European Initiative for Exercise in Medicine
Budapest, Hungary, 15th-16th September, 2014

Why Breaking-up Sedentary Behavior for Exercise is Medicine?

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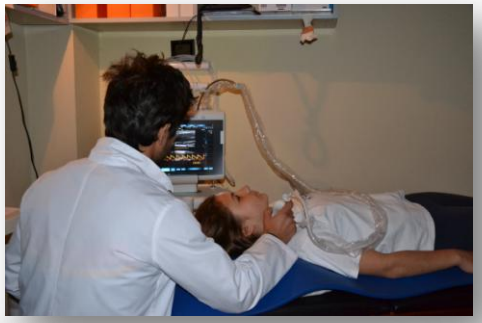
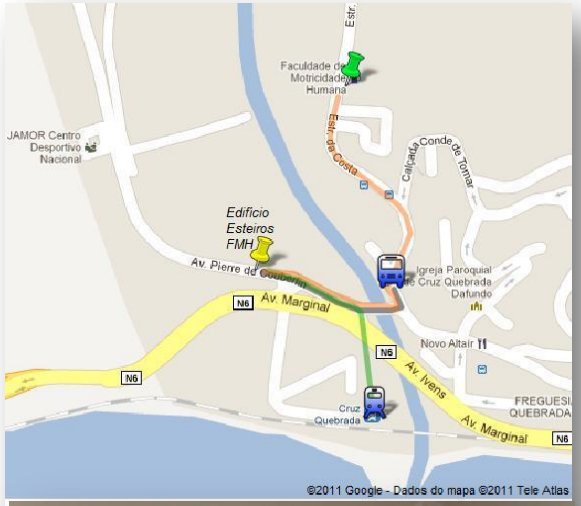
fMH

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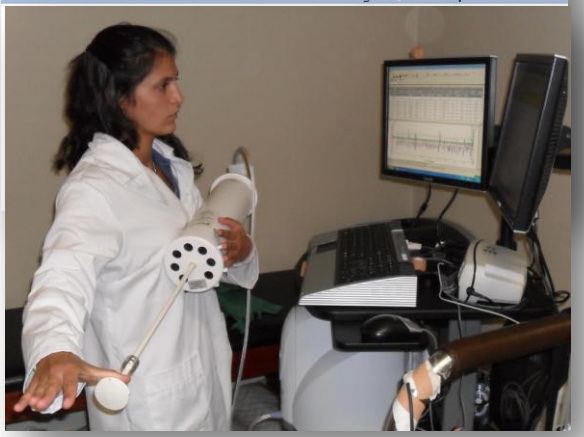
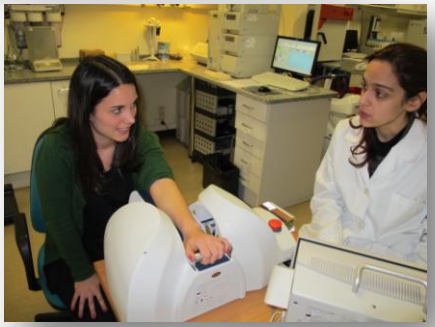
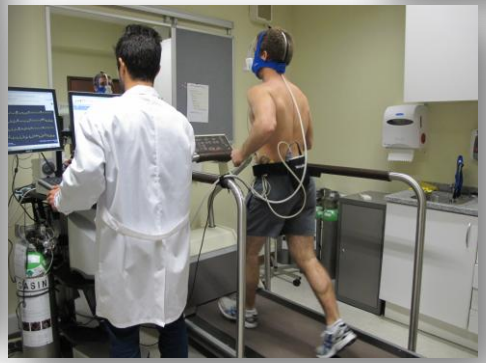






