

# Functional Ability of Children and Adolescents With Cancer

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## Research Article

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# Abstract

**Background:** It is still poorly understood how the mobility of children and adolescents is affected by cancer. In addition, there is a lack of studies to guide the physiotherapeutic procedures essential for the maintenance, development, preservation and improvement of functional capacity of cancer patients. Therefore, the objective this study to evaluate the functional ability of children and adolescents diagnosed with cancer.

**Methods:** A cross-sectional, observational study was carried out, with children and adolescents diagnosed with cancer, from 2 to 18 years of age, of both genders, from the city of Juiz de Fora, Minas Gerais, Brazil. All participants signed the informed consent form. The Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT) questionnaire was applied to the caregivers for assessing the functional ability of the participants, in the domains of daily activities, mobility, social/cognitive and responsibility.

**Results:** 33 children or adolescents, 14 male and 19 female, with a mean age of 9.23 years, accepted to participate in the study. After adjustment, it was observed that in the mobility domain, participants older than 8 years presented worse functional ability (OR = 22.000, 95%CI = 3.415 - 141.733, p=0.0001).

**Conclusions:** Children older than 8 years of age and adolescents with different types of cancer showed higher chance to present worse mobility than expected by age, compared to children under 8 years old. Understanding the impact of childhood cancer is important for the physiotherapist to determine treatment strategies for this population that lives with dysfunctions left by cancer treatment.

## What Is Known About This Topic

- Cancer is the leading cause of death due to illness among children and adolescents aged 1 to 19 years of age.
- Children and adolescents with cancer can not participate actively in the main areas of life, at home, at school and in the community.
- Cancer may lead to a broad of contextual, personal and environmental factors, impairments in body structures and functions, limitations of activity and restrictions in participation.

### What this study adds

- It is still poorly understood how functional ability of children and adolescents is affected by cancer.
- The results of this study identified impairments of the participants in their function ability.
- Children and youths over the age of 8 years have a chance of demonstrating mobility 22 times worse than children under 8 years.

## Introduction

Childhood cancer is uncontrolled proliferation of abnormal cells and can occur anywhere in the body [1]. The most common cancer in childhood and adolescence are leukemias, those that affect the central nervous system and lymphomas. In Brazil and in developing countries, cancer is already the leading cause of death due to illness among children and adolescents aged 1 to 19 years of age [2].

Childhood and juvenile cancer should be evaluated separately from adult cancers because of differences in primary sites, different histological origins, and different clinical and prognostic behaviours [1-3]. Child-juvenile cancer tends to have lower latency periods, grows rapidly and becomes invasive [4]. The causes of childhood cancer are still unknown [1,5], and to date, there is no scientific evidence to make clear the association between disease and environmental factors. Therefore, prevention does not yet exist [2]. The clinical signs of childhood and adolescents' cancer may not differ much from common and non-serious diseases in this age group. Often, the child or teenager is in reasonable health at the onset of illness [1], making cancer hard to detect and diagnose. The main symptoms or signs are: continued and unexplained weight loss; headaches; increased pain in bones, joints, back or legs; lump or mass in any part of the body, specially the abdomen; development of excessive bruising, bleeding or rash; a whitish colour behind the pupil or growth of the eye; nausea; constant tiredness; eye or vision changes; recurrent or persistent fever of unknown origin [6].

The treatment of childhood cancer is complex and includes several stages and forms of treatment isolated or combined, such as surgery, radiotherapy, chemotherapy, among others [7]. Chemotherapy is the most common and is a set of drugs that acts at various stages of cellular metabolism, reaching beyond the malignant cells, the healthy ones of the organism, being responsible for several reactions such as: anemia, fatigue, leucopenia, apathy, loss of appetite, pain, alopecia, weight loss, diarrhea, bruising, mucositis, nausea and vomiting [8-9]. All these factors cause discomfort, suffering and stress, as well as prolonged hospital stays, which means that the child cannot participate actively in the main areas of life, at home, at school and in the community [7].

From the diagnosis, during the treatment and its complications, the cancer patient and his relatives experience highly stressful situations, in the physical and emotional domains. The impact of the new reality to be lived can generate anxiety, depression, irritability, disorientation, loss of control and fear of death [10-11]. The child must deal with uncertainty about the future and with the feeling of loss of control, since he will depend on the care of others for many tasks that he may have previously performed alone, losing their autonomy in self-care. They will have to be submitted to norms and treatments imposed by the caregiver team, with limited activities and overprotection of their parents [11-14].

