

Original Article

Effectiveness of a task-oriented training on occupational performance, functional independence, and fatigue in children with childhood cancer: a randomized-controlled trial

Eficácia de um treino com tarefas orientadas para o desempenho ocupacional, independência funcional e fadiga em crianças com câncer na infância: um estudo aleatório controlado

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Abstract

Objective: The objective of the study is to explore the effectiveness of task-oriented training (TOT) on occupational performance, functional independence, and fatigue of children with cancer. **Method:** Two hundred and thirteen children (101 females, 112 males) with cancer were randomized to experimental (n = 112; 9.53±2.23 years) or control (n = 101; 7.93±1.98 years) groups. The experimental group received a TOT together with a conventional occupational therapy (COT), while the control group received only a COT. Both groups received 20 sessions of therapy. The outcomes regarding occupational performance via the Canadian Occupational Performance Measure, functional independence via the Functional Independence Measure for Children and fatigue via the Visual Analog Scale were evaluated by the blind evaluators before and after the interventions in the hospital setting. **Results:** The occupational performance and satisfaction (p<0.001) scores showed statistically significant differences in the experimental group compared to the control group (p<0.01). A statistically significant improvement was determined in functional independence for both groups (p< 0.001). The experimental group indicated a significant reduction in fatigue (p values for fatigue before, during, after activity, morning and evening: p< 0.001) and in the control group (P values for fatigue all situation: p< 0.05). **Conclusion:** The TOT seems to ensure more beneficial effects in increasing occupational performance, improving functional

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independence in daily activities, and decreasing fatigue at the early phases of inpatient treatment of childhood cancer.

Keywords: Neoplasms, Child, Fatigue, Activities of Daily Living, Occupational Therapy.

RESUMO

Objetivo: O objetivo do estudo é explorar a eficácia do treino com tarefas orientados para o desempenho ocupacional, independência funcional e fadiga em crianças com câncer infantil. **Método:** Duzentas e treze crianças com câncer infantil (101 meninas, 112 meninos) foram selecionadas aleatoriamente para o estudo (n = 112; 9.53 ± 2.23 anos) ou grupos controle (n = 101; 7.93 ± 1.98 anos). O grupo de estudo recebeu um treino com tarefas orientadas juntamente com uma terapia ocupacional convencional (TOC), enquanto o grupo de controle recebeu apenas um TOC por 20 sessões. Os resultados referentes ao desempenho ocupacional por meio da Medida Canadense de Desempenho Ocupacional, independência funcional por meio da Medida de Independência Funcional e fadiga por meio da Escala Visual Analógica foram avaliados por avaliadores cegos antes e após as intervenções no ambiente hospitalar. **Resultados:** Os resultados do desempenho ocupacional e satisfação (p <0.001) apresentaram um aumento significativamente maior no grupo de estudo em comparação ao grupo controle (p <0.01). Uma melhora estatisticamente significativa foi determinada na independência funcional dos dois grupos (p <0.001). O grupo de estudo indicou uma redução significativa na fadiga (valores de p para fadiga antes, durante, após atividade, manhã e noite: p <0.001; sendo no grupo controle valores de p para fadiga em qualquer situação: p <0.05). **Conclusão:** O treino com tarefas orientadas parece garantir efeitos mais benéficos no aumento do desempenho ocupacional, melhorando a independência funcional nas atividades diárias e diminuindo a fadiga nas fases iniciais do tratamento hospitalar de câncer infantil.

Palavras-chave: Neoplasias, Criança, Fadiga, Atividades Cotidianas, Terapia Ocupacional.

Introduction

Cancer is a leading cause of death for children and adolescents around the world, and its standardized annual incidence is usually between 70 and 160 per million at 0–14 ages (Stiller, 2004). The most common categories of childhood cancers involve leukemia, brain tumors, lymphomas, and solid tumors (Steliarova-Foucher et al., 2017). Childhood cancers are highly specific and differ in many ways from cancers found in adults (Stiller, 2004). Children hospitalized in pediatric oncology wards have been experiencing negative symptoms such as limitation to perform the daily activities, developmental delay, dependency on caregivers, limited participation in social activities or impairments in motor functions (Moore & Beckwitt, 2006). The process of hospitalization and treatment lead up to activity participation restrictions and functional impairments in children with childhood cancers (Alfano et al., 2012). These processes as well as the side effects of drugs in the form of fatigue and weakness have negative

effects on different aspects of children's physical, emotional, and psychosocial abilities (Williams et al., 2015).

Functional independence has been broadly defined as the ability to perform daily life activities without help (Milte & Crotty, 2014). The ability of an individual who has difficulty in functional independence to perform daily life activities independently and safely, is affected (Beaton & Grimmer, 2013). Pediatric cancer patients frequently report a limitation of participation in personal care skills, in routine activities and attendance to school (Taguchi et al., 2018). However, little is known about the functional outcomes and potential complications of inpatients receiving rehabilitation services (Greenberg et al., 2006; Tsao et al., 2016)

Fatigue is one of the most prevalent negative effects for cancer patients during treatment. Fatigue has negative impacts on person's mood and daily activities, causing significant impairments in life, reducing motivation or interest for attendance even in well-know activities (Berger et al., 2015). Children and adolescents usually report cancer-related fatigue as one of the most permanent, disturbing, and stressful symptoms. (Hockenberry et al., 2011). Effective management of fatigue in children and adolescents with cancer has been reported to be important, but it has been emphasized that studies in this field are limited (Nunes et al., 2018).

The aim of cancer rehabilitation programs is generally to reduce complaints during the disease process, to increase the level of independence and quality of life (Brick & Skidmore, 2020). Conventional Occupational Therapy (COT) involves a range of planned activities designed to promote the development of skills in the context of play, and adaptive behavior. COT is not a fixed program and varies from center to center and is aimed toward addressing the specific needs of a given child (Case-Smith & O'Brien, 2014). By comparison, task-oriented approaches tend to focus on motor performance, i.e. on learning particular motor skills, with attention given to specific aspects of task performance that are causing the child difficulty (Smits-Engelsman et al., 2013). It is stated that optimal cancer rehabilitation lies in the adoption and practice of task-oriented rehabilitation approaches (Brick & Skidmore, 2020). Task-oriented approaches focuses on teaching functional tasks as well as functional skills that are essential in daily life are trained (Au et al., 2014).

