The International Children Accelerometer Database

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ICAD
International Children's Accelerometry Database

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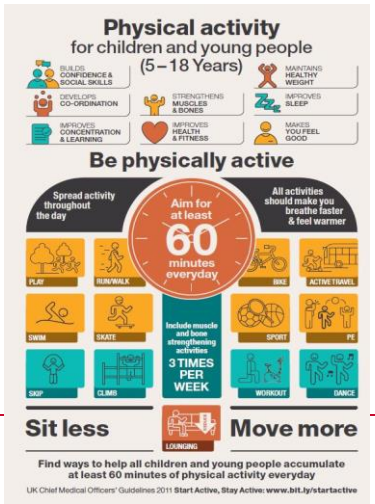
Outline

1. The ICAD history
2. Data Processing (ICAD 1.0 and 2.0)
    a. Standardisation of accelerometer data
    b. Standardisation of correlates
    c. Data access and management
3. Lessons Learned
4. Examples of outputs

Why a pooled data base on childrens physical activity? ICAD 1.0

- **What we knew**



- **What we didn`t know**
  - Population levels and cultural differences
  - Dose-response:
    - Frequency, Intensity, Duration, Mode
  - Inter-relations between movement behaviours, sedentary behaviour and sleep
  - Effect modifiers: population subgroups
  - Correlates and Determinants

Origin of the ICAD

- Established in 2008 with funding from the National Preventative Research Initiative (NPRI) **(£269,622)**
- Collaboration between University of Bath, University of Bristol and the MRC Epidemiology Unit


Chris Riddoch


Ulf Ekelund


Ken Judge


Ash Cooper


Lauren Sherar


Pippa Griew

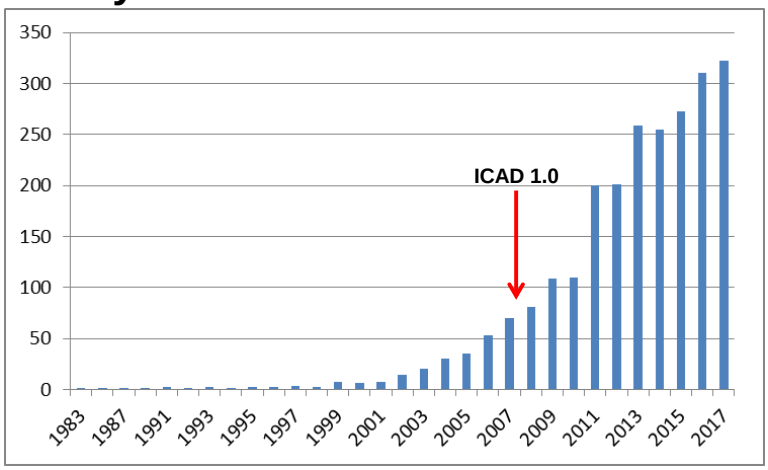
The Opportunity

- Accelerometry – increased precision of physical activity of measurement
- Accelerometers used in a reasonable number of large studies of children
- Waist worn Actigraph monitors was emerging as a tool of choice
- There were relatively standardised protocols for data collection
- Feasible to create a pooled dataset of standardised outcomes

The Potential

- Cost effective
- Increased analytical power - ‘meta-analysis using individual study data’
- Socio-cultural diversity – a more heterogeneous and potentially more representative sample
- Harmonize and optimise the analytical methods used
- Open resource for the scientific community

Published papers that use accelerometers to measure physical activity in children



Search Words physical activ, children, accelerometr**

Pubmed (Feb 16th 2018)

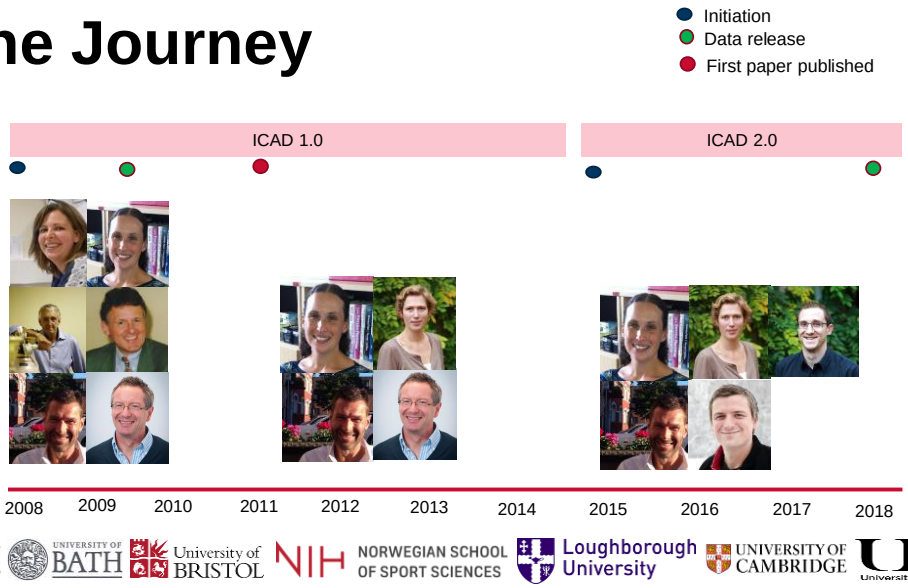
ICAD Objectives

- Pool physical activity data (measured by accelerometry) and associated variables from 14 studies worldwide to create a large, diverse, and contextually rich database.

- Utilise the high level of statistical power to investigate predictors of physical activity and associations with health outcomes in a range of population sub-groups (e.g. gender, minorities, socioeconomic groups, urban/rural communities).

- Use the cultural diversity of the data to generate new models of children's physical activity behaviour, within a 'socio-ecological' framework.

The Journey


Initiation
Data release
First paper published
ICAD 1.0
ICAD 2.0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

ICAD 1.0

- 3-18 years
- >400 sample size (with the exception of preschool)
- Accelerometer data (raw .dat files from 7164, 71256, GT1M)
- Demographic information
- Body composition and metabolic markers
- Socio-economic position (e.g. income, employment)
- Home and family (e.g. parent height/weight, TV viewing)





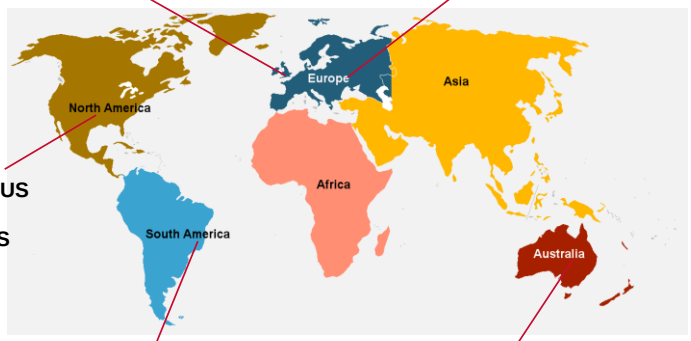
ICAD 1.0 Process

- Pragmatic search for studies which used an Actigraph
- Approached 24 large studies
- 20 agreed to participate

- Obtained .dat files and non accelerometer data through secure server
- Telephone interviews with PIs

PEACH; CHAMPS UK;
SPEEDY; ALSPAC; MAGIC

KISS; Ballabeina; Belgium Preschool study; CoSCIS
EYHS Denmark, Estonia, Norway, Portugal