The way to deal with cancer varies according to the child's age, and his contextual, personal and environmental factors, and impairments in body structures and functions, limitations of activity and restrictions in the participation [15-16]. The protective attitude of the family, while often represent a protective factor, may also represent a barrier to the child's interaction with the environment, including school. This health condition is a stressful factor for the whole family, modifying their attitudes, which in

turn alter the child's perception, their educational attitudes, depending of the evolution of the disease and, in general, being able to alter all the development of their functional ability [17-18].

Functional ability can be defined as the attribute that enable anyone to be and to do what they have reason to value. It is determined by individuals' intrinsic capacity (physical, mental – including psychosocial – capacities), the environments they live and the interaction between the individual and these environments [19, 20]. It is still poorly understood how the functional ability of children and adolescents is affected by cancer. In addition, there is a lack of studies to guide the physiotherapeutic procedures essential for the maintenance, development, preservation and improvement of functional capacity of cancer patients. Therefore, the objective of this study was to evaluate the functional ability of children and adolescents diagnosed with cancer and verify the association of socioeconomic, demographics, type of cancer, type and stages of treatment, physical therapy and type of health care factors with this domain.

## Methods

### Study design:

An observational cross-sectional study was conducted in the city of Juiz de Fora, Minas Gerais, Brazil.

### Participants:

All children and adolescents between the ages of 2 and 18 years who had a diagnosis of cancer were invited to participate. They could be or not in the medical treatment phase between August 2018 and May 2019. Contact was made with the local children and adolescent cancer treatment institution, where a list with the data of all assisted patients was obtained. This study was approved by the Committee on Ethics in Research with Human Beings of the Federal University of Juiz de Fora (CAAE: 82561518.6.0000.5147) and all participants and their guardians signed the free and informed consent form. All methods were performed in accordance with the relevant guidelines and regulations (e.g. Declaration of Helsinki).

Those that had a non-cancer-related neurological syndrome, a diagnosis of depression and any psychological diagnosis, who refused to answer the questionnaires and those patients who did not know of the presence of the cancer, were excluded.

### Setting and control variables:

Telephone contact was made with all the possible participants and an interview date was scheduled in the place of best convenience for the family. The participant and their caregiver who agreed to participate in the survey filled out a personal and environmental factsheet with the following control variables, stratified for analysis in the following categories:

Sex: female or male;

Age: below 8 years, or above 8 years old - The age of 8 years old was used as a cut-off age to stratify the participants because this age was close to the mean age of the participants and provided a more equal distribution between ages of the participants;

Ethnicity: white or non-white;

Type of cancer: solid (osteosarcomas, wilms sarcoma, neuroblastomas, cerebral tumors, liver tumor, mediastinal tumor) or non-solid (leukemias and lymphomas);

Current treatment time:  $\leq 1$  year or  $> 1$  year

Treatment phase: treatment or non-treatment phase – Treatment phase: the child or adolescent had to receive one or more types of treatments (chemotherapy, radiotherapy, surgery); and Non-treatment phase: to be assigned to the non-treatment phase the participant should not be receiving any venous chemotherapy, radiotherapy, or surgery; and children and adolescents that had finished treatment, but continued to do the control through exams and were constantly evaluated by the medical team for up to 5 years after treatment were also assigned to this group. .

Type of treatment: chemotherapy, radiotherapy, surgery (yes or no);

Physical therapy: yes or no; and

Type of assistance: public health system, or no public health system.

#### Dependent Variable:

To evaluate the functional ability of the participants, the Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT) questionnaire was performed [22]. This questionnaire is translated and validated into the Portuguese language [23].

The PEDI-CAT is composed of four domains: daily activities, mobility, social/cognitive and responsibility [22]. This instrument aims to provide a detailed description of the individual's performance and to document individual changes and the progress of the functional skills acquired after an intervention. PEDI-CAT is not a performance-based "test," but rather a large bank of 276 functional activities acquired during childhood and adolescence. The application requires a computer with the instrument software installed and can be self-administered by the parents or caregivers, or through an interview conducted by a professional with the parents to ensure understanding of the information for each item [22].

