

**Associations amongst sedentary and active behaviours,  
energy expenditure, body fat and appetite dysregulation**

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# Associations amongst sedentary and active behaviours, body fat and appetite dysregulation



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Anna Myers, PhD Student

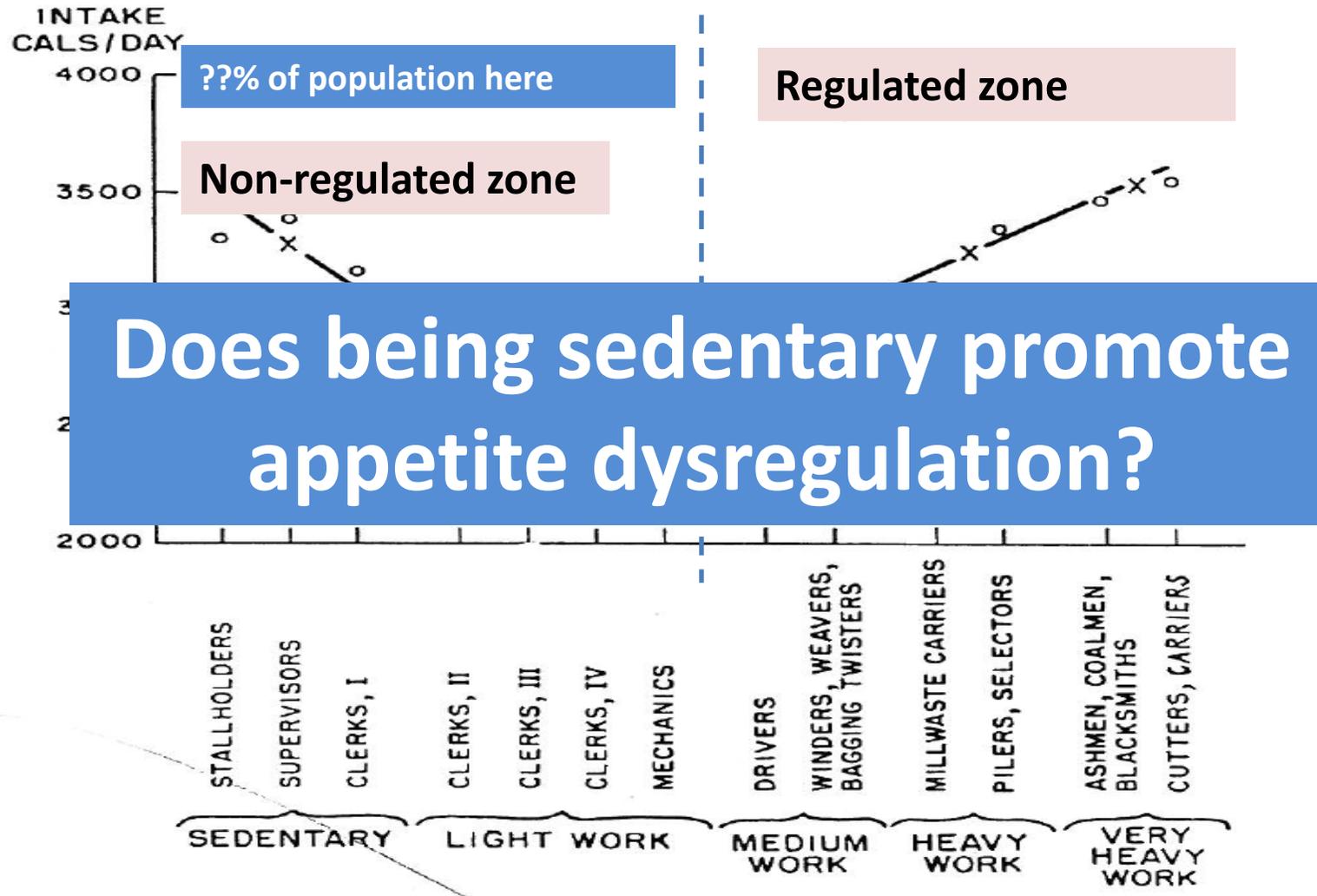


# Background

## WHAT IS SEDENTARY BEHAVIOUR?

- Any waking behaviour characterized by an energy expenditure  $\leq 1.5$  METs whilst in a sitting or reclining posture (Sedentary Behaviour Research Council, 2012)
- We are more sedentary than ever!
  - Recent report suggests limiting work place sitting by increasing standing by 2 – 4 hours/day (Buckley et al. 2015)
- Sedentary behaviour has been linked to a number of negative health outcomes including all-cause mortality, cardiovascular disease, type II diabetes and metabolic syndrome (Rezende et al. 2014)
- Moreover, these deleterious health effects have been shown to be independent of moderate-to-vigorous physical activity (MVPA) (Biswas et al. 2015)
- Less is known about the relationship between objectively measured **sedentary behaviour** and **appetite control**

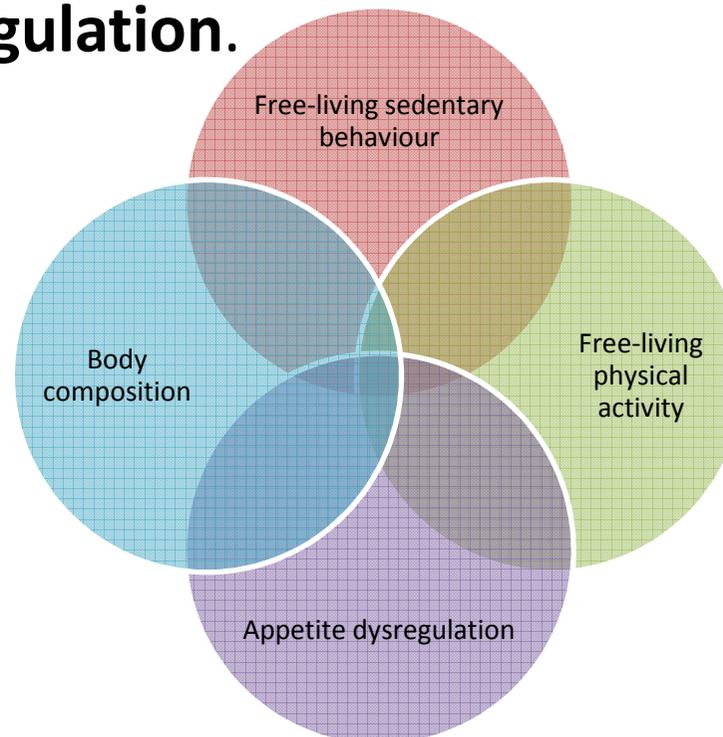
# Linking energy intake with energy expenditure



