the study group (24 individuals) were children suffering from acute lymphoblastic leukaemia (ALL). The remaining 6 per-

Table 1. Characteristics of test and control group

Parameter	Test group									Control group								
	All participants $n = 30$			Girls $n = 13$			Boys $n = 17$			All participants $n = 30$			Girls $n = 14$			Boys $n = 16$		
	Median	Lower quartile	Upper quartile	Median	Lower quartile	Upper quartile	Median	Lower quartile	Upper quartile	Median	Lower quartile	Upper quartile	Median	Lower quartile	Upper quartile	Median	Lower quartile	Upper quartile
Age [years]	12,5	12	15	13	12	15	12	11	14	13	13	14	13	13	14	13	13	13
Body mass [kg]	49,5	36	55	49	39	53	50	36	56	48	41	56	45,5	41	60	49	43,5	55
Body height [cm]	158	144	168	158	150	160	158	143	172	164,5	158	170	161,5	159	170	167	155,5	170

Table 2. Disease unit by children from the test group and from the control group

Parameter	Test group				Control group			
	Girls $n = 13$		Boys $n = 17$		Girls $n = 14$		Boys $n = 16$	
Disease unit	Acute lymphoblastic leukaemia (ALL)	Acute myeloid leukaemia (AML)	Acute lymphoblastic leukaemia (ALL)	Acute myeloid leukaemia (AML)	Acute lymphoblastic leukaemia (ALL)	Acute myeloid leukaemia (AML)	Acute lymphoblastic leukaemia (ALL)	Acute myeloid leukaemia (AML)
Number of children	10	3	14	3	–	–	–	–

sons were children with acute myeloid leukaemia (AML). The average treatment duration in the study group was 2.23 years (median, 2.0). The average age of children in the control group was 13 years. The control group consisted of 30 healthy children including 14 girls and 16 boys. All children from the control group were healthy – without any medical history of cancer (Tables 1, 2).

Physical activity

The statistical significance and percentage comparison of the results of the questionnaire assessing physical activity and sedentary behaviour are presented in Tables 3–6. Statistically significant differences in the amount of time and number of days allocated to physical activity during the week were observed between the groups. Children from the study group were less likely to engage in physical activity when compared with children from the control group. In both groups, the amount of time spent in front of the computer or the TV

Table 3. Statistical significance of differences in results of the questionnaire assessing physical activity and sedentary behaviours between the test and control groups. Marked correlation factors are significant for $p < 0,05$

Health Behaviour in School-aged Children (HBSC) [reply]	Test group – median ($n = 30$)	Control group – median ($n = 30$)	p-value of Mann-Whitney U test
Moderate to Vigorous Physical Activity index (MVPA)	0 days	4 days	< 0,05
Activity in free time	Never	4–6 times a week	< 0,05
Activity in free time (h)	None	Approx. 4 hours	< 0,05
TV during week (h)	2 h	2 h	> 0,05
TV at the weekend (h)	3 h	3 h	> 0,05
Games during week (h)	1 h	1 h	> 0,05
Games at the weekend (h)	1 h	3 h	< 0,05
Computer during week (h)	1 h	2 h	< 0,05
Computer at the weekend (h)	2 h	4 h	< 0,05

Table 4. Results of physical activity by children from the test group and from the control group. The percentage of given answers [%]

Question/variable	Reply	Test group	Control group
Number of days in a week devoted to physical activity jointly at least 60 minutes daily- Moderate to Vigorous Physical Activity index	0 days	100	–
	1 day	–	–
	2 days	–	–
	3 days	–	20
	4 days	–	40
	5 days	–	20
	6 days	–	7
	7 days	–	13
Number of days in a week devoted to large physical effort leading to general fatigue	Daily	–	10
	4–6 times a week	–	37
	2–3 times a week	–	33
	Once a week	–	10
	Once a month	–	–
	Less than once a week	23	3
	Never	77	–
Number of hours in a week outside school classes devoted to arge physical effort leading to general fatigue	None	80	–
	About 30 minutes	20	–
	About 1 hour	–	–
	About 2 hours	–	10
	About 3 hours	–	23
	About 4 hours	–	37
	About 5 hours	–	17
	About 6 hours	–	3
	About 7 or more hours	–	10