CURRENT PARADIGM

GUIDELINES FOR OLDER ADULTS

150 minutes/week of MPA

Major muscle groups 2 or more d/week

OR

75 minutes/week of MVPA

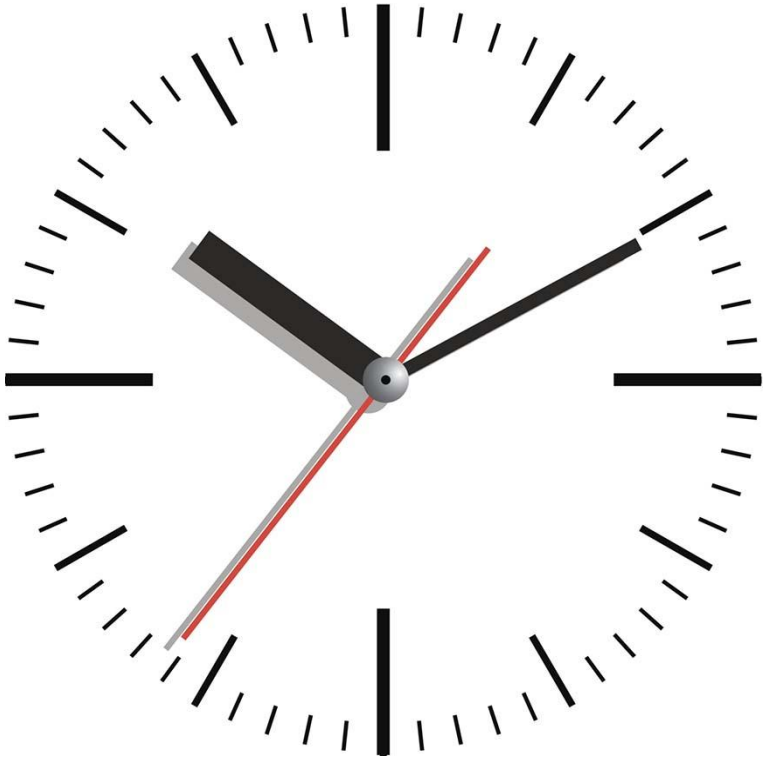
Major muscle groups 2 or more d/week

OR

An equivalent mix of MPA and MVPA

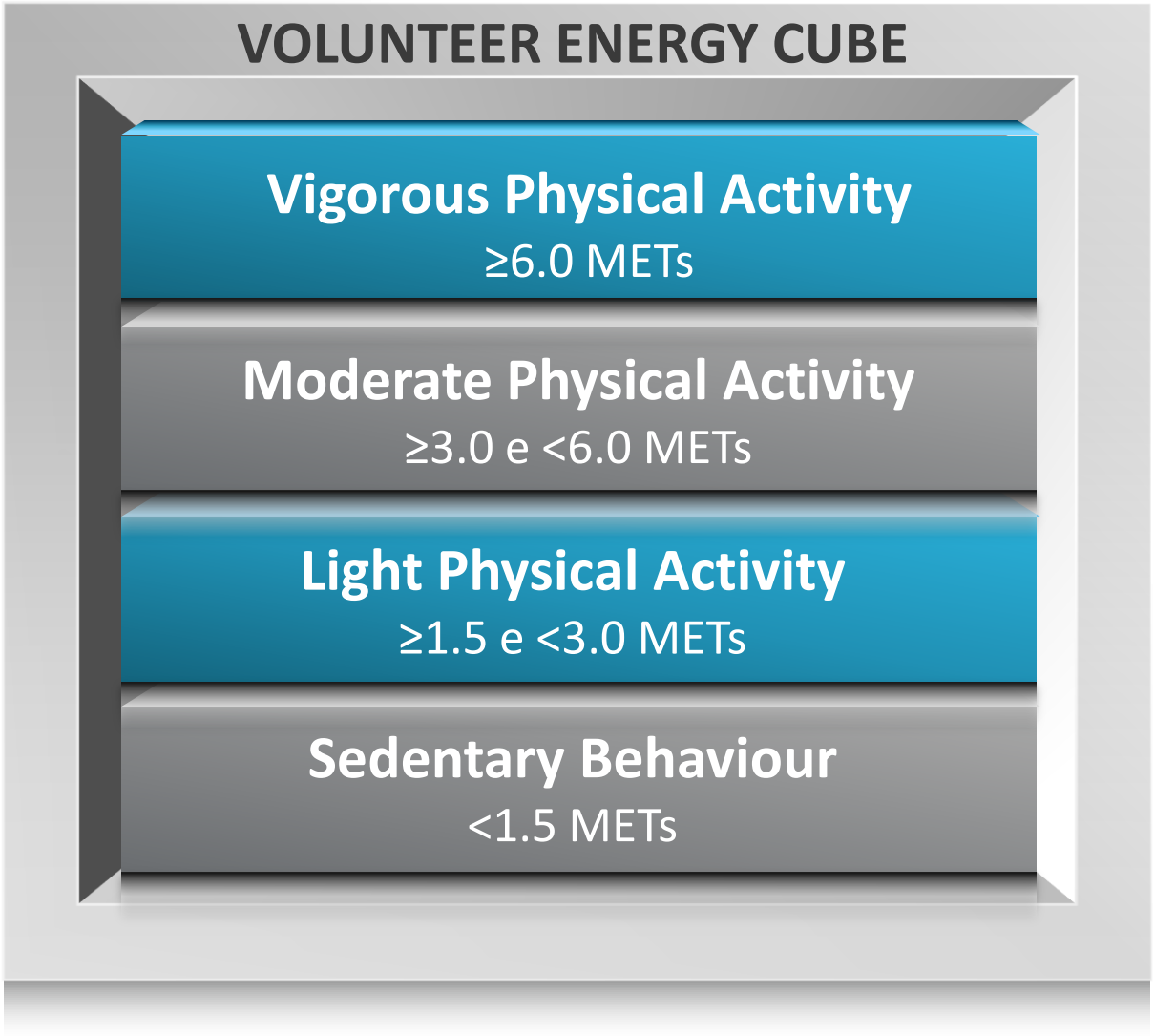
Major muscle groups 2 or more d/week

30 min is 1/48TH of One Day

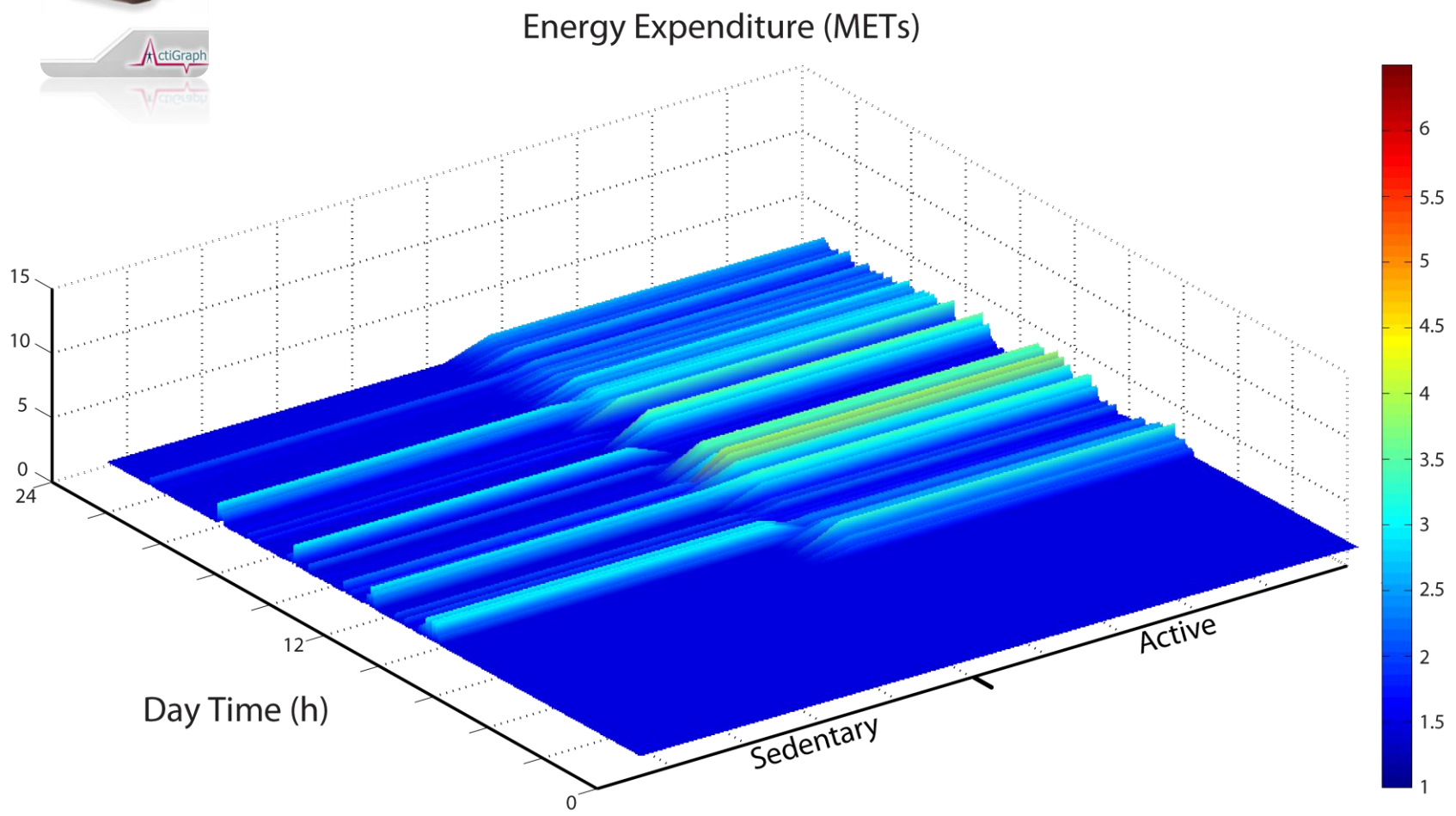


