

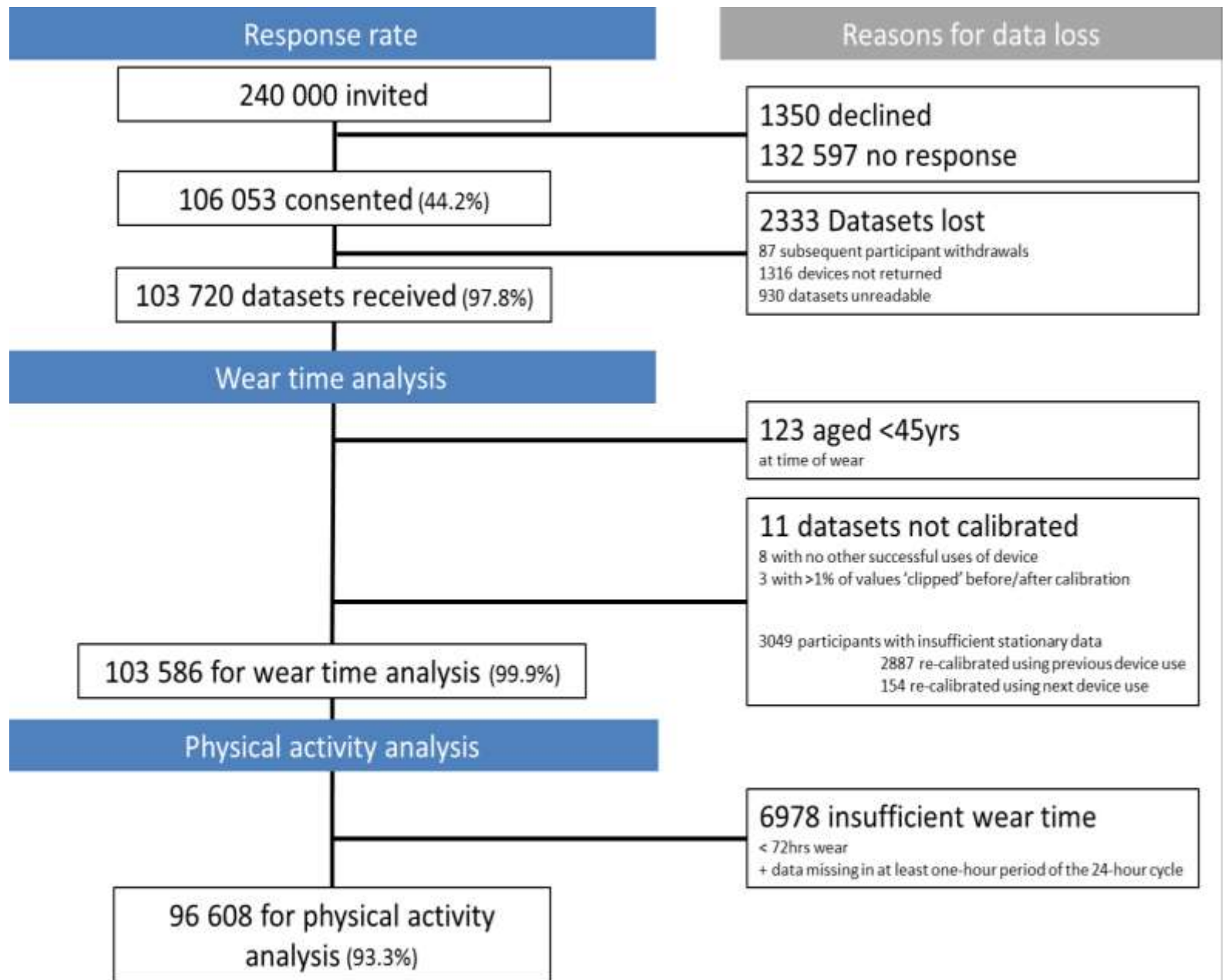


An update on UK Biobank accelerometry data

Nick Wareham

Accelerometry working group

- Physical activity summary variables



Consensus approach to development of open data processing tools

Large Scale Population Assessment of Physical Activity Using Wrist Worn Accelerometers: The UK Biobank Study