Four domains are displayed, where each domain is autonomous and can be administered alone or with the other domains. Scaled scores in points are a way of looking at the difficulties the child has and progressing in skills over time. In the domains of daily activities, mobility and social/cognitive, the score is based on an ordinal scale of four points with different levels of difficulty. The responsibility domain classifies items on a five-point scale, describing the sharing of responsibility between the caregiver and the child or adolescent in the completion of each item. For the four domains, the respondent should

choose the option that best describes the child's role for each item. If the respondent is not sure, there is an option to respond, "I do not know" [22].

Normative scores based on the chronological age of the child were used in this study. Scores between 30 and 70 are considered adequate according to the age range of the child and/or adolescent [22]: the scores were categorized into normal (score  $\geq 30$ ) and inferior performance (score  $< 30$ ).

## Statistical analysis

Descriptive analyses of the sample regarding the control variables were presented. Normality data was checked with Kolmogorov-Smirnov analysis and not confirmed. In addition, the mean, standard deviation, confidence interval and standard error of measurement of the PEDI-CAT normative score of each domain was calculated.

A logistic regression analysis was used to verify the association of functional ability with socioeconomic, demographic, type of cancer, type and stages of treatment, physical therapy and type of health care factors. The univariate logistic regression analysis was performed for each functional domain of the PEDICAT, and all variables with a p-value inferior to 0.20 were eligible for multivariable analysis. For the final model of logistic regression, the variable was considered significant when it reached the level of significance below 0.05. Statistical Package for Social Sciences (SPSS, v. 23, 2018) was used for all analysis.

## Results

From a total of 102 potential participants, 33 children and/or adolescents accepted to participate in the study. The participants had a mean age of 9.23 years and 57.6% were female, 54.5% were younger than 8 years and had low socioeconomical status, 69.7% had non-solid tumors, and 63.6% were undergoing treatment (figure 1).

Table 1 presents the mean and standard deviation values for the results found in the PEDI-CAT test. The mobility domain (32.93 [16.07]) presented the average value very close to the lower limit considered suitable for age. Considering the values of confidence interval and standard error of the measure, the area of mobility was the domain with worse functioning.

Tables 2 to 5 presents the frequency and percentages of the control variables of the participants. Also, it presents the results of the logistic regression analysis (odds ratio, 95% confidence interval and p-value) regarding the number of children with inferior and normal performance in each of the PEDI-CAT domains according to each control variable used in the model. Still following the analysis according to the normative PEDI-CAT, multivariate logistic regression analysis showed that only the age control variable, in the mobility domain of PEDI-CAT, presented significant association. The participants older than 8 years presented worse functioning (OR = 22.000, 95%CI = 3.415 - 141.733,  $p=0.0001$ ) than children that were younger than 8 years old. All the other variables did not show significant results.

## Discussion

This study reports the impact of childhood and juvenile cancer on the mobility of children and adolescents diagnosed with cancer. To date, there are few studies that investigated the effects of this health condition on the functional ability of children and adolescents with cancer and all of them are of a specific type, leukemia [24-26].

The present study demonstrated that children and young people over 8 years of age present a chance to demonstrate mobility 22 times worse than children below 8 years of age. This result possibly reflects the effects that the disease and treatment exert or exerted on these older children. Possibly, these adolescents did not receive physiotherapeutic intervention during the period of hospitalization with a focus on maintaining the mobility of these individuals. Only 11 (33.3%) participants of the study, received some type of physical therapy intervention during their treatment and this treatment (control variable) did not impact on any domain of the PEDI-CAT. As this study is a cross-sectional research, we don't know the type of physiotherapy delivered for these children and adolescents, but perhaps because they were only respiratory care. Therefore, guidelines for these patients to remain active throughout the therapeutic process must be established. It is now known that it is essential to practice physical exercises before, during and after cancer treatment in adult patients with a frequency of 150 minutes per week of moderate intensity activity, [27-28] so that the individual does not lose his mobility during the treatment. But unfortunately, this recommendation for the children's and adolescent's audience does not yet exist.

A study investigated motor performance in children aged 4 to 12 years with acute lymphoblastic leukemia and they were compared with a control group matched for age and sex. The results show that the leukemia group had a worse motor performance than the control group [24].

