MORE PHYSICAL ACTIVITY AND LESS SITTING IN CHILDREN: WHY AND HOW?

CARDON G, DE CRAEMER M, DE BOURDEAUDHUIJ I, VERLOIGNE M.

PROF. G. CARDON
Department of Movement and Sports Sciences
Ghent University
BELGIUM
Lecture Oct 17th, 2014, CIAPSE, Luik

MORE PHYSICAL ACTIVITY AND LESS SITTING IN CHILDREN

- Part 1: WHY?
- Part 2: HOW?
- Part 3: CONCLUSIONS
Bone density
- Tracking
- Healthy weight
- Motor development
- (Academic Achievement)

“Senile osteoporosis is a pediatric disease”

Charles E. Dent, 1972


LAPPE ET AL., 2014

N = 2014 (5-19 years old-US)
Evaluated annually for 6 years (7 visits)

- Bone Mineral Content (Dual-Energy X-ray Absorptiometry (DXA))
- Calcium intake (Food frequency questionnaire)
- Physical activity: self-reports (37 weight bearing activities, e.g. walking, basketball, dance – times of participation last week)

Physical activity ↑ → Bone Mineral Content ↑
after adjustment for calcium intake

No differential effects according to maturational stage
- Bone density
- **Tracking**
- Healthy weight
- Motor development
- (Academic Achievement)

Blair et al. 1989
Tracking of physical activity from early childhood through youth into adulthood.

Telama R¹, Yang X, Leskinen E, Kankaanpää A, Hirvensalo M, Tammelin T, Wikari JS, Raitakari OT.

Telama et al., 2014

- N = 3596 (3-18 years old)

PA at ages 3 and 6 predicted PA in youth and young adulthood

- “Physically active lifestyle starts to develop very early in childhood”

- “Stability of PA is moderate to high from youth to adulthood”
Bicycling to School During the Transition From Childhood Into Adolescence: A Six-Year Longitudinal Study

Greet M. Cardon, Lea R.D. Maes, Leen L. Haerens, and Ilse M.M. De Bourdeaudhuij
Ghent University

<table>
<thead>
<tr>
<th>Year</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>n=1670</td>
</tr>
<tr>
<td>2003</td>
<td>n=1557</td>
</tr>
<tr>
<td>2004</td>
<td>n=1151</td>
</tr>
<tr>
<td>2005</td>
<td>n=807</td>
</tr>
<tr>
<td>2008</td>
<td>n=798</td>
</tr>
</tbody>
</table>

% of children cycling to school:

- Age 10: 30%
- Age 11: 46%
- Age 12: 55%
- Age 13: 58%
- Age 16: 60%
### Prediction of Cycling to School at Age 16

<table>
<thead>
<tr>
<th>Age</th>
<th>Yes (%)</th>
<th>Odds Ratio (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>29.8%</td>
<td>2.0 (1.4, 2.8)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>11</td>
<td>45.6%</td>
<td>2.2 (1.6, 2.9)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>12</td>
<td>55.2%</td>
<td>15.0 (10.3, 21.8)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>13</td>
<td>58.3%</td>
<td>22.3 (14.0, 34.8)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

- Bone density
- Tracking
- **Healthy weight**
- Motor development
- (Academic Achievement)
- Bone density
- Tracking
- Healthy weight
- **Motor development**
- (Academic Achievement)

**PA promotion and motor development**

![Diagram](image)

*Figure 1: Developmental mechanisms influencing physical activity trajectories of children.*

Stodden et al., 2008
- Bone density
- Tracking
- Healthy weight
- Motor development
- (Academic Achievement)
SEDENTARY BEHAVIOUR

Strong evidence for obesity
Moderate evidence for blood pressure, cholesterol, self-esteem, social behavior problems, physical fitness and academic achievement

Moderate evidence for SB may be an important determinant of health
The relationship depends on type of SB and age

How (in)active and sedentary are children?
HOW MEASURING PA/SB IN CHILDREN?

- Pedometers
  Yamax Digi-walker pedometer TYPE SW-200

- Accelerometers

To measure children’s PA in different domains:

- Active transport to school
- PA at school (physical education, during recess)
- Sports during leisure
- Walking for transportation during leisure
FPAQ = Flemish Physical Activity Questionnaire

- Reliability and validity
  - Concurrent validity: correlation coefficients FPAQ and objective accelerometer data

<table>
<thead>
<tr>
<th></th>
<th>With parental assistance</th>
<th>Without parental assistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall MVPA</td>
<td>0.312</td>
<td>0.222</td>
</tr>
</tbody>
</table>

- More valid and reliable with parental assistance

How (in)active and sedentary are children?
**ENERGY-PROJECT 10-12 YEAR OLDS**

**VERLOIGNE ET AL, 2012**

Mean minutes of MVPA per day

![Bar chart showing mean minutes of MVPA per day across different countries with P<0.001.]

- Belgium: 35 min
- Greece: 34 min
- Hungary: 37 min
- The Netherlands: 33 min
- Switzerland: 45 min

**VERLOIGNE ET AL, 2012**

Mean minutes of sedentary time per day

![Bar chart showing mean minutes of sedentary time per day across different countries with P<0.001.]