Cells receive input from their environment every minute of every day

SEMANTICS AND METABOLIC EQUIVALENTS

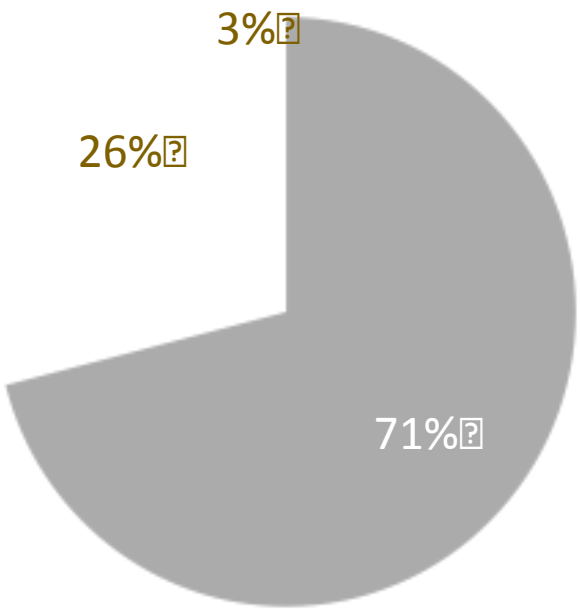


ACTIVE VS. SEDENTARY – OLDER ADULTS

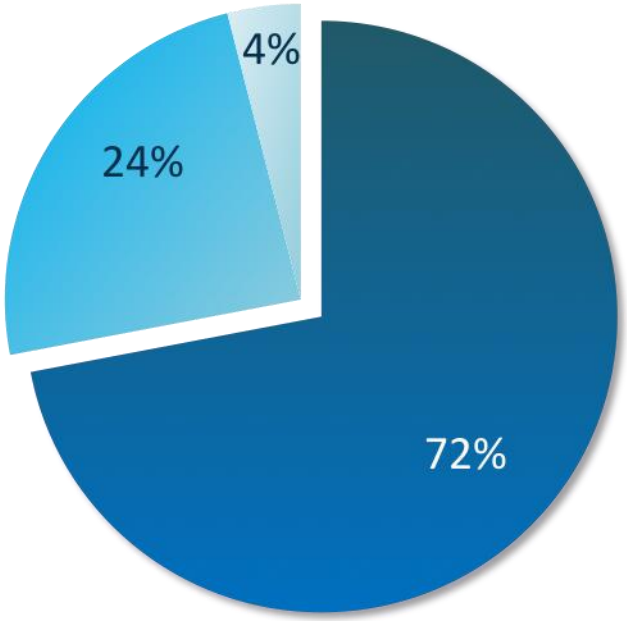


Older Adults - Portugal

Females



Males



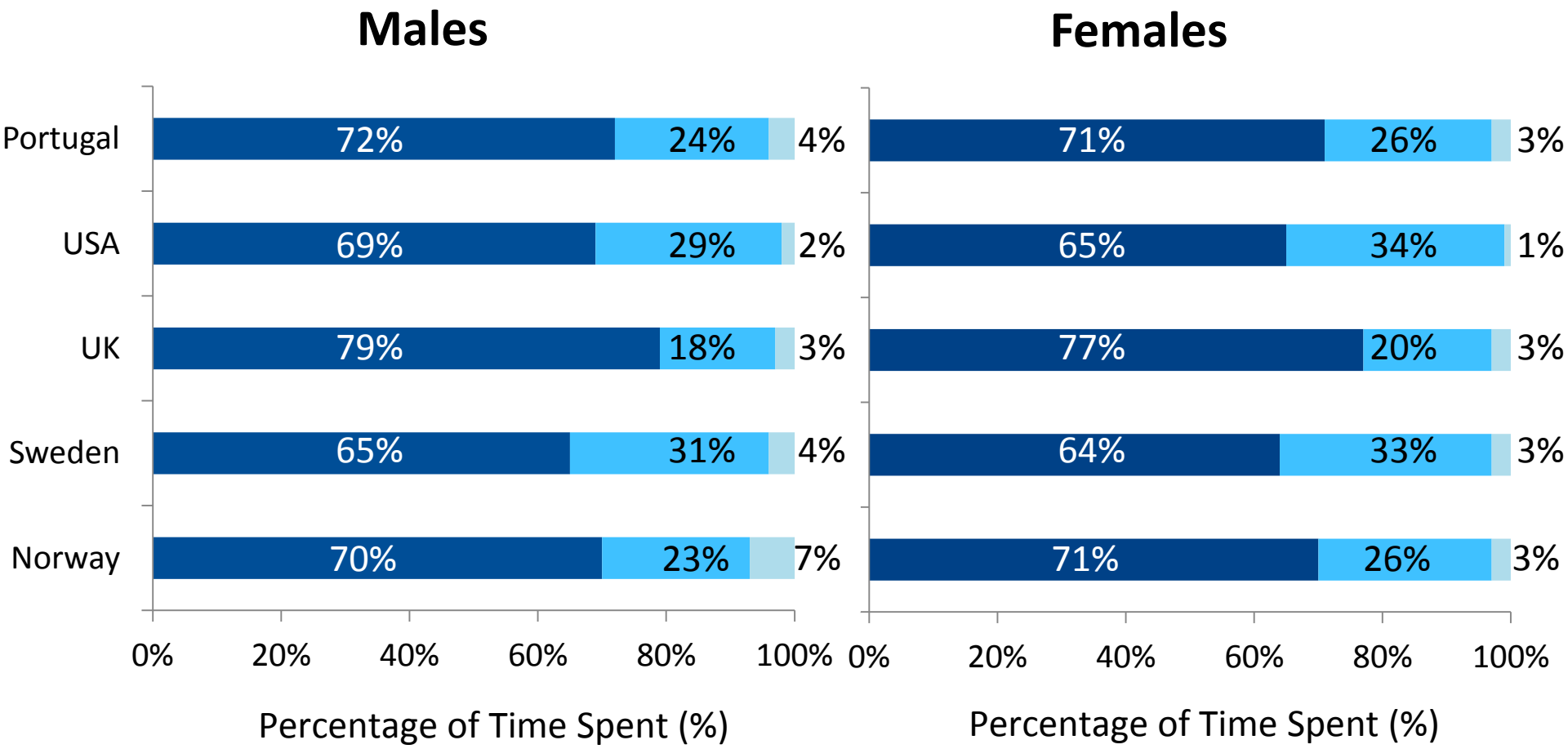
S Sedentary

L Light

M Moderate **V** Vigorous

Baptista et al., *Medicine and Science in Sports and Exercise, 44(8)*, 1604-1612, 2012