Aiden Doherty^{1,2*}, Dan Jackson³, Nils Hammerla³, Thomas Plötz³, Patrick Olivier³, Malcolm H. Granat⁴, Tom White⁵, Vincent T. van Hees⁶, Michael I. Trenell⁶, Christopher G. Owen⁷, Stephen J. Preece⁴, Rob Gillions⁸, Simon Sheard⁸, Tim Peakman⁸, Soren Brage^{5‡}, Nicholas J. Wareham^{5‡}

https://github.com/activityMonitoring/biobankAccelerometerAnalysis

activityMonitoring / biobankAccelerometerAnalysis

Watch 5 Star 8 Fork 3







Code Issues 6 Pull requests 0 Projects 0 Wiki Insights

Extracting meaningful health information from large accelerometer datasets

409 commits 2 branches 0 releases 3 contributors BSD-2-Clause

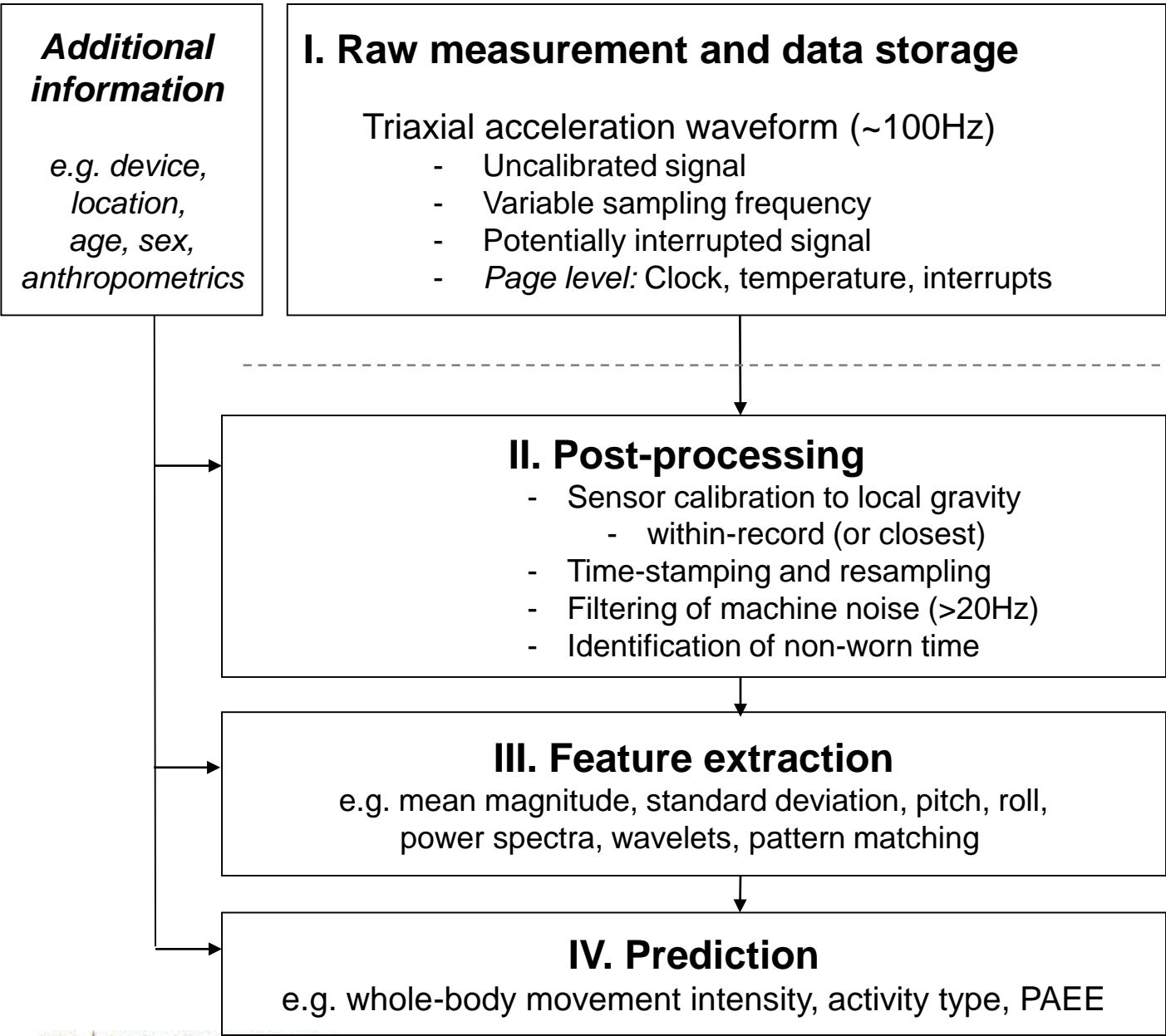
Branch: master New pull request

Find file Clone or download

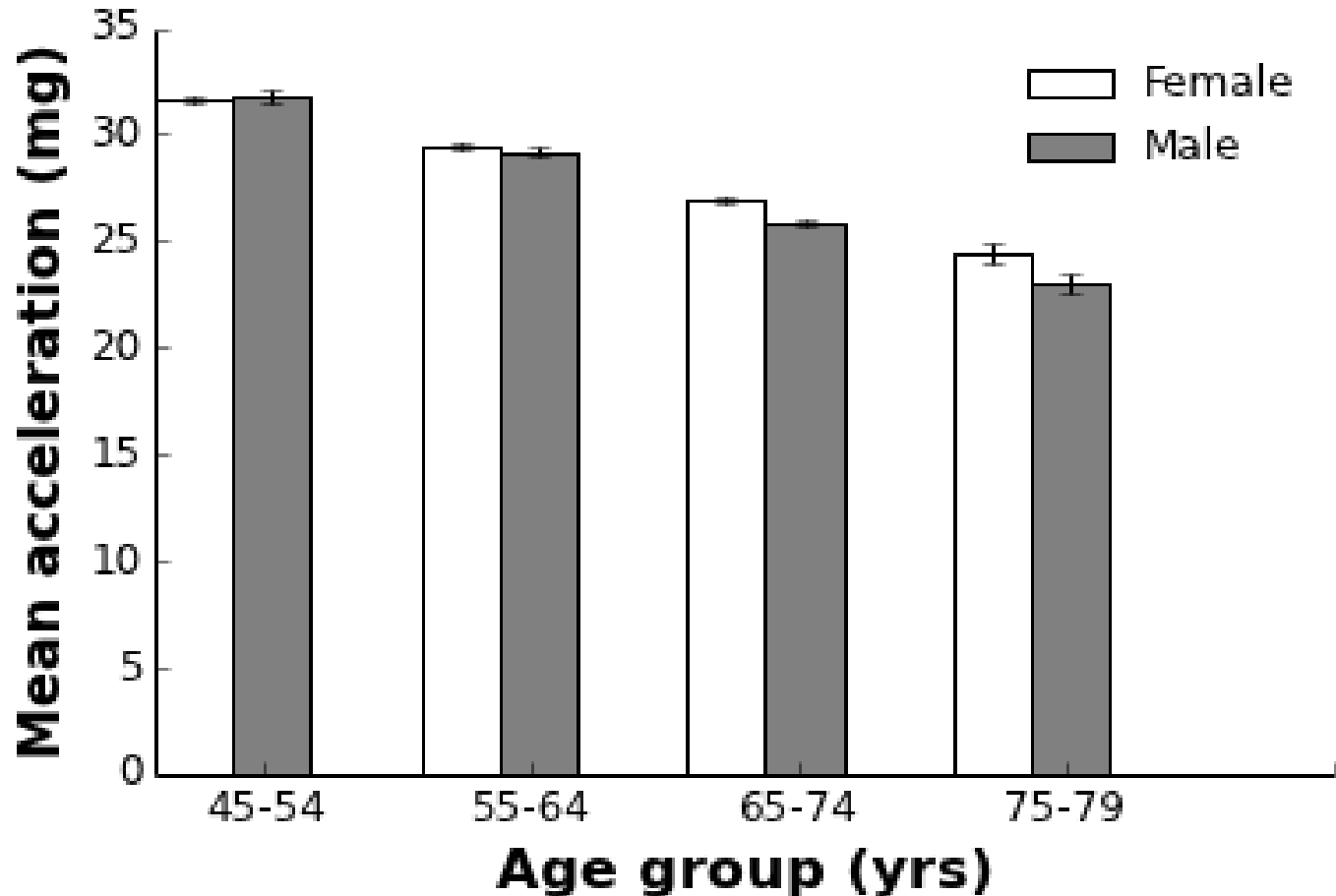
 supersational added gui option	Latest commit 43249ae on 15 Dec 2016
 java	rawOutput correct temperature value a year ago
 .gitignore	.gitignore eclipse files 10 months ago
 ActivitySummary.py	added -startTimeTrim and -endTimeTrim options for trimming file start... a year ago
 LICENSE	BSD licence text updated to reflect contributing authors and organisa... 3 years ago
 README.md	javac no longer needed 2 years ago

