

# The effect of leg inequality on pelvic and hip kinematics in children

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<b>Registration date</b> 01/02/2018	<b>Overall study status</b> Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
<b>Last Edited</b> 30/01/2018	<b>Condition category</b> Musculoskeletal Diseases	<input type="checkbox"/> Individual participant data <input type="checkbox"/> Record updated in last year

## Plain English summary of protocol

### Background and study aims

Unequal leg length affects between 40% and 70% of the population and is classified into two groups: a) anatomical discrepancy, when the inequality is caused by a difference in the length of the bones and can affect children from birth, and b) functional discrepancy, when the inequality is caused by muscle tightness or weakness. It is thought that having legs of different lengths alters the way in which children walk and is thought to cause pain, lower back problems and arthritis in the future. Alder Hey Children's Hospital Orthopaedic department has a regional limb reconstruction service where children with leg length inequality undergo equalisation surgery. The aim of surgery is based on the assumed concept that inequality is detrimental to the child and may lead to problems in the future, but it is invasive and comes with associated risks. There is a gap in the current knowledge and only two studies were found which investigated the effect of unequal leg length on walking in children, and both identified that walking was altered but did not specify how. Modern medicine should be evidence based, therefore this study aims to provide information to inform surgeons on the impact of leg length inequality on children, which may help inform surgical decision making.

### Who can participate?

Children aged 7 to 16 who have undergone 3D gait analysis as part of their routine clinical care

### What does the study involve?

As part of their routine clinical care children are assessed in the North Movement Analysis Centre, Alder Hey using the 3D gait analysis system. At the time of assessment informed consent is taken allowing technical and clinical information to be used for research. It is this anonymised information which is used for the study, requiring no further attendance by the children.

### What are the possible benefits and risks of participating?

The study will add to the limited knowledge base by providing data on gait compensations in children with leg length discrepancy. This in turn may inform appropriate surgical management in the future. There are no risks to the participants as their data is collected as part of routine clinical care. Written parental consent is provided at the time of assessment.

Where is the study run from?  
North West Movement Analysis Centre (UK)

When is the study starting and how long is it expected to run for?  
February 2018 to May 2018

Who is funding the study?  
Investigator initiated and funded

Who is the main contact?  
Mr Paul McGrath  
paul.mcgrath@alderhey.nhs.uk

## Contact information

**Type(s)**  
Public

**Contact name**  
Mr Paul McGrath

**Contact details**  
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## Additional identifiers

**Integrated Research Application System (IRAS)**  
237648

**Protocol serial number**  
IRAS project ID: 237648

## Study information

**Scientific Title**  
What is the effect of an idiopathic leg length discrepancy on coronal plane pelvis and hip kinematics in children during walking?

**Study objectives**  
The study hypothesis is that there will be a change in pelvic and hip coronal plane gait kinematics in children with a leg length discrepancy compared to normal gait kinematics. The change that occurs will be increased pelvic obliquity and associated increased hip adduction on the longer side.

**Ethics approval required**

Old ethics approval format

**Ethics approval(s)**

Ethics Board London-Bromley, 12/01/2018, REC ref: 18/LO/0093

**Study design**

Retrospective case control study

**Primary study design**

Observational

**Study type(s)**

Other

**Health condition(s) or problem(s) studied**

Idiopathic leg length discrepancy

**Interventions**

This retrospective case control study will analyse coronal plane pelvic and hip kinematic data during normal walking in children with a leg length discrepancy (>2cm defined radiologically). Prior to 3D data capture all patients undergo a full lower limb physical exam comprising of leg length measurement, range of movement measurement using goniometry and muscle strength testing. 3D gait data is collected as part of routine clinical care using a 12 camera 340Hz 3D gait analysis system and BTS Smart Capture software (BTS Bioengineering, Milan). 22 reflective markers are placed on patients in line with the conventional gait model Davis heel protocol. Subjects walk at a self-selected speed across a 10 metre walk way and a minimum of 6 walking trials are collected. For data analysis, data from 5 trials are selected for processing using BTS Smart Analyser software; 1 gait cycle per left and right leg is manually defined. Data from the 5 trials are then averaged generating single kinematic graphs for the left and right legs. Coronal plane pelvic and hip kinematic data from each subject that has been converted to text files will be added to a database containing the data of all participants. Data is anonymised and participants will be given unique identifiers prior to input into the database. Mean pelvic and hip kinematics for the participant sample will be generated and compared to the NWMAC normal database. Correlation between leg length discrepancy and gait abnormality at the pelvis and hip will be investigated.

**Intervention Type**

Other

**Primary outcome(s)**

Coronal plane joint range of motion at the pelvis and hip, measured in degrees using a 3D gait analysis system. The measurements are obtained once at the patients attendance at the North West Movement Analysis Centre, Alder Hey as part of their routine clinical care.

**Key secondary outcome(s)**

The amount of leg length discrepancy as a percentage of total height (leg length is measured using a tape measure and recorded in centimetres) at the time of attendance at NWMAC

**Completion date**

25/05/2018

## Eligibility

### Key inclusion criteria

1. Aged between 7 to 16 years
2. Undergone 3D gait analysis as part of their routine clinical care
3. Written parental consent for their data to be used for research purposes
4. No previous orthopaedic surgery

### Participant type(s)

Patient

### Healthy volunteers allowed

No

### Age group

Child

### Lower age limit

7 years

### Upper age limit

16 years

### Sex

All

### Key exclusion criteria

1. Neurological disorder
2. Hip pathology
3. Hip muscle contractures
4. Hip pain
5. Fixed scoliosis
6. Spinal pathology

### Date of first enrolment

05/02/2018

### Date of final enrolment

16/02/2018

## Locations

### Countries of recruitment

United Kingdom

England

**Study participating centre**  
**North West Movement Analysis Centre**  
Alder Hey Children's NHS Foundation Trust  
Eaton Road  
Liverpool  
United Kingdom  
L12 2AP

## Sponsor information

**Organisation**  
University of Salford

**ROR**  
<https://ror.org/01tmqtf75>

## Funder(s)

**Funder type**  
Other

**Funder Name**  
Investigator initiated and funded

## Results and Publications

### Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study are/will be available upon request from Paul McGrath ([paul.mcgrath@alderhey.nhs.uk](mailto:paul.mcgrath@alderhey.nhs.uk)).

**IPD sharing plan summary**  
Available on request

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">HRA research summary</a>			28/06/2023	No	No
<a href="#">Participant information sheet</a>	Participant information sheet	11/11/2025	11/11/2025	No	Yes