Task-oriented interventions are promising for the reduction of acute and chronic residual impairments and disability (McEwen et al., 2015; Wolf et al., 2016). This approach focuses on activities that are important in the lives of children, through direct practice and feedback (Weintraub et al., 2009). Positive results seen in chronic diseases show that there is more improvement in daily life activities and personal independence compared to normal rehabilitation and there is less need for daily care support in activities in the areas of self-care and mobility (Skidmore et al., 2017). Despite the positive findings reported in chronic diseases, studies reporting the results of Task-Oriented Training [TOT] in children with cancer are limited. In a study conducted on childhood cancer, the effect of this approach on children's motor skills was examined (Şahin et al., 2020). However, there are no studies focusing on occupational performance, functional independence and fatigue. For these reasons, this study aims to explore the effects of TOT on occupational performance, functional independence and fatigue of children in pediatric oncology clinic.

Methods

Participants

The study was conducted in the inpatient clinic of the Department of Pediatric Oncology of the State University Hospital. Prior to the study procedure, an informed written consent form, which was approved by the ethics committee of the university was received from each child and his/her legal guardian. The study was conducted in accordance with the Declaration of Helsinki. It was also registered with the clinical trial registry (NCT number: NCT04405531).

The inclusion criteria for children diagnosed with childhood cancer were as follows: (a) 6 and 14 years old; (b) receiving inpatient chemotherapy sessions; (c) scores higher than 28, 30 and 35 in the mini-mental state exam devised for children of ages 6-8, 9-11 and 12-14, respectively (Jain & Passi, 2005). The exclusion criteria for children were as follow: (a) their disease had recurred, or they were in palliative care; (b) they or their parents were not fluent speakers of the Turkish language; (c) they were unwilling to take part in the programs.

Children who were receiving inpatient treatment during the study period were included as potential participants. However, among the potential participants, there were children who were inadequate in speaking Turkish (n=5), whose disease had recurred (n=10) and who declined to participate in the study (n=4), making up a total of 19 children who met the exclusion criteria. Initially, 239 children were eligible.

A simple randomization technique was used to assign each child to one of the two study groups using opaque and sealed envelopes containing a group allocation number from a computer-generated random number table. Allocation of this study was carried out by the fourth author (S.Ş). The experimental and control groups were registered in the rehabilitation program, as they were referred to treatment by an oncologist. The experimental group received a TOT together with a COT, while the control group received only a COT program. Both groups received a treatment for 20 sessions at a hospital setting.

Assessments

Therapy sessions were applied by the first author (Z.K.), whereas assessments were completed by the second author (C.D.) and third author (M.H.), who were blinded to the group allocation. Every child was evaluated separately within his/her own hospital room in a quiet setting to avoid of losing his/her attention. Demographic data (i.e., age, years of schooling, gender and type of cancer) were obtained during the interview. The occupational performance of children was evaluated using the Canadian Occupational Performance Measure (COPM). The Functional Independence Measure for Children (WeeFIM) was used to evaluate their functional independence in activities of daily living and the Visual Analog Scale (VAS) was used to investigate their fatigue level.

Canadian Occupational Performance Measure (COPM)

The COPM is an individualized outcome measure used to document the client's self-rating of performance and satisfaction in three areas of occupational performance which are self-care, productivity and leisure. Each of the identified activities was asked to be scored for importance between 1 and 10 on the Likert Scale (1: not important; 10: very important). Five activities with the highest importance scores were scored for performance and satisfaction using the same 10-point scale. If five or less activities were identified in the first step, all identified activities were scored for performance and satisfaction. Final performance and satisfaction scores were calculated by dividing the total scores of performance and satisfaction to the number of activities that the children regarded as substantial. A change of two points or more in the score on COPM is considered clinically significant (Law et al., 1990).

Functional Independence Measure for Children (WeeFIM)

WeeFIM, which is an 18-item and seven-level ordinal scale, measures a child's incoherent performance in basic daily functional skills. It can be used for children with developmental disabilities from 6 months to 21 years (Wong et al., 2002). Sub-scales include self-care, sphincter control, movement, transfers, social cognition and communication. The self-care subscale has six items: eating, grooming, and bathing, dressing of upper and lower extremities, and the perineal hygiene and adjustment of necessary clothes for the toilet. Sphincter control involves bladder and bowel continence. Transfer involves sitting and getting up on chairs, being able to go in and out of toilets and shower stalls or tubs. Movement involves walking or autonomous mobility such as crawling or use of a wheelchair. Communication includes understanding verbal and nonverbal speech information and meaningful use of language by showing essential requirements and ideas in gestures, words and sentences. Social interaction, problem solving and memory parameters constitute social cognition. A scoring scale between 1 (total assistance) to 7 (total independence) was used at this step. The maximum total score is 126 and the lowest total score is 18, while the maximum scores for self-care, mobility, and cognition are 56, 35, and 35, respectively (Liu et al., 1998).

Visual analog scale (VAS)

VAS is a reliable and easily applicable assessment tool that is accepted worldwide in the literature (Hjermstad et al., 2011). VAS is used to transform some immeasurable values into quantitative data. It is a scale in which a person marks his / her current emotional level on a vertical line with a 10-cm scale. Every emotion is evaluated in a range from non-existent (i.e. never experiencing that particular sensation or feeling) to highly intensive (i.e. constantly experiencing that particular sensation or feeling). The following expressions were used on the scale: 'Show me your fatigue level on the line, here is no fatigue (score = 0), and there is the wickedest probable fatigue (score = 10)'. This process was repeated for five times as before activity, during-activity, after activity, and morning and evening time intervals. It took less than 1 minute for each application to get completed (Tseng et al., 2010).

