International Children Accelerometer Database

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Nowadays...
Reanalysed data from 66 LMIC and 38 European Countries (GSHS and HBSC)

Overall
World 80.3% Inactive

(Hallal et al, Lancet 2012)

Measuring Physical Activity in Youth – A Challenge

- Physical Activity is a complex behaviour
  - Type
  - Domain
  - Frequency
  - Duration
  - Intensity
  - Volume
Measuring Physical Activity in Youth – A Challenge

- Physical Activity is highly variable

Objective measurement of levels and patterns of physical activity

Chris J Riddoch, Calum Mattocks, Kevin Deere, Jo Saunders, Jo Kirkby, Kate Tilling, Sam D Leary, Steven N Blair, Andy R Ness

Cut-point = 3600 cpm
MVPA = 4 METs

(N=2662) (N=5595) (N=2933)

(Riddoch et al, Arch Dis Child, 2008)
7 to 8 year old UK children (N=6497)
- PA measured for 10 h for ≥ 2 days
- MVPA > 2241 cpm
- SED < 100 cpm
- Median MVPA time 60 min/d
- Median SED time 6.4 h/d

38% of girls and 63% of boys were active according to PA recommendations

(Griffiths et al, BMJ Open 2013)

**Interpretation of objective activity data – also a challenge**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Design</th>
<th>Setting</th>
<th>Age</th>
<th>MVPA threshold</th>
<th>MVPA definition</th>
<th>Prevalence sufficiently active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riddoch et al (14)</td>
<td>Cross-sectional (N=2105)</td>
<td>Denmark, Estonia, Norway, Portugal</td>
<td>9–15 years</td>
<td>8 years: ≥1000 cpm</td>
<td>23 METs</td>
<td>8 years: boys, 97.4%; girls, 93.2%</td>
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<tr>
<td>9 years: ≥1000 cpm</td>
<td>15 years: ≥1000 cpm</td>
<td>15 years: boys, 81.0%; girls, 62.2%</td>
<td>8 and 11 years: &gt;45% (weekdays)</td>
<td>12 years: 0.3% (weekdays)</td>
<td>13 years: 10.5% (weekdays)</td>
<td></td>
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<tr>
<td>Nader et al (15)</td>
<td>Longitudinal (N=1032)</td>
<td>USA</td>
<td>9–15 years</td>
<td>Age dependent*</td>
<td>23 METs</td>
<td>6–11 years: boys, 48.8%; girls, 34.7%</td>
</tr>
<tr>
<td>Tkaczyk et al (16)</td>
<td>Cross-sectional (N=1779)</td>
<td>USA</td>
<td>6–19 years</td>
<td>Age dependent**</td>
<td>26 METs</td>
<td>12–19 years: boys, 11.9%; girls, 3.6%</td>
</tr>
<tr>
<td>16–19 years: boys, 10.0%; girls, 5.4%</td>
<td>0.4% - 97.4%</td>
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</table>

(Ekelund et al, BJSM 2011)
ICAD – A pooling Project

- Funding from the National Prevention Research Initiative:

The Opportunity

1. Accelerometry – increased precision of PA measurement
2. Accelerometers used in large children’s studies
3. An ‘instrument of choice’ has emerged
4. Relatively standardised protocols
5. A ‘pooling’ project is therefore feasible
Advantages of pooling data

• Cost effective
• Increased analytical power - ‘meta-analysis using individual data’
• Socio-cultural diversity – a more heterogeneous and potentially more representative sample
• Standardize and optimize the analytical methods used in the generation of PA variables
• Open resource for the scientific community

The Process

• ‘Pragmatic’ search for studies with accelerometry
• Approached 24 large studies (N>400)
• 20 agreed to participate
• Obtained individual .dat files through secure FTP drop site
• Telephone interviews
• Reduced to PA variables (www.kinesoft.org)
• Obtained broad range of accompanying variables
  – Phenotypic, Socio-demographic and environmental variables
Inclusion Criteria