Older Adults – SB and PA

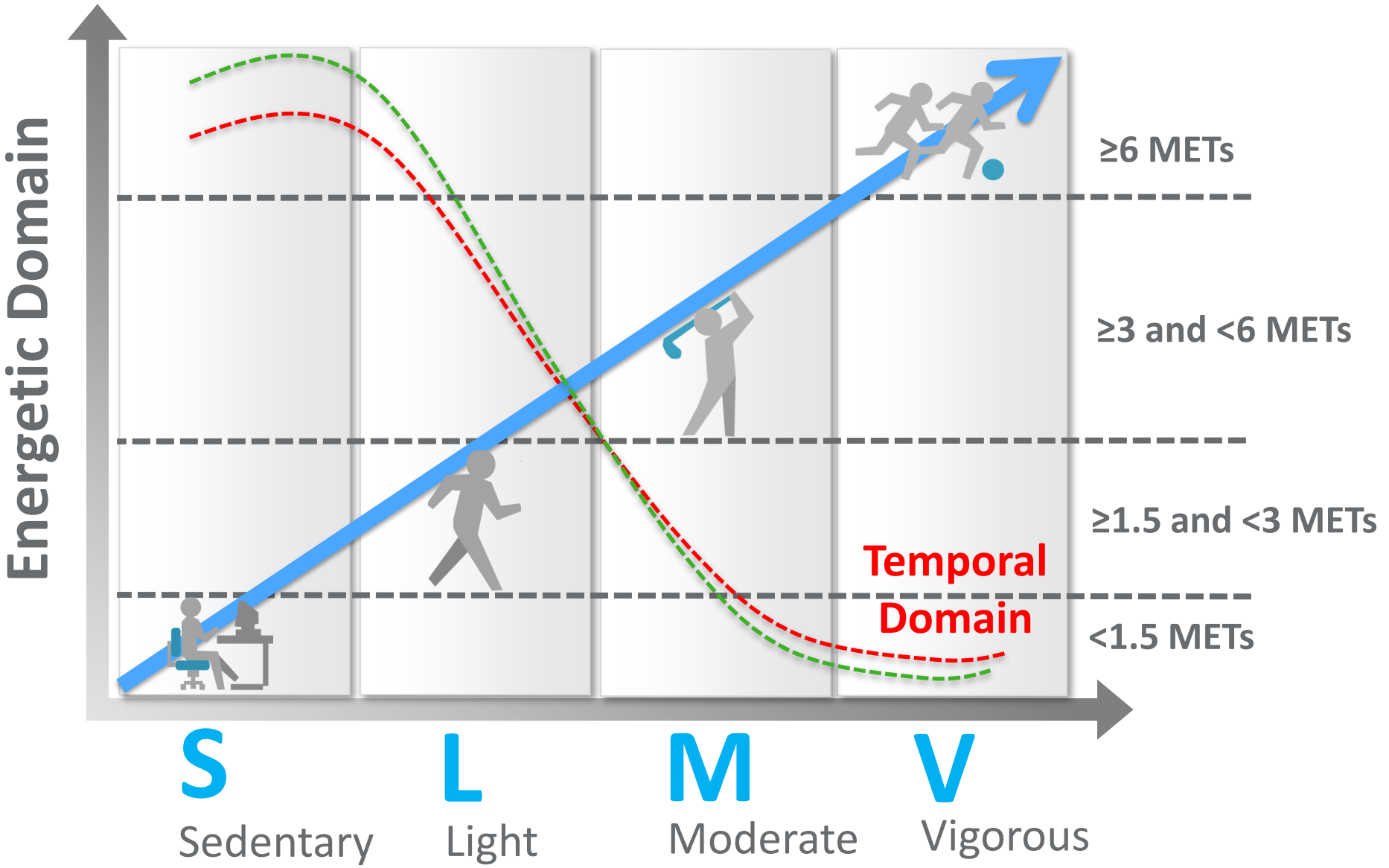


S Sedentary

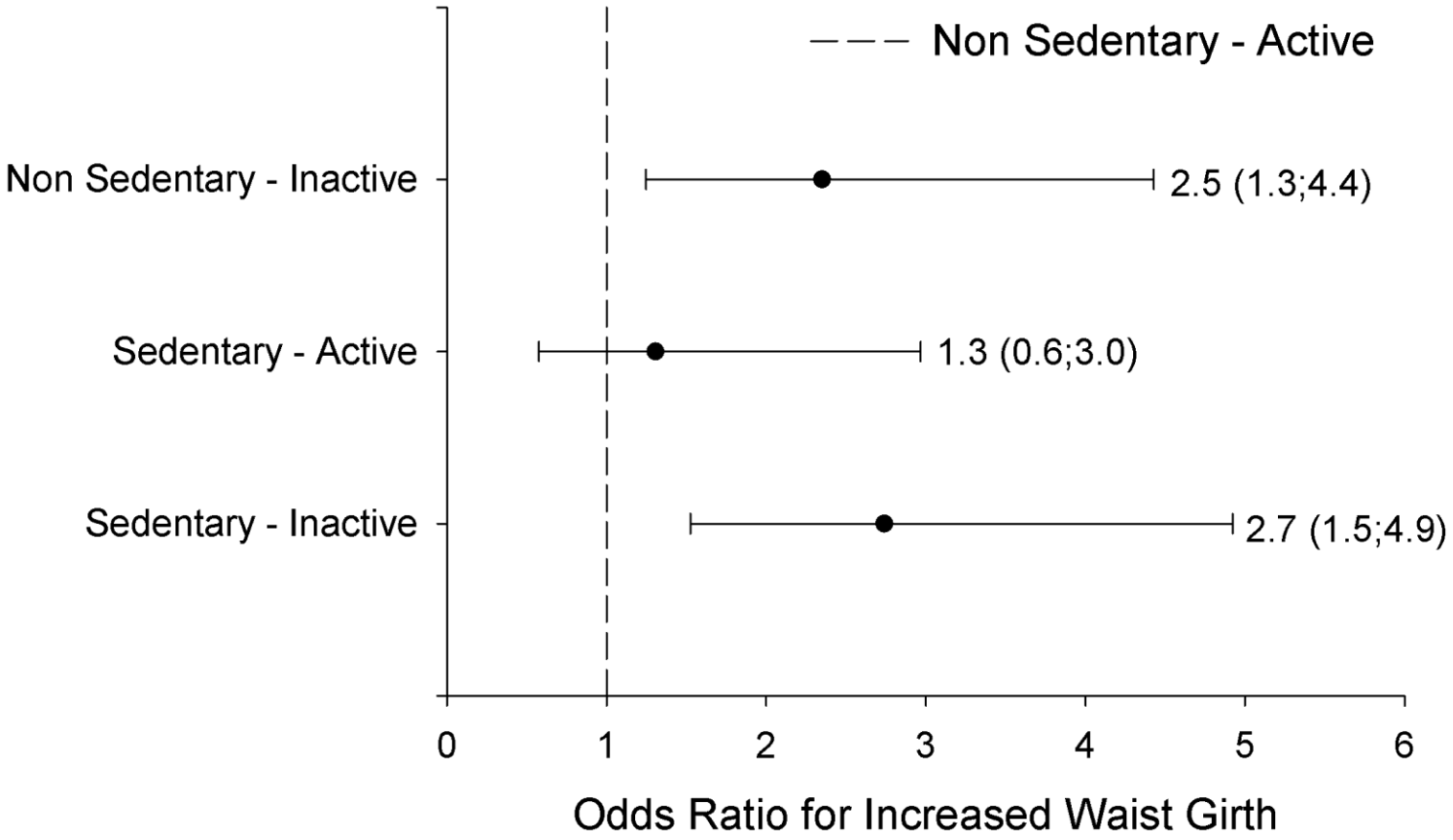
L Light

M Moderate **V** Vigorous

Energetic and Temporal Domains

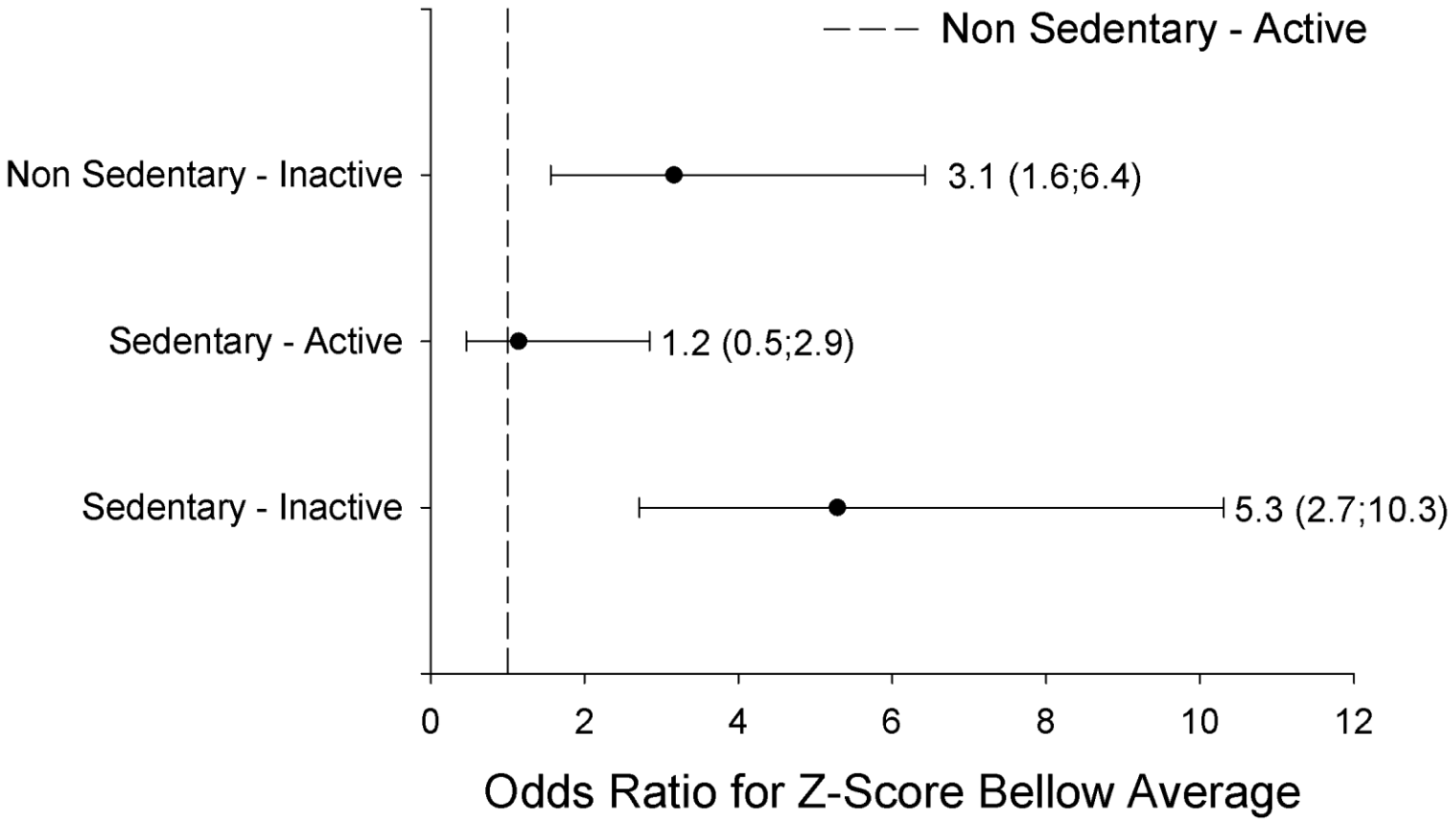


Sedentary Behaviour and Waist in Older Adults



Santos et al., *American Journal Human Biology, 24(1),* 28-34, 2012

SEDENTARY BEHAVIOUR AND FUNTIONAL FITNESS IN OLDER ADULTS