TAAG
CHAMPS US
IBDS
NHANES

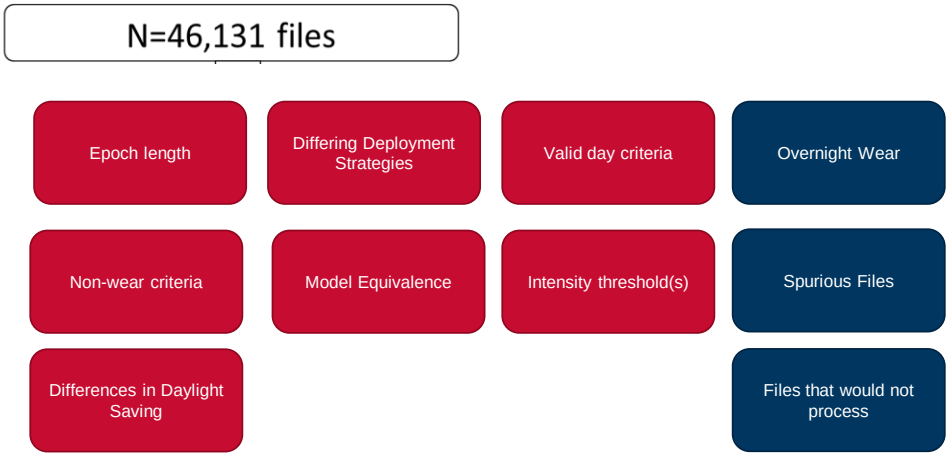
Pelotas

CLAN, HEAPS

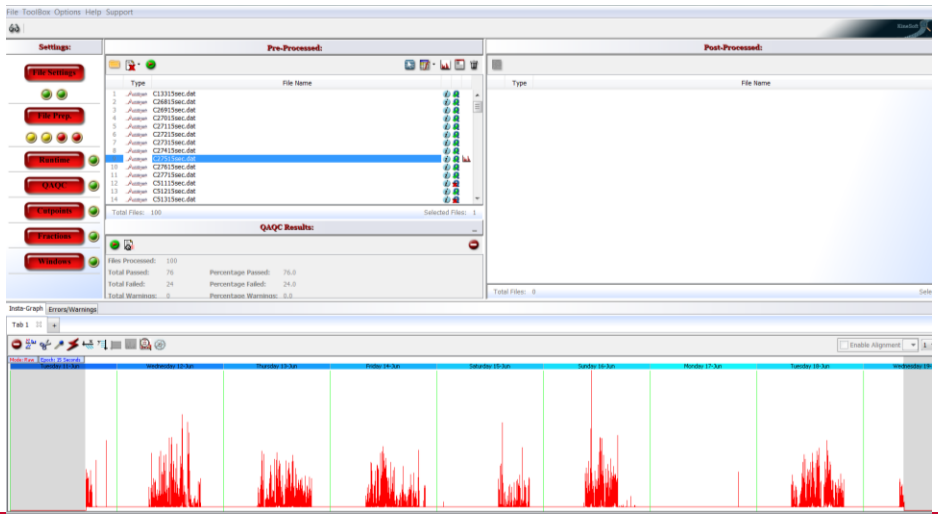
N≈32 000 from 20 studies

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

Sherar *et al. BMC Public Health* 2011, **11**:485
http://www.biomedcentral.com/1471-2458/11/485



Accelerometer Data Reduction (Kinesoft)



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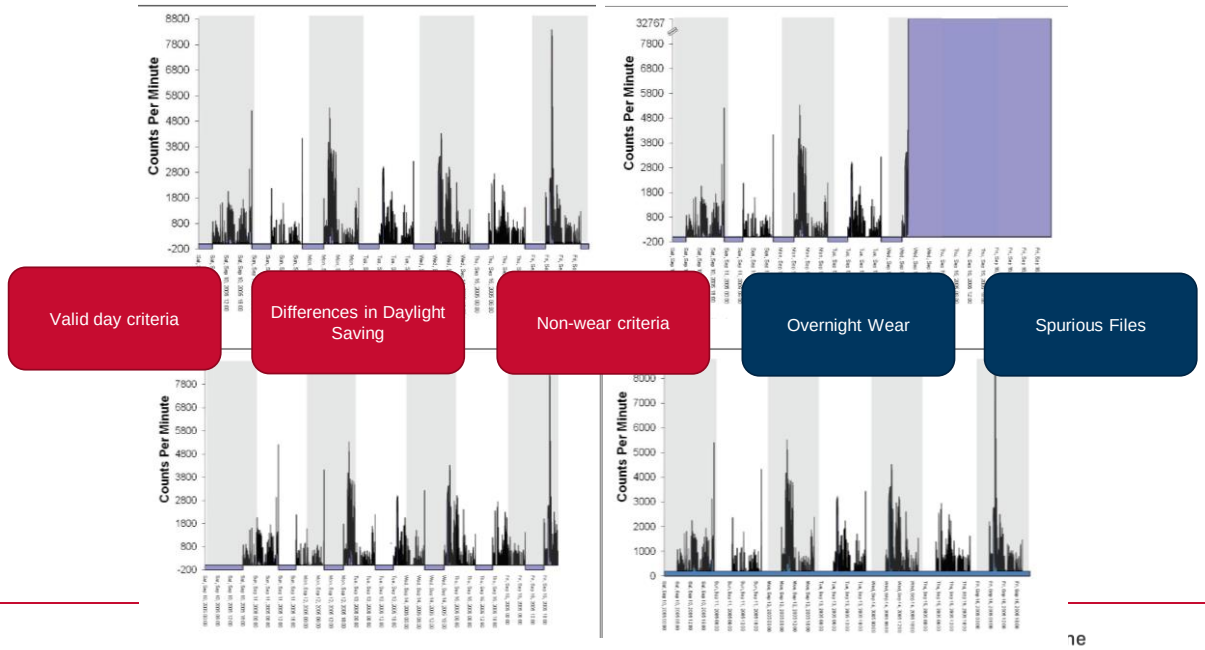

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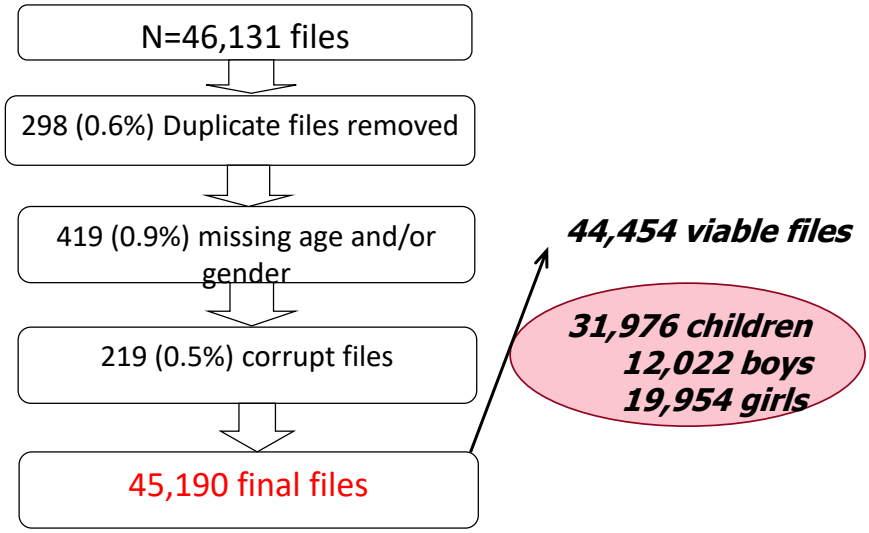

