

The use of instrumented gait analysis in interdisciplinary interventions for children with cerebral palsy

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Thesis & papers



- I Rasmussen HM, Nielsen DB, Pedersen NW, Overgaard S, Holsgaard-Larsen A. Gait Deviation Index, Gait Profile Score and Gait Variable Score in children with spastic cerebral palsy: Intra-rater reliability and agreement across two repeated sessions. **Gait & Posture. 2015;42(2):133-7.**
- IIa Rasmussen HM, Pedersen NW, Overgaard S, Hansen LK, Dunkhase-Heinl U, Petkov Y, Engell V, Baker R, and Holsgaard-Larsen A. The use of instrumented gait analysis for individually tailored interdisciplinary interventions in children with cerebral palsy: a randomised controlled trial protocol. **BMC Pediatrics. 2015;15(1):202.**
- IIb Rasmussen HM, Pedersen NW, Overgaard S, Hansen LK, Dunkhase-Heinl U, Petkov Y, Engell V and Holsgaard-Larsen A. The use of instrumented gait analysis for individually tailored interdisciplinary interventions in children with cerebral palsy: a randomised controlled trial. **[Re-submitted to Dev Med Child Neurol, Feb 2018].**
- III Rasmussen HM, Svensson J, Christensen MT, Pedersen NW, Overgaard S, Holsgaard-Larsen A. Threshold values of ankle dorsiflexion and gross motor function in 60 children with cerebral palsy – a cross-sectional study **[Acta Orthop, 2018 Mar 28:1-6 Epub ahead of print].**

Content

Introduction

Methods

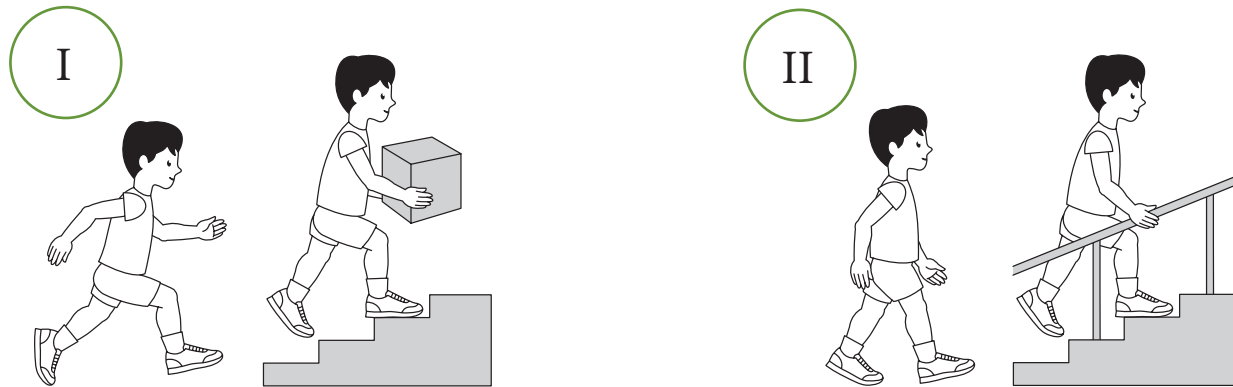
Results

Conclusion

Perspectives

Population

Children with spastic cerebral palsy GMFCS level I and II



60% of children with CP
Rodby-Bousquet & Hägglund (2012)

Rosenbaum PL et al (2008)
www.canchild.ca



The Danish Cerebral Palsy Follow-up Program (CPOP)

National clinical quality database & Follow-up program

Standardized examinations

Gross motor function

Muscle tone

Passive range of motion

Orthotics and assistive devices



www.cpguiden.dk

Rasmussen et al (2016)

Planning of interventions

Local teams

Interdisciplinary consultations

Examinations

Gross motor function

~~Gait pattern~~

Interventions

Rasmussen (2016)



Gait analysis

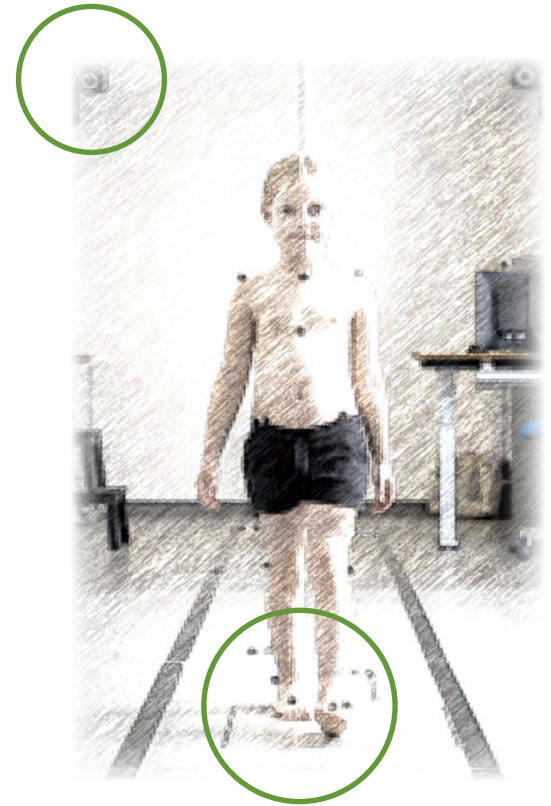
- Movements (kinematic)

- Forces (kinetics)

Gage (1994)

- Diagnose and monitor progress

Baker (2016)

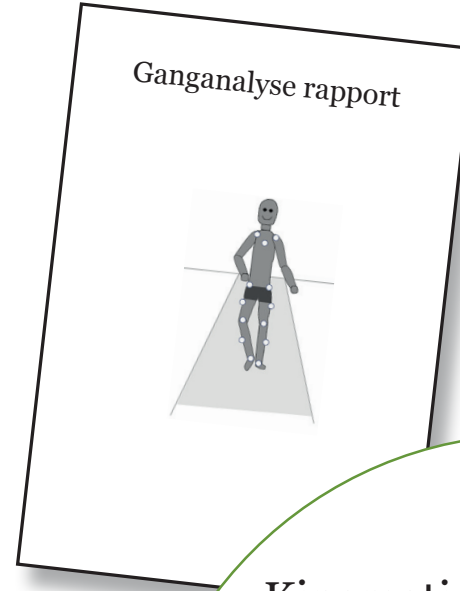


Data from gait analysis

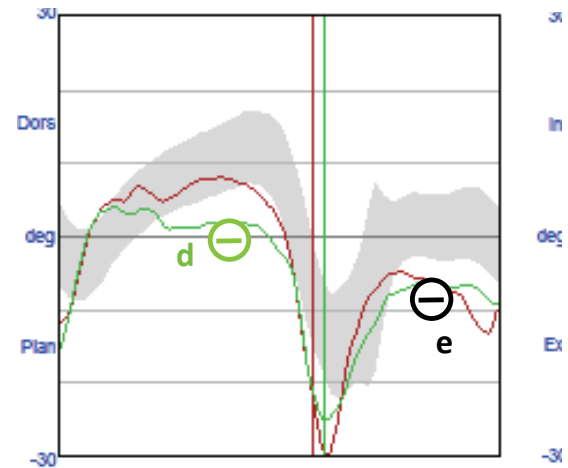
Clinical practise

Impairment focused interpretation
(Baker 2009)