Table 5. Time spent in front of the computer/TV screen during school days by children from the test group and from the control group. The percentage of given answers [%]

Question/Variable	Reply	Test group	Control group
Number of hours daily during free time devoted to watching TV	None	–	17
	About 30 minutes	–	7
	About 1 hour	13	17
	About 2 hours	40	37
	About 3 hours	33	–
	About 4 hours	13	7
	About 5 hours	–	7
	About 6 hours	–	7
	About 7 hours or more	–	3
Number of hours daily during free time devoted to computer games or console	None	33	33
	About 30 minutes	10	3
	About 1 hour	40	13
	About 2 hours	17	13
	About 3 hours	–	23
	About 4 hours	–	10
	About 5 hours	–	–
	About 6 hours	–	–
	About 7 hours or more	–	3
Number of hours daily during free time devoted to the use of computer	None	–	7
	About 30 minutes	43	7
	About 1 hour	57	13
	About 2 hours	–	23
	About 3 hours	–	10
	About 4 hours	–	20
	About 5 hours	–	10
	About 6 hours	–	7
	About 7 hours or more	–	3

screen increased on non-school days. Children from the control group more often than those from the study group used the computer during the week and at the weekend: 2 and 4 hours, respectively (Table 3).

No child undergoing cancer treatment undertook physical activity that would last at least 60 minutes a day. In the control group, 80% of children performed such physical activity at least 4 days a week. As many as 77% of children undergoing oncological treatment did not perform any physically effortful activities leading to general fatigue. In the control group, all children took high-intensity physical exercise at least once a week (Table 4).

Children undergoing oncological treatment usually did not go to school and spent less time in front of the computer screen. In most of their free time, they watched TV. As many as 86% of study group children spent at least 2 hours a day on school days in front of the TV screen, compared with 61% of control group children. Children with cancer used the computer for up to 1 hour a day. Healthy children devoted much longer time for this activity, which resulted from learning activities and communication with their peers (Table 5).

An increase in the time spent in front of the TV screen and computer during free days was noted in both groups (Table 6).

Quality of life

The results of the KIDSCREEN-10 questionnaire referring to physical and mental health, autonomy, relationships with parents and peers, school, and health self-assessment are listed in Tables 7–10. There were statistically significant differences between the groups with regard to these responses. Children treated for cancer presented a lower quality of life. All children undergoing treatment for leukaemia reported malaise and worse physical fitness. As many as 83% of healthy children declared at least very good physical fitness and well-being. In the study group, all children pointed at a deficit of internal strength and energy. In the control group, 70% of children very often felt internal strength and

Table 6. Time spent in front of the computer/TV screen by children from the test group and from the control group. The percentage of given answers [%]

Question/Variable	Reply	Test group	Control group
Number of hours daily during free time devoted to watching TV	None	–	17
	About 30 minutes	–	3
	About 1 hour	–	7
	About 2 hours	20	7
	About 3 hours	50	33
	About 4 hours	30	17
	About 5 hours	–	7
	About 6 hours	–	3
	About 7 hours or more	–	7
Number of hours daily during free time devoted to playing computer games or console	None	13	17
	About 30 minutes	30	3
	About 1 hour	17	7
	About 2 hours	27	10
	About 3 hours	13	20
	About 4 hours	–	10
	About 5 hours	–	10
	About 6 hours	–	10
	About 7 hours or more	–	13
Number of hours daily during free time devoted to using computer	None	–	–
	About 30 minutes	–	3
	About 1 hour	53	3
	About 2 hours	57	23
	About 3 hours	–	17
	About 4 hours	–	10
	About 5 hours	–	17
	About 6 hours	–	7
	About 7 hours or more	–	20

energy. All children in the study group had experienced sadness in the previous week, whereas as many as 90% of healthy children experienced sadness only occasionally or not at all. Children from the study group as well as from the control group rarely experienced loneliness (Table 7).

The autonomy of children treated oncologically and their relationships with peers were at a lower level compared with the children from the control group. Both groups declared good relations with their parents (Table 8).

As many as 90% of children with cancer declared problems at school. Almost 67% of healthy children very often or always did well at school. All children in the study group reported worse concentration and problems with staying focused. Healthy children more often declared good attention and the ability to concentrate (Table 9).

