A Pilot Study of Change in Secondary Impairments in Children with Cerebral Palsy: Are Current Preventative Measures Working?

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Purpose

Young children with cerebral palsy (CP) present with secondary impairments in strength, range of motion (ROM), and endurance.[1]

The purposes of this study are to

1) Describe strength, ROM, and endurance in children with CP across Gross Motor Function Classification System (GMFCS)[2] levels at two testing sessions.

2) Determine if there are differences in strength, ROM, and endurance over time.

Participants

77 children with CP who participated in the Move & Play and ON Track Studies.

- Time 1 testing ages: 18 – 56 months (mean 2 yrs, 11 mo; SD 11 mo)
- Time 2 testing ages: 75-133 months (mean 8 yrs, 7 mo; SD 13 mo)
- 40 boys (52%), 37 girls (48%)
- 81% white

Recruited from multiple sites across Canada and the United States.

GMFCS: level I (N=20), level II (N=23), level III (N=7), level IV (N=10), & level V (N=17).

Methods

Design:

Prospective cohort study:

-Time 1 (beginning of Move & PLAY)

-Time 2 (beginning of On Track)

Average of 5 years and 10 months between data collection times.

Data collection:

-Trained and reliable assessors rated GMFCS, muscle strength and range of motion at time 1 & 2.

-Parents completed the endurance form.

Data analysis:

Descriptive and non-parametric comparative analyses were completed.

Measures

- Functional Strength Assessment (FSA): scores of 1 (lowest) to 5 (highest)
- Spinal Alignment and Range of Motion Measure (SAROMM): scores of 0 (full ROM) to 4 (severe limitation).
- Early Activity Score for Endurance (EASE): scores of 1 (never) to 5 (always, higher equals more endurance).

https://www.canchild.ca/en/research-in-practice/current-studies/on-track

Results

Functional Strength Assessment (FSA) (median, IQR)

GMFCS level	Time 1	Time 2	Wilcoxon Signed Rank Test
I	3.50 (.38)	4.56 (.75)	**Z=-3.67; P < 0.001**
II	3.00 (.63)	4.00 (.94)	**Z=-4.17; P < 0.001**
III	3.00 (.50)	3.75 (1.00)	Z=-2.00; P = 0.05
IV	2.37 (1.25)	2.37 (1.47)	Z=-0.42; P = 0.67
V	1.25 (1.00)	1.62 (.75)	Z=-1.29; P = 0.20

Spinal Alignment & Range of Motion Measure (SAROMM) (median, IQR)

GMFCS level	Time 1	Time 2	Wilcoxon Signed Rank Test
I	.23 (.35)	.33 (.31)	Z=-1.39; P = 0.17
II	.40 (.64)	.85 (.60)	Z=-1.99; P = 0.05
III	.39 (.73)	.69 (.69)	Z=-1.53; P = 0.13
IV	1.21 (.90)	1.64 (.43)	**Z=-2.19; P < 0.02**
V	1.39 (.54)	2.23 (1.00)	**Z=-3.28; P < 0.001**

Early Activity Scale for Endurance (EASE) (median, IQR)

GMFCS level	Time 1	Time 2	Wilcoxon Signed Rank Test
I	4.25 (1.00)	4.00 (1.00)	Z=-1.28; P = 0.20
II	3.25 (1.56)	3.25 (1.13)	Z=-1.09; P = 0.27
III	3.00 (2.25)	2.50 (1.25)	Z=-0.26; P = 0.80
IV	3.00 (1.06)	2.13 (1.63)	Z=-1.18; P = 0.03
V	1.75 (0.50)	1.25 (1.38)	Z=-0.75; P = 0.45

- Time 2 FSA scores were significantly higher than time 1 scores for children at GMFCS levels I and II.
- Time 2 SAROMM scores were significantly higher (higher indicates more ROM restriction) than the time 1 scores for children at GMFCS levels IV and V.
- The EASE median scores were not significantly different at any GMFCS level.

Conclusions

- Children with CP present with secondary impairments.
- Strength increased for children with relatively higher function (GMFCS levels 1 and II).
- ROM restrictions increased for children with relatively lower function (GMFCS IV and V).
- Endurance decreased, but not significantly, for all GMFCS levels except II.

Clinical Relevance

- The results of this study, even with a small sample size, support the need for physical therapists to focus on secondary impairments in children with CP.
- Interventions which focus on strengthening, as well as prevention of ROM restrictions, are encouraged.
- Endurance should be encouraged for all children at all GMFCS levels.
- Continued examination of secondary impairments, to detect changes, is important in children with CP.

References

1. Jeffries LM, Fiss AF, McCoy SW, Bartlett DJ. Desription of primary and secondary impariments in young children with cerebral palsy. *Pediatric Physical Therapy*. 2016; 28: 7-14.
2. Palisano RJ, Rosenbaum P, Bartlett D, Livingston MH. Content validity of the Expanded and Revised Gross Motor Function Classification System. Developmental Medicine and Child Neurology. 2008:50:744-750

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