- History
- Orientation: Gait indices
- Video
- Evidence and interpretation
- Kinematic / kinetic graphs
- Physical examination
- Patient reported outcome measures



Kinematic / kinetic graphs



Data from gait analysis

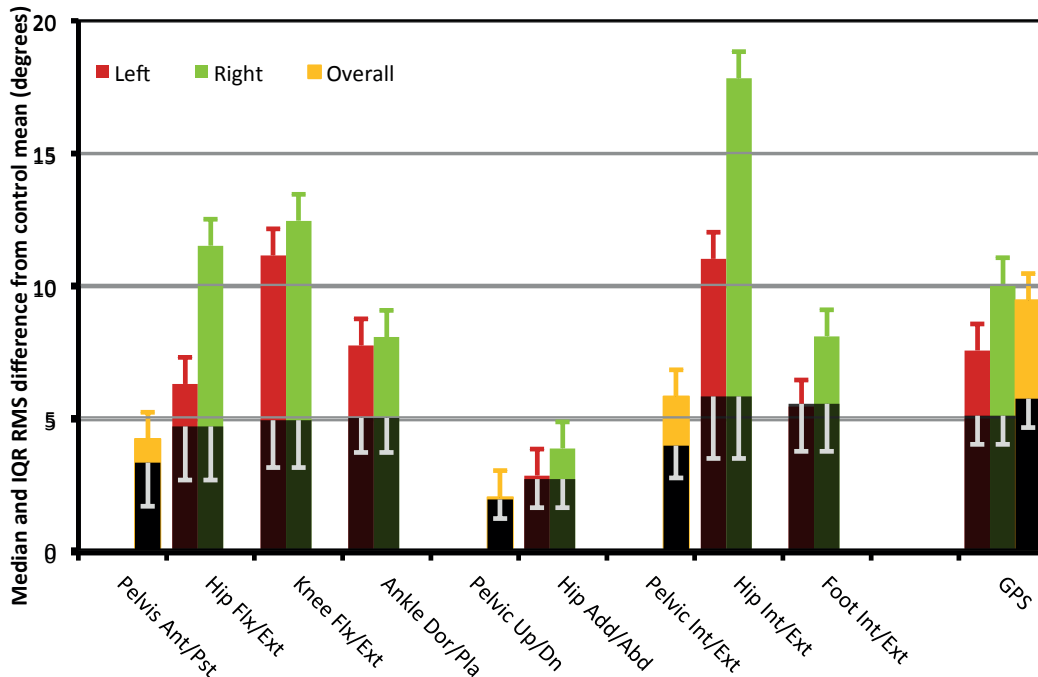
Research: Gait indices

Gait Deviation Index
Schwartz (2008)

Gait Profile Score
Baker (2009)