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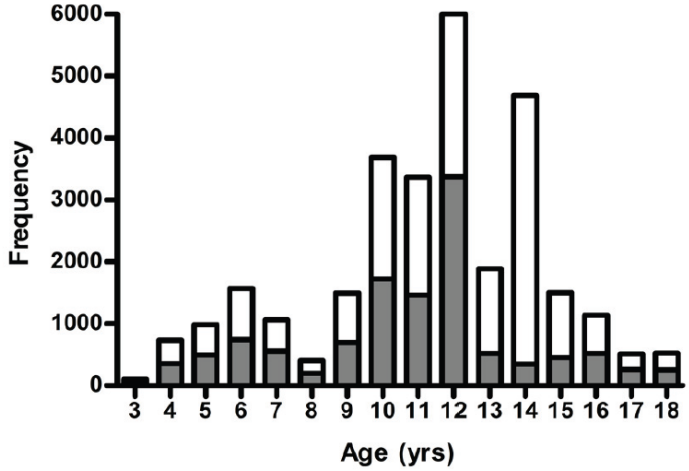


- The model seemed to work
  - Objective, time-stamped physical activity data
  - High statistical power
  - Heterogeneity – exposures and outcomes
  - Some high impact papers

- Predominantly cross-sectional
- Limited information on the correlates of behaviour
- Limited representation of particular age-groups / countries

ICAD 2.0: Objectives

1. Add additional waves of accelerometer and health outcome data from existing studies

2. Add information on a broader range of correlates of physical activity from existing studies

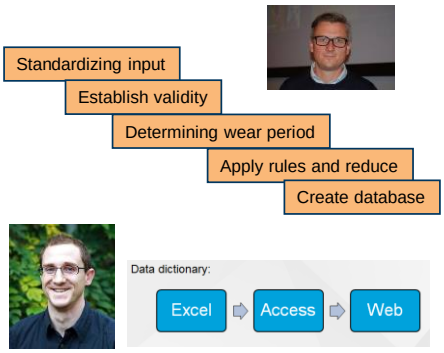
New data (received 2014/15):

- New waves of data submitted: 13 studies
- Additional data from original submission: 7 studies

The ICAD 2 - Harmonization

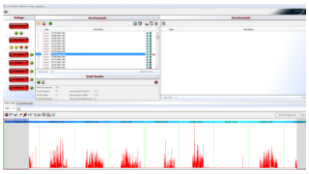
- Aim to attain the comparability of information collected from different sources - **get your data ducks swimming in the same direction**

  - **Accelerometer data**
    - 55.000 accelerometer files from 21 studies
    - 49 waves of data collection → 49+ variations of initialization and deployment strategies
  - **Non-accelerometer data**
    - Retrospective data harmonisation requires clear, detailed notes on all variables in each study
    - >11,000 variables across 30 different constructs
    - Personal, social and environmental factors that might influence children's PA and SED



ICAD 2.0: Actigraph Data reduction

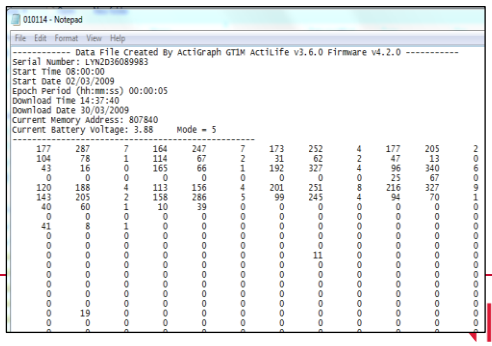
- New Actigraph monitors
  - Raw hz
- Binned cut-points (e.g. 0-100; 101-200)
- Followed same procedures as ICAD 1.0
- 13 studies have 2 or more waves of accelerometer data
- >55000 files from 21 studies
- 49 waves of data collection



The ICAD – accelerometry harmonisation

- Aim to attain, or at least improve, the comparability of information collected from different sources - **get your data ducks swimming in the same direction**

- **STEP 1** – Standardising input data (60 sec epoch and vertical axis)



Example:
DAT-file (GT1M) with header mode 5: initialised in mode 5 (Vertical axis, 2nd axis, steps – three streams of data in the file)

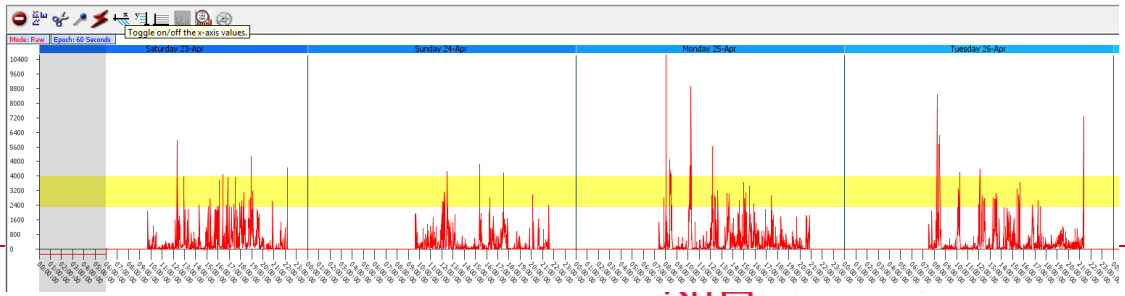
- Original DAT exported to an AGD
- The AGD file exported to CSV
- CSV file opened in Excel
- Deleted all but the first column of data in the CSV file
- Changed the mode from 5 to 0 in the ninth line of the CSV file
- Saved the CSV file
- Converted the CSV file to AGD in ActiLife
- Exported the new AGD to DAT in ActiLife
- Reintgrated the new DAT file to 60 second epoch in Kinesoft

The ICAD – accelerometry harmonisation

- Aim to attain, or at least improve, the comparability of information collected from different sources - **get your data ducks swimming in the same direction**

- **STEP 2 –** Establish the validity

VALID !



