Reporting collateral effects of pediatric constraint induced movement therapy: Parent observed speech and language changes

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Abstract

In recent years the body of evidence for intensive bouts of therapeutic intervention in single disciplines has significantly grown. Implementation of these protocols has gained popularity clinically. Understanding collateral aspects of these intensive occupational and physical therapy sessions is of interest to families and clinicians of various disciplines. This project establishes a uniform documentation method for family comments recorded during home programs using the International Classification of Functioning, Disability and Health–Children and Youth (World Health Organization, 2007) and seeks to identify trends in these anecdotal responses by age group.

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1. Introduction

For children who have hemiparesis, Constraint Induced Movement Therapy (CIMT) has been reported as an effective intervention to improve uni-manual and bimanual upper extremity (UE) skills.1

Constraint induced movement therapy involves intensive upper extremity training of the affected limb while immobilizing and restricting use of the dominant arm and hand with a device such as a cast or splint. Tasks completed in therapy are designed to be incrementally more challenging to encourage greater functional capability of the affected limb. There continues to be variability in the dosage of therapy, type of constraining device, recommended age for initiation of therapy, treatment environment and optimal frequency. Despite these variations, short term follow up measures have reported retention of skills2,3 and participation in CIMT at an early age has shown impact on bimanual skills of children with hemiparesis later in childhood.3

Overall there are limited reports of qualitative information from children and caregivers participating in CIMT. These studies focus on the parent and child’s perceptions of cast wearing, outcomes of upper extremity training4 and group style intervention.5,6

A few CIMT case studies have reported parent feedback regarding positive changes in communication skills in their children after intervention; specifically improvements in vocabulary and speech intelligibility.7,10

Further exploration of secondary or non-targeted functional improvements after constraint induced movement therapy are of interest to patients, families and providers of various disciplines. There have been two reports of collateral gains in gait patterns following CIMT.11,12 These changes credit possible gains in core strength and stability achieved during upper extremity intervention.

Published studies have described informal anecdotal reports of speech and language changes during CIMT by parents; however no formal studies have quantified these changes. Cope and colleagues13 published a single case study describing a home based CIMT intervention provided to a 12 month old internationally adopted child with right hemiplegic cerebral palsy. Intervention consisted of a constant long arm cast constraint applied for the duration of the 2 week intervention period. The patient received 8 h of occupational and physical therapy each week for a total of 16 h of therapy. Both therapists focused on upper limb activities including unilateral skills training, sensory based activities, weight-bearing and bimanual coordination. They used a variety of outcome tools, one of which, the Knox Parent Questionnaire, captured not only
positive changes in gross motor function and upper extremity skills but non-targeted speech and communication skills. At the beginning of the CIMT intervention the participant only spoke 1–2 words but spoke 20 and initiated use of signs more often by the end of the program. Expressive and receptive language improvements were noted during play and in her overall daily communication with caregivers.

Glover and colleagues\(^9\) reported on a CIMT intervention with a 38 month old child with right hemiplegia as a result of a left side parietal infarct. At the start of intervention she had intact receptive language skills but impaired expressive language skills, uttering only 6 words. During intervention she received 2 h of daily therapy while wearing a non-removable long arm cast for 2 weeks. The case series reported that after initiation of intervention, both the child’s caregivers and speech language pathologist noted improvements in spoken language skills.

A review by Cioni and colleagues\(^15\) reported physiological changes in brain weight, structure and plasticity, in animals exposed to an enriched environment. Infants exposed to enriched environments have demonstrated improved visual system functioning after multi-sensory intervention\(^1\) The most effective clinical and experimental interventions in the literature had the characteristics of being intensive, personalized to the needs of each child, family centered and initiated early in the child’s life\(^15\) all traits common to pediatric CIMT intervention.

Deficits in cognition and speech are often present in children with hemiplegia. It has been reported that at least 50% of children with cerebral palsy have speech motor impairment\(^16,17\).