Intervention

Experimental group

The intervention program for the experimental group at the hospital setting was conducted with a client-centered approach. Therapy consisted of task-oriented activities of daily life training. Intervention was designed according to the functional activities children chose in COPM. The activities gathered from the COPM were all recorded and transferred into TOT, with the aim of improving occupational performance and functional independence in the daily living, while decreasing fatigue levels.

Based on COPM, activities and tasks which were preferred by the children were used for skill training. All sessions involved a functional activity per performance area (self-care / productivity / leisure). The first phase of the TOT, functional activity analysis, was performed for the activities, which were detected to be problematic with the COPM and WeeFIM. Functional activity analysis was used to determine the needs of the child to perform the activity he/she choose. In the second phase, the occupational performance, fatigue and functional independence levels that prevent the realization of the activity were determined by functional activity analysis. These designated occupational performance, fatigue and functional independence levels constituted the task of this intervention, as we aim to improve children's functionality. In the third phase, various functional activities including these tasks were executed (Rowe & Neville, 2018). The TOT was practiced by following the above-mentioned steps for each performance area.

As an example, for one of the performance problems, functional activity analysis of writing activity was performed (phase 1). Various problems that have been detected were as follows: inability in providing word spacing, jumbling of letters, difficulties in pencil holding and using, writing too slowly, inconsistent letter size and showing signs of fatigue too quickly. These problems are related with occupational performance, functional independence and fatigue patterns (phase 2). The TOT was practiced with the purpose of improving occupational performance and functional independence of activities in daily living and decreasing fatigue level. A variety of functional activities were performed with children (pressing sticks into play-dough, using tweezers to place small balls of tissue paper into a container, pushing small pieces of pipe cleaners into a cardboard box, doing puzzle, painting, trying to create as many words as possible in word games, finding the required letters within a page that includes various letters, etc.) (phase 3). Also, the activities were individually adapted in accordance with the fatigue strategies (e.g., energy conservation, relaxation techniques and family training). This program had its focus on improving handwriting, which is an important daily activity in children's lives, through direct implementation and feedback.

All activities were designed for the inpatient settings of children. The TOT was conducted for 40–45 min/day during the hospitalization period, and all children completed 20 sessions in a month.

Control group

The COT was applied to the control group. In order for the children in the control group to achieve the desired goal, therapy was provided by considering their functional levels. The COT included functional activities based on the client-centered principles of the neuro-developmental approach (Øygaard et al., 2011). All the sessions started with relaxation training combined with breathing exercises. At the end of approximately 10 minutes of application time, individualized functional activities were implemented. The control group received only the COT for 20 sessions in a month for 40–45 min/day during the hospitalization duration.

Statistical analysis

Statistical analyses were executed using the Statistical Package for Social Sciences (SPSS) version 22. Normal distribution was analyzed using visual (plots / histograms) and analytical methods (Kolmogorov-Smirnov test). Using mean and standard deviations for continuous variables and frequencies and proportions for categorical variables, group characteristics and outcomes were defined. Descriptive statistics were presented as median for the non-normally distributed quantitative and ordinal data, while the categorical variables were shown in numbers (percentage). Since the data were not normally distributed, the Wilcoxon signed rank test was used to test the mean differences between pre and post-intervention outcomes. The Mann-Whitney U test was used to see whether the differences between the scores of the experimental and control groups were statistically significant. Statistical significance level was assumed at $p < 0.05$.

Results

Of the 220 participants, 105 were appointed to the randomly selected control group and the other 115 to the randomly selected experimental group. Of the 220 participants, 7 did not complete the interventions (4 in the control group and 3 in the experimental group). 213 participants who consummated the intervention participated all the therapy sessions. A diagram of the procedural flow of the study is demonstrated in Figure 1. The demographic characteristics of all the participants in the experimental and control groups are shown in Table 1. The differences in the demographic characteristics of both groups were insignificant. In addition, both groups were found to be homogeneous in terms of pre-intervention outcome measures ($p > 0.05$), as shown in Table 4.

Moreover, a total of 636 activities in COPM were carried out by all the children in both groups. As for an analysis of these activities, 173 self-care, 250 productivity (school/play), and 213 leisure activities were grouped consistently with the occupational performance areas. The top-three most stated activities were as follows: “writing” (8.64%), “paper cutting / pasting” (7.70%), and “painting” (6.91%); (for other activities, see Table 2). These activities have been reported by children as the most important daily life activities.

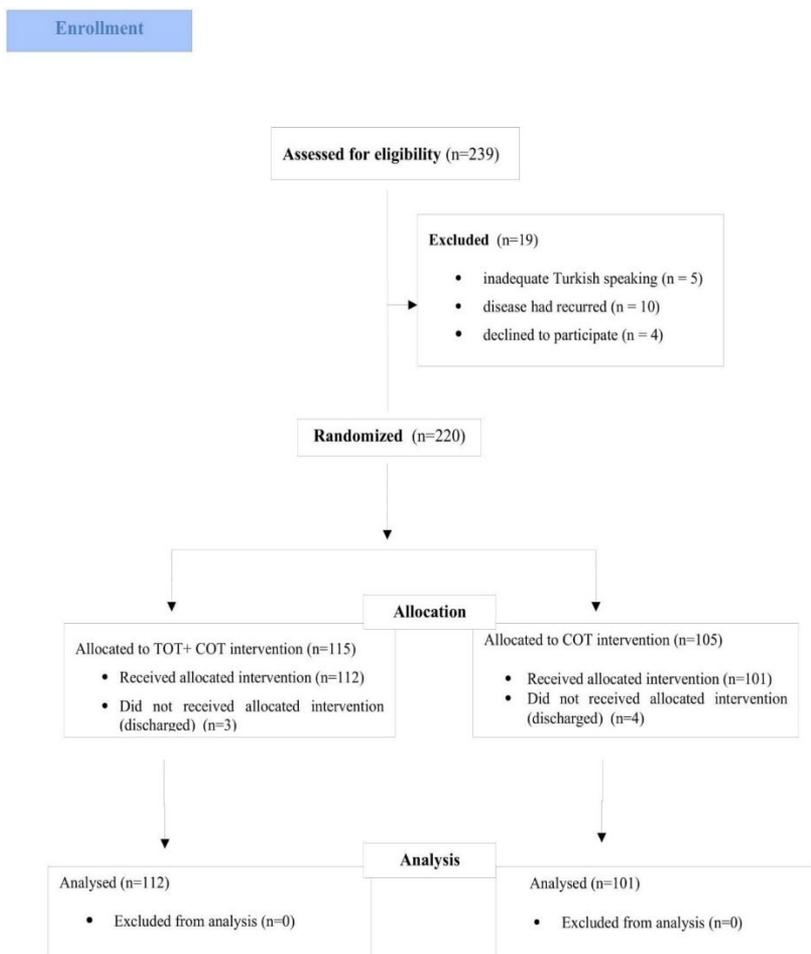


Figure 1. Flow chart.