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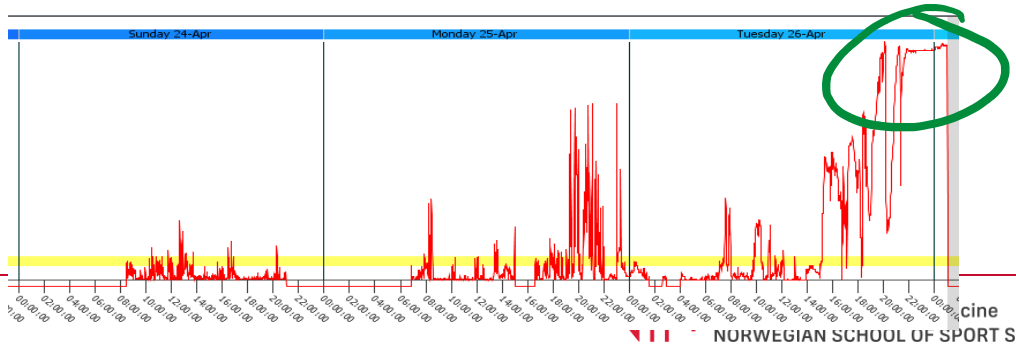
The ICAD – accelerometry harmonisation

- Aim to attain, or at least improve, the comparability of information collected from different sources - **get your data ducks swimming in the same direction**

- **STEP 2 –** Establish the validity

SPURIOUS



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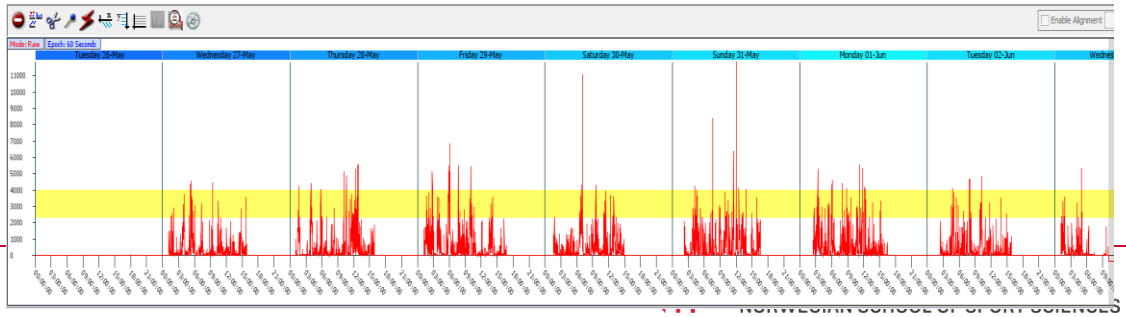
The ICAD – accelerometry harmonisation

- Aim to attain, or at least improve, the comparability of information collected from different sources - **get your data ducks swimming in the same direction**

- **STEP 2 –** Establish the validity

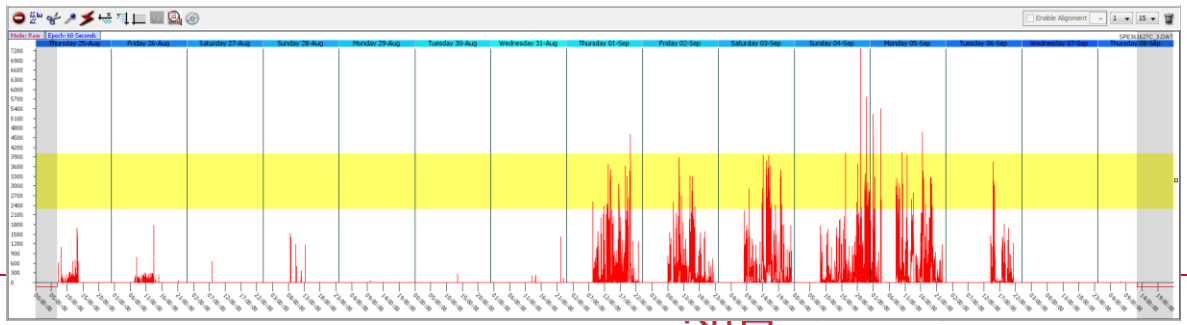
TRANSLOCATED



The ICAD – accelerometry harmonisation

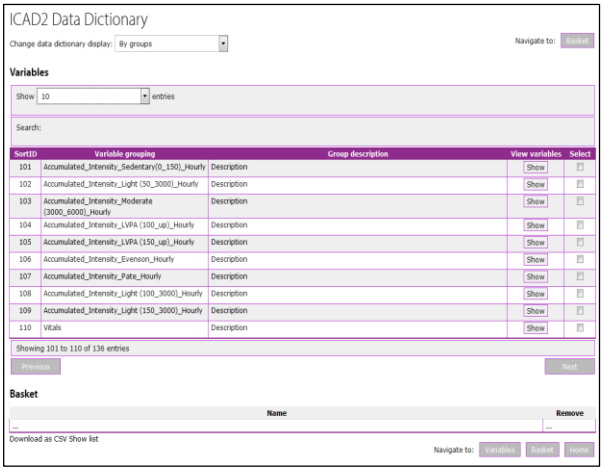
- Aim to attain, or at least improve, the comparability of information collected from different sources - **get your data ducks swimming in the same direction**

- **STEP 3 –** determine wear period



Online data dictionary

- **Summary of data processing**
  - **55,386 accelerometer data files processed**
    - **Around 220 hours of processing time over about 3 weeks**
    - **392 excel spread sheets**
    - **Merged with other variables**
  - **Available through online data dictionary with shopping cart function**



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

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SortID	Variable grouping	Group description	View variables	Select
101	Accumulated_Intensity_Sedentary(0_150)_Hourly	Description	Show	
102	Accumulated_Intensity_Light (50_3000)_Hourly	Description	Show	
103	Accumulated_Intensity_Moderate (3000_6000)_Hourly	Description	Show	
104	Accumulated_Intensity_LVPA (100_up)_Hourly	Description	Show	
105	Accumulated_Intensity_LVPA (150_up)_Hourly	Description	Show	
106	Accumulated_Intensity_Evenson_Hourly	Description	Show	
107	Accumulated_Intensity_Pate_Hourly	Description	Show	
108	Accumulated_Intensity_Light (100_3000)_Hourly	Description	Show	
109	Accumulated_Intensity_Light (150_3000)_Hourly	Description	Show	
110	Vitals	Description	Show	
111	Accumulated_Intensity_Moderate (2000_6000)_Hourly	Description	Show	
112	Accumulated_Intensity_Vigorous (6000_up)_Hourly	Description	Show	
113	Accumulated_Intensity_MVPA (2000_up)_Hourly	Description	Show	
114	Accumulated_Intensity_MVPA (3000_up)_Hourly	Description	Show	
115	Accumulated_Intensity_LVPA (50_up)_Hourly	Description	Show	
116	Wear_Counts_Daily	Description	Show	
117	Wear_counts_Totals	Description	Show	
118	Weartime_Minutes_Totals	Description	Show	
119	Wear_Counts_Hourly	Description	Show	
120	Wear_Minutes_Hourly	Description	Show	
121	StD_Age	Description	Show	
122	AM_Birthweight	Description	Show	
123	AM_Glucose	Description	Show	
124	AM_Insulin	Description	Show	
125	AM_HDL	Description	Show	