All children from the study group rated their health below the medium level. Children from the control group assessed their health as at least good (Table 10).

Correlations of the results

The calculation of correlation values for HBSC 1 was not possible because this variable assumes only one value (1). No correlation was observed between the level of physical activity and the quality of life either in the group of girls or in the group of boys from the study group (Tables 11, 12).

Discussion

Our study indicated that children undergoing cancer treatment showed a lower level of physical activity when compared with their healthy peers. The same results were obtained by other researchers. What is more, they observed that cancer also contributed to limiting children's mobility and increased the time spent in a sitting position [11]. Additionally, the study conducted by Götte et al. [12] also proved that children undergoing cancer treatment presented a significantly lower level of physical activity in all dimensions of everyday

Table 7. Self-assessment of physical and mental health condition KIDSCREEN by children from the test group and from the control group. The percentage of given answers [%]

Question/Variable	Reply	Test group	Control group
Good well-being and physical fitness	Not at all	40	–
	Slightly	60	6,7
	Average	–	10,0
	Very much	–	53,3
	Significantly	–	30,0
Fisher's test	*p*-value	< 0,05	
Feeling of internal strength and energy	Never	23,3	–
	Seldom	76,7	6,7
	Quite often	–	23,3
	Very often	–	26,7
	Always	–	43,3
Fisher's test	*p*-value	< 0,05	
Feeling of sadness	Never	–	30
	Seldom	–	60
	Quite often	40	10
	Very often	60	–
	Always	–	–
Fisher's test	*p*-value	< 0,05	
Feeling of loneliness	Never	26,7	53,4
	Seldom	50,0	40,0
	Quite often	23,3	3,3
	Very often	–	–
	Always	–	3,3
Fisher's test	*p*-value	< 0,05	

Table 8. Autonomy, relations with parents and peers by children from the test group and from the control group. The percentage of given answers [%]

Question/Variable	Reply	Test group	Control group
Time for oneself	Never	–	3,3
	Seldom	43,4	6,7
	Quite often	53,3	23,3
	Very often	3,3	36,7
	Always	–	30
Fisher's test	*p*-value	< 0,05	
Ability to do things that you want to do	Never	3,3	3,3
	Seldom	30	3,3
	Quite often	63,4	26,7
	Very often	3,3	40
	Always	–	26,7
Fisher's test	*p*-value	< 0,05	
Good, equal treatment by parents/Good relations with parents	Never	–	–
	Seldom	–	–
	Quite often	–	20
	Very often	10	13,3
	Always	90	66,7
Fisher's test	*p*-value	< 0,05	
Good relations with peers, fun	Never	40	6,7
	Seldom	60	3,3
	Quite often	–	13,3
	Very often	–	40
	Always	–	36,7
Fisher's test	*p*-value	< 0,05	

Table 9. Ability to pay attention, coping at school by children from the test group and from the control group. The percentage of given answers [%]

Question/Variable	Reply	Test group	Control group
Good coping at school	Not at all	26,7	–
	Seldom	63,3	3,3
	Quite often	10	30
	Very often	–	40
	Always	–	26,7
Fisher's test	*p*-value	< 0,05	
Good attention and focus	Never	23,3	–
	Seldom	76,7	10
	Quite often	–	23,4
	Very often	–	33,3
	Always	–	33,3
Fisher's test	*p*-value	< 0,05	

Table 10. Self-assessment of child's health by children from the test group and from the control group. The percentage of given answers [%]

Question/Variable	Reply	Test group	Control group
Self-assessment of own health	Perfect	–	33,3
	Very good	–	50
	Good	–	16,7
	So-so	86,7	–
	Bad	13,3	–
Fisher's test	*p*-value	< 0,05	

Table 11. Correlation of results of individual replies from the questionnaire assessing the quality of life and the results of the questionnaire assessing physical activity and sedentary behaviours among girls from the test group. Statistically significant correlations at the statistical significance level of $\alpha = 0,05$