For children with CP, speech can be unaffected or mildly impaired to include articulatory errors that can be caused from hyper or hypotonicity. For some, more significant speech impairments may include dysarthria and apraxia. Dysarthria is a motor speech disorder that “often is characterized by slurred or slow speech that can be difficult to understand Dysarthria impacts the muscles used in speech production as well as systems required for adequate respiration, phonation, articulation, resonance and prosody.”\(^18\).

For children with motor speech disorders, acquired apraxia of speech may occur in isolation, but more often may co-occur with dysarthria.

A recent study by Allison and colleagues\(^19\) specifically evaluated speech production (articulation) skills following CIMT. Results showed that gains were made in all children regardless of age or side of hemiparesis. The finding regarding age is particularly important in the ability to recommend this treatment to children who are older, as oftentimes it is assumed that younger children will have better outcomes. These results are promising for continued investigation to understand the mechanisms that yielded improved speech motor during CIMT.

Following the initial positive results of that study the authors recommended further exploration of parent feedback on language changes. To date, however, no studies have categorized caregiver reported changes in a uniform manner. Current reports of changes in language skills during CIMT have been informal and not uniformly presented. There is a need to investigate the frequency and possible mechanisms for these reported anecdotal changes. A detailed methodology for coding assessment and intervention data using the International Classification of Functioning and Disability Children and Youth Version\(^19\) with children with cerebral palsy has been used in other intervention research.\(^20\)

This study’s objectives are to establish a uniform documentation method of these types of reports using the International Classification of Functioning, Disability and Health Children and Youth (ICF-CY)\(^19\) and identify trends in anecdotal responses by age groups.

2. Methods

IRB approval was obtained for this study. This retrospective chart review collected demographic data, functional status and home program logs of sequential clinical cases enrolled in an established CIMT program\(^3\) from June 2009 to February 2017.

The clinical team involved in this research treated children within the CIMT program. During treatment the parents of the participants often made comments about changes they observed regarding non targeted speech and language skills. Some clinicians documented these observations in their daily notes but found a need to start collecting this information in a more formal or structured manner.

As part of the clinical CIMT program each participant had a structured weekend home program issued each week. Three to four ADL or play based tasks were given as “homework” to address motor skills achieved or improved upon during the treatment week. Parents were to complete the activities on both weekend days and provide a written comment on how the child performed each activity. Parents returned the home program to the child’s therapists upon return to the clinic each Monday. The clinical team decided that this was a possible opportunity to collect information about speech and language changes. The template used by therapists was modified in June of 2009 and at the end of each weekly log a comment section was added to give parents the opportunity to reflect on not only arm and hand function of the child’s affected limb but also additional gains in other functional areas. The following is the verbatim statement that was added to the end of each home program log: “Please write 2 observations of changes in your child’s use or function of his/her [affected] arm/hand since starting the program and any additional changes in language or general observations [from this week]”

It was from these logs that reported language function observations were collected. The ICF-CY\(^18\) was a useful tool to in previous analysis of motor goals from this cohort so it was chosen again for this project. Parent comments regarding observations other than those targeted in therapy were coded by an occupational therapist (first author) using the ICF-CY to establish common labels for the parents’ observed behaviors. Disagreements on codes were resolved by consensus with the second author. A frequency count of coded speech and language behaviors were calculated, analyzed and then broken down by age group.

A total of 120 cases were reviewed in this descriptive study. Sixty cases were excluded as they had no reported comments from parents or parents did not return the home program sheet. Fifty cases remained in this study and were analyzed. A total of 62 parent statements related to speech and language skills were reported in those logs. An additional 36 statements were made that were unrelated to speech and language skills. These comments included both negative and positive statements regarding things such as confidence, optimism, motivation, behavior, sleep, mood and appetite changes.

The ICF-CY states that it “offers a conceptual framework and a common language and terminology for recording problems manifested in infancy, childhood and adolescence involving functions and structures of the body, activity limitations and participation restrictions and environmental factors important for children and youth.”\(^18\) It can be used by many different clinical disciplines and consumers.

The ICF coding system includes a letter code such as “b” for Body Structure or “d” for Activities and Participation followed by a number that corresponds to each specific item in that section. Available qualifiers used to describe level of functioning within each item was not deemed appropriate for this data and therefore not used for this study. Further, more detailed description of this
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