Table 1. Demographic characteristics of participants in both groups.

	Experimental group (n=112)	Control group (n=101)	P ^{ab}
	Mean±SD (min–max)	Mean±SD (min–max)	
Age (year)	9.53±2.23 (6-14 years)	7.93±1.98 (6-14 years)	0.83 ^a
Years of schooling	6.12±3.02 (1-9)	6.13±3.03 (1-9)	0.93 ^a
Type of Cancer	n (%)	n (%)	
Osteosarcoma	42 (37.5)	44 (43.5)	
Neuroblastoma	27 (24.1)	22 (21.8)	0.94 ^b
Lymphoma	25 (22.4)	24 (23.7)	
Carcinoma	18 (16.0)	11 (11.0)	
Gender			0.56 ^b
Girl	51 (50.5)	50 (49.5)	
Boy	61 (54.5)	51 (45.5)	

SD, Standart Deviasyon; n, Number of participants. P^a Mann-Whitney U test for continuous variable. P^b Chi-square test for categorical variables. P-values of <0.05 were considered significant.

Table 2. Activity categorization according to COPM.

CHILD		
COPM	n	(%)
SELF-CARE	173	27.20
	108	16.98
Eating	26	4.08
Dressing	25	3.93
Brushing	30	4.71
Toilet hygiene	27	4.24
Functional mobility	31	4.87
Walk (self-mobility outdoors)	31	4.87
Community Management	34	5.34
Shopping (via canteen)	34	5.34
PRODUCTIVITY	250	39.30
	64	10.06
Play table tennis	31	4.87
Play chess	33	5.18
School	186	29.34
Paper Cutting/Paste	49	7.70
Skills for Preparing to Writing	43	6.76
Writing	55	8.64
Cutting with scissors	39	6.13
LEISURE	213	33.49
Quiet Recreation	77	12.10
Playing car	28	4.40
Puzzle	22	3.45
Doing origami	27	4.24
Active Recreation	112	17.61
Painting	44	4.91
Play house	35	5.50
Board game	33	5.18
Socialization	24	3.77
Peer relationship	24	3.77
Total	636	100

COPM, Canadian Occupational Performance Measure; n, Number of participants.

Within-group analyses of occupational performance and satisfaction, functional independence and fatigue levels were illustrated in Table 3. Occupational performance and satisfaction scores showed a significant increase both in the experimental group (p values <0.001) and in the control group (p values <0.01). A statistically significant improvement in both groups (p <0.001) was found in functional independence levels in daily life activities. In addition, a significant decrease on fatigue levels was seen both in the experimental group (for fatigue in the all situation: p < 0.001) and in the control group (for fatigue in the all situation: p < 0.05). The effect sizes of the two groups are

shown in Table 3. As for a comparison of both groups, strong (effect size > 0.80) effect sizes in performance and fatigue scores (for during-activity and post-activity) and moderate effect sizes (effect size between 0.30 and 0.80) in satisfaction and fatigue (for morning and before activity) were detected in the experimental group. On the other hand, all the scores with an effect size below 0.3 indicated no difference in the control group.

Table 3. Pre and post assessment results of Canadian Occupational Performance Measure, Functional Independence Measure for Children and Visual Analog Scale-fatigue scale in the experimental and control groups.

	Experimental group				Control group					
	Pre intervention (X±SD)	Post intervention (X±SD)	z	p-value	Effect Size	Pre intervention (X±SD)	Post intervention (X±SD)	z	p-value	Effect Size
COPM										
Performance	4.51±2.41	6.47±2.45	6.89	<0.001**	0.81 ^a	4.42 ±2.47	4.70±2.53	-2.81	0.005**	0.11
Satisfaction	4.19±2.96	6.22±2.90	6.32	<0.001**	0.68	3.62±2.95	3.93±3.00	-3.07	0.002**	0.10
WeeFIM (total)	98.58±21.24	101.04±21.06	5.11	<0.001**	0.11	97.75±22.05	99.2±22.51	-3.81	<0.001**	0.06
VAS - fatigue scale										
Pre-activity	2.58±2.42	1.55±1.71	5.68	<0.001**	0.42	2.30±2.44	2.23±2.37	-2.53	0.011*	0.02
During-activity	3.66±2.34	1.58±1.39	7.19	<0.001**	0.88 ^a	3.31±2.30	3.22±2.31	-2.45	0.014*	0.03
Post-activity	4.17±2.57	1.58±1.31	7.66	<0.001**	1.00 ^a	3.76±2.81	3.67±2.74	-2.27	0.023*	0.03
Morning	2.27±2.59	1.37±1.83	4.94	<0.001**	0.34	2.46±2.64	2.40±2.58	-2.46	0.014*	0.02
Evening	2.56±2.75	1.94±2.35	4.13	<0.001**	0.22	2.22±2.75	2.03±2.61	-2.20	0.027*	0.06

SD, Standart Deviasyon; n, Number of participants; X, mean; p, statistical significance; z, Standard scores. COPM, Canadian Occupational Performance Measure; WeeFIM, Functional Independence Measure for Children; VAS, visual analog scale. p-valued for within-group change were calculated using the Wilcoxon signed-rank test. * p<0.05; **, p<0.01, ^a effect size >0.80.

