PHYSICAL ACTIVITY IN STUDENTS UNDER HEAVY ACADEMIC BURDEN

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The Programme for International Student Assessment (PISA) is a triennial international survey which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students. To date, students representing more than 70 economies have participated in the assessment.
PISA 2012 Results

“ What 15-year-olds know and what they can do with what they know ”

- 65 participating countries and economies, 510 000 students between the ages of 15 - 3 years and 16 – 2 years
- Assessment of mathematics, reading, science and problem-solving minor areas
"The academic pressure and burden of Chinese students are the heaviest around the world."

Average number of hours per week spent doing homework by Source: PISA in Focus 46, OECD
Lack of physical activity (PA)

The physical health of Chinese student is getting worse constantly

1995-2005 the incidence of myopia

2008 the rate of 50-meter run
从1985年起，我国共进行了4次全国青少年体质健康调查。体质监测数据表明，尽管青少年的营养和发育水平不断提高，但青少年学生的相关体能素质指标近20年来却持续下降；

- 85%学生在选择专业时受到限制；
- 63.7%高中学生不合格参军；
- 2/3青少年视力不良；
- 1/4城市儿童肥胖和超重；
- 85%的城市青少年体质健康发展调查；
Cost comparison of average annual direct medical costs per active vs inactive person, subdivided by various factors like physical activity level, physical limitation status, and smoking category (A), and a similar comparison by sex and age-group of active and inactive persons, grouped by smoking status (B). All subjects in part B had no physical limitations.

**DIFF** = Cost savings of active persons over their inactive counterparts in each category. Figures in parentheses are negative numbers. CI = 95% confidence interval. Negative numbers are in parentheses.
The benefits of physical health from physical activity in children

1. To promote the growth of bone and height
2. To exercise the limbs of children and strengthen their muscle
3. To improve the function of heart and lung, accelerate blood circulation, strengthen metabolism
4. To increase the peristalsis of stomach, enhance gastrointestinal digestion so that appetite could increase and nutrient could be absorbed completely
5. To promote the development of nervous system
6. To help children better adapt the change of external environment and prevent diseases
The benefits of mental health from physical activity in children

1. To overcome inferiority and enhance self-confidence
2. To ease the pressure and make up for psychological defects
3. To Shape the children's character of cheerful, lively and optimist ;
4. To develop the habit of cooperation with others and the behavior of obeying rules to be more suitable for society
World Health Organization (WHO)

RECOMMENDED LEVELS OF PHYSICAL ACTIVITY FOR HEALTH

5–17 years old

For children and young people of this age group physical activity includes play, games, sports, transportation, recreation, physical education or planned exercise, in the context of family, school, and community activities. In order to improve cardiorespiratory and muscular fitness, bone health, cardiovascular and metabolic health biomarkers and reduced symptoms of anxiety and depression, the following are recommended:

1. Children and young people aged 5–17 years old should accumulate at least 60 minutes of moderate-to vigorous-intensity physical activity daily.
2. Physical activity of amounts greater than 60 minutes daily will provide additional health benefits.
3. Most of daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone, at least 3 times per week.
### Daily Average for the Time Distribution of Physical Exercise in Chinese Urban and Rural Han Students in 2010

<table>
<thead>
<tr>
<th>Age Group</th>
<th>9 - 13 Years</th>
<th>13 - 16 Years</th>
<th>16 - 19 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>&lt;30 min</td>
<td>30 - 60 min</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>31,287</td>
<td>17.7</td>
<td>47.4</td>
</tr>
<tr>
<td>Girls</td>
<td>31,834</td>
<td>19.5</td>
<td>49.8</td>
</tr>
<tr>
<td>Urban/Rural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>32,031</td>
<td>16.3</td>
<td>48.7</td>
</tr>
<tr>
<td>Rural</td>
<td>31,090</td>
<td>21.1</td>
<td>48.6</td>
</tr>
<tr>
<td>Nutrition status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wasting</td>
<td>6,493</td>
<td>20.5</td>
<td>48.3</td>
</tr>
<tr>
<td>Normal</td>
<td>48,848</td>
<td>18.8</td>
<td>47.5</td>
</tr>
<tr>
<td>Overweight</td>
<td>6,729</td>
<td>16.8</td>
<td>48.8</td>
</tr>
<tr>
<td>Obesity</td>
<td>4,051</td>
<td>16.8</td>
<td>49.0</td>
</tr>
<tr>
<td>Living region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern</td>
<td>23,311</td>
<td>15.6</td>
<td>46.2</td>
</tr>
<tr>
<td>Middle</td>
<td>17,160</td>
<td>22.8</td>
<td>48.8</td>
</tr>
<tr>
<td>Western</td>
<td>22,641</td>
<td>18.6</td>
<td>51.0</td>
</tr>
<tr>
<td>Social economic status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developed</td>
<td>21,734</td>
<td>17.9</td>
<td>48.2</td>
</tr>
<tr>
<td>Middle-developed</td>
<td>20,879</td>
<td>17.7</td>
<td>47.5</td>
</tr>
<tr>
<td>Undeveloped</td>
<td>20,508</td>
<td>20.4</td>
<td>50.3</td>
</tr>
<tr>
<td>Total</td>
<td>63,121</td>
<td>18.6</td>
<td>48.6</td>
</tr>
</tbody>
</table>