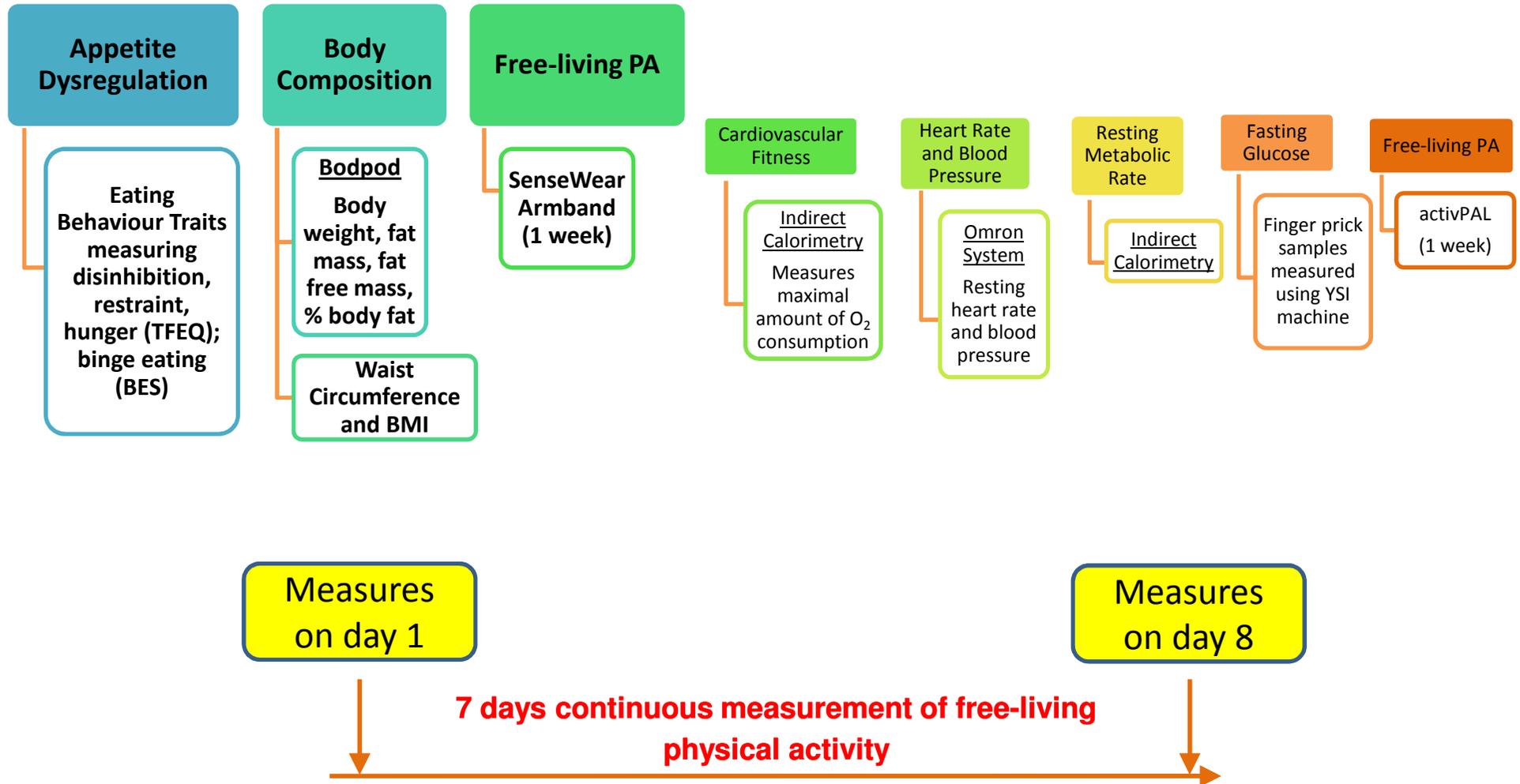
**Figure 1.** At moderate and high levels of physical activity energy intake matches energy expenditure; however at lower levels of physical activity EI exceeds energy expenditure creating a positive energy balance (Blundell, 2011 adapted from Mayer et al. 1956).

# Is sedentariness associated with body composition and dysregulated appetite control?

- The objective of this study was to investigate whether objectively measured free-living PA and **sedentary behaviour** were associated with **body composition** and **appetite dysregulation**.