Another

study provided physical therapy to children aged 4 to 18 years with leukemia. During treatment, these children had muscle cramps, decreased range of motion, decreased ankle dorsiflexion strength, knee extension, and loss of functional mobility. The author states that after 4 to 5 months of treatment, children presented delayed motor skills and loss of balance, in addition to decreasing muscle strength and range of motion ankle, which corroborated with the worse balance and postural control [25].

Another study conducted with children with leukemia aged 5 to 10 years proposed a 6-month home intervention with supervised exercises. Strength, flexibility, fitness and motor function were the outcomes evaluated. The results showed that at the end of the intervention, there was improvement in knee strength, grip strength, better sitting and lifting performance, improvement in ankle range of motion and also in the 6-minute walk test. Therefore, this study shows that exercise intervention for patients with leukemia was effective [26].

Besides some few up-to-date studies that investigate functional ability, focusing in the mobility domain in children during the treatment or control phase of cancer, a systematic review and meta-analysis study of randomized controlled trials showed that the mobility of children with cancer is impaired during and after treatment and concluded that physical training can improve the mobility of

these children [29]. Scientific evidence shows that survivors of childhood cancer tend to be more sedentary because they have severe fatigue due to chemotherapy and radiotherapy treatments [30-31]. Despite some recent studies have shown improvements in the functional capacity to perform daily activities, and better range of motion, strength, sense of fatigue, bone density, aerobic capacity, after the introduction of an exercise protocol during and after treatment of ALL [32-34], these results cannot be generalized to all types of cancer. A meta-analysis brought together studies that showed that both physical activity and physical fitness were significantly less frequent in childhood cancer survivors than in non-cancer controls [35].

Only mobility showed a significant difference in the functioning profile of the participants with cancer, in the different ages stratified in this study. These results are probably due to lack of activity, to overprotection of the parents, to the course of the disease and/or due to the treatment or drugs with causes cancer fatigue [36-37]. Daily activities, social/cognition and responsibility, therefore, did not present differences between ages or any other control variable reported in this study. As the literature is poor in studies regarding these variables, we recommend that these results be interpreted with caution. To date, this is the first study that uses the PEDI-CAT in children and adolescents with cancer in Brazil, showing that this instrument can be and should be applied to evaluate the function and ability of these children in future investigations.

The present study presents limitations as the small number of participants, but all the youngsters and children diagnosed with cancer enrolled in the main foundation to support children's cancer in the region that the team was able to contact during the period of accomplishment of the study participated.

## Declarations

### Ethics approval and consent to participate

This study was approved by the Committee on Ethics in Research with Human Beings of the Federal University of Juiz de Fora (CAAE: 82561518.6.0000.5147) and all participants and their guardians signed the free and informed consent form. All **methods were performed in accordance with the relevant guidelines and regulations (e.g. Declaration of Helsinki).**

### Consent for publication

N/a

### Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

## Competing interests

The authors declare no conflict of interest

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## Authors' contributions

OCL and PSCC designed the study and were involved in the entire process from initial to the end of the manuscript. OCL designed the study, collected the data, analyzed the results, and drafted and revised the manuscript. AB and ECD did the statistical analysis and acted as peer reviewer by validating the results and reviewing the manuscript. JSF and RAL critically reviewed the data analyses and reviewed the manuscript for important intellectual content. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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## Authors' information (optional)

N/a

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## Tables

Table 1: Mean, standard deviation, confidence interval and standard error of measure per PEDI-CAT domain.

	Mean	Standard Deviation	CI 95%	SME	<30	>30
PEDI CAT (N=33)						
Daily activities	42.76	12.54	38.31-47.21	2.18	n=5	n=28
<b>Mobility</b>	<b>32.93</b>	<b>16.07</b>	<b>27.23-38.64</b>	<b>2.79</b>	<b>n=13</b>	<b>n=20</b>
Social Cognitive	40.06	12.57	35.60-44.51	2.18	n=8	n=25
Responsibility	39.70	10.16	36.09-43.30	1.77	n=7	n=26
Legend: 95%CI= 95% Confidence Interval; SME: standard measurement error						

Table 2. Frequency, number of children with inferior and normal performance in PEDICAT-Daily Activities, odds ratio, 95% confidence interval and p-value.