Gait Variable Score
Movement Analysis Profile

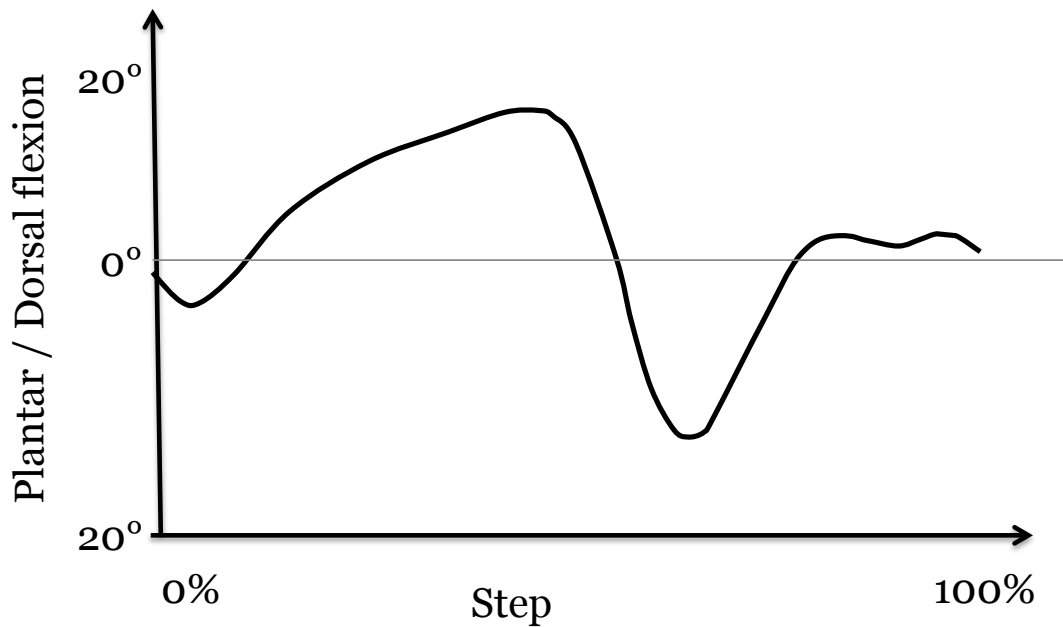


Data from gait analysis

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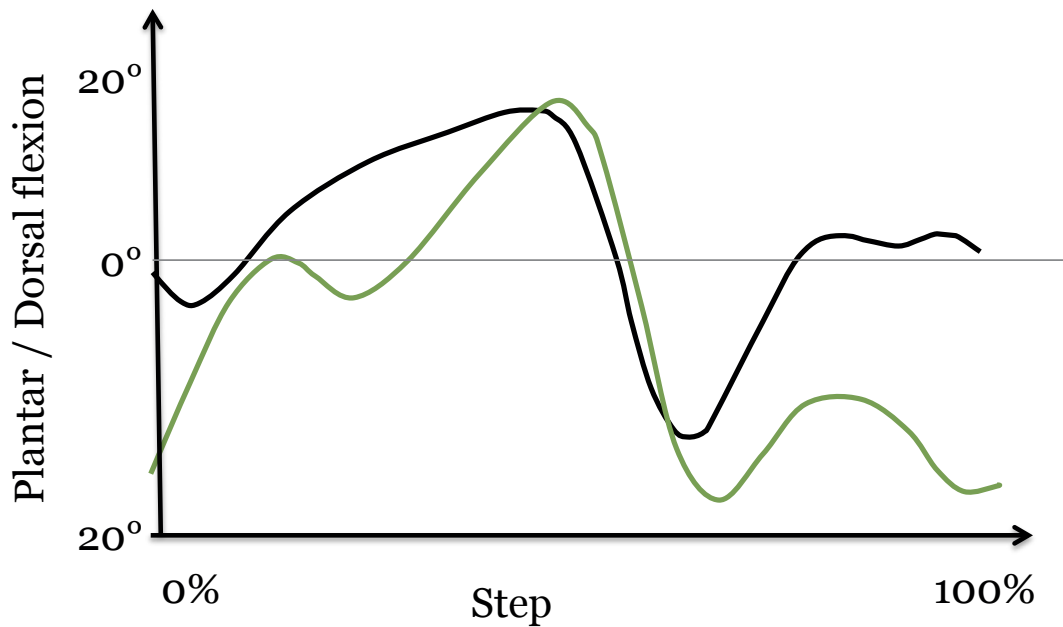


Data from gait analysis

Research: Gait indices

Gait Deviation Index
Schwartz (2008)

Gait Profile Score
Baker (2009)

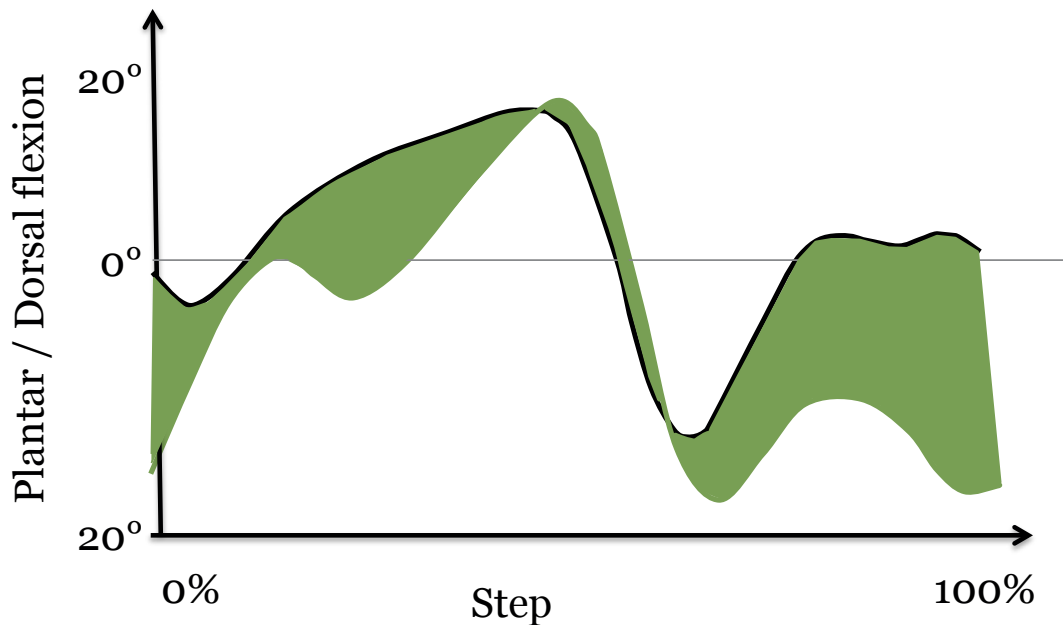


Data from gait analysis

Research: Gait indices

Gait Deviation Index
Schwartz (2008)

Gait Profile Score
Baker (2009)



Gait analysis



- 40-70% Changes in treatment plans

Lofterod (2007), Cook (2003), Kay (2000), Deluca (1997)

- 77-97% Compliance

Wren TA (2013), Lofterod (2007), Wren TA (2005)

- Effectiveness of interventions

Franki (2014), Van den Broeck (2010), Wren (2013)

Motivation for the study

Combining the CPOP with the use of gait analysis



Study aim

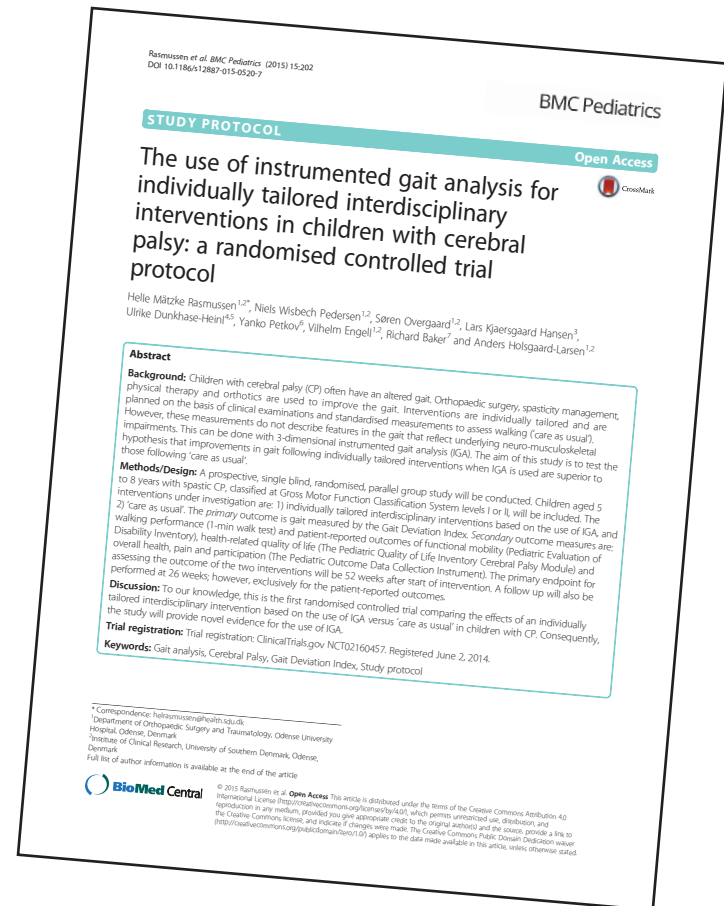
Study aim

This study aimed to determine if individually tailored interdisciplinary interventions **with gait analysis** lead to greater improvements than individually tailored interdisciplinary intervention **without gait analysis** in overall gait pathology, walking performance and patient-reported outcome measures of function, disability and health-related quality of life.

