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

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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

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

Results

- Results are calculated at follow-up
- 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 diopter (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 1.5D (p<0.01)
- Each 10% increment in SED-PA prompt a 0.3 mm longer AL (P<0.05) 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 School Study Denmark (CHAMPS)

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 to 7.5</td>
</tr>
<tr>
<td>SE, D*</td>
<td>0.5</td>
<td>1.50</td>
<td>-7.12 to 5.37</td>
</tr>
<tr>
<td>Myopia, n (%)</td>
<td>30 (15)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SED PA, %</td>
<td>63.3</td>
<td>5.79</td>
<td>48.2-75.9</td>
</tr>
<tr>
<td>L PA, %</td>
<td>28.3</td>
<td>4.16</td>
<td>17.6-40.4</td>
</tr>
<tr>
<td>M PA, %</td>
<td>5.1</td>
<td>1.56</td>
<td>2.2-9.4</td>
</tr>
<tr>
<td>V PA %</td>
<td>3.2</td>
<td>1.47</td>
<td>0.7-8.7</td>
</tr>
</tbody>
</table>

Data are presented as the mean, SD, range or n(%). Right eye only.

*Refractive error.
**Spherical equivalent.
***Myopia: SE ≤ 0.5D.
****Mean time spent on PA for each activity level (%).

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.