The prevalence rates of each group:
- **9 - 13 years**: 32.7%
- **13 - 16 years**: 20.7%
- **16 - 19 years**: 12.5%

Nationwide in 2010, 22.7% of the students had been physically active doing any kind of physical activity for a total of at least 60 minutes per day.

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Song, Y., et al. [Current situation and cause analysis of physical activity in Chinese primary and middle school students in 2010]. Beijing Da Xue Xue Bao, 2012. 44(3):347-54
Physical Fitness in Chinese children is not optimistic

Academic performance scores are giving higher priority over physical activity
The high concern of academic success in parents, teachers and children is one of the important factors that lead to the lack of physical activity.

Current research findings:
Physical activity would not compromise or even positively associated with academic performance.
A control study on the capacity of learning after reading and exercise among children with ADHD and normal children indicated that:
Both children with ADHD and healthy control children exhibited enhanced performance after exercise on tests of reading comprehension and arithmetic compared with after the seated reading condition.

A cross-sectional study demonstrated that:
Children with higher aerobic fitness levels also have larger hippocampal volumes compared to lower-fitness children. Furthermore, larger hippocampal volumes were associated with superior relational memory task performance.

Our Research

Shanghai Children’s Health, Education and Lifestyle Evaluation (the SCHEDULE study, 2014)

- Students and parents questionnaire
- Teachers questionnaire
- Physical examination
- Collection of examination results

- Risk factors
  - Physical health
  - Mental health
  - Academic achievement
  - The social and economic situation
  ...

- Object of research
  - Grade 1-5 pupils in Shanghai

- Multistage Cluster Sampling
  - 7 regions, 21 schools

- Sample size
  - 17620 questionnaires were issued and 17368 were taken back with response rate 98.5%

Our Research

Result

Physical Activity (Vigorous, moderate and low intensity)

Positive correlation

academic achievement

Our Research

Associations between screen time, physical activity and academic performance

When screen time is greater than or equal to 2 hours, the positive relationship between sports and academic achievement was almost counteracted completely.

When screen time is less than 2 hours, the positive relationship is still maintained, and it is not significant to be affected by the length of screen time.

Linear optimization model was applied to get the optimum solution for the time of physical activity, sleeping, screen and homework. The incidence rate of obesity and abnormal psychology in children who follow this optimal schedule is much lower than that of average in Shanghai.

The incidence rate of obesity and abnormal psychology is the lowest in those who spend 2 hours on moderate to intensive physical activity every day.

Note: Optimal allocation: MVPA = 2 hours, Screen = 1 hour, Sleep = 10 hours; Homework = 1 hour
The cohort study of all Swedish men

Change in physical achievement between ages 15 y and 18 y predicted cognitive performance at age 18 y. Moreover, cardiovascular fitness during early adulthood predicted socioeconomic status and educational attainment later in life.

The randomized controlled trial demonstrated a causal effect of a PA program on executive control, and provide support for PA for improving childhood cognition and brain health.
There is converging evidence at the molecular, cellular, behavioral and systems levels that PA participation is beneficial to cognition. Such evidence highlights the importance of promoting PA across the lifespan to reverse recent obesity and disease trends, as well as to prevent or reverse cognitive and neural decline.
THANK YOU

Be Smart, exercise your heart: exercise effects on brain and cognition