Variable	Moderate to Vigorous Physical Activity index (MVPA)	Activity during free time	Activity during free time (h)	TV during week (h)	TV at the weekend (h)	Games during week (h)	Games at the weekend (h)	Computer during week (h)	Computer at the weekend (h)
Well-being and fitness	–	–0,10	0,41	0,45	–0,50	0,14	–0,28	–0,28	–0,07
Feeling of energy	–	0,16	–0,16	–0,65	0,45	–0,03	–0,08	0,64	0,28
Feeling of sadness	–	–0,30	–0,03	0,32	–0,20	0,06	0,16	–0,53	–0,22
Feeling of loneliness	–	0,09	0,36	-0,41	0,41	0,18	0,53	–0,17	–0,31
Free time	–	–0,35	–0,30	0,23	0,20	0,32	0,18	–0,16	–0,10
Activities during free time	–	–0,18	–0,16	0,05	0,45	0,37	0,28	0,28	–0,05
Treatment by parents	–	0,10	0,34	0,03	–0,39	0,23	0,18	–0,28	–0,03
Playtime with peers	–	0,68	0,30	–0,48	0,14	–0,32	0,50	–0,18	–0,54
Coping at school	–	0,22	0,29	0,08	–0,23	0,25	0,31	0,00	0,07
Focus and attention	–	0,37	0,23	0,25	0,05	0,16	0,43	–0,19	–0,31
Self-assessment of health	–	0,34	0,10	–0,37	0,39	–0,23	0,28	–0,18	–0,39

Table 12. Correlation of results of individual replies from the questionnaire assessing the quality of life and the results of the questionnaire assessing physical activity and sedentary behaviours among boys from test group. Statistically significant correlations at the statistical significance level of $\alpha = 0,05$

Variable	Moderate to Vigorous Physical Activity index (MVPA)	Activity during free time	Activity during free time (h)	TV during week (h)	TV at the weekend (h)	Games during week (h)	Games at the weekend (h)	Computer during week (h)	Computer at the weekend (h)
Well-being and fitness	–	0,11	-0,34	0,03	0,24	–0,33	–0,05	0,20	0,23
Feeling of energy	–	–0,17	0,12	–0,46	0,44	–0,38	–0,25	0,44	0,30
Feeling of sadness	–	0,07	–0,30	0,20	0,10	0,02	0,26	–0,17	0,13
Feeling of loneliness	–	0,21	0,06	0,12	–0,07	0,67	0,55	–0,19	–0,30
Free time	–	–0,18	0,49	0,30	0,19	0,06	0,00	0,00	–0,06
Activities during free time	–	0,55	–0,29	–0,36	0,14	0,15	–0,16	0,21	0,00
Treatment by parents	–	–0,09	0,06	–0,37	0,33	–0,39	–0,36	0,24	–0,18
Playtime with peers	–	–0,31	0,21	0,33	–0,03	0,02	0,09	0,07	0,13
Coping at school	–	–0,04	–0,39	0,06	–0,56	0,36	0,40	–0,01	0,27
Focus and attention	–	–0,27	0,18	0,16	0,40	–0,33	–0,23	0,45	0,23
Self-assessment of health	–	0,13	–0,09	0,20	–0,04	0,16	0,02	0,02	0,27

life. The weekly amount of time devoted to exercises diminished considerably. The most substantial decrease in physical activity during treatment has been observed in patients with bone cancer and those treated in stationary conditions. Owing to the well-known benefits of physical activity during childhood and a proven risk of physical inactivity during cancer treatment, supervised exercise interventions should be implemented during therapy [12]. The research by Anzar et al. [1] also proved the significantly lower level of physical activity in a group of children treated for ALL. This study revealed a substantially lower level of total weekly time devoted to intense physical activity (MVPA). The level of weekly MVPA observed among children treated for ALL amounted to 328 ± 107 minutes vs. 506 ± 175 minutes in the control group. None of the children undergoing cancer treatment met the weekly norm of physical activity.

Physical activity is a crucial element of a healthy lifestyle and may have a positive impact on many physical and psychological parameters. Vallet et al. [13] evaluated the effectiveness of a 6-week adaptive physical activity programme. They observed an improvement of muscle tone, strength of abdominal muscles, and output heart rate. Physical activities contributed to an increase of psychological parameters such as overall self-esteem of a child, as well as the perception of their sport competences and physical strength. The research conducted by Keats and Culos-Reed [14] also confirms the positive impact of physical exercises on the organisms of treated children. A 16-week training had a beneficial influence on their physical and psychological parameters. The analysis proved an rise of the overall physical activity, fitness, and the quality of life in oncologically treated children. Therefore, it is justifiable to apply exercise interventions and to promote knowledge about the accurate pro-health attitudes.