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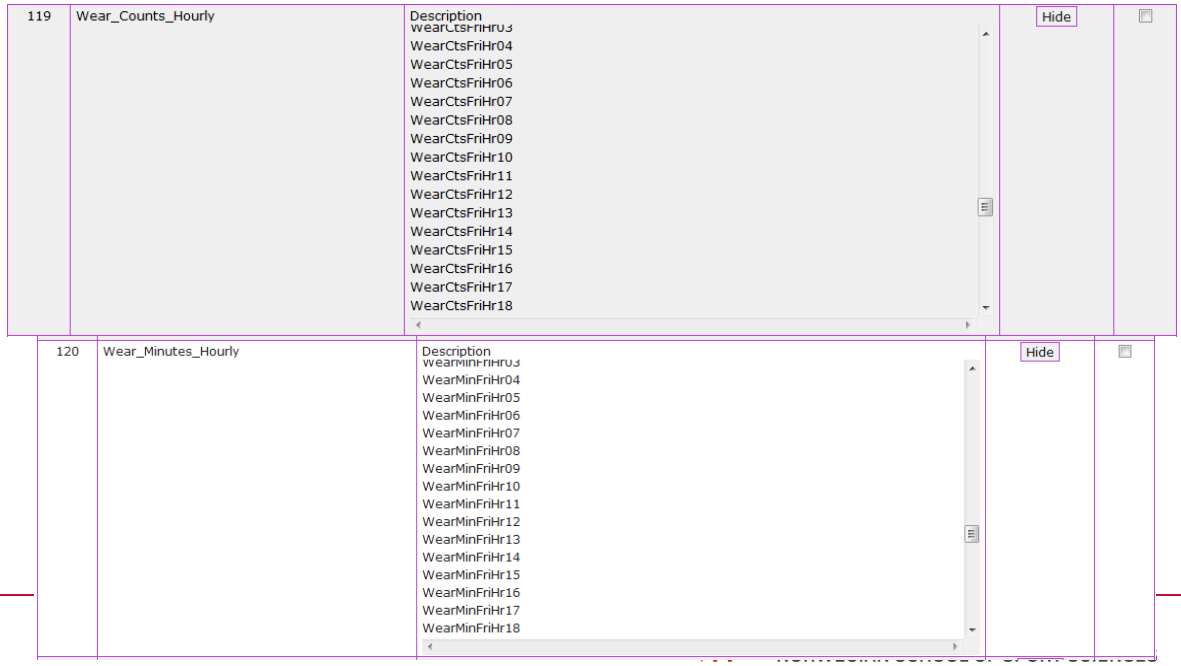
119
Wear_Counts_Hourly
Description
WearCtsFriHr04
WearCtsFriHr05
WearCtsFriHr06
WearCtsFriHr07
WearCtsFriHr08
WearCtsFriHr09
WearCtsFriHr10
WearCtsFriHr11
WearCtsFriHr12
WearCtsFriHr13
WearCtsFriHr14
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Hide
120
Wear_Minutes_Hourly
Description
WearMinFriHr04
WearMinFriHr05
WearMinFriHr06
WearMinFriHr07
WearMinFriHr08
WearMinFriHr09
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WearMinFriHr11
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WearMinFriHr13
WearMinFriHr14
WearMinFriHr15
WearMinFriHr16
WearMinFriHr17
WearMinFriHr18
Hide

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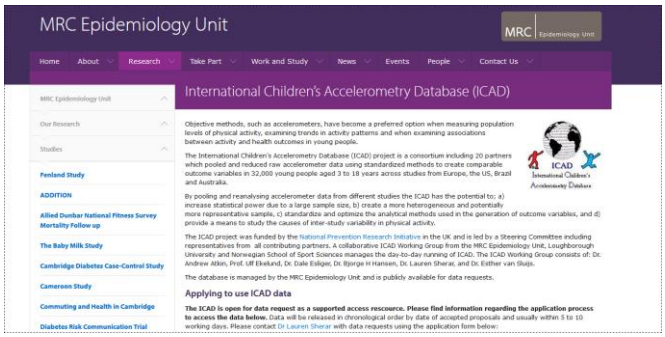
Online data dictionary

- ICAD is an open database
- Data base managed by the MRC Epidemiology Unit
- Simple Application procedure
- Data user agreement
- Authorship rules/Publication guidelines
- Working group
- Steering Group
- Newsletter



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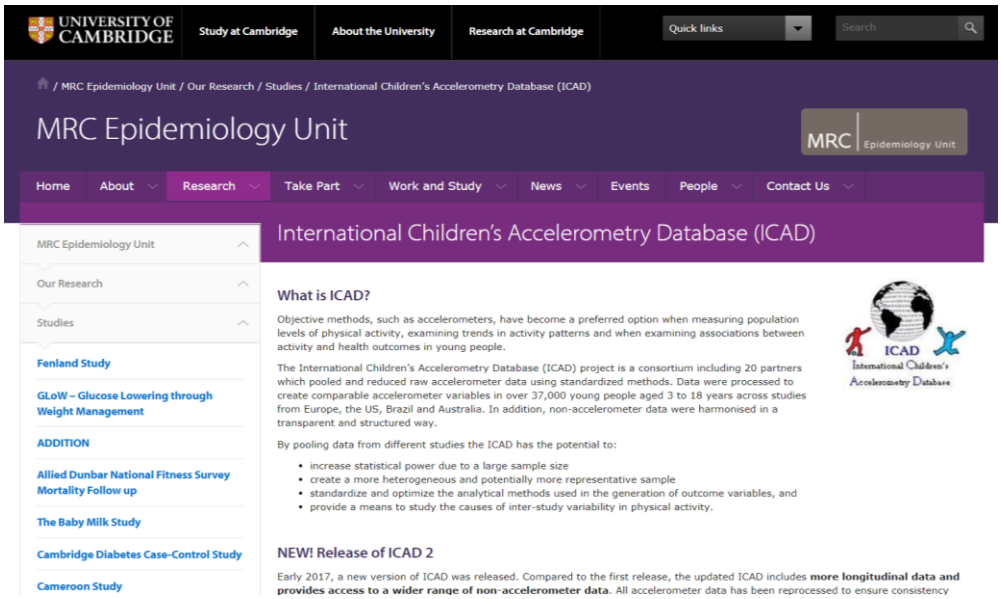

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Data Access and Management

- Data accessible via application
- No access fee
- Data use agreement
- Authorship & publication policy
  - Authors – writing group + 1 individual from each study (≥1 if ≥1 wave of data)
  - Group authorship
  - Standard acknowledgement section
- Data Management
  - MRC Epi Unit, Univ Loughborough, and Norwegian School of Sport Sciences
- Working group: day-to-day management
- Steering Committee: strategic oversight

Ethics and Privacy

- MRC Policy and Guidance on Sharing of Research Data from Population and Patient Studies https://www.mrc.ac.uk/documents/pdf/data-sharing-from-population-and-patient-studies/
- All data is anonymised
- Relies on partners ensure that original consent and ethical approval were obtained and that data can be shared

Always open for applications

Applying to use ICAD data

The ICAD is open for data requests as a supported access resource. Please find information regarding the application process to access the data below. General and pre-submission enquiries should be directed to Lauren Sherar (l.b.sherar@lboro.ac.uk). Please review the available variables, and the information provided on data harmonisation. Please contact datasharing@mrc-epid.cam.ac.uk with data requests using the application form below. Data will be released in chronological order by date of proposal acceptance and is usually within 5 to 10 working days.