Santos et al., *Experimental Gerontology, 47(12),* 908-912, 2012

BREAKING UP SEDENTARY BEHAVIOUR

Clinical Care/Education/Nutrition/Psychosocial Research
ORIGINAL ARTICLE

Breaks in Sedentary Time

Beneficial associations with metabolic risk

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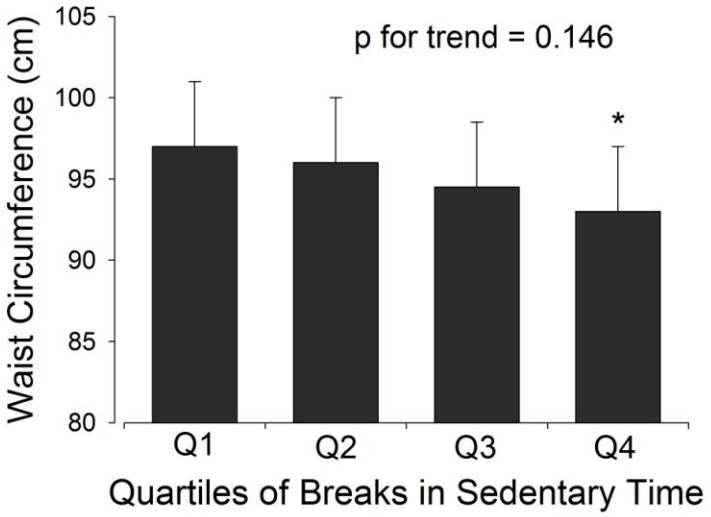
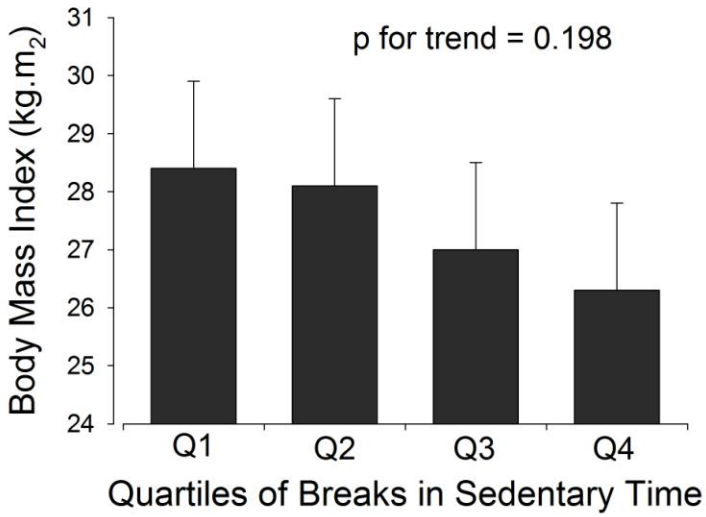
DAVID W. DUNSTAN, PHD[2]
JO SALMON, PHD[3]
ESTER CERIN, PHD[4]