- Age <18 years
- Individual .dat files (7164, 71256, GT1M)
- Sex, age, height and weight

Studies – United Kingdom

Movement and Activity
Glasgow Intervention in Children (MAGIC)

Children’s Health and Activity
Monitoring Programme in Schools
(CHAMPS (UK))

Avon Longitudinal Study of
Parents and Children
(ALSPAC)

Personal and Environmental
Associations with Children’s
Health (PEACH)

Sport, Physical activity
and Eating behaviour:
Environmental
Determinants in Young people (SPEEDY)
Studies - Brazil

Pelotas ‘1993’
Birth Cohort

Studies - Australia

Children Living in Active Neighbourhoods (CLAN)
Healthy Eating and Play Study (HEAPS)
Sample size

- N=46,131 files
- 298 (0.6%) Duplicate files removed
- 419 (0.9%) missing age and/or gender
- 219 (0.5%) corrupt files
- Final N (files)=45,190

44,454 viable files

31,976 children
12,022 boys
19,954 girls

Age distribution (repeated measures included)
Evidence based data reduction decisions

Objective Measurement of Physical Activity: Best Practices and Future Directions
July 26-21, 2009 - NIH Main Campus, Natcher Conference Center, Bethesda, MD

Accelerometer Use in Physical Activity: Best Practices and Research Recommendations

Assessing Physical Activity Using Wearable Monitors: Measures of Physical Activity

Best Practices for Using Physical Activity Monitors in Population-Based Research

The ICAD database

PA and Sedentary exposures
Counts/min
Sedentary
Light
Moderate
Vigorous
Bouts
Hourly
Travel
TV
Computer

Confounders/mediators
Age
Gender
Ethnicity
SEP
Puberty
Birthweight
Parental characteristics
Education
Season

Health outcomes
Body Composition
CVD risk factors
Outputs

**International children’s accelerometry database (ICAD): Design and methods**

Lauren B Sherar\(^1\), Pippa Grew\(^2\), Dale W Essiger\(^3\), Ashley R Cooper\(^3\), Ulf Ekelund\(^4,5\), Ken Judge\(^6\) and Chris Riddoch\(^6\)

Sherar et al. BMC Public Health 2011, 11:485

http://www.biomedcentral.com/1471-2458/11/485

![Graph depicting accelerometer data](image)

**Outputs**

**Moderate to Vigorous Physical Activity and Sedentary Time and Cardiometabolic Risk Factors in Children and Adolescents**

![Graphs showing waist circumference, systolic blood pressure, fasting insulin, and triglycerides](image)

(Ekelund et al, JAMA 2012)
**Outputs**

Association between birth weight and objectively measured sedentary time is mediated by central adiposity: data in 10,793 youth from the International Children’s Accelerometry Database


*4-5 additional manuscripts under review*
ICAD – Ongoing

- Existing partners currently contributing additional data (e.g. prospective)
- New partners identified and will be invited during 2015
- Exploring the possibility to combine data from studies using different accelerometer brands (placements?)

http://www.mrc-epid.cam.ac.uk/research/studies/icad/

Take home message

- Pooling objectively measured physical activity from large scale observational studies in youth is feasible and have the opportunity to generate new knowledge about population levels and determinants of sedentary time and physical activity and how these behaviours are associated with health outcomes
Acknowledgements

- Funding from the **National Prevention Research Initiative**: 

- Study participants from the **contributing studies**:

<table>
<thead>
<tr>
<th>Study</th>
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<tr>
<td>ALSPAC</td>
<td>Project TAAG</td>
<td>KISS</td>
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<td>Ballabeina Study</td>
<td>CLAN</td>
<td>MAGIC</td>
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<td>Belgium Pre-school Study</td>
<td>HEAPS</td>
<td>NHANES</td>
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<td>CHAMPS-UK</td>
<td>CoSCIS</td>
<td>PEACH</td>
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<td>CHAMPS US</td>
<td>1993 Pelotas</td>
<td>SPEEDY</td>
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