- General instructions for ICAD use
- ICAD online Data Dictionary
- ICAD application form
- Data use agreement

Publishing and presenting ICAD Data

- Publication guidelines
- Checklist for publication
- Acknowledgement slide for presentations

Additional material

- ICAD approved proposals and progress (updated Sep 2017)
- List of ICAD partners
- Log of changes to ICAD database
- ICAD symposium at ISBNPA Annual Meeting (June 2015, Edinburgh): see video here.
- Accelerometry data reduction settings for ICAD 2 (Dec 2015):
  - Summary document
  - Detailed document

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

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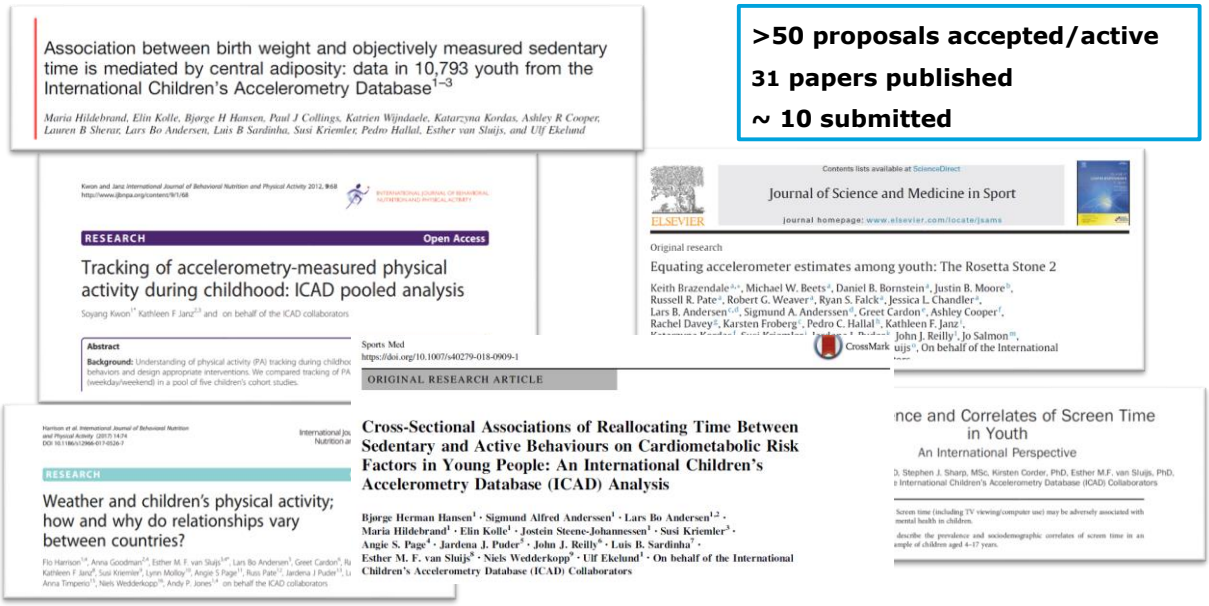
Communication

- Quarterly newsletter
- Annual Steering Committee Meeting
- Bespoke emails
- Circulation of proposals



>50 proposals accepted/active

31 papers published

~ 10 submitted

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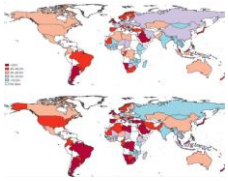
The Lancet Physical Activity Series 1

Global physical activity levels: surveillance progress, pitfalls, and prospects

*Pedro C Hallal, Lars Bo Andersen, Fiona C Bull, Regina Guthold, William Haskell, Ulf Ekelund, for the Lancet Physical Activity Series Working Group**



To implement effective non-communicable disease prevention programmes, policy makers need data for physical activity levels and trends. In this report, we describe physical activity levels worldwide with data for adults (15 years or older) from 122 countries and for adolescents (13–15-years-old) from 105 countries. Worldwide, 31·1% (95% CI 30·9–31·2) of adults are physically inactive, with proportions ranging from 17·0% (16·8–17·2) in southeast Asia to about 43% in the Americas and the eastern Mediterranean. Inactivity rises with age, is higher in women than in men, and is increased in high-income countries. The proportion of 13–15-year-olds doing fewer than 60 min of physical activity of moderate to vigorous intensity per day is 80·3% (80·1–80·5); boys are more active than are girls. Continued improvement in monitoring of physical activity would help to guide development of policies and programmes to increase activity levels and to reduce the burden of non-communicable diseases.

(Hallal et al, Lancet 2012)

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

Ulf Ekelund, PhD
Jian'an Luan, PhD
Lauren B. Sherar, PhD
Dale W. Esliger, PhD
Pippa Griew, MSc
Ashley Cooper, PhD
for the International Children's Accelerometry Database (ICAD) Collaborators

Context Sparse data exist on the combined associations between physical activity and sedentary time with cardiometabolic risk factors in healthy children.

Objective To examine the independent and combined associations between objectively measured time in moderate- to vigorous-intensity physical activity (MVPA) and sedentary time with cardiometabolic risk factors.

Design, Setting, and Participants Pooled data from 14 studies between 1998 and 2009 comprising 20 871 children (aged 4-18 years) from the International Children's Accelerometry Database. Time spent in MVPA and sedentary time were measured using accelerometry after reanalyzing raw data. The independent associations between time in MVPA and sedentary time, with outcomes, were examined using meta-analysis. Participants were stratified by tertiles of MVPA and sedentary time.

Main Outcome Measures Waist circumference, systolic blood pressure, fasting triglycerides, high-density lipoprotein cholesterol, and insulin.

Results Times (mean [SD] min/d) accumulated by children in MVPA and being sedentary were 30 (21) and 354 (96), respectively. Time in MVPA was significantly associated with all cardiometabolic outcomes independent of sex, age, monitor wear time, time spent sedentary, and waist circumference (when not the outcome). Sedentary time was not associated with any outcome independent of time in MVPA. In the combined analyses, higher levels of MVPA were associated with better cardiometabolic risk factors across tertiles of sedentary time. The differences in outcomes between higher and lower MVPA were greater with lower sedentary time. Mean differences in waist circumference between the bottom and top tertiles of MVPA were 5.6 cm (95% CI, 4.8-6.4 cm) for high sedentary time and 3.6 cm (95% CI, 2.8-4.3 cm) for low sedentary time. Mean differences in systolic blood pressure for high and low sedentary time were 0.7 mm Hg (95% CI, −0.07 to 1.6) and 2.5 mm Hg (95% CI, 1.7-3.3), and for high-density lipoprotein cholesterol, differences were −2.6 mg/dL (95% CI, −1.4 to −3.9) and −4.5 mg/dL (95% CI, −3.3 to −5.6), respectively. Geometric mean differences for insulin and triglycerides showed similar variation. Those in the top tertile of MVPA accumulated more than 35 minutes per day in this intensity level compared with fewer than 18 minutes per day for those in the bottom tertile. In prospective analyses (N = 6413 at 2.1 years' follow-up), MVPA and sedentary time were not associated with waist circumference at follow-up, but a higher waist circumference at baseline was associated with higher amounts of sedentary time at follow-up.

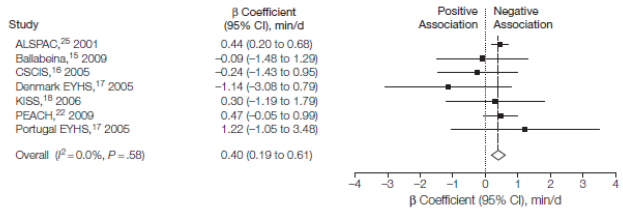
Conclusion Higher MVPA time by children and adolescents was associated with better cardiometabolic risk factors regardless of the amount of sedentary time.