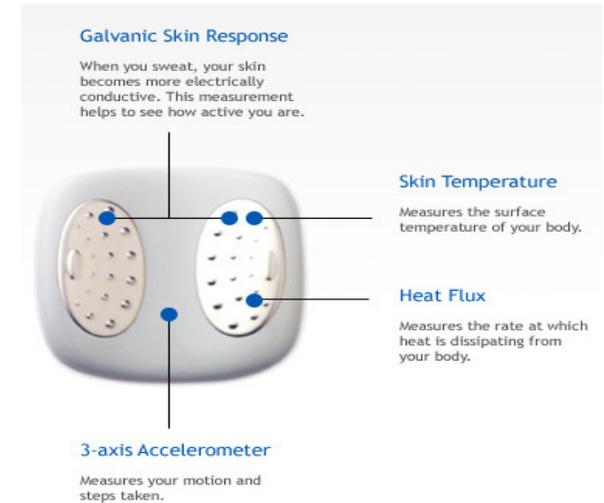


# Methods



# Free-living physical activity and sedentary behaviour

- SenseWear armband Mini (BodyMedia, Pittsburgh, PA): Triaxial accelerometer; Galvanic skin response; skin temperature; heat flux
- Armband worn on non-dominant arm half way between the elbow and the shoulder
- 6-7 days continuous wear including 2 weekend days
  - Classification of a full day:  $\geq 22$  hours wear time
- Proprietary algorithms calculate intensity of activity in METs

