Physical activity in childhood and the association with myopia in adolescence – The CHAMPS Eye Study

Lundberg, Kristian; Vestergaard, Anders Højslet; Jacobsen, Nina; Goldschmidt, Ernst; Peto, Tunde; Wedderkopp, Niels; Grauslund, Jakob

Publication date:
2016

Citation for published version (APA):
Physical activity in childhood and the association with myopia in adolescence – The CHAMPS Eye Study

Kristian Lundberg1,2, Anders Hejazit Vestergaard1,2, Nina Jacobsen1, Ernst Goldschmidt1, Tunde Peto2,3, Niels Wedderkopp1,3, Jakob Grauslund1,3

1 Department of Ophthalmology, Odense University Hospital, Odense, Denmark; 2 Department of Clinical Research, Faculty of Health Sciences, University of Southern Denmark, Odense, Denmark; 3 Department of Ophthalmology, Rigshospitalet-Glostrup University Hospital, Copenhagen, Denmark; 4 Danish Institute for Myopia Research, Vedbæk, Denmark; 5 National Institute for Health Research Biomedical Research Centre at Manchester Eye Hospital NHS Foundation Trust and University of Manchester; 6 Centre of Research in Childhood Health, Institute of Sports Science and Clinical Biomechanics, University of Southern Denmark, Odense, Denmark; 7 Sport medicine clinic, The Orthopedic Department, Hospital of Middelfart, Institute of Regional Health Services Research, University of Southern Denmark, Middelfart, Denmark.

Presentation number: 2471

Purpose
- To investigate the effect of physical activity (PA) on the development of myopia in a Danish cohort of schoolchildren

Design and methods
- A prospective cohort study with 198 school children.
- Baseline - August to October 2010
- PA assessed with GT3X accelerometer (ActiGraph) worn at least 10 hours/day, minimum 4 days and 1 weekend day
- PA measure: mean counts/min
- Cut off-points for the PA intensity levels:
  - Sedentary (SED) ≤ 100 counts/min
  - Light (L) > 100 counts/min
  - Moderate (M) ≥ 2296 counts/min
  - Vigorous (V) ≥ 4012 counts/min

Baseline Axial length

Follow-up - March to May 2015
- Examination at Department of Ophthalmology, Odense, Denmark, including:
  - Autorefration in cycloplegia and Keratometry (Tonoref II, Nidek)
  - Biometri (axial length (AL) (Lenstar LS 900, Haag Streit)
- Results are calculated at follow-up

Baseline Axial length

Results
- Mean age was 15.5 years (range 14.2-17.5)
- 50% were male
- Mean axial length: 23.4±0.94mm
- Mean spherical refractive error (RE):
  - +0.69±1.54 dioptr (D)
  - 11% were myopic (RE ≤ 0.5 D)
- Mean spherical equivalent (SE): 0.5±1.50D
- 15% were myopic (SE ≤ 0.5 D)
- 10% increment in M-PA-time was predictive of a decrease in AL of 1.2 mm (p<0.01) and an increase in SE of 1.50 (p<0.01)
- Each 10% increment in SED-PA prompt a 0.3 mm longer AL (P<0.01) and a -0.4D increment of the SE (P<0.05)

Conclusion
- Increased level of physical activity was associated with refractive error and a shorter axial length for sedentary and moderate physical activity, consistent with theory.

Background
- Myopia is the most frequent eye disease globally
- Caused by axial growth of the eye during childhood
- Lifestyle changes, reduced physical activity and time spent outdoors are thought to be the driving force behind the rapid increase of myopia worldwide
- This is a sub-study of the Childhood Health, Activity, and Motor Performance Study Denmark (CHAMPS)

Corresponding author
Kristian Lundberg, MD, PhD-student
Phone: +45 6541 3196
E-mail: lars.kristian.lundberg@rsyd.dk

Commercial relationship
The authors have no conflict of interest to disclose
KL: Travel Grant from Novartis and The Institute of Clinical Research, University of Southern Denmark, Odense, Denmark. TP: funded by The NIHR BMRC, London, United Kingdom.

Table: Characteristics of Study Population of 198 children at follow-up

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>15.5</td>
<td>0.71</td>
<td>14.3-17.5</td>
</tr>
<tr>
<td>Sex (Male), n (%)</td>
<td>99 (50)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Axial length, mm</td>
<td>23.4</td>
<td>0.94</td>
<td>20.1-25.9</td>
</tr>
<tr>
<td>RE, D*</td>
<td>0.69</td>
<td>1.54</td>
<td>-6.25 – 7.5</td>
</tr>
<tr>
<td>SE, D**</td>
<td>0.5</td>
<td>1.50</td>
<td>-7.12 - 5.37</td>
</tr>
<tr>
<td>Myopia, n (%) ***</td>
<td>30 (15)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

PA***
- SED PA, % 63.3 | 5.79 | 48.2-75.9 |
- L PA, % 28.3 | 4.16 | 17.6-40.4 |
- M PA, % 5.1 | 1.56 | 2.2-9.4 |
- V PA % 3.2 | 1.47 | 0.7-8.7 |

Data are presented as the mean, SD, range or n(%). Right eye only.
*Refractive error.
**Spherical equivalent.
***Myopia: SE ≤ -0.50.

Figure 1-4: Prediction from linear regression analyses. Axial length (y-axis) by physical activity (x-axis). 1-4 shows increasing levels of physical activity from sedentary to vigorous. *Statistical significant.

Commercial relationship
The authors have no conflict of interest to disclose
KL: Travel Grant from Novartis and The Institute of Clinical Research, University of Southern Denmark, Odense, Denmark. TP: funded by The NIHR BMRC, London, United Kingdom.