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Upsee Daisy! Gross motor outcomes after dynamic weight bearing in two children with truncal hypotonia: a case series

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Background and Purpose

- Poor postural control associated with central hypotonia limits a child's ability to interact with the environment, delaying attainment of developmental milestones.¹
- Supported standing programs are commonly used to ameliorate impairments and optimize function in children with poor postural control.² Increased social interactions,^{2,3} as well as reduced burden of care^{4,5} have all been associated with supported standing programs.
- The Upsee⁶ is an orthotic standing and walking device which is worn by the child and parent. As the adult stands, moves, and walks the child is encouraged to stand, move, and step.
- There are no reports of the effectiveness of the Upsee as a dynamic standing program.

The purpose of this case series was to report the impact of a home-based dynamic standing program on postural control and gross motor activity in two children with truncal hypotonia.

Case Description

Child 1: 24 month-old boy diagnosed at birth with a rare form of chromosome 3 deletion and agenesis of the corpus callosum. His Gross Motor Function Classification System (GMFCS) classification was Level IV.

Child 2: 21 month-old boy born at 39 weeks gestation. Complications during birth caused a true umbilical cord knot, resulting in hypoxic ischemic encephalopathy. He was diagnosed with Cerebral Palsy (CP) at 12 months of age. His GMFCS classification was Level V.

Functional Impairments

Activity Limitations

Participation Restrictions

- | | | |
|---|---|---|
| <ul style="list-style-type: none"> Truncal hypotonia Child 1: hypotonia of extremities Child 2: hypertonia of extremities Decreased strength Decreased balance | <ul style="list-style-type: none"> Transitional movements (pull to stand, sit ↔ supine,) Creeping Standing Walking Wheelchair mobility | <ul style="list-style-type: none"> Play activities Family routines (picnics, parties, outings) Caregiving routines (eating, dressing, bathing) |
|---|---|---|

Methods

- 12-week home-based program of upright dynamic weight bearing using the Upsee device.
- Harness system was adjusted by a physical therapist during the first assessment.
- Families educated in the correct use of the device, and followed a protocol of up to 30 minutes of weight bearing per day, 3 to 5 days per week.
- Parents were educated on dynamic weight bearing to facilitate muscle activation in the trunk and legs while using the Upsee.
- Families were asked to keep a journal of the amount of time spent in the device and activities performed by their child.



Child 1: 24 months old



Child 2: 21 months old

Results

Table: Results of outcome measures at initial and post intervention

Outcome Measure	Child 1				Child 2			
	Pre-test	Post-test	Actual change	Expected change*	Pre-test	Post-test	Actual change	Expected change*
GMFM-66^{7,8}								
A. Lying & Rolling	12	12			10	11		
B. Sitting	23	24			5	8		
C. Crawling & Kneeling	0	2			1	1		
D. Standing	0	1			0	1		
E. Walking, Running, & Jumping	0	3			0	1		
Total GMFM-66 Score	35	42	7.0	2.11	16	22	6.0	1.41
SATCo⁹	11/20	20/20			0/20	0/20		

GMFM= Gross Motor Function Measure-66^{7,8}
SATCo= Segmental Assessment of Trunk Control⁹
* As predicted by Marios et al.¹⁰

Discussion

- Children with truncal hypotonia can participate in, and benefit from, a dynamic standing program using the Upsee.
- We speculate that this program may be effective in improving the gross motor abilities of children with severely impaired postural control.
- Both children's actual change exceeded the expected change by 23 to 30%, suggesting effectiveness of the intervention versus natural development.
- Of the two children, Child 1 demonstrated more improvement in gross motor function and trunk control.
- One possible reason for this is that Child 2 presented with increased extensor tone of his four extremities, which increased when he became excited or when attempting to focus on an activity at hand and constrained his movement activity.
- Also, Child 2 spent less time overall in the Upsee, never progressing beyond 15 minutes of weight bearing per session.
- Future research is needed to further explore the necessary dosage of an upright dynamic weight bearing program for children with impaired postural control.
- Studies with a more homogenous and larger sample are needed to conduct a randomized controlled trial design comparing the use of the Upsee to a traditional standing frame.
- Future studies should also aim to capture changes across the full ICF-CY model, including activities and participation.

Conclusion

The findings from this case series support the use of the Upsee as a new home-based upright dynamic weight bearing program for children with impaired postural control.

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