



# The Effects of Soft Splinting on Upper Limb Function in People with Cerebral Palsy: A Systematic Review

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# Background

Soft splinting is believed:

- To enhance sensory and proprioceptive awareness
- To increase proximal stability
- To enhance function
- To improve grasping

Evidence mainly anecdotal – No previous systematic review of evidence about soft splinting



# Aim of this systematic review

To describe the existing evidence about the effects of soft splinting on upper limb function in people with cerebral palsy



# Search Strategy

Search terms:

- dynamic splint\*, soft splint\*, lycra, neoprene, hand splint\*, hand orthos\*s, wrist orthos\*s, upper limb orthos\*s

Databases:

- PUBMED, CINAHL, Proquest Health and Medical Complete, Cochrane Database of Systematic reviews, OTseeker, Physiotherapy Evidence Database (PEDro), and Database of Reviews of Effectiveness (DARE)



# Selection Criteria

## Inclusion criteria:

- the effects of soft splinting on upper limb function were reported
- participants had CP (with separate results for the participants with CP if the sample included participants without CP)
- the article appeared in a peer-reviewed journal
- the article was in English.



# Selection Criteria

## Exclusion criteria:

- reviews, letters, editorials, surveys or anecdote
- the soft splinting intervention included surgery or electrical stimulation
- the intervention included dynamic or static splinting with rigid components.



# Selection Process

966 articles were retrieved

Exclusions:

- 477 - no report effects of soft splinting on upper limb function
- 248 - participants did not have CP
- 115 - not in English
- 25 - reviews, letters, editorials, surveys, anecdote
- 34 - surgery or electrical stimulation
- 63 - dynamic or static splinting with rigid components



## Selection Process

- All titles and abstracts were reviewed independently by two authors
- Disagreements were resolved by discussions between themselves and a third author
- Four articles were selected
- The reference lists were reviewed by two authors for articles that met the selection criteria
- This process yielded a fifth article



## Data Extraction

- American Academy of Cerebral Palsy and Developmental Medicine's (AACPDMD) Methodology
- Coders were blinded to authors' identities: names and affiliations were blacked out
- All articles were coded independently by all authors; disagreements were resolved by discussion



# Levels of Evidence

Level	Designs
I	Systematic Review of RCTs Large RCT (n>100)
II	Small RCTs (N<100)
III	Cohort studies (concurrent control group)
IV	Case series, cohort study without concurrent control, case-control study
V	Expert Opinion, case study, anecdote



# Levels of Evidence

Study	Design
Blair et al. 1995	IV Case Series (CS)
Blair et al. 1995	II RCT
Edmondson et al. 1999	IV Case Series
Nicholson et al. 2001	IV Case Series
Knox 2003	IV Case Series
Corn et al. 2003	Single subject AB design



# Participants and Interventions

Study	Methods
Blair et al. 1995 (CS)	24 <4.5->8y wore Lycra UPSuits 6.5hr/day, av. 53 days
Blair et al. 1995 (RCT)	16 <4.5->8y, 8 wore Lycra UPSuits daytime for 4 weeks
Edmondson et al. 1999 (CS)	15 2-12y wore Camp lycra body suits >6h/day for a year
Nicholson et al. 2001 (CS)	12 2-17y wore individually tailored lycra garments for >6h/day for 6 weeks
Knox 2003 (CS)	8 3-13y wore Camp lycra garments >4h/day for 4 weeks
Corn et al. 2003 (single subject)	2 8y, 16y wore Second Skin upper limb splints 6h/day at school for several weeks



## Quality of Study (Only levels I-III)

1. Inclusion and exclusion criteria well described and followed?
2. Intervention well described?
3. Measures clearly described, valid and reliable?
4. Were there blind assessments?
5. Appropriate statistical evaluation including power calculations?
6. Dropouts/loss to follow-up reported and less than 20%?
7. Appropriate methods for controlling confounding variables and limiting potential biases?



# Results of Blair et al.'s (1995) RCT

Quality Rating – 0/7

## Outcome measures

- Respiratory Capacity
  - Forced expiratory volume in 1 min
  - Forced vital capacity
- Muscle Strength
  - Grip strength
  - Abdominal muscle strength

No significant differences on any of these  
outcome measures



# Adverse Effects from all studies

- Vomiting
- Upper extremity cyanosis
- Hyperthermia
- Induced muscle weakness
- Respiratory compromise
- Intractable peripheral cyanosis
- Erythema in the axilla
- Eczema irritated
- Rubbing
- Child didn't urinate while wearing suit
- Circulation difficulties
- Friction sores
- Restricted upper limb function



# Compliance

Study	Compliance results
Blair et al. 1995	6/24 children showed poor compliance UPSuits worn 60% days intended
Edmondson et al. 1999	14/15 children wore body suit at least 6h/day after 1 week
Nicholson et al. 2001	All children wore body suit for 6h/day for 6 weeks
Knox 2003	4/8 children achieved wearing time for >4h/day for 4 weeks



# Conclusions

## Implications for Practice

- There is no published evidence to support the use of upper limb soft splinting for people with CP
- Therapists need to monitor adverse effects, especially those associated with body suits

## Implications for Research

- High quality RCTs (with homogeneous samples and adequate power) are needed
- Outcome measures of activities and participation as well as body structures and function



# Website

<http://www.aacpdm.org/index>

Go to ⇒ Resources

Go to ⇒ Outcome Studies



# Acknowledgements

Lisa Samson-Fang and other reviewers from  
the AACPD M Treatment Outcomes  
Committee