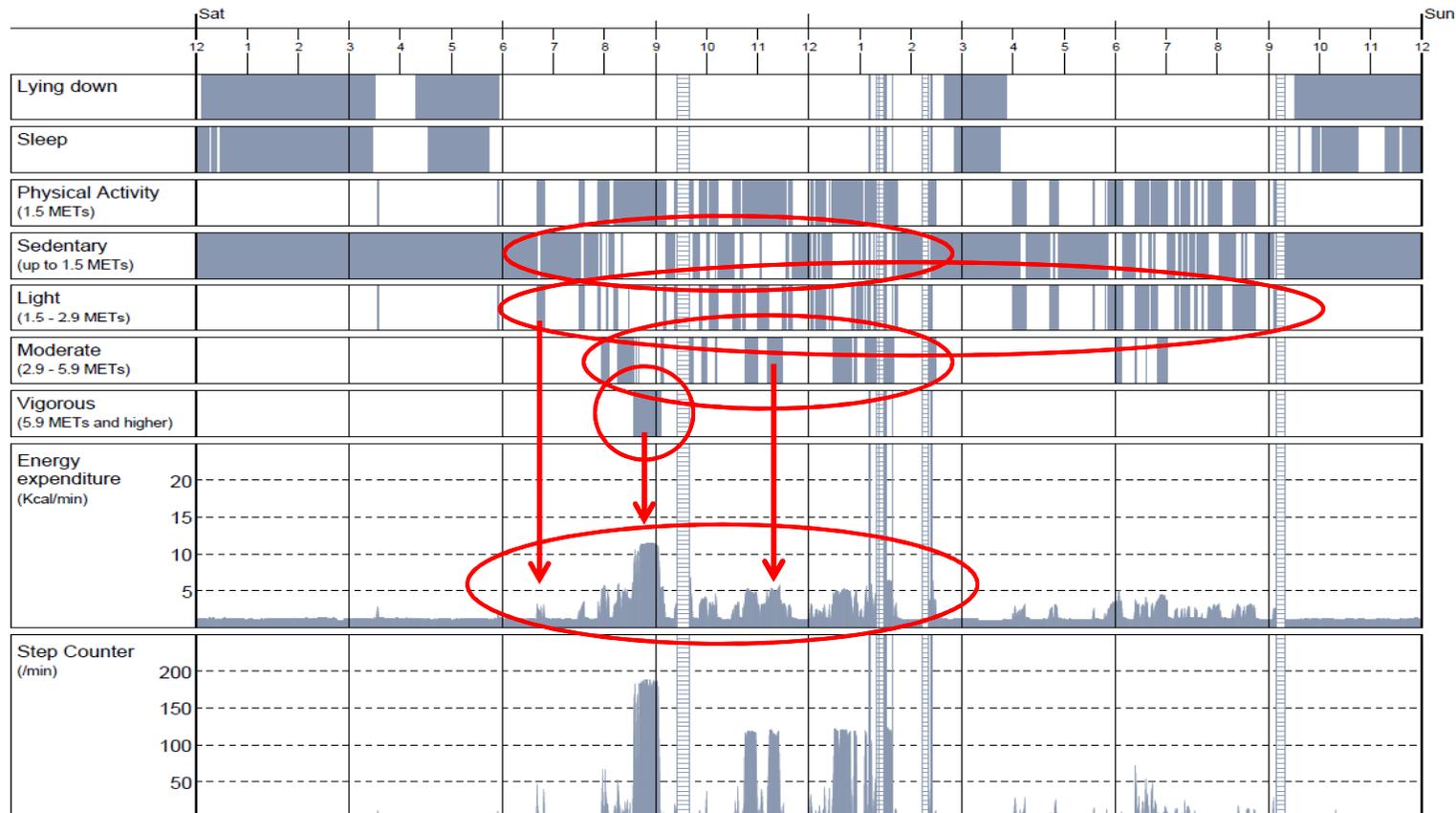


	<b>Sedentary</b>	<b>Light</b>	<b>Moderate</b>	<b>Vigorous</b>
Intensity (METs)	<1.5	1.5-2.9	3-5.9	>6

# Free-living physical activity and sedentary behaviour profile

<b>Subject</b>	<b>Age</b> 71	<b>Gender</b> Male	<b>Weight</b> 73.9 kg	<b>Height</b> 175 cm	<b>Handed</b> Right	<b>Smoker</b> No	<b>BMI</b> 24.13
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<b>Start Time</b> Sat 17 May 2014 00:00	<b>End Time</b> Sun 18 May 2014 00:00	<b>Duration of View</b> 1 day	<b>Duration on-body</b> 23 hrs 15 min (96.9%)
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# RESULTS