Increasing changes over time in comparing professional performance, functional independence and fatigue levels between groups are shown in Table 4. There were statistically significant differences in performance, satisfaction (p values <0.001) and fatigue levels (for fatigue only during and after activity: p <0.05) between groups, when the changes from pre-intervention to after 20 sessions are compared. However, there were no statistical differences between groups in terms of functional independence and fatigue (for fatigue in the morning, evening and before activity) (p>0.05).

Table 4. Change in outcomes from pre and post intervention in the experimental and control groups.

	Pre intervention (Mean±SD)				Post intervention (Mean±SD)			
	Experimental group	Control group	z	p	Experimental group	Control group	z	p
COPM								
Performance	4.51±2.41	4.42 ±2.47	-0.50	0.61	6.47±2.45	4.70±2.53	-5.38	<0.001**
Satisfaction	4.19±2.96	3.62±2.95	-1.44	0.14	6.22±2.90	3.93±3.00	-5.33	<0.001**
WeeFIM (total)	98.58±21.24	97.75±22.05	-0.13	0.89	101.04±21.06	99.2±22.51	-0.44	0.660
VAS - fatigue scale								
Pre-activity	2.58±2.42	2.30±2.44	-0.87	0.38	1.55±1.71	2.23±2.37	-1.67	0.093
During-activity	3.66±2.34	3.31±2.30	-1.12	0.25	1.58±1.39	3.22±2.31	-5.28	<0.001**
Post-activity	4.17±2.57	3.76±2.81	-0.90	0.36	1.58±1.31	3.67±2.74	-5.40	<0.001**
Morning	2.27±2.59	2.46±2.64	-0.55	0.58	1.37±1.83	2.40±2.58	-2.44	0.581
Evening	2.56±2.75	2.22±2.75	-0.97	0.33	1.94±2.35	2.03±2.61	-0.19	0.842

SD, Standart Deviasyon; p, statistical significance; z, Standard scores. COPM, Canadian Occupational Performance Measure; WeeFIM, Functional Independence Measure for Children; VAS, visual analog scale. p-valued for between-group difference calculated using the Mann-Whitney U tests. ** p<0.01.

Discussion

The purpose of this study was to explore the effect of TOT on occupational performance and satisfaction, functional independence, and fatigue levels of children with childhood cancer. Our results show that TOT can be effective in increasing occupational performance and satisfaction levels and improving independent functional status in daily activities of living and in decreasing fatigue levels at the early phases in inpatient rehabilitation process. When the occupational performance and during/post activity fatigue levels of the participants in the study group were examined, it was determined that the effect was higher than the control group. As far as we know, this is the first study ever showing the effects of task-orientated rehabilitation on performance, satisfaction, functional independence, and fatigue levels in pediatric cancer patients.

Ness et al. pointed at the functional limitations in self-care, life routines and school in childhood cancer (Ness et al., 2005). Another studies specified a deficiency in performing daily life activities and significant reduction in school performance in children with childhood cancer (An et al., 2011). Our findings established that the activity preferences of the children in the study were mostly in the area of productivity, especially in school activities. We can state that children prefer these activities a lot more because they do not attend school during their treatment. Therefore, it can be seen that, in the intervention approaches with TOT which are applied on children with childhood cancer who receive inpatient treatment, it is necessary to perform applications for all performance areas, and productivity in particular.

The level of activity was determined to have decreased substantially in pediatric patients who were receiving inpatient cancer treatment in particular. Also, it was reported that there was a strong need for interventions appropriate to the individual needs of children with childhood cancer (Winter et al., 2009). Children with childhood cancer were observed to get tired quickly and not have enough strength, and prefer to

participate in activities that need the least movement and environment discovery (Keene, 2018). Another study reported that children with childhood cancer had lower performance levels in daily living activities (Demers et al., 2016). Şahin et al. examined the effects of the task-oriented treatment program on motor skills in a study, the main focus of which was children with cancer, and they also identified that the increase in occupational performance and satisfaction levels was higher in the experimental group when compared to the control group. The authors advised the use of COPM on children diagnosed with cancer for the planning of task-oriented programs in hospital settings (Şahin et al., 2020). COPM was proposed to be clinically beneficial when a difference of more than 2 points was detected (Law et al., 1990). The experimental group exhibited an increase of more than 2 points in performance and satisfaction. Consequently, a statistically significant and clinically efficient increase was found in the performance and satisfaction of the experimental group compared to the control group. According to the findings of this study, the TOT, which was proposed for increasing occupational performance was useful in increasing performance and satisfaction scores in hospital settings. When the groups were compared with regard to occupational performance and satisfaction, the scores of the experimental group were higher than those of the control group, which showed that the TOT was more efficient.

The general goal of the cancer rehabilitation process is the attainment of an individual who is independently functioning and self-sufficient in his/her environment within the limits of his/her disease (Wright & Ness, 2017). Children with cancer experience a wide range of functional disorders related to the effects of primary lesions or treatment complications (Pham et al., 2018). The cancer literature has reported variable results regarding the functional abilities of long-term survivors of childhood cancer (Armstrong et al., 2009; Boman et al., 2009). Various pilot studies using aerobic training have been conducted on children with childhood cancer and improved functional skills have been observed (Marchese et al., 2004; San Juan et al., 2007). Tsao et al. (2016) revealed that children with childhood cancer had less gain in self-care skills, mobility, and total score change after a course of inpatient treatment. The results of our study showed that there has been a significant improvement in functional independence in daily living activities in both groups alike. As one of the main goals of the COT program is to increase the functional independence level of the person, we think that the significant improvement observed in the control group is related to this. After all, the fact that the results of the TOT applied to the experimental group are higher should not be overlooked.