..... I N F E R E N C E>

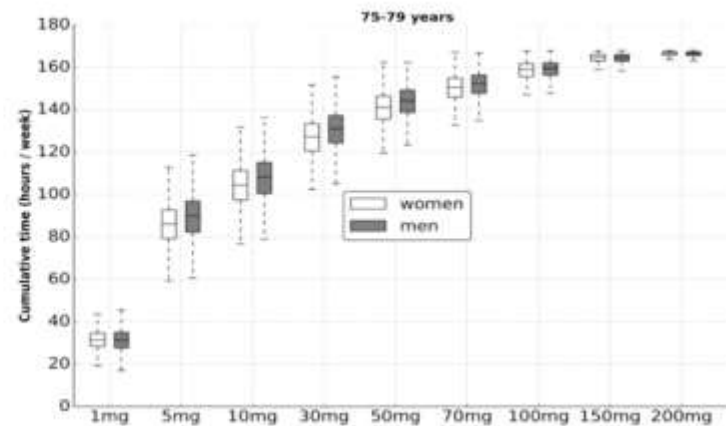
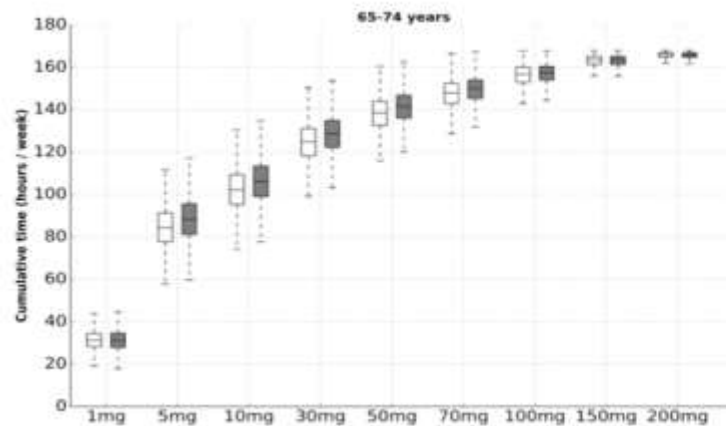
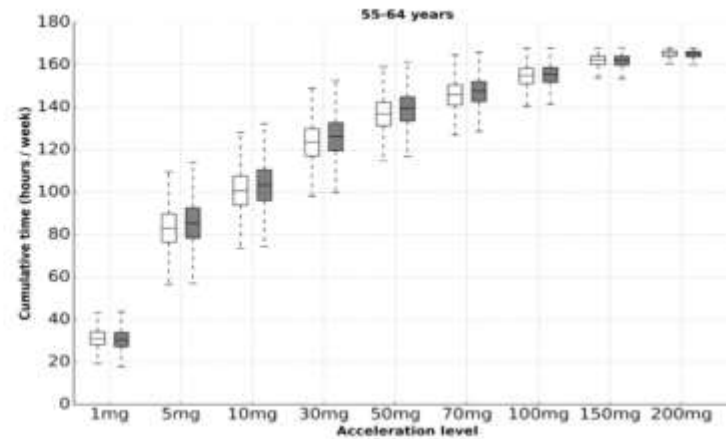
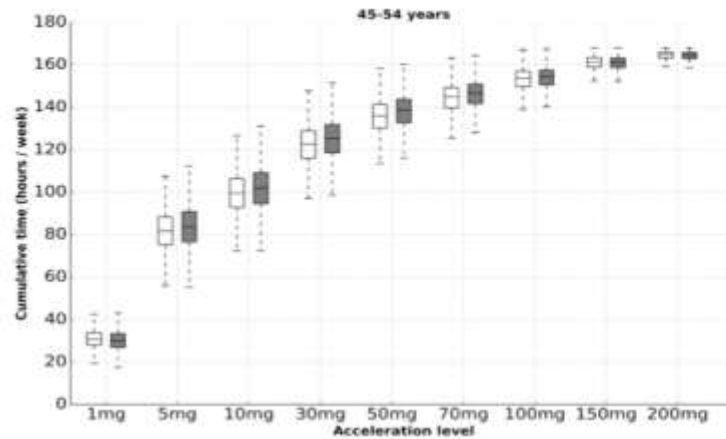
Data acquisition level Time-independent level