Variables	Frequency (n=33)		PEDICAT-DA inferior performance		PEDICAT-DA normal performance		OR	95% CI	p- value
	n	%	n	%	n	%			
<b>Sex</b>									
Male	14	42.4	3	60.0	11	39.3	Ref		
Female	19	57.6	2	40.0	17	60.7	0.431	0.062 – 3.012	0.396
<b>Age</b>									
< 8 years	18	54.5	1	20.0	17	60.7	Ref		
>=8 years	15	45.5	4	80.0	11	39.3	6.182	0.608 – 62.831	0.124
<b>Socioeconomic level</b>									
Low	18	54.5	3	60.0	15	53.6	Ref		
High	15	45.5	2	40.0	13	46.4	0.769	0.111 – 5.338	0.791
<b>Ethnicity</b>									
White	14	42.4	4	80.0	10	35.7	Ref		
Not white	19	57.6	1	20.0	18	64.3	0.139	0.014 – 1.418	0.096
<b>Type of Cancer</b>									
Solid	10	30.3	2	40.0	8	28.6	Ref		
Not solid	23	69.7	3	60.0	20	71.4	0.600	0.084 – 4.294	0.611
<b>Current treatment time</b>									
≤ 1 year	17	51.5	4	80.0	13	46.4	Ref		
> 1 year	16	48.5	1	20.0	15	53.6	0.217	0.021 – 2.191	0.195
<b>Treatment Phase</b>									

<i>Treatment</i>	21	63.6	3	60.0	18	64.3	Ref		
<i>Non-treatment</i>	12	36.4	2	40.0	10	35.7	1.200	0.171 – 8.426	0.855
<b>Radiotherapy</b>									
<i>No</i>	28	84.8	5	100.0	23	82.1	Ref		
<i>Yes</i>	5	15.2	0	0.0	5	17.5	0.000	-	0.999
<b>Surgery</b>									
<i>No</i>	23	69.7	4	80.0	19	67.9	Ref		
<i>Yes</i>	10	30.3	1	20.0	9	32.1	0.528	0.051 – 5.427	0.591
<b>Chemotherapy</b>									
<i>No</i>	4	12.1	0	0.0	4	14.3	Ref		
<i>Yes</i>	29	87.9	5	100.0	24	85.7	-	-	0.999
<b>Physical Therapy</b>									
<i>No</i>	22	66.7	3	60.0	19	67.9	Ref		
<i>Yes</i>	11	33.3	2	40.0	9	32.1	1.407	0.199 – 9.963	0.732
<b>Type of Assistance</b>									
<i>Public health system</i>	29	87.9	3	60.0	26	92.9	Ref		
<i>No public health system</i>	4	12.1	2	40.0	2	7.1	8.667	0.873 – 86.062	0.065

Legends: PEDICAT-DA= Pediatric Evaluation of Disability Inventory Computer Adaptive Test-domain Daily Activities; n= number; OR= odds ratio; 95%CI= 95% Confidence Interval; p-value= level of statistical significance; Ref= reference category; \*=p<0,05.

Table 3. Frequency, number of children with inferior and normal performance in PEDICAT-Mobility, odds ratio, 95% confidence interval and p-value.

Variables	Frequency (n=33)		PEDICAT-M inferior performance		PEDICAT-M normal performance		OR	95% CI	p- value
	n	%	n	%	n	%			
<b>Sex</b>									
Male	14	42.4	5	38.5	9	45.0	Ref		
Female	19	57.6	8	61.5	11	55.0	1.309	0.316 – 5.431	0.711
<b>Age</b>									
< 8 years	18	54.5	2	15.4	16	80.0	Ref		
>=8 years	15	45.5	11	84.6	4	20.0	22.000	3.415 – 141.733	<b>0.001*</b>
<b>Socioeconomic level</b>									
Low	18	54.5	9	69.2	9	45.0	Ref		
High	15	45.5	4	30.8	11	55.0	0.364	0.084 – 1.583	0.178
<b>Ethnicity</b>									
White	14	42.4	5	38.5	9	45.0	Ref		
Not white	19	57.6	8	61.5	11	55.0	1.309	0.316 – 5.431	0.711
<b>Type of Cancer</b>									
Solid	10	30.3	5	38.5	5	25.0	Ref		
Not solid	23	69.7	8	61.5	15	75.0	0.533	0.118 – 2.408	0.414
<b>Current treatment time</b>									
≤ 1 year	17	51.5	6	46.2	11	55.0	Ref		
> 1 year	16	48.5	7	53.8	9	45.0	1.426	0.351 – 5.793	0.620
<b>Treatment Phase</b>									
Treatment	21	63.6	9	69.2	12	60.0	Ref		
Non-treatment	12	36.4	4	30.8	8	40.0	0.667	0.152 – 2.926	0.591

