

Clinical Trial Protocol

Iranian Registry of Clinical Trials

27 Jul 2026

The effects of biomechanically optimized ankle foot orthosis footwear combinations on the trunk and upper limb kinematics in children with cerebral palsy while walking

Protocol summary

Study aim

Studying the effects of biomechanically optimized ankle foot orthosis footwear combination on trunk and upper limb kinematics during walking in children with cerebral palsy

Design

Before-and-after clinical trial in the form of a case series, non-random sampling from available samples, on 10 patients

Settings and conduct

Each individual will undergo a motion analysis test and functional tests of one-minute walking test and Timed up and go test in three positions: barefoot, with a conventional ankle foot orthosis, and with optimized ankle foot orthosis at the Musculoskeletal Disorders Research Center, Faculty of Rehabilitation Sciences, Isfahan University of Medical Sciences. The order of the tests will be random for each participant.

Participants/Inclusion and exclusion criteria

Inclusion criteria: Spastic hemiplegia cerebral palsy, ability to walk independently without the use of an assistive device, age 5-15 years. Exclusion criteria: Flexion contracture fix more than 25 degrees of hip and knee joints, having severe ataxia or dystonia, spasticity more than 3 on the modified Ashworth scale in the upper and lower limbs, having severe communication and cognitive impairment.

Intervention groups

Intervention group: Ankle foot orthoses and shoes are made both conventionally and with biomechanical optimization for each patient, and a motion analysis test is performed using each. Control group: Do not receive any intervention.

Main outcome variables

Trunk and upper limb kinematics in walking; walking ability; dynamic balance

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20250202064598N1**

Registration date: **2025-03-17, 1403/12/27**

Registration timing: **prospective**

Last update: **2025-03-17, 1403/12/27**

Update count: **0**

Registration date

2025-03-17, 1403/12/27

Registrant information

Name

Zeinab Amini kahrizsangi

Name of organization / entity

Country

Iran (Islamic Republic of)

Phone

+98 31 3792 5014

Email address

zeinab_amini@rehab.mui.ac.ir

Recruitment status

Recruitment complete

Funding source

Expected recruitment start date

2025-04-21, 1404/02/01

Expected recruitment end date

2025-09-23, 1404/07/01

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date

empty

Scientific title

The effects of biomechanically optimized ankle foot orthosis footwear combinations on the trunk and upper limb kinematics in children with cerebral palsy while walking

Public title

The effects of optimizing ankle-foot orthosis footwear combinations on the kinematics of children with cerebral palsy

Purpose

Treatment

Inclusion/Exclusion criteria

Inclusion criteria:

Spastic hemiplegic cerebral palsy Independent walking without the use of assistive devices (gross motor function classification 1-2)

Exclusion criteria:

Presence of fix flexion contracture more than 25 degrees of the hip and knee joints severe symptoms of ataxia or dystonia History of surgery or specific disease in the trunk, lower limbs, elbow and wrist joints within the past 6 months Spasticity greater than 3 on the modified modified Ashworth scale in the upper and lower limbs Having severe communication and cognitive impairment (having scores of 4 and 5 on the Communication function classification system) Having a score of 5 on the MACS scale in the upper limb of the affected side

Age

From **5 years** old to **15 years** old

Gender

Both

Phase

N/A

Groups that have been masked

No information

Sample size

Target sample size: **10**

Randomization (investigator's opinion)

N/A

Randomization description

Blinding (investigator's opinion)

Not blinded

Blinding description

Placebo

Not used

Assignment

Single

Other design features

The study includes an intervention group of children with cerebral palsy, all of whom receive interventions and the immediate effects of each intervention on kinematic data are analyzed. Additionally, a healthy control group is included, which does not receive any interventions; only their normal kinematic data are recorded.

Secondary Ids

empty

Ethics committees

1

Ethics committee

Name of ethics committee

Ethics Committee of Isfahan University of Medical Sciences

Street address

Hezar Jerib Street, Isfahan University of Medical Sciences, Isfahan

City

Isfahan

Province

Isfahan

Postal code

8174673461

Approval date

2025-03-10, 1403/12/20

Ethics committee reference number

IR.MUI.NUREMA.REC.1403.186

Health conditions studied

1

Description of health condition studied

cerebral palsy

ICD-10 code

G80.2

ICD-10 code description

Spastic hemiplegic cerebral palsy

Primary outcomes

1

Description

trunk kinematic during gait

Timepoint

At the beginning of the study and immediately after receiving the interventions

Method of measurement

3D gait recording and analysis system

2

Description

Upper limbs kinematic during gait

Timepoint

At the beginning of the study and immediately after receiving the intervention

Method of measurement

3D gait recording and analysis system

3

Description

Walking ability

Timepoint

At the beginning of the study and immediately after receiving the intervention

Method of measurement

1 minute walking test

4

Description

Dynamic balance

Timepoint

At the beginning of the study and immediately after receiving the intervention

Method of measurement

Timed up and go test

Secondary outcomes

1

Description

Satisfaction

Timepoint

At the beginning of the study and immediately after receiving the intervention

Method of measurement

Structured interview

2

Description

Spatial-temporal gait parameters

Timepoint

At the beginning of the study and immediately after receiving the intervention

Method of measurement

3D gait recording and analysis system

Intervention groups

1

Description

Intervention group: The conventional foot and ankle orthosis is made for each patient using a 5 mm thick polypropylene sheet after taking a mold and modifying the mold. In this orthosis, the ankle will be at 90 degrees. The orthosis extends from the tips of the toes to below the knee. The orthosis incision line in the ankle area is placed one centimeter in front of the medial and lateral malleoli. If there is a difference in the length of the lower limbs, the shortening will be compensated under the orthosis. In the conventional foot and ankle orthosis, shoes with a regular PU sole are worn. After the fitting, the patient wears the orthosis and shoes, and tests are performed.

