

Exploring postural control and effects of a jumping rope intervention in survivors of childhood acute lymphoblastic leukemia

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Introduction

- Advances in medicine have led to high survival rates in children with cancer.¹ Medical treatments used to treat cancer can cause a multitude of late effects that can affect children up to 5 years after treatment.^{2,3}
- It is known that childhood cancer survivors have deficits in balance and postural control as compared to age-matched controls.^{4,5}
- There are limited studies analyzing postural control following an intervention to improve gross motor function. In addition, there are limited studies within this population analyzing postural control during a dynamic task.
- **Purpose:** To examine postural control in ALL CCS utilizing COP parameters and note potential changes in response to a six-week jumping intervention in ALL CCS.
- **Hypothesis:** There will be a statistically significant improvements in postural control from baseline to post-training as measured by center of pressure parameters (velocity and excursion) and the BOT-2.

Methods

Participants:

- 10 children (ages 6-17 years)
- Completed medical treatment for ALL within the past 5 years
- No history of neurological disorder such as cerebral palsy, Down syndrome

Procedures and Measurements:

- **Bruininks-Oseretsky Test of Motor Proficiency Second Ed. (BOT-2)**, total point scores of subsets of balance and bilateral coordination, used to calculate scale score for each balance, bilateral coordination and body coordination
- **Center of pressure parameters** were collected from dual force plates during a counter movement jump. COP parameters collected from baseline to time when subject leaves force plate (Fz=0).
 - **Center of pressure velocity:** Calculated as moving average of COP displacement divided by time. Calculated mean velocity for selected time period. (Figure 1)
 - **Center of pressure excursion:** 95% confidence ellipse area calculated for COP displacement for selected time period. (Figure 2)

Statistical Analysis:

- Descriptive data reported as mean, standard deviation
- Paired, dependent samples t-test to compare group means at baseline and post-intervention
- Pearson product-moment coefficients to assess relationships
- $\alpha < 0.05$ level of significance

Methods cont.

Figure 1. Center of pressure velocity

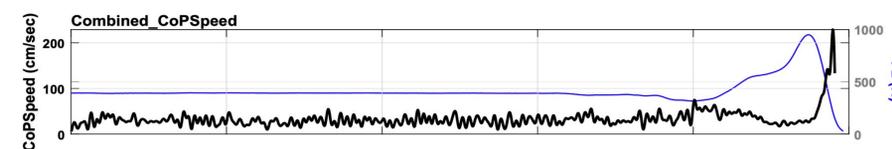
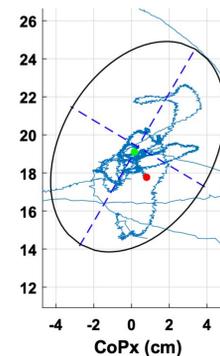


Figure 2. Center of pressure excursion



Results

Table 1	Age	Sex	Time from completion of therapy
1	11	m	3 years 11 mo.
2	14	f	4 year 5 mo.
3	6	f	2 years 2 mo.
4	10	f	4 years 2 mo.
5	14	f	1 year 9 mo.
6	9	m	3 years 8 mo.
7	10	m	4 years
8	8	m	4 years
9	12	m	3 years
10	8	f	4 years 3 mo.

Table 2	Mean	SD	t	p-value
BOT BiC - pre	10.80	4.07		
BOT BiC - post	16.40	4.03	-9.969	<0.0001
BOT B - pre	9.50	4.13		
BOT B - post	11.56	2.27	-1.6118	0.1457
BOT BoC - pre	37.80	6.45		
BOT BoC - post	45.89	5.84	-6.35	0.0002
COPv - pre	87.0211111	38.9181638		
COPv - post	100.83	51.9790751	2.2414	0.0751
COPe - pre	89.5133333	37.7258291		
COPe - post	124.4475	66.2980204	-0.87975	0.4082

Results (cont.)

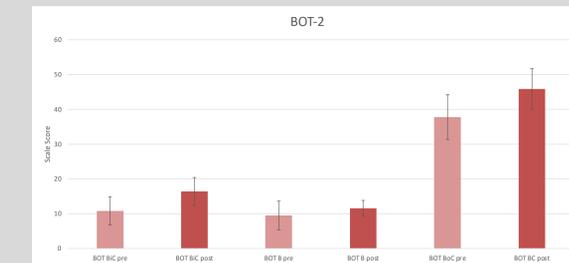
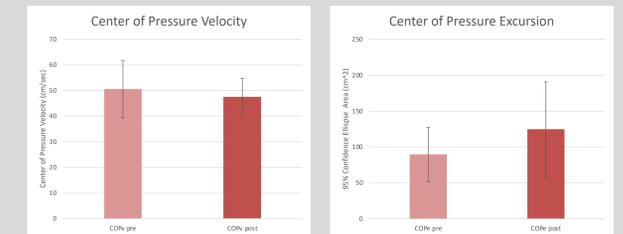


Figure 3. BOT-2 scores at baseline and post-intervention

Figure 4. Center of pressure parameters at baseline and post-intervention



Discussion

- This study demonstrates there were significant improvements in a clinical measure of balance following a six-week jumping rope intervention in childhood cancer survivors
- There were no significant improvements in center of pressure parameters from baseline to post-intervention, non-significant findings likely due to small sample size, and large within-subject as well as between-subject variability
- Our study highlights the need to comprehensively assess balance, coordination, and postural control as measures of center of pressure alone may not adequately capture balance or coordination deficits in a population of childhood cancer survivors.
- **Clinical Relevance:** Jumping rope is a complex motor task that can be used as an intervention to improve balance and coordination in a population of childhood cancer survivors. Clinical measures of balance such as the BOT-2 capture balance and coordination deficits that may otherwise be not picked up by posturography alone.

References

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