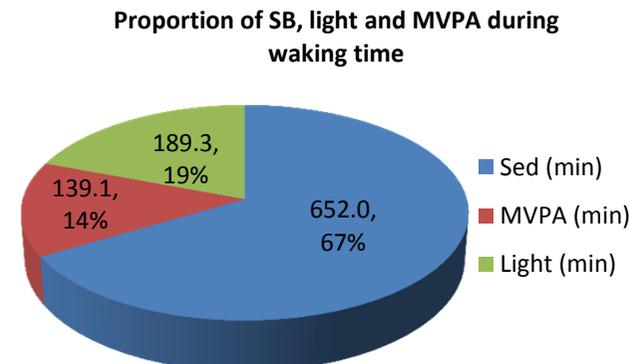
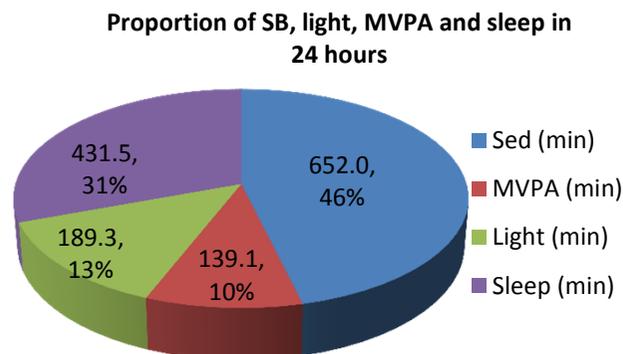
# Results 1 –

## Physical activity and sedentary behaviour

- 58 participants (13 males, 45 females) age  $37.0 \pm 13.8$  years, BMI  $28.6 \pm 4.9$  kg/m<sup>2</sup>
- 96.4% (n55) compliance ( $\geq 6$  days,  $\geq 22$  hours/day)

	Minimum	Maximum	Mean	Std. Deviation
Sedentary behaviour (min/day)	360.7	924.0	<u>652.0</u>	104.0
Light PA (min/day)	81.0	327.0	189.4	58.1
Moderate PA (min/day)	30.0	368.5	129.9	78.4
Vigorous PA (min/day)	0.0	47.7	9.2	11.4
Total PA (min/day)	123.9	635.9	328.4	100.4
MVPA (min/day)	31.1	404.2	139.1	86.0