<b>Radiotherapy</b>									
<i>No</i>	28	84.8	11	84.6	17	85.0	Ref		
<i>Yes</i>	5	15.2	2	15.4	3	15.0	1.030	0.148 – 7.193	0.976
<b>Surgery</b>									
<i>No</i>	23	69.7	9	69.2	14	70.0	Ref		
<i>Yes</i>	10	30.3	4	30.8	6	30.0	1.037	0.227 – 4.728	0.963
<b>Chemotherapy</b>									
<i>No</i>	4	12.1	2	15.4	2	10.0	Ref		
<i>Yes</i>	29	87.9	11	84.6	18	90.0	0.611	0.075 – 4.983	0.646
<b>Physical Therapy</b>									
<i>No</i>	22	66.7	8	61.5	14	70.0	Ref		
<i>Yes</i>	11	33.3	5	38.5	6	30.0	1.458	0.335 – 6.347	0.615
<b>Type of Assistance</b>									
<i>Public health system</i>	29	87.9	11	84.6	18	90.0	Ref		
<i>No public health system</i>	4	12.1	2	15.4	2	10.0	1.636	0.201 – 13.344	0.646

Legends: PEDICAT-M= Pediatric Evaluation of Disability Inventory Computer Adaptive Test - domain Mobility; n= number; OR= odds ratio; 95%CI= 95% Confidence Interval; p-value= level of statistical significance; Ref= reference category; \*=p<0,05.

Table 4. Frequency, number of children with inferior and normal performance in PEDICAT-Social Cognitive, odds ratio, 95% confidence interval and p-value.

Variables	Frequency (n=33)		PEDICAT-SC inferior performance		PEDICAT-SC normal performance		OR	95% CI	p- value
	n	%	n	%	n	%			
<b>Sex</b>									
Male	14	42.4	3	37.5	11	44.0	Ref		
Female	19	57.6	5	62.5	14	56.0	1.310	0.255 – 6.715	0.746
<b>Age</b>									
< 8 years	18	54.5	3	37.5	15	60.0	Ref		
>=8 years	15	45.5	5	62.5	10	40.0	2.500	0.485 – 12.886	0.273
<b>Socioeconomic level</b>									
Low	18	54.5	5	62.5	13	52.0	Ref		
High	15	45.5	3	37.5	12	48.0	0.650	0.127 – 3.325	0.605
<b>Ethnicity</b>									
White	14	42.4	3	37.5	11	44.0	Ref		
Not white	19	57.6	5	62.5	14	56.0	1.310	0.255 – 6.715	0.746
<b>Type of Cancer</b>									
Solid	10	30.3	3	37.5	7	28.0	Ref		
Not solid	23	69.7	5	62.5	18	72.0	0.648	0.121 – 3.466	0.612
<b>Current treatment time</b>									
≤ 1 year	17	51.5	4	50.0	13	52.0	Ref		
> 1 year	16	48.5	4	50.0	12	48.0	1.083	0.220 – 5.326	0.922
<b>Treatment Phase</b>									

<i>Treatment</i>	21	63.6	7	87.5	14	56.0	Ref		
<i>Non-treatment</i>	12	36.4	1	12.5	11	44.0	0.182	0.019 – 1.706	0.136
<b>Radiotherapy</b>									
<i>No</i>	28	84.8	7	87.5	21	84.0	Ref		
<i>Yes</i>	5	15.2	1	12.5	4	16.0	0.750	0.071 – 7.883	0.811
<b>Surgery</b>									
<i>No</i>	23	69.7	6	75.0	17	68.0	Ref		
<i>Yes</i>	10	30.3	2	25.0	8	32.0	0.708	0.116 – 4.318	0.708
<b>Chemotherapy</b>									
<i>No</i>	4	12.1	1	12.5	3	12.0	Ref		
<i>Yes</i>	29	87.9	7	87.5	22	88.0	0.955	0.085 – 10.710	0.910
<b>Physical Therapy</b>									
<i>No</i>	22	66.7	4	50.0	18	72.0	Ref		
<i>Yes</i>	11	33.3	4	50.0	7	28.0	2.571	0.500 – 13.229	0.258
<b>Type of Assistance</b>									
<i>Public health system</i>	29	87.9	7	87.5	22	88.0	Ref		
<i>No public health system</i>	4	12.1	1	12.5	3	12	1.048	0.093 – 11.754	0.970

Legends: PEDICAT-SC= Pediatric Evaluation of Disability Inventory Computer Adaptive Test - domain Social Cognitive; n= number; OR= odds ratio; 95%CI= 95% Confidence Interval; p-value= level of statistical significance; Ref= reference category; \*=p<0,05.