Average vector magnitude by age and sex



Movement intensity distribution by age and sex



UK Biobank showcase

biobank[™] [Index](#) [Browse](#) [Search](#) [Catalogues](#) [Downloads](#) [Help](#)

Category 1013
Raw accelerometer statistics - Physical activity measurement - Additional exposures

Description
Raw accelerometer statistics

18 Data-Fields | **1 Parent Category**

Field ID Description

90002	Data problem indicator
90182	Data recording errors
90179	Device ID
90187	Total data readings
90188	Sample rate average
90189	Sample rate standard deviation
90190	Sample rate minimum
90191	Sample rate maximum
90180	Interrupted recording periods
90181	Duration of interrupted recording periods
90183	Readings exceeding +/-8 gravities before calibration
90185	Readings exceeding +/-8 gravities after calibration
90184	Maximum readings exceeding +/-8 gravities before calibration in a 5 second epoch
90186	Maximum readings exceeding +/-8 gravities after calibration in a 5 second epoch
90192	Temperature average
90193	Temperature standard deviation
90194	Temperature minimum
90195	Temperature maximum

Improving the health of future generations

Category 1008

Physical activity measurement - [Additional exposures](#)

Description

Physical activity measurement recorded via a wrist-worn accelerometer. Data collection was between June 2013 and January 2016.

5 Sub-Categories

4 Data-Fields

1 Parent Category

3 Resources

Category ID	Description	Items
1009	Acceleration averages	38
1010	Acceleration intensity distribution	67
1011	Accelerometer wear time duration	42
1012	Accelerometer calibration	21
1013	Raw accelerometer statistics	18

Improving the health of future generations

Emerging publications

Genome-wide association study of habitual physical activity in over 377,000 UK Biobank participants identifies multiple variants including *CADM2* and *APOE*

Yann C. Klimentidis¹ · David A. Raichlen² · Jennifer Bea^{3,4} · David O. Garcia⁵ · Nathan E. Wineinger⁶ · Lawrence J. Mandarino⁷ · Gene E. Alexander^{8,9} · Zhao Chen¹ · Scott B. Going⁴

Association of objectively measured physical activity with brain structure: UK Biobank study