JONATHAN E. SHAW, MD[2]
PAUL Z. ZIMMET, MD[2]
NEVILLE OWEN, PHD[1]

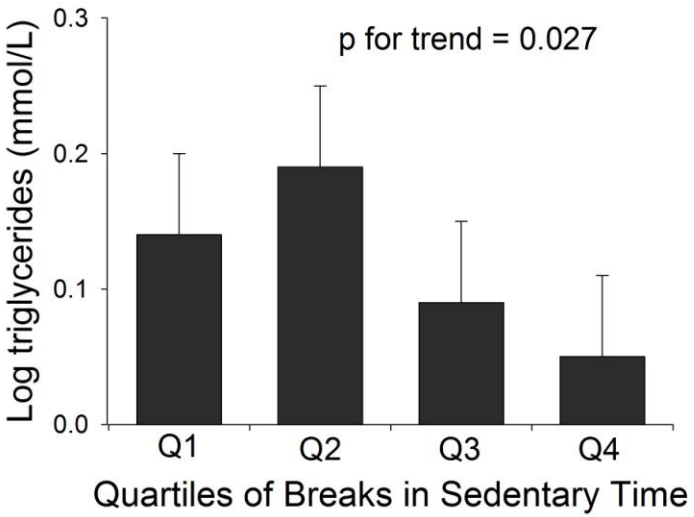
Preliminary evidence that breaking up sedentary time may provide beneficial metabolic effects, in addition to the beneficial effects of reducing sedentary time and increasing time spent in moderate-to-vigorous physical activity

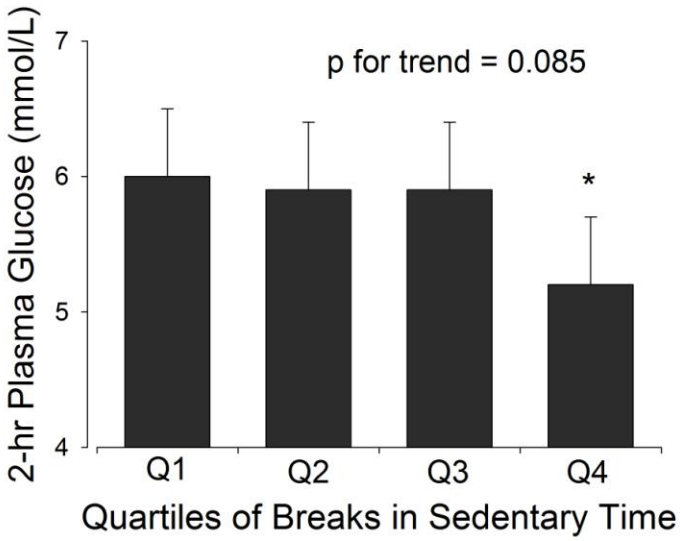
Healy et al., *Diabetes Care, 31*, 661-666, 2008