Children after bone marrow transplantation who exercise regularly for 8 weeks may achieve significant health benefits and improve their quality of life. San Juan et al. [15] observed an improvement in terms of skeletal muscles function and peak oxygen uptake. Moreover, regular physical exercises contributed to an increase in muscle strength. With regard to the quality of life, physical exercises positively impacted self-esteem and increased the level of satisfaction among the treated children.

In the presented study, we observed that children undergoing cancer treatment showed low quality of life. This was also noticed by Speyer et al. [16], who investigated the impact of physical activity on the health-related quality of life (HRQoL), determined by health condition. HRQoL of children physically active during hospitalization was higher than that of children who did not exercise regularly. According to the children and their parents, physical exercises significantly improved their functioning on a daily basis. What is more, physical activity had an impact on children's psychosocial functions. Increase in self-esteem and better psychological health were observed, the former being the most substantial. Children staying in hospital and taking series of exercises were found to be more confident than those who did not exercise.

Bhat et al. [17] evaluated the quality of life of children undergoing oncological treatment by the Paediatric Quality of Life Inventory (PedsQL). The results of the study have shown that the quality of life conditioned by the health status of children with cancer was significantly lower and differed from the norm. Patients experienced decline not only in physical, but also in psychological health. Disorders were also observed in emotional and social functioning. Children suffering from cancer achieved lower results at school and often required individual teaching. As evidenced

in the research, differences in the communication and functioning of oncologically treated children may lead to social isolation [17]. In our study, we proved that children undergoing cancer treatment had problems with concentration at school. Moreover, their contact with peers was negligible, which might result from frequent hospitalizations. It was confirmed by other scholars, who also noticed that children staying in hospital did not take part in classes and physical education lessons, having almost no contact with their peers [10].

Owing to the constantly improving effectiveness of treatment in children oncology, there is a growing number of children who have recovered from cancer. As a consequence, the 'quality of survival' of these children is becoming an increasingly important aspect in therapeutic matters. Limited level of physical activity and lower quality of life during their development period result in adverse consequences in their adult lives. Adults who suffered from cancer in childhood are less likely to take up any form of physical activity and are more prone to lead an inactive lifestyle [18]. Oancea et al. [19] assessed the rate of emotional disorders among a group of adults who had suffered from cancer in childhood. The results show that those people experience a chronic feeling of anxiety: they associate childhood solely with pain and problems with memory and learning. Anticancer treatment during this period clearly has long-term consequences and impacts the quality of life in the future.

Regardless of the progress of cancer treatment during childhood, the patient is always susceptible to the risk of physical, psychological, and social side effects of the disease and therapy. This impact was investigated by Li et al. [20]. More than a half of the studied children presented symptoms of depression. Children with cancer showed lower self-esteem and self-confidence. Additionally, a qualitative interview revealed that cancer and the related treatment had a negative influence on the children's everyday life.

Our study did not prove a correlation between the level of physical activity and the quality of life in the group of treated children. A possible reason is that the research groups were not large enough.

Children after oncological treatment have many years of life ahead of them; therefore, it is very important to improve their quality of life. This can be achieved, inter alia, by increasing their level of physical activity during the oncological treatment. It would be appropriate to create a rehabilitation program for oncologically treated children. Its aim would be to increase the children's level of physical activity and thus reduce the unfavourable physical and mental consequences of the treatment.

Limitations

The results of the conducted research require confirmation in a larger group of children undergoing oncological treatment. It would also be advisable to devote more time to the observation of the examined children. The study included only a subjective assessment of the level of physical activity in children treated for leukaemia. Further research may be supplemented with objective methods to determine the level of physical activity, and ought to be primarily related to physical fitness and its impact on everyday functioning in adult life.

Conclusions

1. Children treated for leukaemia had a lower level of physical activity when compared with their healthy peers.

2. Children undergoing oncological treatment did not undertake any form of physical activity contributing to the improvement of exercise capacity parameters.

3. Children treated for leukaemia showed lower quality of life when compared with their healthy peers.

4. In the examined group of children, there was no correlation between the level of physical activity and the quality of life.

Disclosure statement

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Conflict of interest

The authors state no conflict of interest.

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