Category

Rehabilitation

2

Description

Intervention group: The optimized ankle foot orthosis is made using a 5 mm thick polypropylene sheet for each patient after taking a mold and modifying the mold. In

the optimized orthosis, the angle of the ankle in the orthosis will match the length of the gastrosoleus muscle. The orthosis extends from the tips of the toes to below the knee. The orthosis incision line in the ankle area is placed one centimeter in front of the medial and lateral ankles. If there is a difference in the length of the lower limbs, the shortening will be compensated under the orthosis. In the optimized combination, the shoe is worn with the optimized insole. After fitting, the patient wears the orthosis and shoe and tests are performed.

Category

Rehabilitation

3

Description

Control group: Without intervention

Category

N/A

Recruitment centers

1

Recruitment center

Name of recruitment center

Orthotics and Prosthetics Clinic, Faculty of Rehabilitation Sciences, Isfahan University of Medical

Full name of responsible person

Saeed Forghany

Street address

Hezar Jerib Street, Faculty of Rehabilitation Sciences, Isfahan University of Medical Sciences

City

Isfahan

Province

Isfahan

Postal code

73461-81746

Phone

+98 31 3792 5096

Fax

+98 31 3668 7270

Email

tavanbakhshi@rehab.mui.ac.ir

Sponsors / Funding sources

1

Sponsor

Name of organization / entity

Esfahan University of Medical Sciences

Full name of responsible person

Gholamreza Askari

Street address

Hezar Jerib Street, Isfahan University of Medical Sciences, Isfahan, Iran

City

Isfahan

Province

Isfahan

Postal code
73461-81746

Phone
+98 31 3792 5096

Fax
+98 31 3668 7270

Email
askari@mui.ac.ir

Grant name

Grant code / Reference number

Is the source of funding the same sponsor organization/entity?
Yes

Title of funding source
Esfahan University of Medical Sciences

Proportion provided by this source
100

Public or private sector
Public

Domestic or foreign origin
Domestic

Category of foreign source of funding
empty

Country of origin

Type of organization providing the funding
Academic

Person responsible for general inquiries

Contact

Name of organization / entity
Esfahan University of Medical Sciences

Full name of responsible person
Saeed forghany

Position
Professor

Latest degree
Ph.D.

Other areas of specialty/work
orthotic and prosthetic

Street address
Hezar Jerib Street, Faculty of Rehabilitation Sciences,
Isfahan University of Medical Sciences, Isfahan

City
Isfahan

Province
Isfahan

Postal code
73461-81746

Phone
+98 31 3792 5041

Email
Saeed_forghany@yahoo.co.uk

Person responsible for scientific inquiries

Contact

Name of organization / entity
Esfahan University of Medical Sciences

Full name of responsible person
Saeed Forghany

Position
Professor

Latest degree
Ph.D.

Other areas of specialty/work
Orthotic and Prosthetic

Street address
Hezar Jerib Street, Faculty of Rehabilitation Sciences,
Isfahan University of Medical Sciences

City
Isfahan

Province
Isfahan

Postal code
73461-81746

Phone
+98 31 3792 5041

Email
Saeed_forghany@yahoo.co.uk

Person responsible for updating data

Contact

Name of organization / entity
Esfahan University of Medical Sciences

Full name of responsible person
Saeed forghany

Position
Professor

Latest degree
Ph.D.

Other areas of specialty/work
orthotic and prosthetic

Street address
Hezar Jerib Street, Faculty of Rehabilitation Sciences,
Isfahan University of Medical Sciences, Isfahan

City
Isfahan

Province
Isfahan

Postal code
73461-81746

Phone
+98 31 3792 5041

Email
Saeed_forghany@yahoo.co.uk

Sharing plan

Deidentified Individual Participant Data Set (IPD)
Yes - There is a plan to make this available

Study Protocol
Yes - There is a plan to make this available

Statistical Analysis Plan
Yes - There is a plan to make this available

Informed Consent Form
Yes - There is a plan to make this available

Clinical Study Report
Yes - There is a plan to make this available

Analytic Code
Not applicable

Data Dictionary

Not applicable	Information will be shared for teaching and research of applicants. Dr. Forghani (responsible administrator) will review the applications.
Title and more details about the data/document	From where data/document is obtainable
Study information (other than personal information) will be shared with other researchers.	Individuals can request information from the designated responsible person.
When the data will become available and for how long	What processes are involved for a request to access data/document
Information is shared after results or data summaries are printed.	Applications should be sent via email to Saeed_forghany@yahoo.co.uk.
To whom data/document is available	Comments
Information will be shared for academic purposes only.	
Under which criteria data/document could be used	