Protocol article:

Rasmussen HM, edersen NW, Overgaard S, Hansen LK, Dunkhase-Heinl U, Petkov Y, Engell V, Baker R, Holsgaard-Larsen, A BMC Pediatrics (2015)

Article IIb - resubmitted

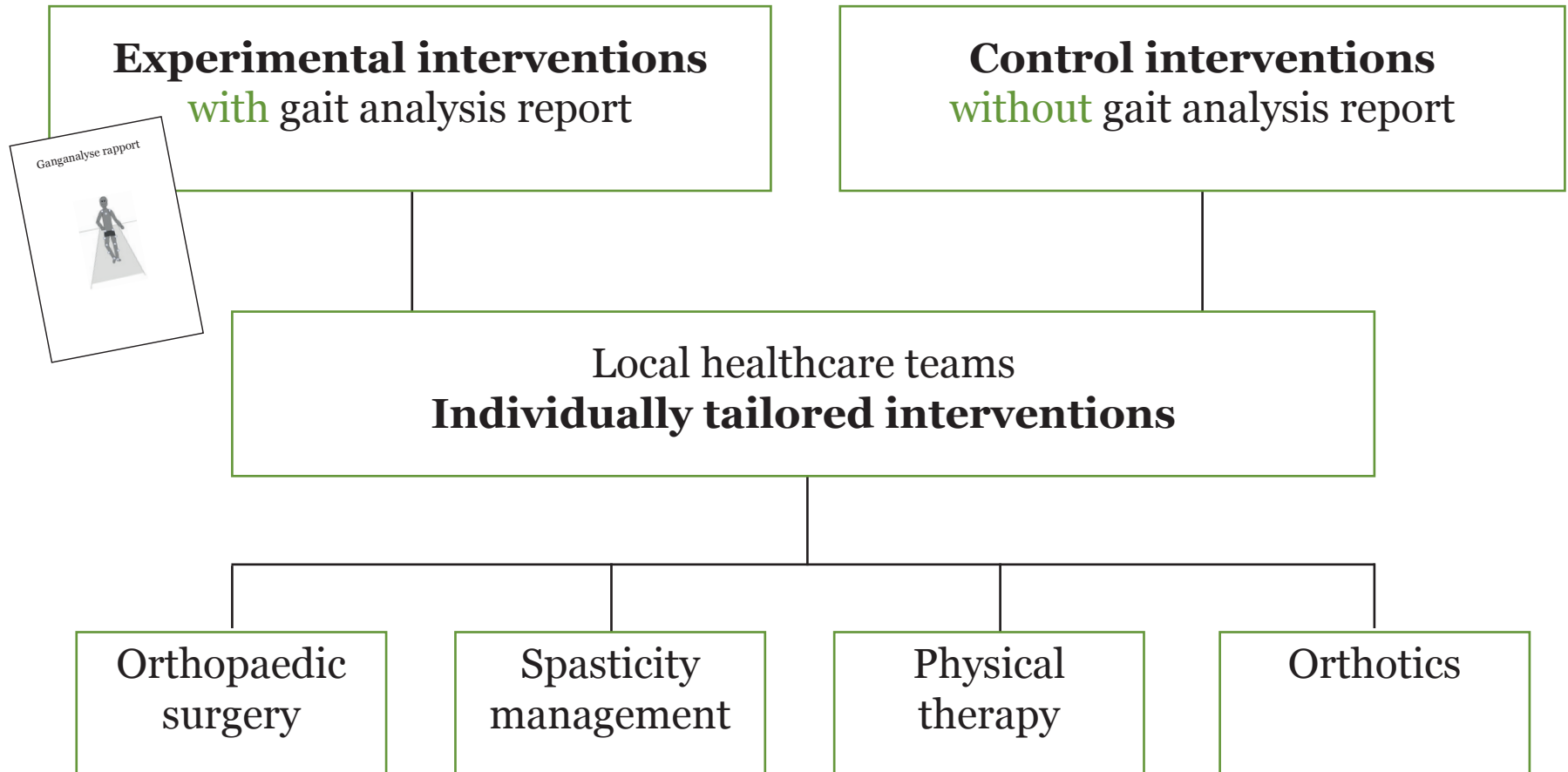


Outcomes

- Overall gait pathology
- Walking performance
- Function & disability
- Health-related quality of life

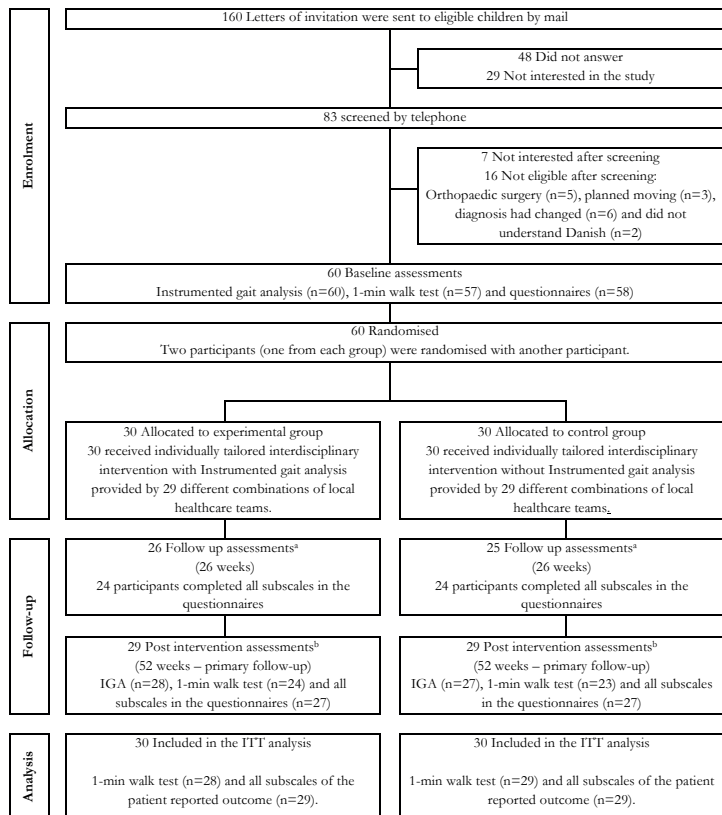
	Study II
Instrumented gait analysis	
Gait Deviation Index (primary outcome)	x
1-minute walk	x
Patient reported outcome measures	
Pediatric Evaluation of Disability Inventory Mobility scale	x
Pediatric Outcome Data Collection Instrument	x
The Pediatric Quality of Life Inventory Cerebral Palsy Module	x