JAMA. 2012;307(7):704-712 www.jama.com

NATIONAL AND INTERNATIONAL public health authorities agree that children and adolescents should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity (MVPA) daily.[1-4] Although the exact amount of physical activity needed for optimal health is unknown, recent research has established inverse cross-sectional associations between objectively measured physical activity with adiposity and cardiometabolic risk factors in youth.[5-10]

Many health authorities and organizations have also recognized the potentially detrimental effects of prolonged time spent sedentary and consequently compiled guidelines for reducing the amount of sedentary time, especially TV viewing.[3-9,11] Some recent reports appear to confirm the importance of reducing sedentary time in youth as they

Figure 2. Associations Between Baseline Waist Circumference and Time Spent Sedentary at Follow-up



β coefficients show difference in time spent sedentary (min/d) for 1-cm difference in baseline waist circumference. Model adjusted for sex, age, monitor wear time, baseline time spent sedentary, and follow-up time.

(Ekelund et al, *JAMA* 2012)

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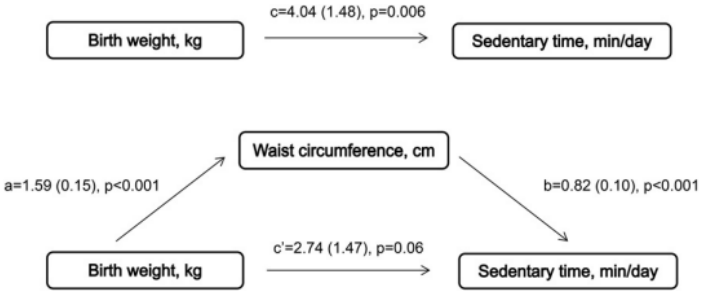
Association between birth weight and objectively measured sedentary time is mediated by central adiposity: data in 10,793 youth from the International Children's Accelerometry Database[1–3]

Maria Hildebrand, Elin Kolle, Bjørge H Hansen, Paul J Collings, Katrien Wijndaele, Katarzyna Kordas, Ashley R Cooper, Lauren B Sherar, Lars Bo Andersen, Luis B Sardinha, Susi Kriemler, Pedro Hallal, Esther van Sluijs, and Ulf Ekelund



Conclusion: The association between birth weight and sedentary time appears partially mediated by central adiposity, suggesting that both birth weight and abdominal adiposity may be correlates of sedentary time in youth. *Am J Clin Nutr* 2015;101:983–90.

(Hildebrand et al, *Am J Clin Nutr* 2015)

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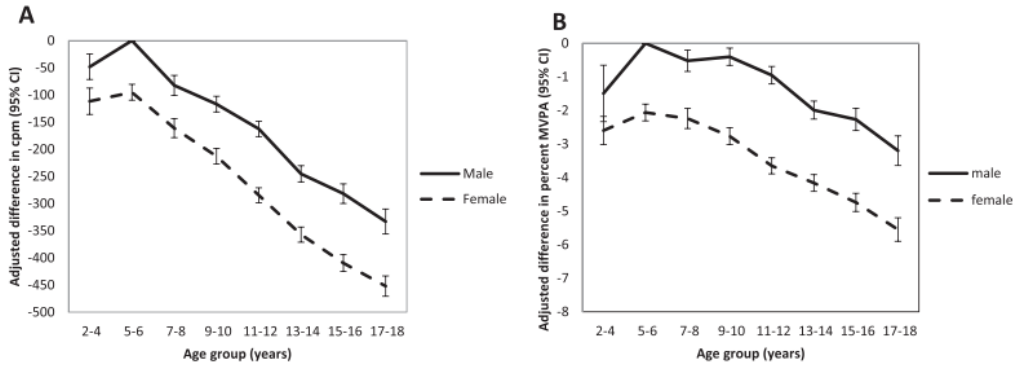
Objectively measured physical activity and sedentary time in youth: the International children's accelerometry database (ICAD)

Ashley R. Cooper[1,2*], Anna Goodman[3], Angie S. Page[1], Lauren B. Sherar[4], Dale W. Esliger[4], Esther MF van Sluijs[5], Lars Bo Andersen[6], Sigmund Anderssen[7], Greet Cardon[8], Rachel Davey[9], Karsten Froberg[6], Pedro Hallal[10], Kathleen F. Janz[11], Katarzyna Kordas[12], Susi Kreimler[13], Russ R. Pate[14], Jardena J. Puder[15], John J. Reilly[16], Jo Salmon[17], Luis B. Sardinha[18], Anna Timperio[17] and Ulf Ekelund[7]



(Cooper et al, *IJBNPA* 2015)

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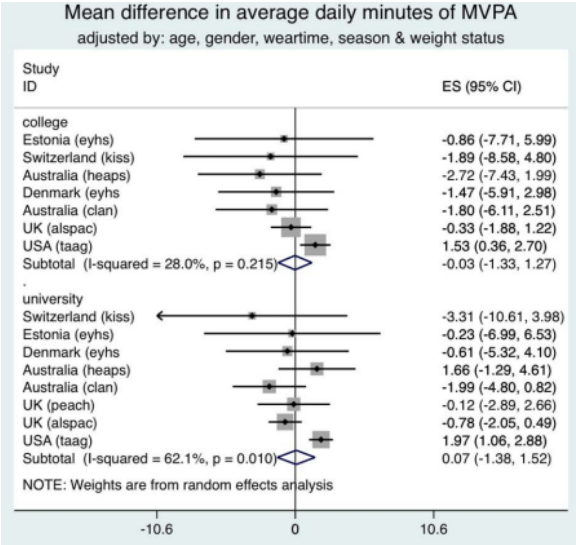
Association between maternal education and objectively measured physical activity and sedentary time in adolescents

Lauren B Sherar,[1,2] Tom P Griffin,[3] Ulf Ekelund,[4,5] Ashley R Cooper,[6] Dale W Esliger,[1,2] Esther M F van Sluijs,[5,7] Lars Bo Andersen,[4,8] Greet Cardon,[9] Rachel Davey,[10] Karsten Froberg,[8] Pedro C Hallal,[11] Kathleen F Janz,[12] Katarzyna Kordas,[13] Susi Kriemler,[14] Russell R Pate,[15] Jardena J Puder,[16] Luis B Sardinha,[17] Anna F Timperio,[18] Angie S Page[6]

Conclusions Across a number of international samples, adolescents of mothers with lower education may not be at a disadvantage in terms of overall objectively measured PA.