**~11 hours!**  
**67% of the**  
**waking day**

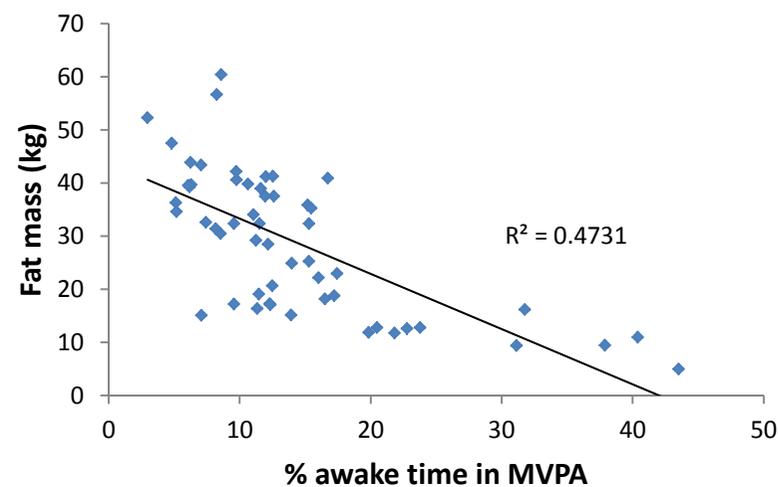
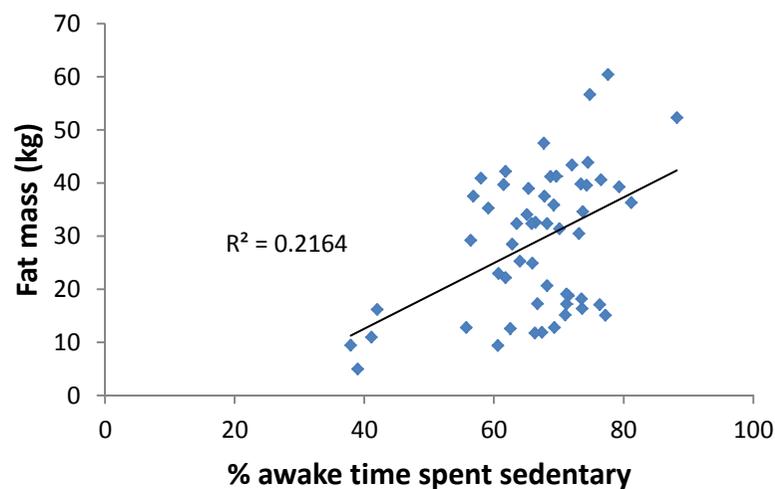


## Results 2 – Body composition

- Sedentary behaviour was positively associated and MVPA negatively associated with multiple indices of adiposity

	Body mass	BMI	Fat mass	% fat mass	WC
<b>Sedentary behaviour</b>	0.40†	0.47†	0.47†	0.44†	0.44†
<b>MVPA</b>	-0.52†	-0.69†	-0.69†	-0.71†	-0.63†

n=55; data are Pearson correlations (r). \*p<0.05; †p<0.01. Waist circumference (WC).



## Results 3 – Body composition

- After controlling for MVPA the correlations between sedentary behaviour and adiposity were no longer significant
- However, when the correlations between MVPA and adiposity were adjusted for sedentary behaviour they remained significant
- This suggests that the absence of MVPA could be more important than the presence of sedentary behaviour in the accumulation of fat mass

	Body mass	BMI	Fat mass	% fat mass	WC
<b>Sedentary behaviour<sup>1</sup></b>	-0.04	-0.22	-0.24	-0.35†	-0.16
<b>MVPA<sup>2</sup></b>	-0.37†	<b>-0.61†</b>	<b>-0.60†</b>	<b>-0.68†</b>	<b>-0.52†</b>

n=55; data are Pearson correlations (r). <sup>1</sup> controlled for MVPA in minutes; <sup>2</sup> controlled for sedentary time in minutes.  
\*p<0.05; †p<0.01. Waist circumference (WC).