BREAKING UP SEDENTARY BEHAVIOUR



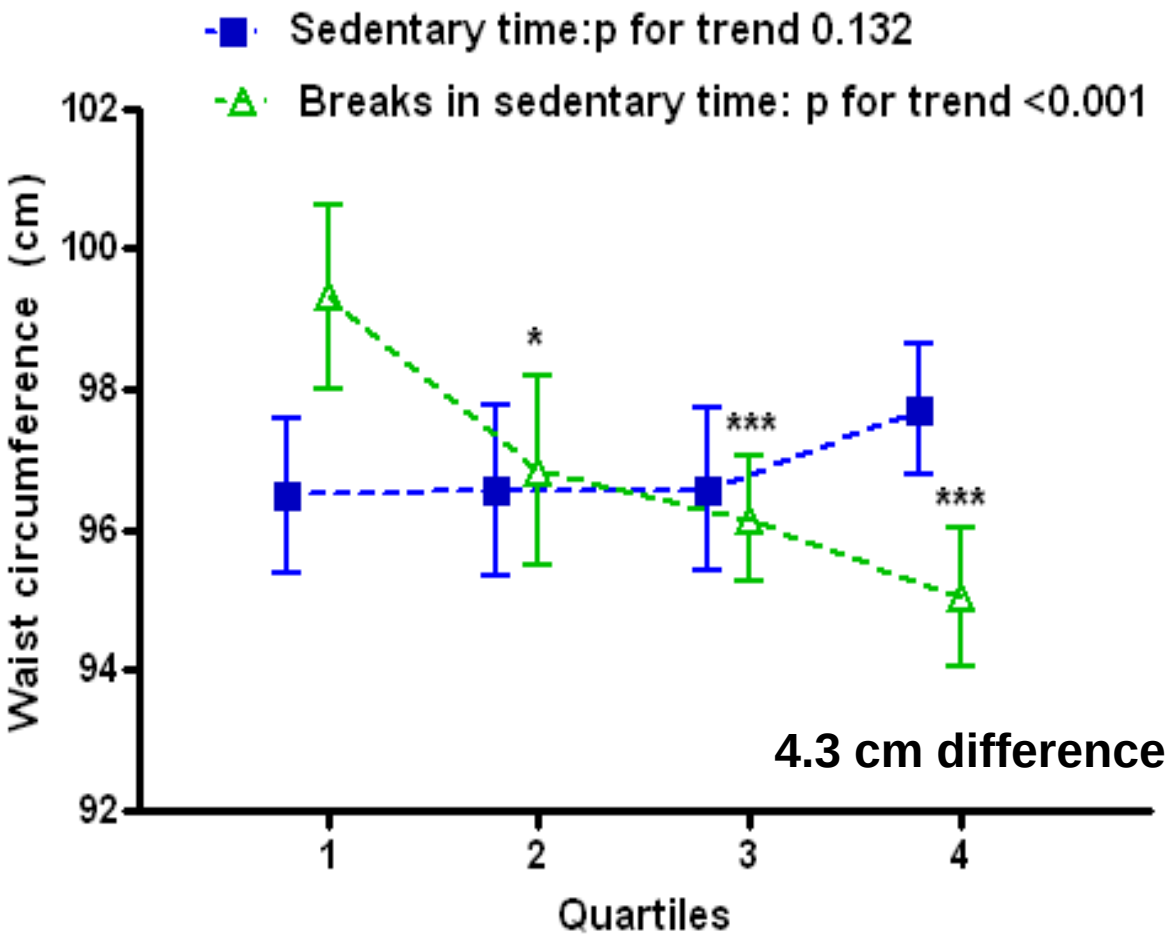






Healy et al., *Diabetes Care, 31*, 661-666, 2008

SEDENTARY TIME & BREAKS IN SEDENTARY TIME



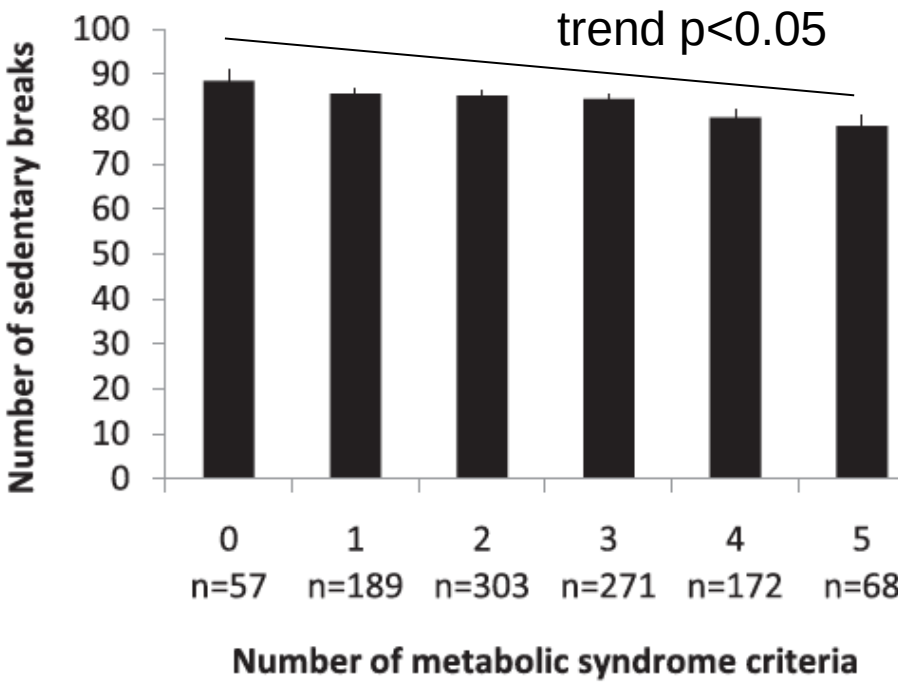
Sedentary time:
detrimental
HDL-C, triglycerides, insulin, HOMA-%B, HOMA-%S

Breaks:
beneficial
Waist circumference, HDL-C, C-reactive protein

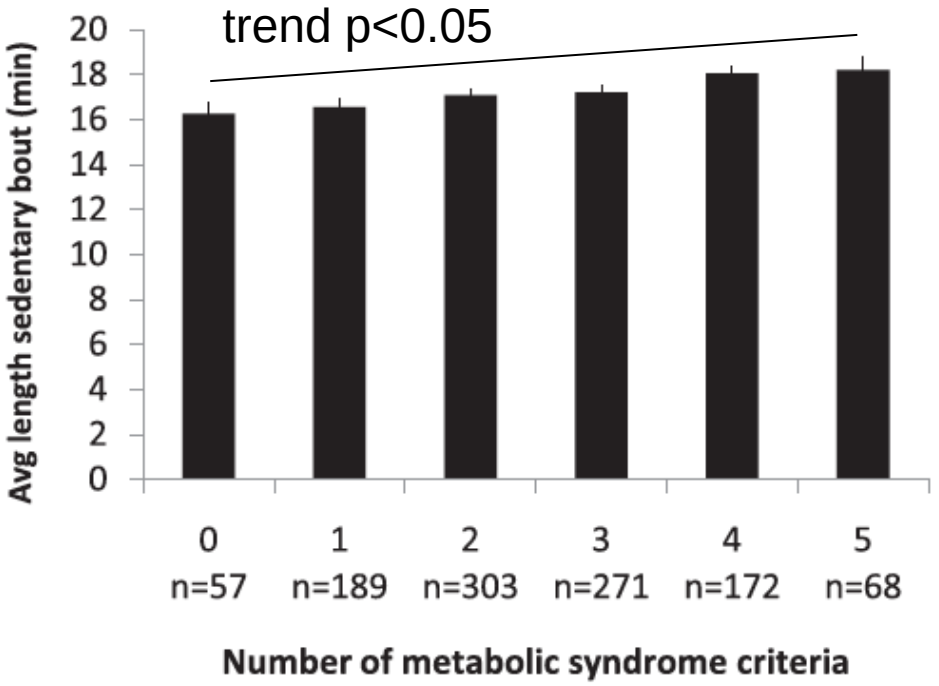
Healy et al., *European Heart Journal, 32,* 590-597, 2011