Interventions



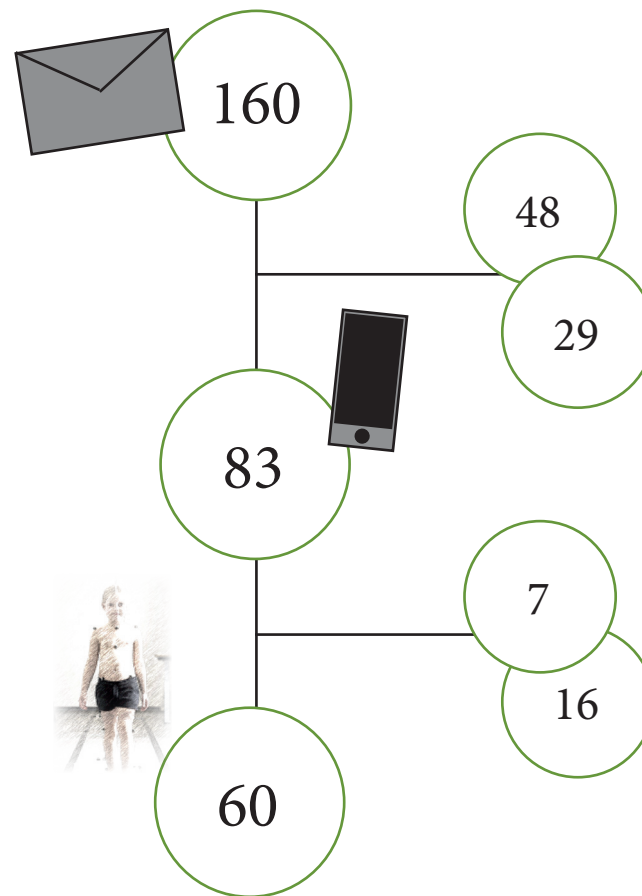
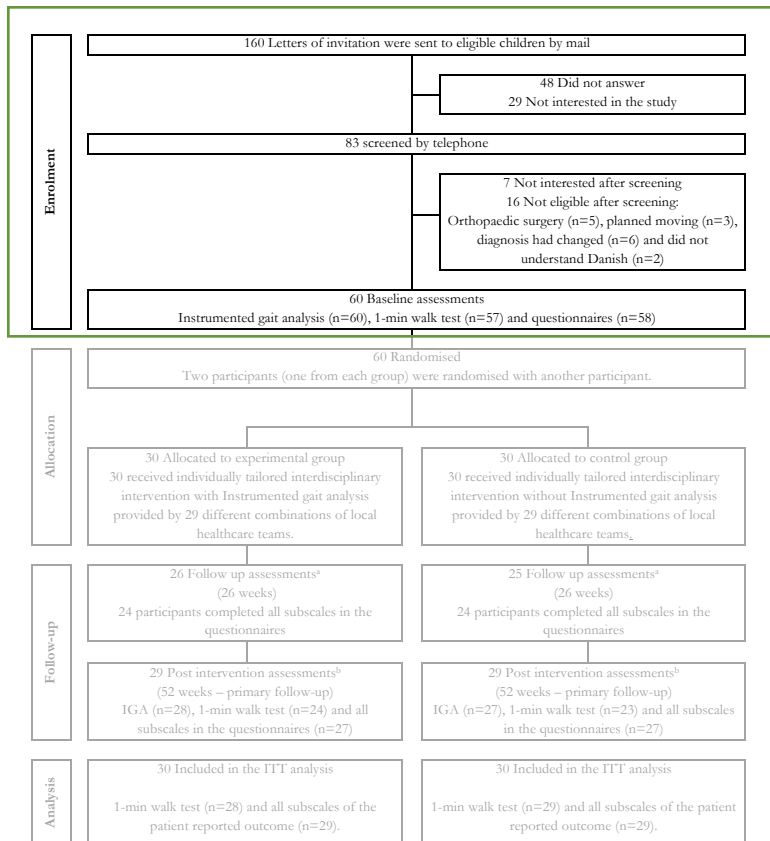
Results

Flow chart



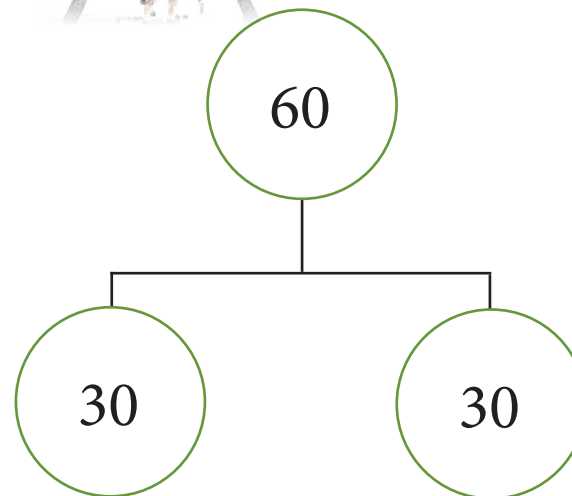
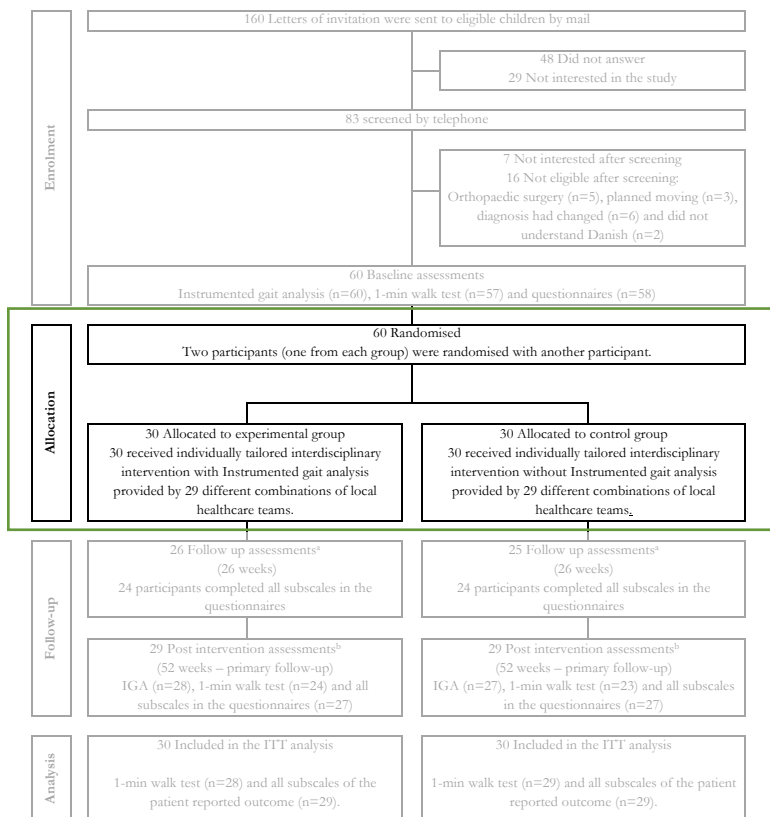
Results