## Results 4 – Eating behaviour traits

- There was no association between sedentary behaviour and appetite dysregulation
- MVPA was associated with TFEQ Disinhibition and Binge Eating
- But these relationships were no longer significant when controlling for adiposity

	Unadjusted		Adjusted for % fat mass	
	SB	MVPA	SB <sup>1</sup>	MVPA <sup>1</sup>
<b>Disinhibition</b>	0.22	-0.52 <sup>†</sup>	-0.14	-0.12
<b>Binge eating</b>	0.17	-0.38 <sup>†</sup>	-0.18	-0.08

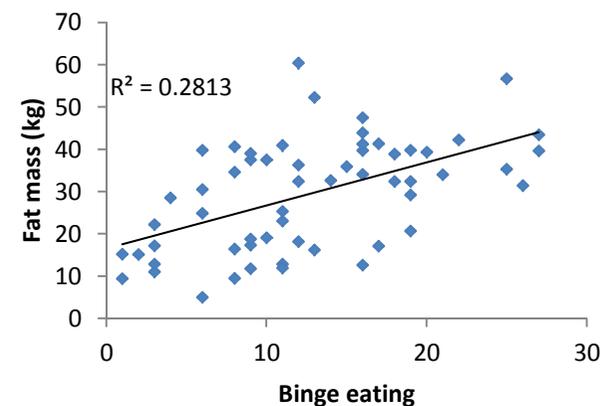
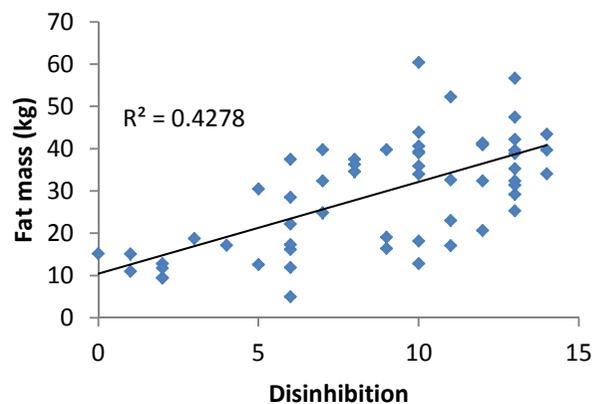
n=58; data are Pearson correlations (r). <sup>1</sup> controlled for % fat mass (n=55). <sup>†</sup>p<0.01.  
Waist circumference (WC); SB (sedentary behaviour); energy expenditure (EE).

## Results 5 – Eating behaviour traits

- Higher levels of adiposity were associated with higher levels of TFEQ Disinhibition and Binge Eating

	Lean mass	Fat mass	% fat mass	WC	SB <sup>1</sup>	MVPA <sup>1</sup>
<b>Disinhibition</b>	-0.11	0.65†	0.65†	0.61†	-0.14	-0.12
<b>Binge eating</b>	-0.03	0.53†	0.49†	0.52†	-0.18	-0.08

n=58; data are Pearson correlations (r). <sup>1</sup> controlled for % fat mass (n=55). †p<0.01. Waist circumference (WC); SB (sedentary behaviour); energy expenditure (EE).



# Summary

- Sedentary time was associated with higher adiposity – **NOT** independent of MVPA
- MVPA was associated with lower adiposity – **WAS** independent of sedentary behaviour
- After controlling for adiposity sedentary behaviour and MVPA were **NOT** associated with appetite dysregulation
- Adiposity **WAS** positively associated with Disinhibition and Binge Eating
- The influence of sedentary behaviour and MVPA on appetite dysregulation may **not** be direct, but could be indirectly influencing appetite via fat mass accumulation over time

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Thank you for listening