Early motor intervention in infants with unilateral cerebral palsy: a systematic review and narrative synthesis

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Background & Aims

Due to the higher amount of plasticity of the infant brain, it has been suggested that the benefits from early, activity-based motor interventions are larger compared to the same intervention after two years of life. Hence, studies reporting on the topic of early activity-based motor interventions in infants with unilateral cerebral palsy (uCP) are rising.

The aim of this study was to systematically review the current literature on early motor interventions in infants with uCP.

Methods

LITERATURE SEARCH:

We conducted this systematic review following the guidelines of the PRISMA statement (Liberati et al. 2009).

Five electronic databases were screened: PubMed, Embase, Cochrane Central Register of Controlled trials, Cinahl and Web of Science.

After duplicates were removed, search results were assessed for study eligibility by two independent authors (LM and NDB).

Participant and study characteristics were extracted from the selected studies. Critical appraisal was done using the PEDro-scale.

A detailed overview of the selection process is shown in Figure 1.

Finally, nine studies were selected including seven intervention studies (i.e. four single blinded randomized controlled trials, one retrospective study, two pre-post designs), one participatory design and one cross-sectional survey. Only the results of the intervention studies are presented of which two are from the same study sample (Chamudot et al. 2018).

Figure 1: Flow chart of the selection process

Results

EARLY MOTOR INTERVENTIONS IN UCP

First author	Study design	Intensity	Therapist	Participants	Study results
Baby-CIMT vs. control					
Hwang et al. 2020	single blinded RCT	splint 3weeks + 15 x 2 hour sessions	OT delivered	N=24 Age: 5-34 m 14 ♂; 10 ♀ 4 L; 20 R	Improved upper limb use in real life after CIMT (parental questionnaire; Cohen's d > 0.90)
Nordstrand et al. 2015	retrospective non-RCT	30 minutes/day, 7days, 12 weeks	Parent delivered with weekly OT guidance	N=72 Age: <16 m 38 ♂; 34 ♀ 27 L; 45 R	2y-old who followed CIMT had more chance to achieve higher function (AHA; Cohen's d = 0.97)
Baby-CIMT vs. baby-massage					
Eliasson et al. 2018	single blinded RCT	30 minutes/day, 6days, 12 weeks	Parent delivered with weekly OT guidance	N=31 Age: 3-8 m 16 ♂; 15 ♀ 15 L; 16 R	Larger bi- and unimanual improvements after CIMT (HA1; Cohen's d = 0.57 and 0.64)
Baby-CIMT vs. bimanual therapy					
Chamudot et al. 2018	single blinded RCT	1hour/day; 7days, 8 weeks	Parent delivered with weekly OT guidance	N=33 Age: 8-16 m 19 ♂; 14 ♀ 11 L; 22 R	Bimanual improvements independent of therapy group (mini-AHA; Cohen's d > 2.08)
eTIPS					
Basu et al. 2018	pre-post design	incorporated daily	Parent delivered with weekly OT guidance	N=13 Age: 0-6 m 8 ♂; 5 ♀ 6 L; 7 R	Feasible and safe to be delivered by the parents in the home setting
Intensive Task-oriented OT					
Kim et al. 2015	pre-post design	NR	OT delivered	N=36 Age: NR 26 ♂; 10 ♀ NR L; NR R	Improvements after intervention (HFCS; p > 0.05)

CIMT: constraint-induced movement therapy; RCT, randomized controlled trial; OT, occupational therapist; N, number; m, months; L, left-sided hemiplegia; R, right-sided hemiplegia; HFCS, House Functional Classification Scale.

Three studies reported no adverse events (Basu et al. 2018, Eliasson et al. 2018, Hwang et al. 2020).

Applying CIMT does not appear to delay the function of the restrained hand (Eliasson et al. 2018), nor the infant's gross motor development (Chamudot et al. 2018, Hwang et al. 2020).

PREDICTORS OF TREATMENT RESPONSE

Baseline function (Eliasson et al. 2018; Chamudot et al. 2018) nor age (Chamudot et al. 2018) were identified as treatment predictors.

The underlying pattern of brain damage was also not a treatment predictor, but only in high-functioning infants. In low-functioning infants, infants with focal infarcts had more chance to develop a very low function (Nordstrand et al. 2015).

Infants with focal infarcts seemed to benefit more from bimanual therapy compared to CIMT, while in white matter lesions treatment response appeared to be independent of the intervention (Chamudot et al. 2018).

Conclusions

- Early motor interventions for the upper limb seem effective, safe and feasible to apply in infants with uCP.
- Despite interindividual variability in treatment response, this review could not yet identify clear treatment predictors.