Table 5. Frequency, number of children with inferior and normal performance in PEDICAT-Responsibility, odds ratio, 95% confidence interval and p-value.

Variables	Frequency (n=33)		PEDICAT-R inferior performance		PEDICAT-R normal performance		OR	95% CI	p- value
	n	%	n	%	n	%			
<b>Sex</b>									
Male	14	42.4	4	57.1	10	38.5	Ref		
Female	19	57.6	3	42.9	16	61.5	0.469	0.086 – 2.547	0.380
<b>Age</b>									
< 8 years	18	54.5	2	28.6	16	61.5	Ref		
>=8 years	15	45.5	5	71.4	10	38.5	4.000	0.648 – 24.693	0.136
<b>Socioeconomic level</b>									
Low	18	54.5	6	85.7	12	46.2	Ref		
High	15	45.5	1	14.3	14	53.8	0.143	0.015 – 1.360	0.090
<b>Ethnicity</b>									
White	14	42.4	3	42.9	11	42.3	Ref		
Not white	19	57.6	4	57.1	15	57.7	0.978	0.181 – 5.283	0.979
<b>Type of Cancer</b>									
Solid	10	30.3	3	42.9	7	26.9	Ref		
Not solid	23	69.7	4	57.1	19	73.1	0.491	0.087 – 2.770	0.421
<b>Current treatment time</b>									
≤ 1 year	17	51.5	4	57.1	13	50.0	Ref		
> 1 year	16	48.5	3	42.9	13	50.0	0.750	0.139 – 4.035	0.738
<b>Treatment Phase</b>									

<i>Treatment</i>	21	63.6	5	71.4	16	61.5	Ref		
<i>Non-treatment</i>	12	36.4	2	28.6	10	38.5	0.640	0.104 – 3.951	0.631
<b>Radiotherapy</b>									
<i>No</i>	28	84.8	7	100.0	21	80.8	Ref		
<i>Yes</i>	5	15.2	0	0.0	5	19.2	0.000	-	0.999
<b>Surgery</b>									
<i>No</i>	23	69.7	5	71.4	18	69.2	Ref		
<i>Yes</i>	10	30.3	2	28.6	8	30.8	0.900	0.143 – 5.662	0.911
<b>Chemotherapy</b>									
<i>No</i>	4	12.1	1	14.3	3	11.5	Ref		
<i>Yes</i>	29	87.9	6	85.7	23	88.5	0.783	0.069 – 8.934	0.844
<b>Physical Therapy</b>									
<i>No</i>	22	66.7	4	57.1	18	69.2	Ref		
<i>Yes</i>	11	33.3	3	42.9	8	30.8	1.687	0.304 – 9.358	0.549
<b>Type of Assistance</b>									
<i>Public health system</i>	29	87.9	5	71.4	24	92.3	Ref		
<i>No public health system</i>	4	12.1	2	28.6	2	7.7	4.800	0.540 – 42.632	0.159

Legends: PEDICAT-R= Pediatric Evaluation of Disability Inventory Computer Adaptive Test - domain Responsibility; n= number; OR= odds ratio; 95%CI= 95% Confidence Interval; p-value= level of statistical significance; Ref= reference category; \*=p<0,05.

## Figures

Contact with the Foundation for Cancer Support for Children and Adolescents in the region.

**(n = 102)**

Excluded (**n = 69**)

- 1 – Age
- 2 - Non-existing telephone number
- 3 - Difficulty coming to Juiz de Fora
- 4 - Refused to participate

**n = 33**

- 2 to 18 years
- Diagnosis of cancer

Male - 14

Female – 19  
> 8 years – 15  
<8 years - 18

**Figure 1**

Flow chart of participants in the study