Fatigue is a persistent and subjective feeling of tiredness that is associated with cancer (Huang & Ness, 2011). The study related with the interventions on pediatric cancer patients indicated positive effects on fatigue (Baumann et al., 2013). Most studies investigating fatigue present a positive impact of clinical exercise during medical treatment (Yeh et al., 2011; Spathis et al., 2015). However, these findings are not confirmed by all of the other authors (Rosenhagen et al., 2011; Kreissl et al., 2016). Also, motivating children with cancer to exercise has been stated to be challenging (Yeh et al., 2011). Remarkably, fatigue itself was an important barrier to physical and social activities. One particular study reported that there should be a focus on the effectiveness of interventions, of which activity promotion is the most promising (Spathis et al., 2015). When the groups were compared with regard to fatigue levels, the

results of the experimental group were seen to be higher than those of the control group. Hence, our study showed that TOT, which focuses on the goals of each individual, has a significant effect on fatigue. Our results established that TOT is a more effective intervention tool in improving adverse conditions of fatigue in children. Also, TOT is considered to be useful and it comes to the fore in the rehabilitation implementations for fatigue.

There are some limitations to this study. Primarily, using a clinical service limits the generalizability. Secondly, even though we have found out a significant effect of TOT in this process, these findings cannot be generalized for age, socio-economic conditions and all types of childhood cancer, depending on the heterogeneous population. Finally, future long-term follow-up studies must be accomplished to specify the long-term influences of treatments.

This study provides valuable target information on the impaired occupational performance, functional independence, and fatigue of children with childhood cancer, which has not yet been explored adequately in an early phase of pediatric oncological aftercare. The TOT appears to be more useful in increasing the level of occupational performance, occupational satisfaction, and fatigue at the early phases in inpatient rehabilitation of childhood cancer. Our findings indicate that further studies are required to explore the long-term effects of TOT on these functions after discharge. Since children with cancer prefer school-related activities more to other activities, it may be beneficial in future studies to investigate the educational areas and children's participation level in school. Also, TOT is expected to be highly beneficial if incorporated into pediatric cancer rehabilitation.

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References

- Alfano, C. M., Ganz, P. A., Rowland, J. H., & Hahn, E. E. (2012). Cancer survivorship and cancer rehabilitation: revitalizing the link. *Journal of Clinical Oncology*, *30*(9), 904-906. <http://dx.doi.org/10.1200/JCO.2011.37.1674>.
- An, K. J., Song, M. S., Sung, K. W., & Joung, Y. S. (2011). Health-related quality of life, activities of daily living and parenting stress in children with brain tumors. *Psychiatry Investigation*, *8*(3), 250-255. <http://dx.doi.org/10.4306/pi.2011.8.3.250>.
- Armstrong, G. T., Liu, Q., Yasui, Y., Huang, S., Ness, K. K., Leisenring, W., Hudson, M. M., Donaldson, S. S., King, A. A., Stovall, M., Krull, K. R., Robison, L. L., & Packer, R. J. (2009). Long-term outcomes among adult survivors of childhood central nervous system malignancies in the Childhood Cancer Survivor Study. *Journal of the National Cancer Institute*, *101*(13), 946-958. <http://dx.doi.org/10.1093/jnci/djp148>.
- Au, M. K., Chan, W. M., Lee, L., Chen, T. M., Chau, R. M., & Pang, M. Y. (2014). Core stability exercise is as effective as task-oriented motor training in improving motor proficiency in children with developmental coordination disorder: a randomized controlled pilot study. *Clinical Rehabilitation*, *28*(10), 992-1003. <http://dx.doi.org/10.1177/026921551452759>.

- Baumann, F. T., Bloch, W., & Beulertz, J. (2013). Clinical exercise interventions in pediatric oncology: a systematic review. *Pediatric Research*, 74(4), 366-374. <http://dx.doi.org/10.1038/pr.2013.123>.
- Beaton, K., & Grimmer, K. (2013). Tools that assess functional decline: systematic literature review update. *Clinical Interventions in Aging*, 8, 485-494. <http://dx.doi.org/10.2147/CIA.S42528>.
- Berger, A. M., Mooney, K., Alvarez-Perez, A., Breitbart, W. S., Carpenter, K. M., Cella, D., Cleeland, C., Dotan, E., Eisenberger, M. A., Escalante, C. P., Jacobsen, P. B., Jankowski, C., LeBlanc, T., Ligibel, J. A., Loggers, E. T., Mandrell, B., Murphy, B. A., Palesh, O., Pirl, W. F., & Plaxe, S. C. (2015). Cancer-related fatigue, version 2.2015. *Journal of the National Comprehensive Cancer Network : JNCCN*, 13(8), 1012-1039. <http://dx.doi.org/10.6004/jnccn.2015.0122>.
- Boman, K., Hoven, E., Anclair, M., Lannering, B., & Gustafsson, G. (2009). Health and persistent functional late effects in adult survivors of childhood CNS tumours: a population-based cohort study. *European Journal of Cancer*, 45(14), 2552-2561. <http://dx.doi.org/10.1016/j.ejca.2009.06.008>.
- Brick, R., & Skidmore, E. (2020). Optimizing cancer rehabilitation through activity-focused approaches. *Seminars in Oncology Nursing*, 36(1), 150985. <http://dx.doi.org/10.1016/j.soncn.2019.150985>.
- Case-Smith, J., & O'Brien, J. C. (2014). *Occupational therapy for children and adolescents-e-book*. Amsterdam: Elsevier Health Sciences.
- Demers, C., Gélinas, I., & Carret, A. S. (2016). Activities of daily living in survivors of childhood brain tumor. *American Journal of Occupational Therapy*, 70(1), 7001220040. <http://dx.doi.org/10.5014/ajot.2016.014993>.
- Greenberg, E., Treger, I., & Ring, H. (2006). Rehabilitation outcomes in patients with brain tumors and acute stroke: comparative study of inpatient rehabilitation. *American Journal of Physical Medicine & Rehabilitation*, 85(7), 568-573. <http://dx.doi.org/10.1097/01.phm.0000223218.38152.53>.
- Hjermstad, M. J., Fayers, P. M., Haugen, D. F., Caraceni, A., Hanks, G. W., Loge, J. H., Fainsinger, R., Aass, N., Kaasa, S., & European Palliative Care Research Collaborative – EPCRC. (2011). Studies comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for assessment of pain intensity in adults: a systematic literature review. *Journal of Pain and Symptom Management*, 41(6), 1073-1093. <http://dx.doi.org/10.1016/j.jpainsymman.2010.08.016>.
- Hockenberry, M. J., Hooke, M. C., McCarthy, K., & Gregurich, M. A. (2011). Sickness behavior clustering in children with cancer. *Journal of Pediatric Oncology Nursing*, 28(5), 263-272. <http://dx.doi.org/10.1177/1043454211409586>.
- Huang, T. T., & Ness, K. K. (2011). Exercise interventions in children with cancer: a review. *International Journal of Pediatrics*, 2011, 1-12. <http://dx.doi.org/10.1155/2011/461512>.
- Jain, M., & Passi, G. R. (2005). Assessment of a modified Mini-Mental Scale for cognitive functions in children. *Indian Pediatrics*, 42(9), 907-912.
- Keene, N. (2018). *Childhood Leukemia: a guide for families, friends, & caregivers*. Chicago: Independent Publishers Group.
- Kreissl, S., Mueller, H., Goergen, H., Mayer, A., Brilliant, C., Behringer, K., Halbsguth, T. V., Hitz, F., Soekler, M., Shonukan, O., Rueffer, J. U., Flechtner, H. H., Fuchs, M., Diehl, V., Engert, A., Borchmann, P., & German Hodgkin Study Group. (2016). Cancer-related fatigue in patients with and survivors of Hodgkin's lymphoma: a longitudinal study of the German Hodgkin Study Group. *The Lancet. Oncology*, 17(10), 1453-1462. [http://dx.doi.org/10.1016/S1470-2045\(16\)30093-6](http://dx.doi.org/10.1016/S1470-2045(16)30093-6).
- Law, M., Baptiste, S., McColl, M., Opzoomer, A., Polatajko, H., & Pollock, N. (1990). The Canadian occupational performance measure: an outcome measure for occupational therapy. *Canadian journal of occupational therapy. Revue Canadienne D'ergotherapie*, 57(2), 82-87. <http://dx.doi.org/10.1177/00084174900570020>.
- Liu, M., Toikawa, H., Seki, M., Domen, K., & Chino, N. (1998). Functional Independence Measure for Children (WeeFIM): a preliminary study in nondisabled Japanese children. *American Journal*