Flow chart: Enrollment



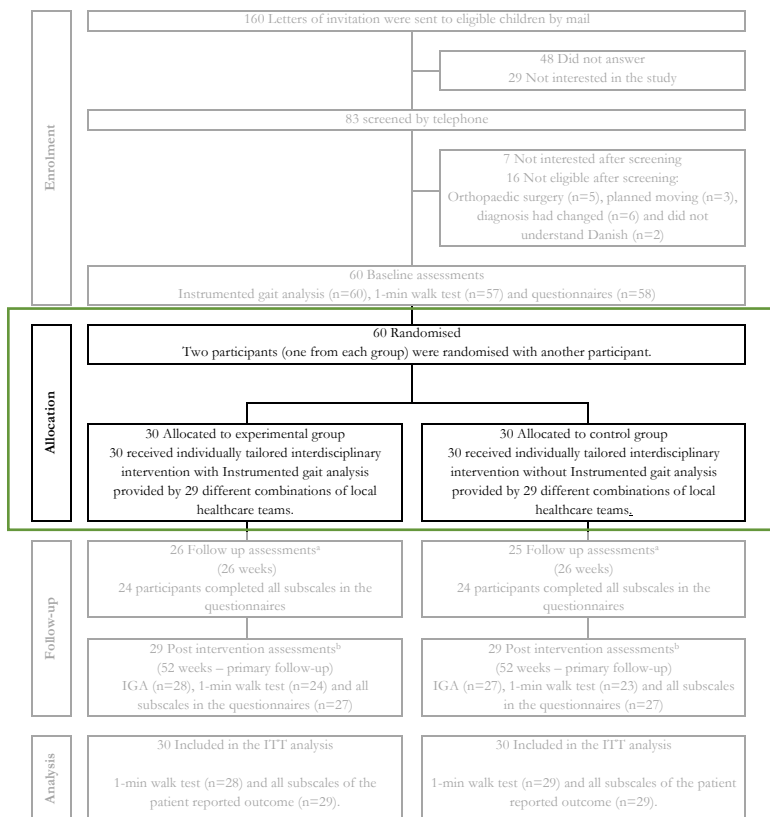
Results

Flow chart: Allocation

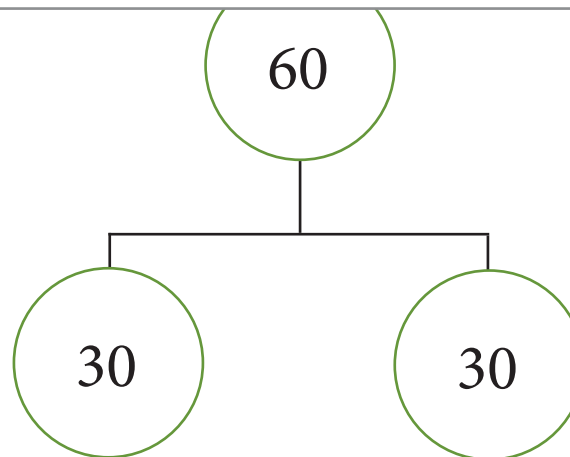


Results

Flow chart: Allocation

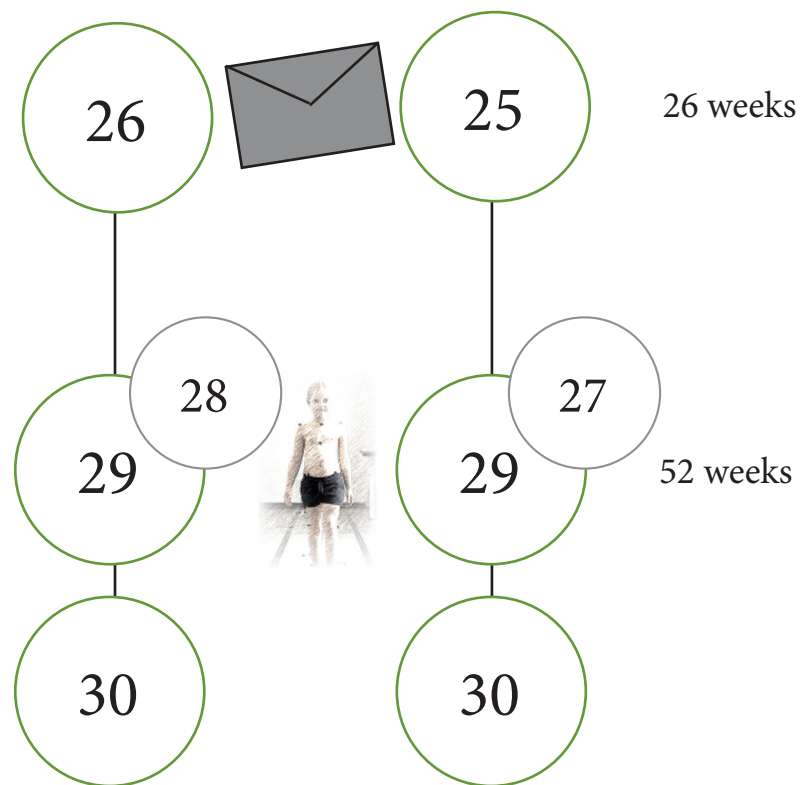
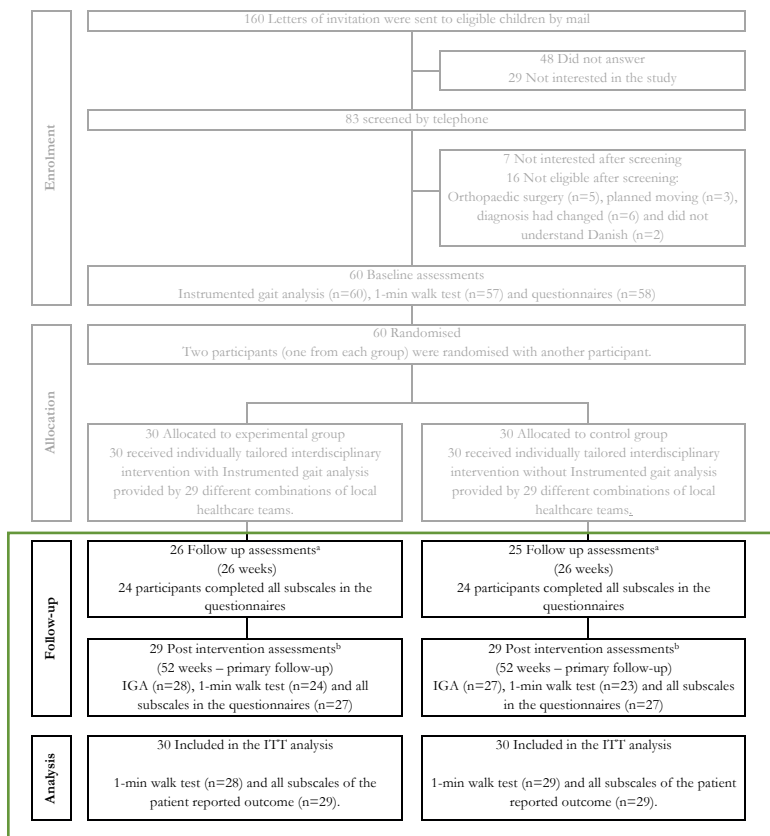


Participants	Study II-III	
Number, n	60	
Age, mean (SD)	6 y 10 m	(1 y 3 m)
Sex, girls/boys, n (%)	21/39	(35/65)
CP subtype, UL/BL, n (%)	43/17	(72/28)
GMFCS I / II, n (%)	42/18	(70/30)



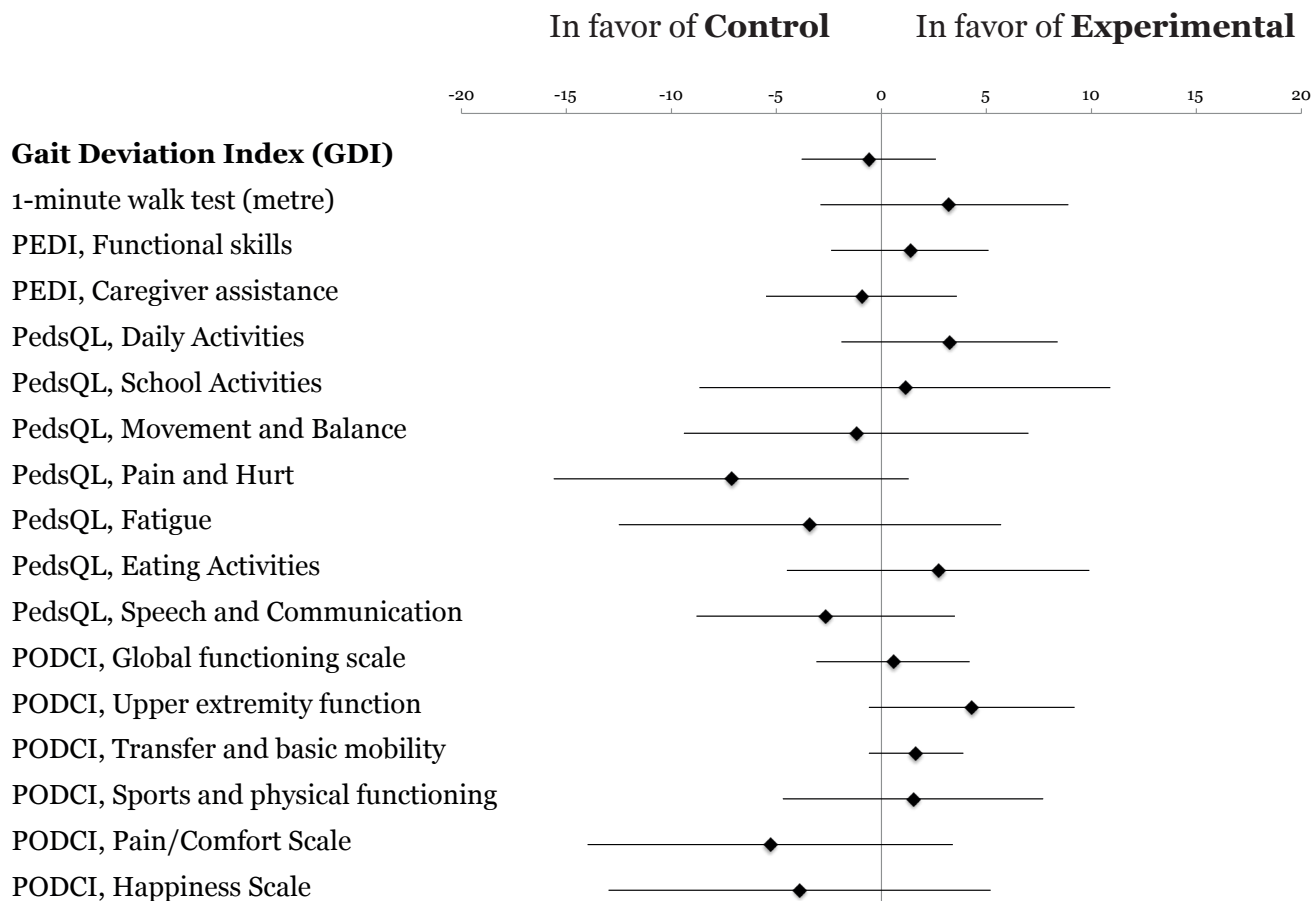
Results

Flow chart: Follow-up & analysis



Results

Between-group differences



Results

Applied interventions & compliance

Applied interventions	Exp	CON
Physiotherapy	24	24
Orthotics	8	12
Spasticity management	7	10
Orthopedic surgery	0	1

$n = 28/29, p = > 0.05$

Results

Applied interventions & compliance

Applied interventions	Exp	CON
Physiotherapy	24	24
Orthotics	8	12
Spasticity management	7	10
Orthopedic surgery	0	1

$n = 28/29, p = > 0.05$

Compliance	+ Rec + app	+ Rec
Physiotherapy	24	28
Orthotics	6	10
Spasticity management	5	14
Orthopedic surgery	0	1

Conclusion

Study aim

This study aimed to determine if individually tailored interdisciplinary interventions with gait analysis lead to greater improvements than individually tailored interdisciplinary intervention without gait analysis in overall gait pathology, walking performance and patient-reported outcome measures of function, disability and health-related quality of life.