■ M. Hamer^{1,2} · N. Sharma³ & G. D. Batty²

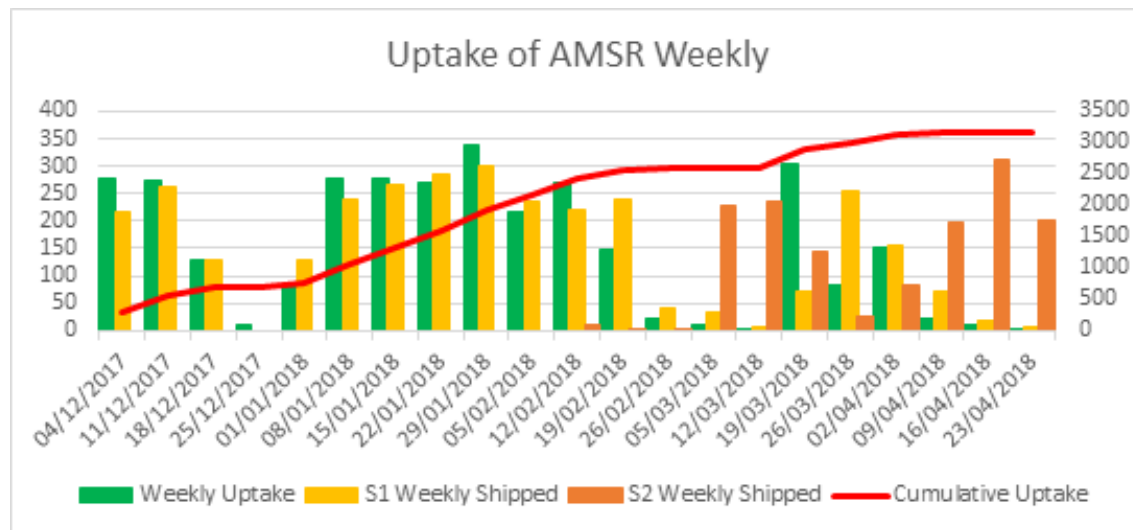
A small amount of precisely measured high-intensity habitual physical activity predicts bone health in pre- and post-menopausal women in UK Biobank

Victoria H Stiles^{1*} · Brad S Metcalf¹ · Karen M Knapp² and Alex V Rowlands^{3,4,5}

Variable	Model	No. of Events	HR (95% CI)	P Value
Grip strength	1	14419	0.75 (0.73–0.76)	<0.001
	2	14419	0.76 (0.74–0.78)	<0.001
	3	14350	0.78 (0.76–0.79)	<0.001
IPAQ-PA	1	14350	0.83 (0.82–0.84)	<0.001
	2	14350	0.86 (0.84–0.87)	<0.001
	3	14350	0.87 (0.86–0.89)	<0.001
Cardiorespiratory fitness	1	1162	0.78 (0.72–0.83)	<0.001
	2	1162	0.75 (0.69–0.81)	<0.001
	3	1157	0.76 (0.70–0.83)	<0.001
PA	1	348	0.52 (0.46–0.58)	<0.001
	2	348	0.56 (0.50–0.63)	<0.001
	3	347	0.56 (0.50–0.63)	<0.001

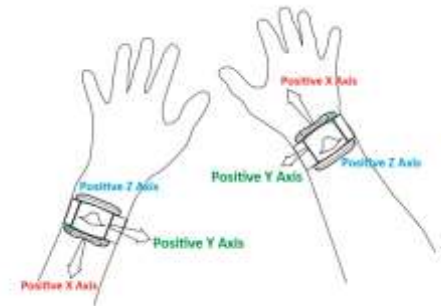
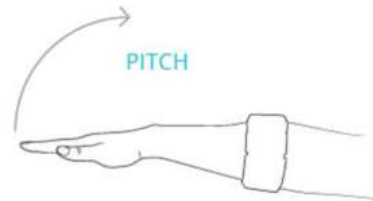
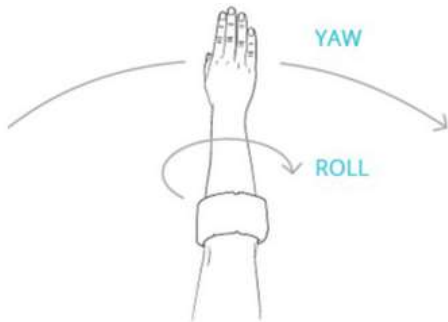
Accelerometry working group

- Physical activity summary variables
- Repeated measures study
- 7 day accelerometry repeated 4 times across a year at 3 monthly intervals (n=3178)