- of *Physical Medicine & Rehabilitation*, 77(1), 36-44. <http://dx.doi.org/10.1097/00002060-199801000-00006>.
- Marchese, V. G., Chiarello, L. A., & Lange, B. J. (2004). Effects of physical therapy intervention for children with acute lymphoblastic leukemia. *Pediatric Blood & Cancer*, 42(2), 127-133. <http://dx.doi.org/10.1002/pbc.10481>.
- McEwen, S., Polatajko, H., Baum, C., Rios, J., Cirone, D., Doherty, M., & Wolf, T. (2015). Combined cognitive-strategy and task-specific training improve transfer to untrained activities in subacute stroke: an exploratory randomized controlled trial. *Neurorehabilitation and Neural Repair*, 29(6), 526-536. <http://dx.doi.org/10.1177/1545968314558602>.
- Milte, R., & Crotty, M. (2014). Musculoskeletal health, frailty and functional decline. *Best Practice & Research. Clinical Rheumatology*, 28(3), 395-410. <http://dx.doi.org/10.1016/j.berh.2014.07.005>.
- Moore, J. B., & Beckwith, A. E. (2006). Self-care operations and nursing interventions for children with cancer and their parents. *Nursing Science Quarterly*, 19(2), 147-156. <http://dx.doi.org/10.1177/0894318406286594>.
- Ness, K. K., Mertens, A. C., Hudson, M. M., Wall, M. M., Leisenring, W. M., Oeffinger, K. C., Sklar, C. C., Robison, L. L., Gurney, J. G., & Less, S. (2005). Limitations on physical performance and daily activities among long-term survivors of childhood cancer. *Annals of Internal Medicine*, 143(9), 639-647. <http://dx.doi.org/10.7326/0003-4819-143-9-200511010-00007>.
- Nunes, M., Bomfim, E., Olson, K., Lopes-Junior, L. C., Silva-Rodrigues, F. M., Garcia de Lima, R. A., & Nascimento, L. C. (2018). Interventions minimizing fatigue in children/adolescents with cancer: an integrative review. *Journal of Child Health Care*, 22(2), 186-204. <http://dx.doi.org/10.1177/1367493517752498>.
- Øygaard, K., Haestad, H., & Jørgensen, L. (2011). Physiotherapy, based on the Bobath concept, may influence the gait pattern in persons with limb-girdle muscle dystrophy: a multiple case series study. *Physiotherapy Research International*, 16(1), 20-31. <http://dx.doi.org/10.1002/pri.469>.
- Pham, K., Bjornson, K. F., Osorio, M., Whitlock, K. B., & Massagli, T. L. (2018). A novel protocol for contact isolation for multidrug-resistant organisms in children on inpatient rehabilitation and effects on functional outcomes: a noninferiority study. *PM & R*, 10(6), 594-600. <http://dx.doi.org/10.1016/j.pmrj.2017.11.006>.
- Rosenhagen, A., Bernhörster, M., Vogt, L., Weiss, B., Senn, A., Arndt, S., Siegler, K., Jung, M., Bader, P., & Banzer, W. (2011). Implementation of structured physical activity in the pediatric stem cell transplantation. *Klinische Padiatrie*, 223(3), 147-151. <http://dx.doi.org/10.1055/s-0031-1271782>.
- Rowe, V. T., & Neville, M. (2018). Task oriented training and evaluation at home. *OTJR*, 38(1), 46-55. <http://dx.doi.org/10.1177/1539449217727120>.
- Şahin, S., Akel, B. S., Huri, M., & Akyüz, C. (2020). Investigation of the effect of task-orientated rehabilitation program on motor skills of children with childhood cancer: a randomized-controlled trial. *International Journal of Rehabilitation Research*, 43(2), 167-174. <http://dx.doi.org/10.1097/MRR.0000000000000400>.
- San Juan, A. F., Fleck, S. J., Chamorro-Viña, C., Maté-Muñoz, J. L., Moral, S., Pérez, M., Cardona, C., Del Valle, M. F., Hernández, M., Ramírez, M., Madero, L., & Lucia, A. (2007). Effects of an intrahospital exercise program intervention for children with leukemia. *Medicine and Science in Sports and Exercise*, 39(1), 13-21. <http://dx.doi.org/10.1249/01.mss.0000240326.54147.f>.
- Skidmore, E. R., Butters, M., Whyte, E., Grattan, E., Shen, J., & Terhorst, L. (2017). Guided training relative to direct skill training for individuals with cognitive impairments after stroke: a pilot randomized trial. *Archives of Physical Medicine and Rehabilitation*, 98(4), 673-680. <http://dx.doi.org/10.1016/j.apmr.2016.10.004>.