- Belgium: 8u 10 min
- Greece: 8u 34 min
- Hungary: 8u 11 min
- The Netherlands: 7u 36 min
- Switzerland: 7u 59 min
TOYBox – study, 3-5 year olds

Physical activity

- Steps per weekday
- Steps per weekend day

- Belgium (Be)
- Bulgaria (Bu)
- Germany (Ge)
- Greece (Gr)
- Poland (Po)
- Spain (Sp)

Sedentary time

- Min/day

- TV weekday
- TV weekend day
- Computer weekday
- Computer weekend day

- Belgium (Be)
- Bulgaria (Bu)
- Germany (Ge)
- Greece (Gr)
- Poland (Po)
- Spain (Sp)
MORE PHYSICAL ACTIVITY AND LESS SITTING IN CHILDREN

- Part 1: WHY?
- Part 2: HOW?
- Part 3: CONCLUSIONS
“Investments that work for PA”

2. *Transport* policies and systems that prioritise walking, cycling and public transport.
3. *Urban design* regulations and infrastructure that provide for equitable and safe access for recreational physical activity, and recreational and transport-related walking and cycling across the life course.
4. Physical activity and Non Communicable Disease (NCD) prevention integrated into primary *health care* systems.
5. *Public education*, including mass media to raise awareness and change social norms on physical activity.
6. *Community-wide programs* involving multiple settings and sectors and that mobilize and integrate community engagement and resources.
7. Sports systems and programs that promote *‘sport for all’* and encourage participation across the life span.

---

### Components of a PA promoting school

<table>
<thead>
<tr>
<th>Components of a PA promoting school</th>
<th>% of schools implementing (241 elementary schools)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE lessons at least once a week</td>
<td>100%</td>
</tr>
<tr>
<td>PA also approached in other subjects than PE</td>
<td>86%</td>
</tr>
<tr>
<td>Sports fields and materials available during breaks</td>
<td>72%</td>
</tr>
<tr>
<td>Organized sports / PA during lunch break</td>
<td>57%</td>
</tr>
<tr>
<td>Promotion of active transport</td>
<td>42%</td>
</tr>
<tr>
<td>Organized after school sports / PA</td>
<td>31%</td>
</tr>
</tbody>
</table>
### Components of a PA promoting school

<table>
<thead>
<tr>
<th>Component</th>
<th>% of schools implementing (241 elementary schools)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE lessons at least once a week</td>
<td>100%</td>
</tr>
<tr>
<td>PA also approached in other subjects than PE</td>
<td>86%</td>
</tr>
<tr>
<td>Sports fields and materials available during breaks</td>
<td>72%</td>
</tr>
<tr>
<td>Organized sports / PA during lunch break</td>
<td>57%</td>
</tr>
<tr>
<td><strong>Promotion of active transport</strong></td>
<td>42%</td>
</tr>
<tr>
<td>Organized after school sports / PA</td>
<td>31%</td>
</tr>
</tbody>
</table>

**DROP-OFF SPOTS**

- locations within feasible *walking distance* from school
- parents can *drop off/pick up* child
- *walk to or from school* (independently or under adult supervision)
- Opportunity for *children living further* than feasible walking/cycling distance from school

Van Wollegem et al, 2014
**DROP-OFF SPOTS**

**FEASIBILITY**
- Adult supervision necessary
  - 50% parents: only supervision needed for youngest children (6-9 y)

**INTERVENTION EFFECTS**
- Positive significant intervention effects:
  - + 732 step counts before and after school/day
  - + 2 walking trips/week
- No intervention effect for total step counts/day

**PROCESS EVALUATION**
- positively perceived by school principals and parents
- teachers expressed doubts

---

**Components of a PA promoting school**

<table>
<thead>
<tr>
<th>Components of a PA promoting school</th>
<th>% of schools implementing (241 elementary schools)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE lessons at least once a week</td>
<td>100%</td>
</tr>
<tr>
<td>PA also approached in other subjects than PE</td>
<td>86%</td>
</tr>
<tr>
<td>Sports fields and materials available during breaks</td>
<td>72%</td>
</tr>
<tr>
<td>Organized sports / PA during lunch break</td>
<td>57%</td>
</tr>
<tr>
<td>Promotion of active transport</td>
<td>42%</td>
</tr>
<tr>
<td>Organized after school sports / PA</td>
<td>31%</td>
</tr>
</tbody>
</table>
After school sport participation in Flanders
De Meester A et al, 2014

Elementary (5th – 6th grade)  Secondary

- 53%  n=554
- 24%  n=254
- 8%   n=81
- 15%  n=168
- 12%  n=118
- 9%   n=91

- 72%  n=1695

Reduction of playground density

<table>
<thead>
<tr>
<th>Time</th>
<th>Normal</th>
<th>Reduced Playground Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>10h00 – 10h15</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9h45 – 10h00</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>10h00 – 10h15</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>
- Connectivity
- Walkability
- Many crossroads
- High population density

- Dead end streets
- Safety
- Low traffic
- Yard / playground
Play streets

= street that is reserved for children's safe play for a specific period during school vacations
e.g. one week in July and one week in August
14h – 19h

collaboration between the inhabitants of the street and the city council

D’Haese et al, 2014

Effects of play streets on MVPA
Effects of play streets on sedentary time

**UP4FUN INTERVENTION**

http://www.projectenergy.eu

- **Motivating factors:**
  - stickers
  - bracelets

- **Parental involvement:**
  - Newsletters (NEWS)
  - Family Fun Event
  - Quiz with parents and children
The ToyBox-study:
development of a kindergarten-based, family-involved intervention to prevent obesity in 4-6 year old preschoolers
MORE PHYSICAL ACTIVITY AND LESS SITTING IN CHILDREN

- Part 1: WHY?
- Part 2: HOW?
- Part 3: CONCLUSIONS
More physical activity and less sitting in children

Part 3: Conclusions

- What about the implementation?
- What about the policy makers?
PARTICIPATORY APPROACH

- Important to involve the target group during the entire research process
- Participants: strong feeling of self-determination and autonomy
- ‘Participatory researchers’

MORE PHYSICAL ACTIVITY AND LESS SITTING IN CHILDREN

Part 3: Conclusions

- What about the implementation?
- What about the policy makers?
Thank you!