Accelerometry working group

- Physical activity summary variables
- Repeated measures study
- Further consensus work on physical activity – preparation for characterising types of activity (Soren Brage)
- Needs further work to determine which hand device is worn on and how it is orientated



Accelerometry working group

- Physical activity summary variables
- Repeated measures study
- Further consensus work on physical activity – preparation for characterising types of activity
- **Sleep summary variables (Mary Morrell)**
- **Focus on comparison of different inferential algorithms with criterion methods**

Accelerometry working group

- Physical activity summary variables
- Repeated measures study
- Further consensus work on physical activity – preparation for characterising types of activity
- Sleep summary variables
- **Other related traits – cardiorespiratory fitness**

The importance of consensus working to avoid misunderstandings

$$\text{net oxygen consumption} = 7 + 10.8(\text{workload})/\text{weight}$$

Variable	Model	No. of Events	HR (95% CI)	P Value
Grip strength	1	14419	0.75 (0.73–0.76)	<0.001
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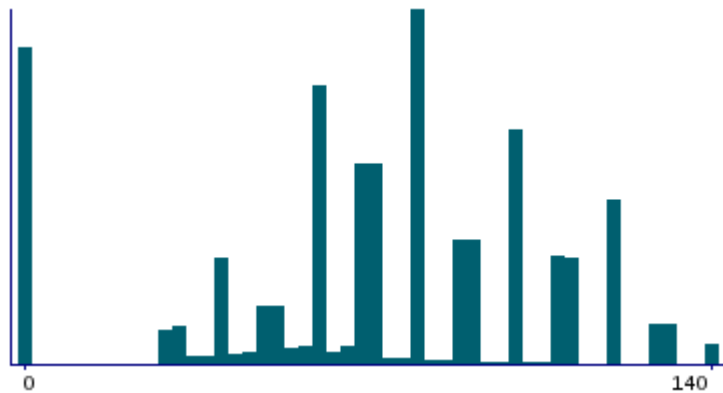
Individualised risk-stratified
ramped protocol



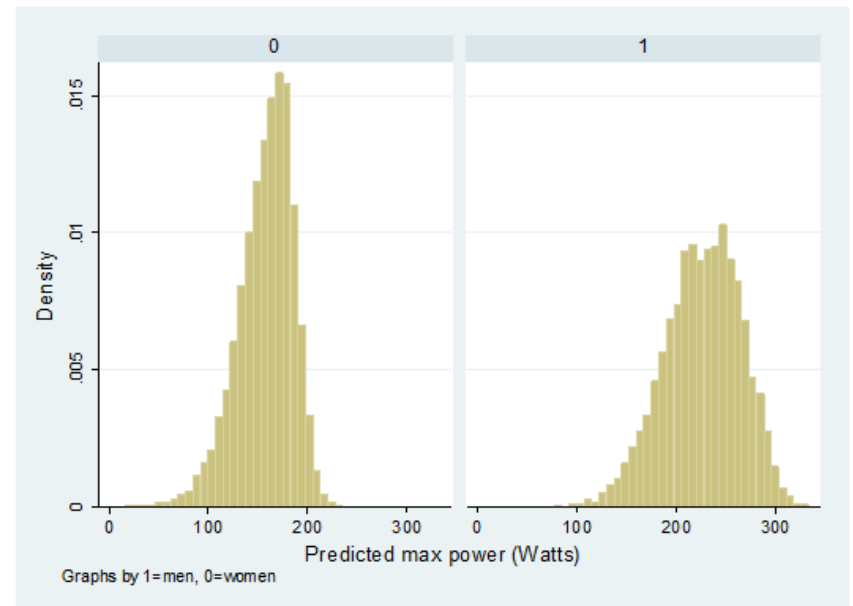
Source: Tikkanen et al. Circulation 2018

Caution with interpretation of what showcase variables actually represent

Distribution of max work load permitted in the protocol



Distribution of measured max work load (Danish study)



Accelerometry working group

- Physical activity summary variables
- Repeated measures study
- Further consensus work on physical activity – preparation for characterising types of activity
- Sleep summary variables
- Other related traits – cardiorespiratory fitness