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ORIGINAL ARTICLE

Does adiposity mediate the relationship between physical activity and biological risk factors in youth?: a cross-sectional study from the International Children's Accelerometry Database (ICAD)

J Tarp[1], A Bugge[1], LB Andersen[2,3], LB Sardinha[4], U Ekelund[3,5], S Brage[5] and NC Møller[1] On behalf of the International Children's Accelerometry Database (ICAD) Collaborators

BACKGROUND/OBJECTIVES: To model the association between accumulating 60 daily minutes of moderate-to-vigorous physical activity and a composite score of biological risk factors into a direct and an indirect effect, using abdominal obesity as the mediator.
SUBJECTS/METHODS: Cross-sectional data from the International Children's Accelerometry Database (ICAD) including 6–18-year-old children and adolescents ($N = 3412$) from 4 countries providing at least 3 days of accelerometry-assessed physical activity. A standardized composite risk score was calculated from systolic blood pressure and fasting blood samples of insulin, glucose, triacylglycerol and inverse HDL-cholesterol. Abdominal obesity was assessed by the waist-circumference:height ratio. Two-stage regression analysis, allowing for exposure–mediator interaction, was used for the effect decomposition.
RESULTS: Participants achieving 60 daily minutes of moderate-to-vigorous physical activity had a 0.31 (95% CI: − 0.39, − 0.23) standard deviations lower composite risk score than those achieving less than 60 min. Modelling the associations suggested that 0.24 standard deviations (95% CI: − 0.32, − 0.16) was attributed to the direct effect and − 0.07 (95% CI: − 0.11, − 0.02) to the indirect effect indicating that 22% of the total effect was mediated by central adiposity. Modelling 30 and 90 min of moderate-to-vigorous physical activity per day resulted in changes in the direct but not the indirect effect.
CONCLUSIONS: One hour of daily moderate-to-vigorous physical activity was associated with clinically relevant differences in metabolic control compared to engagement in less than this minimally recommended amount. The majority of the difference was explained by the direct effect of physical activity.

(Tarp et al, *Int J Obes* 2018)

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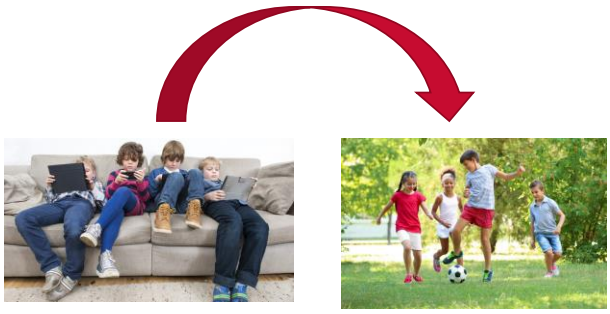
Cross-Sectional Associations of Reallocating Time Between Sedentary and Active Behaviours on Cardiometabolic Risk Factors in Young People: An International Children's Accelerometry Database (ICAD) Analysis

Bjørge Herman Hansen[1] · Sigmund Alfred Anderssen[1] · Lars Bo Andersen[1,2] · Maria Hildebrand[1] · Elin Kolle[1] · Jostein Steene-Johannessen[1] · Susi Kriemler[3] · Angie S. Page[4] · Jardena J. Puder[5] · John J. Reilly[6] · Luis B. Sardinha[7] · Esther M. F. van Sluijs[8] · Niels Wedderkopp[9] · Ulf Ekelund[1] · On behalf of the International Children's Accelerometry Database (ICAD) Collaborators



Key Points

Our results show beneficial theoretical associations between replacing as little as 10 min/day of sedentary time with an equal amount of time spent in moderate-to-vigorous physical activity and a wide array of cardiometabolic risk markers in healthy youth.

Replacing sedentary time with an equal amount of light physical activity showed minor beneficial associations with cardiometabolic risk markers.

Replacing sedentary time with active behaviours, particularly those of at least moderate intensity, appears to be an effective strategy to reduce cardiometabolic risk in young people.

(Hansen et al, *Sports Med* 2018)

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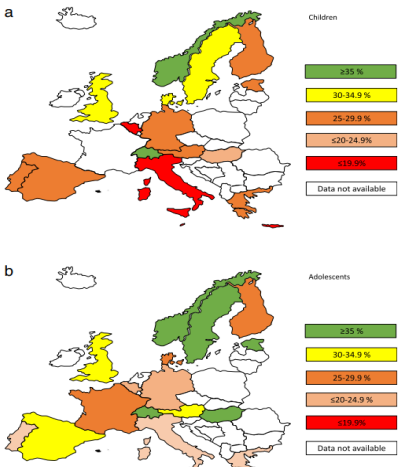
RESEARCH Open Acc

Variations in accelerometry measured physical activity and sedentary time across Europe – harmonized analyses of 47,497 children and adolescents

Jostein Steene-Johannessen[1*], Bjørge Herman Hansen[1], Knut Eirik Dalene[1], Elin Kolle[1], Kate Northstone[2], Niels Christian Møller[3], Anders Grøntved[3], Niels Wedderkopp[3], Susi Kriemler[4], Angie S. Page[5], Jardena J. Puder[6], John J. Reilly[7], Luis B. Sardinha[8], Esther M. F. van Sluijs[9], Lars Bo Andersen[10], Hidde van der Ploeg[11], Wolfgang Ahrens[12], Claudia Flexeder[13], Marie Standl[13], Holger Shculz[13], Luis A. Moreno[14], Stefaan De Henauw[15], Nathalie Michels[15], Greet Cardon[15], Francisco B. Ortega[16], Jonatan Ruiz[16], Susana Aznar[17], Mikael Fogelholm[18], Andrew Decelis[19], Line Grønholt Olesen[3], Mads Fiil Hjorth[20], Rute Santos[21], Susana Vale[22], Lars Breum Christiansen[3], Russ Jago[5], Laura Basterfield[23], Christopher G. Owen[24], Claire M. Nightingale[24], Gabriele Eiben[25], Angela Polito[26], Fabio Lauria[27], Jeremy Vanhelst[28], Charalambos Hadjigeorgiou[29], Kenn Konstabel[30], Dénes Molnár[31], Ole Sprengeler[12], Yannis Manios[32], Jaanus Harro[33], Anthony Kafatos[34], Sigmund Alfred Anderssen[1], Ulf Ekelund[1] and On behalf of the Determinants of Diet and Physical Activity knowledge hub (DEDIPAC); International Children's Accelerometry Database (ICAD) Collaborators, IDEFICS Consortium and HELENA Consortium



Conclusions: Two third of European children and adolescents are not sufficiently active. Our findings suggest substantial gender-, country- and region-specific differences in physical activity. These results should encourage policymakers, governments, and local and national stakeholders to take action to facilitate an increase in the physical activity levels of young people across Europe.

(Steene-Johannessen et al, *IJBNPA* 2020)

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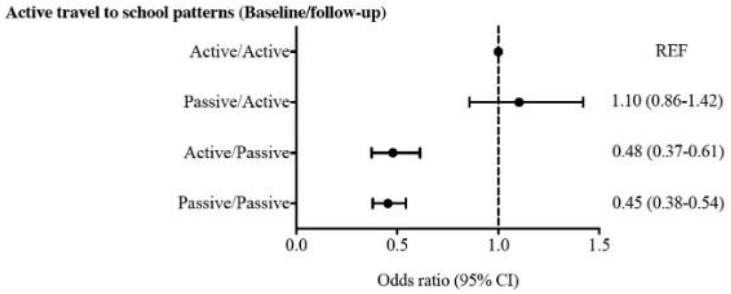
Association of change in the school travel mode with changes in different physical activity intensities and sedentary time: A International Children's Accelerometry Database Study

André O. Werneck [a], Russell Jago [b], Susi Kriemler [c], Lars Bo Andersen [d], Niels Wedderkopp [e,i], Kate Northstone [f], Jo Salmon [g], Esther M.F. van Sluijs [h,*], On behalf of the International Children's Accelerometry Database (ICAD) Collaborators

60 min/d of moderate-to-vigorous physical activity



The odds of meeting PA recommendations at follow-up is > 50% lower in 'passive' commuters

(Werneck et al, *Prev Med* 2021)

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