Conclusion

This study could not confirm the hypothesis that improvement in the overall gait pathology, walking performance and patient-reported outcomes following individually tailored interventions when gait analysis is used are superior to those following 'usual care' in a case-mix of all children with cerebral palsy at GMFCS levels I and II, at an early age.

Perspectives

Study results - Gait analysis

Explorative data - analysis

Christina Esmann

Measure of processes of Care

Gross Motor Function Measure (selected items)

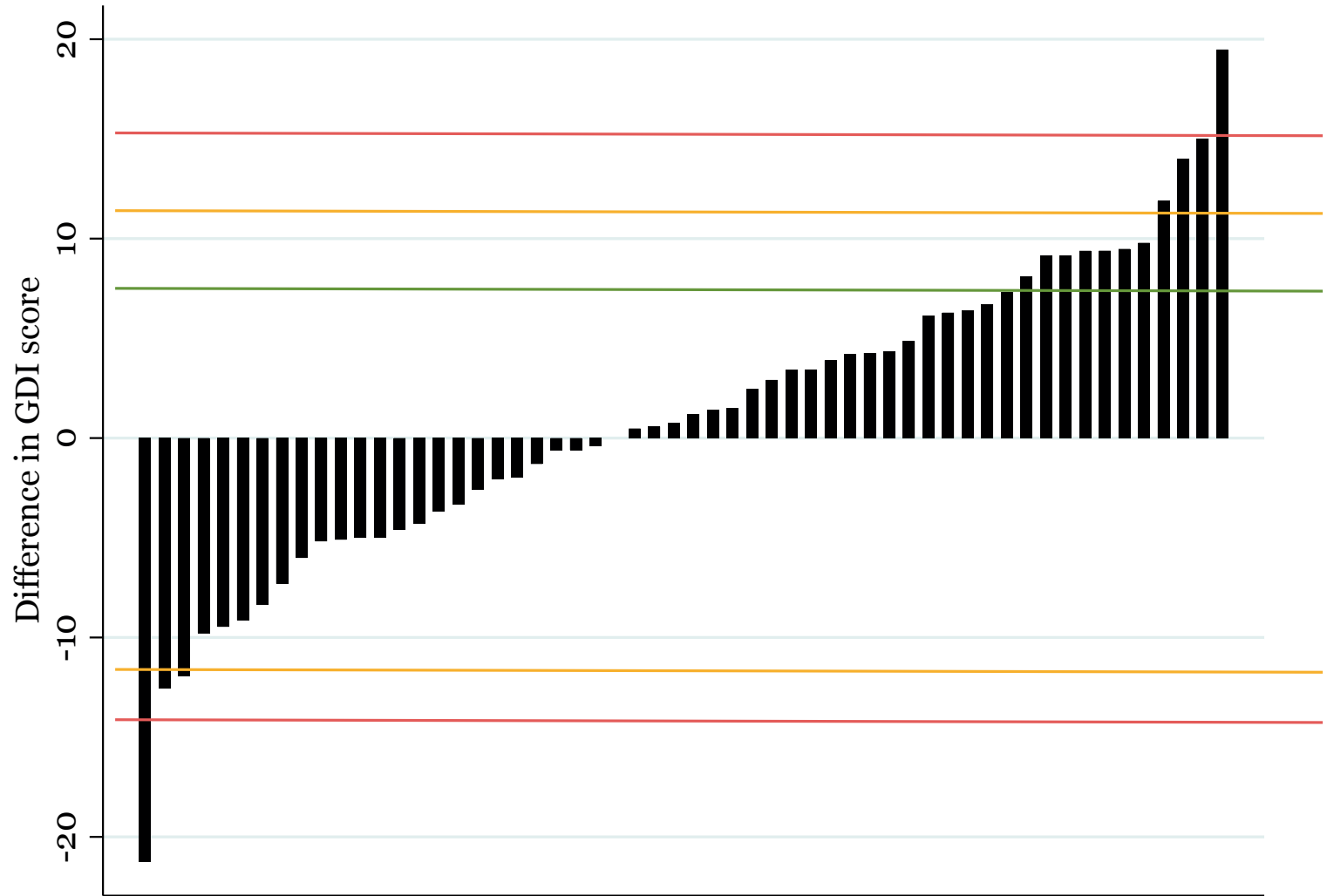
Gait Analysis

Validation of methods used for interpretation

Dissimination of recommendations

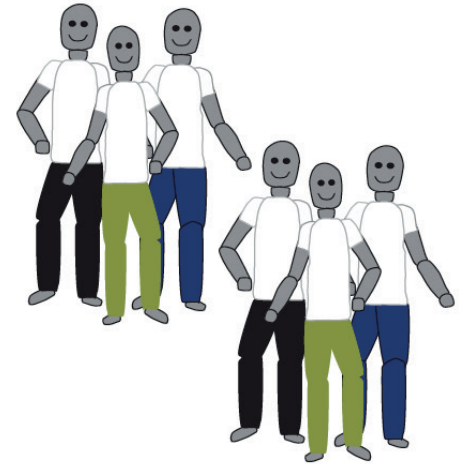
Aherence to recommendations

Change in participants



Thanks!

Participants and their parents
The local teams and healthcare professionals
Research assistants & colleagues



University of Southern Denmark,
Odense University Hospital Research grant,
Region of Southern Denmark Research grant and PhD grant, The Physiotherapy Practice Foundation,
The Ludvig and Sara Elsass Foundation,
The Linex Foundation and
The Danish Physiotherapy Research Fund.