

# Augmenting Constraint Induced Movement Therapy with the Armeo® Spring Pediatric: A Comparative Study

Heather Roberts, OTR/L, PhD Nancy Clegg, BSN, MSN, PhD Linsley Smith, BS, RN Angela Shierk, OTR/L, PhD Mauricio R. Delgado, MD | Texas Scottish Rite Hospital for Children and University Texas Southwestern Medical Center, Dallas, Texas

## BACKGROUND

Constraint Induced Movement Therapy (CIMT) involves restraining the non-involved upper limb for a specified period of time while a child engages in intense training activities with the affected limb. CIMT is recognized as an intervention that offers promise in remediation of hand function and improved use of the upper limb in children with hemiplegic CP (hCP). However, no published studies to date have examined the effectiveness of CIMT combined with the use of the Armeo® Spring Pediatric, a robotic device, in the pediatric hCP population. The Armeo® Spring device combines virtual reality games with repetitive hand and arm movements. The virtual reality games are aimed to increase motivation to complete the repetitive tasks required to improve upper limb function. The purpose of this study is to examine the effectiveness of traditional CIMT compared to augmented CIMT, which incorporated the use of the Armeo® Spring in the treatment protocol

## OBJECTIVES

- Determine the effects of a two-week modified constraint induced movement therapy (mCIMT) camp that incorporated Armeo® Spring training for children with hCP.
- Examine the differences in hand arm function and participation of children who completed a mCIMT intervention in a camp like setting with Armeo® Spring training to those who completed a mCIMT intervention who did not receive Armeo® Spring training.

## METHODS

### Study Participants/ Setting

22 children recruited from neurology clinic at a tertiary care facility- Texas Scottish Rite Hospital for Children (TSRHC) in Dallas, Texas.

### Inclusion Criteria

- diagnosis of hemiplegia between 5-12 years
- classified MACS level I, II, or III
- follow one step directions
- able to attend camp every day

### Exclusion Criteria

- did not meet age range or above criteria
- significant visual impairment
- uncontrolled seizures

### Materials

#### CIMT Group

8 participants completed a traditional CIMT camp 6 hours for 10 days

#### Augmented CIMT with Armeo® Spring Pediatric

14 participants completed an augmented CIMT camp with addition of Armeo® Spring for 30 minutes daily. Therapist chose to lock out different motions or work on all motions at the same time depending on the needs of individual child. Adjustments were made to level of gravity assistance the exoskeleton provides depending on the strength of the upper extremity. Child chose virtual reality games based on interest.

Participants underwent standardized assessment protocol at baseline and following two weeks of CIMT.

### Outcome Measures

- Standardized assessment protocol baseline and post 2 weeks of CIMT camp
- Primary: Assisting Hand Assessment (AHA)
- Secondary: Melbourne Assessment Unilateral Upper Limb Function (MUUL), Canadian Occupational Performance Measure (COPM), and measurements of body structure and function - Tone (MAS and Tardieu), ROM, grip strength, proprioception and stereognosis

## RESULTS

Outcome Measure	Armeo+mCIMT		mCIMT only		Difference between group change score
	Pre	Post	Pre	Post	
AHA	59.7	68.9	56.63	59	0.02
	(-15.06)	(-13.62)	(-16.68)	(-15.19)	
MUUL	82.6	90.1	71.5	83	0.93
	(-13)	(-10.14)	(-27.43)	(-20.61)	
COPM-P	2.6	7.81	3.68	7.03	0.17
	(-1.15)	(-0.95)	(-1.49)	(-1.64)	
COPM-S	2.9	7.9	3.48	7.64	0.44
	(-1.33)	(-1.39)	(-1.14)	(-1.29)	

TABLE 1: Outcome Measures Comparing mCIMT to Armeo® Spring with mCIMT

Outcome Measure	Armeo+mCIMT	mCIMT only
AHA	0.001	0.06
MUUL	0.001	0.01
COPM-P	0.001	0.0008
COPM-S	0.01	0.0003

TABLE 2: Outcome Measures - Pre/Post-paired t-test

### Results: Primary Outcome

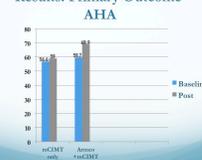


FIGURE 1 AND 2: Armeo® Spring Pediatric



FIGURE 3: Pirate Camp

## DISCUSSION

- First research addressing use of Armeo® Spring Pediatric in children with hCP
- Clinically and statistically significant changes in hand function with use of Armeo® Spring Pediatric
- Rigorous study design with standardized procedures for
  - Outcome measures
  - Frequency and duration (time on Armeo® Spring Pediatric and mCIMT camp)
  - Type of constraint
  - Delivery of mCIMT camp

## CONCLUSIONS

- All subjects in both groups demonstrated improvements on all outcome measures
  - Addition of Armeo® Spring Pediatric with mCIMT camp associated with significant improvements in bi-manual use on AHA
    - This was not observed on the MUUL and may be due to increased intra-rater reliability of the AHA from certification process of AHA
    - The AHA may be more sensitive to change
- Armeo® Spring appears to be a motivating novel therapy that provides a high level of intensity and allows the optimum adjustability for the child

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