The influence of childhood obesity on spatio-temporal gait parameters

Author: Montes Alguacil, Jesús
Overweight and obesity in 6–12 year old children in Switzerland

Michael B. Zimmermann, Corina Häberli, Claudia Pintzer, Luciano Molinari

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2 Institute for Pharmaceutical Science, Swiss Federal Institute of Technology, Zurich, Switzerland
3 Department of Growth and Development, University Children's Hospital, Zurich, Switzerland

Global prevalence and trends of overweight and obesity among preschool children

Mercedes de Onis, Monika Bööckner, Elaine Borghi


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INTRO

Changes of intersegment angular motion of the body during gait.
Strutzenberger G. 2011; Shultz SP. 2014; Mahaffey R. 2016

Progression of angular deformities in varus/valgus of the knee.
Mc Millan AG. 2010

An increased risk of osteoarthritis in adulthood.
Strutzenberger G. 2011; Shultz SP. 2014 Clin.

A less walking stability in obese children than those with normal weight.
Yan S. 2013

Obese children need to produce more energy in the joints of lower limbs.
Shultz SP. 2014

Other...

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Childhood Obesity and Gait Parameters

INTRO  METHODS  RESULTS  DISCUSSION  CONCLUSION

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Childhood Obesity and Gait Parameters

INTRO

METHODS

RESULTS

DISCUSSION

CONCLUSION

Optogait Photoelectric System

CIRCUMSTANCES OF THE STUDY

A LARGE SAMPLE SIZE

CHILDREN WALKING OVERGROUND AT SELF-SELECTED VELOCITY

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Ethical Issues:

Parents provided signed consents.

Ethics Committee of the University of Malaga. CEUMA 91/2016-H)

Declaration of Helsinki.
Participants:

N=238 participants, 7 to 11 years old

Inclusion/Exclusion criteria

Primary schools.
Childhood Obesity and Gait Parameters

INTRODUCTION

METHODS

RESULTS

DISCUSSION

CONCLUSION

Data Collection:

Anthropometric variables.

Body Mass Index. Classification. Sobradillo 2004

<table>
<thead>
<tr>
<th>Age(y)</th>
<th>n (%)</th>
<th>Underweight (n/%)</th>
<th>Normalweight (n/%)</th>
<th>Overweight (n/%)</th>
<th>Obese (n/%)</th>
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</thead>
<tbody>
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<td>-</td>
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</table>

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Data Collection:

Spatio-temporal variables were collected by Optgait system

- Stance phase
- Swing phase
- Single support
- Double support
- Step length
- Step time
- Load response phase
- Pre-swing phase
- Contact phase
- Foot flat phase
- Propulsive phase
- Gait cycle
- Stride length
- Speed
- Acceleration
- Cadence
- Total distance.
Statistical Analysis:

Exploratory analysis by Kolmogorov-Smirnov

Bivariante analysis by Student`s Test

Multivariante by ANOVA

In addition…

Levene Test
Browne-Forsythe Test (Robustness)
Bonferroni Test (Post-hoc)
### Anthropometric characteristics of the sample by gender.

<table>
<thead>
<tr>
<th></th>
<th>95% Confidence Interval</th>
<th>Mean</th>
<th>Lower</th>
<th>Upper</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
<th>S. Err.</th>
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<td></td>
<td></td>
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<td></td>
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No statistical differences related to spatial parameters.

Temporal parameters with p<0.05 in obese and overweight children.

- Stance phase
- Swing phase
- Single support
- Double support
- Step length
- Step time
- Load response phase
- Pre-swing phase
- Contact phase
- Foot flat phase
- Propulsive phase
- Gait cycle
- Stride length
- Speed
- Acceleration
- Cadence
- Total distance.
Childhood Obesity and Gait Parameters

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Temporal parameters with p<0.05 in obese and overweight children.

- **Stance phase**
  - Step length
  - Step time
  - Load response phase
  - Pre-swing phase

- **Swing phase**
  - Single support
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  - Foot flat phase
  - Propulsive phase

- **Gait cycle**
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  - Speed
  - Acceleration
  - Cadence
  - Total distance

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Childhood Obesity and Gait Parameters

<table>
<thead>
<tr>
<th>Phases of gait with significant differences in relation to BMI</th>
<th>95% Confidence Interval</th>
<th>Dependent Variables</th>
<th>Mean Difference</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
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</tbody>
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PREVIOUS STUDIES. SIGNIFICANT RESULTS:

3-D Analysis and Force platforms:

Stance phase, Step width, Pre-swing phase


Photoelectric systems:

Stance phase, Pre-swing phase

Beulertz J. 2016, Galli M. 2015

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Childhood Obesity and Gait Parameters

Gait strategy with obesity:

- Optimization of energy consumption
- Balance stabilization
- Prevention of falls.

D’Hondt E. 2011
Pau M. 2012
Yan S. 2013
Pathare N. 2015
Villarrasa-Sapiña I. 2016

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Childhood Obesity and Gait Parameters

Obesity influences Spatio-temporal Gait Parameters of Children

STANCE PHASE

PRE-SWING  LOAD RESPOnde

STABILITY

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Childhood Obesity and Gait Parameters

Thank you!
Childhood Obesity and Gait Parameters