- Smits-Engelsman, B. C., Blank, R., van der Kaay, A. C., Mosterd-van der Meijs, R., Vlugt-van den Brand, E., Polatajko, H. J., & Wilson, P. H. (2013). Efficacy of interventions to improve motor performance in children with developmental coordination disorder: a combined systematic review and meta-analysis. *Developmental Medicine and Child Neurology*, 55(3), 229-237. <http://dx.doi.org/10.1111/dmcn.12008>.
- Spathis, A., Booth, S., Grove, S., Hatcher, H., Kuhn, I., & Barclay, S. (2015). Teenage and young adult cancer-related fatigue is prevalent, distressing, and neglected: it is time to intervene. A systematic literature review and narrative synthesis. *Journal of Adolescent and Young Adult Oncology*, 4(1), 3-17. <http://dx.doi.org/10.1089/jayao.2014.0023>.
- Steliarova-Foucher, E., Colombet, M., Ries, L., Moreno, F., Dolya, A., Bray, F., Hesselting, P., Shin, H. Y., & Stiller, C. A. (2017). International incidence of childhood cancer, 2001-10: a population-based registry study. *The Lancet. Oncology*, 18(6), 719-731. [http://dx.doi.org/10.1016/S1470-2045\(17\)30186-9](http://dx.doi.org/10.1016/S1470-2045(17)30186-9).
- Stiller, C. A. (2004). Epidemiology and genetics of childhood cancer. *Oncog*, 23(38), 6429-6444. <http://dx.doi.org/10.1038/sj.onc.1207717>.
- Taguchi, K., Ueno, T., Shimizu, Y., Ishimoto, R., & Hada, Y. (2018). Effect of inpatient rehabilitation on activities of daily living in pediatric cancer patients in Japan. *International Journal of Rehabilitation Research*, 41(2), 146-151. <http://dx.doi.org/10.1097/MRR.000000000000280>.
- Tsao, E., Bjornson, K., Christensen, A., & Apkon, S. (2016). Functional outcomes and unplanned transfers of pediatric patients with central neurological impairments receiving inpatient rehabilitation care with cancer and noncancer diagnoses. *PM & R*, 8(6), 529-535. <http://dx.doi.org/10.1016/j.pmrj.2015.10.007>.
- Tseng, B. Y., Gajewski, B. J., & Kluding, P. M. (2010). Reliability, responsiveness, and validity of the visual analog fatigue scale to measure exertion fatigue in people with chronic stroke: a preliminary study. *Stroke Research and Treatment*, 2010, 1-7. <http://dx.doi.org/10.4061/2010/412964>.
- Weintraub, N., Yinon, M., Hirsch, I. B. E., & Parush, S. (2009). Effectiveness of sensorimotor and task-oriented handwriting intervention in elementary school-aged students with handwriting difficulties. *OTJR*, 29(3), 125-134. <http://dx.doi.org/10.3928/15394492-20090611-05>.
- Williams, P. D., Piamjariyakul, U., Shanberg, R., & Williams, A. R. (2015). Monitoring and alleviation of symptom occurrence and severity among Thai children and adolescents during cancer treatments. *Journal of Pediatric Oncology Nursing*, 32(6), 417-428. <http://dx.doi.org/10.1177/1043454214563754>.
- Winter, C., Müller, C., Brandes, M., Brinkmann, A., Hoffmann, C., Harges, J., Gosheger, G., Boos, J., & Rosenbaum, D. (2009). Level of activity in children undergoing cancer treatment. *Pediatric Blood & Cancer*, 53(3), 438-443. <http://dx.doi.org/10.1002/pbc.22055>.
- Wolf, T. J., Polatajko, H., Baum, C., Rios, J., Cirone, D., Doherty, M., & McEwen, S. (2016). Combined cognitive-strategy and task-specific training affects cognition and upper-extremity function in subacute stroke: an exploratory randomized controlled trial. *American Journal of Occupational Therapy*, 70(2), 7002290010. <http://dx.doi.org/10.5014/ajot.2016.017293>.
- Wong, V., Wong, S., Chan, K., & Wong, W. (2002). Functional Independence Measure (WeeFIM) for Chinese children: Hong Kong Cohort. *Pediatrics*, 109(2), E36. <http://dx.doi.org/10.1542/peds.109.2.e36>.
- Wright, M. J., & Ness, K. (2017). Rehabilitation and exercise. In A. Bleyer, R. Barr, L. Ries, J. Whelan & A. Ferrari (Eds.), *Cancer in adolescents and young adults* (pp. 651-665). Cham: Springer.
- Yeh, C. H., Man Wai, J. P., Lin, U. S., & Chiang, Y. C. (2011). A pilot study to examine the feasibility and effects of a home-based aerobic program on reducing fatigue in children with acute lymphoblastic leukemia. *Cancer Nursing*, 34(1), 3-12. <http://dx.doi.org/10.1097/NCC.0b013e3181e4553c>.

Author's Contributions

Zeynep Kolit: Elaboration of the text; organization of sources and analysis, correction and final revision. Sedef Şahin: Elaboration of the text; organization of sources and analysis, correction and final review. Ceren Davutoğlu: Elaboration of the text; organization of sources and analyzes. Meral Huri: Elaboration of the text; organization of sources and analyzes. All authors approved the final version of the text.

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