Breaks, Bouts and the Metabolic Syndrome

1,367 men and women, aged >60 years who participated in the NHANES



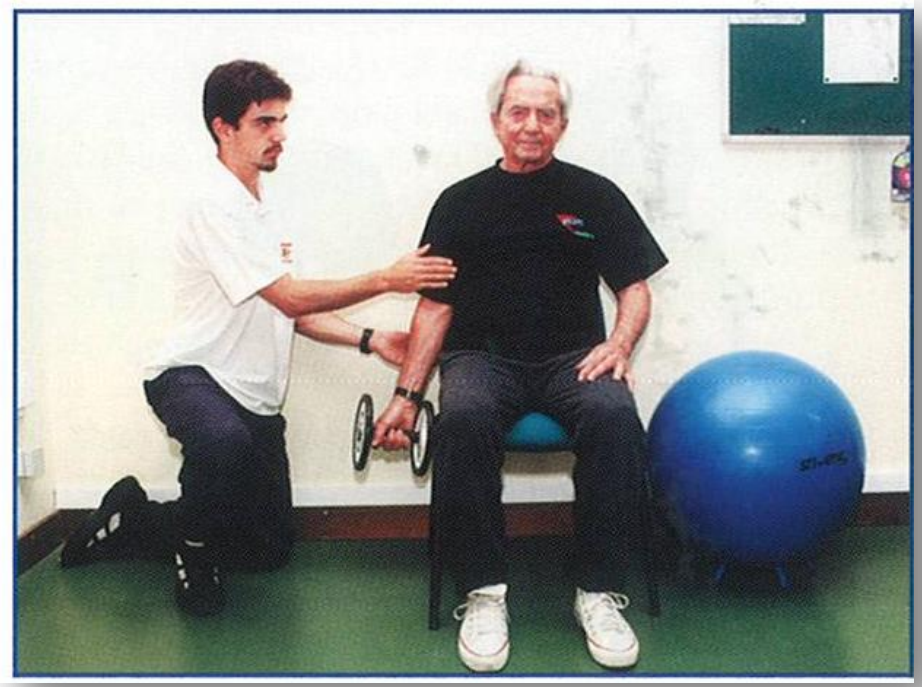
Interruption in SB >100 counts/min

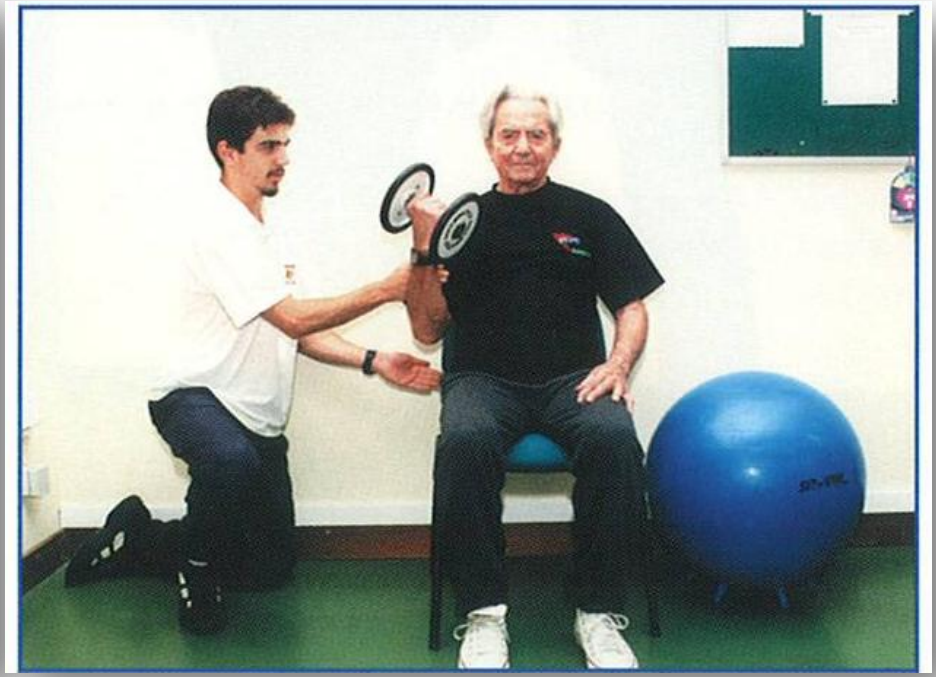


Period of time >5 min

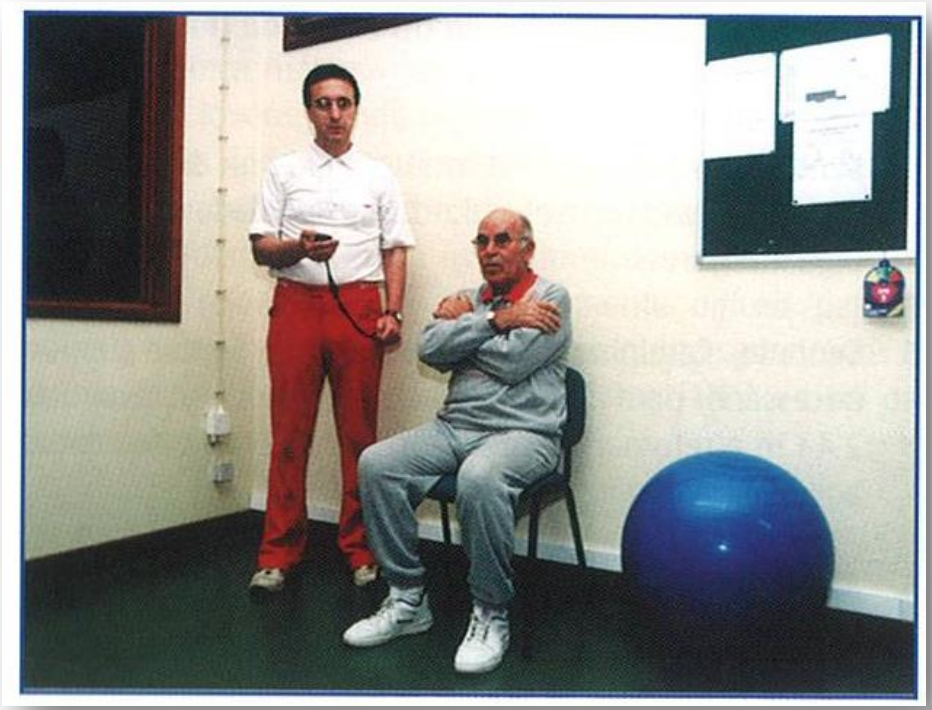
Bankoski et al., *Diabetes Care, 34*, 497-503, 2011

Arm Curl: women 5 lb; men 8 lb (repetitions/30 s)

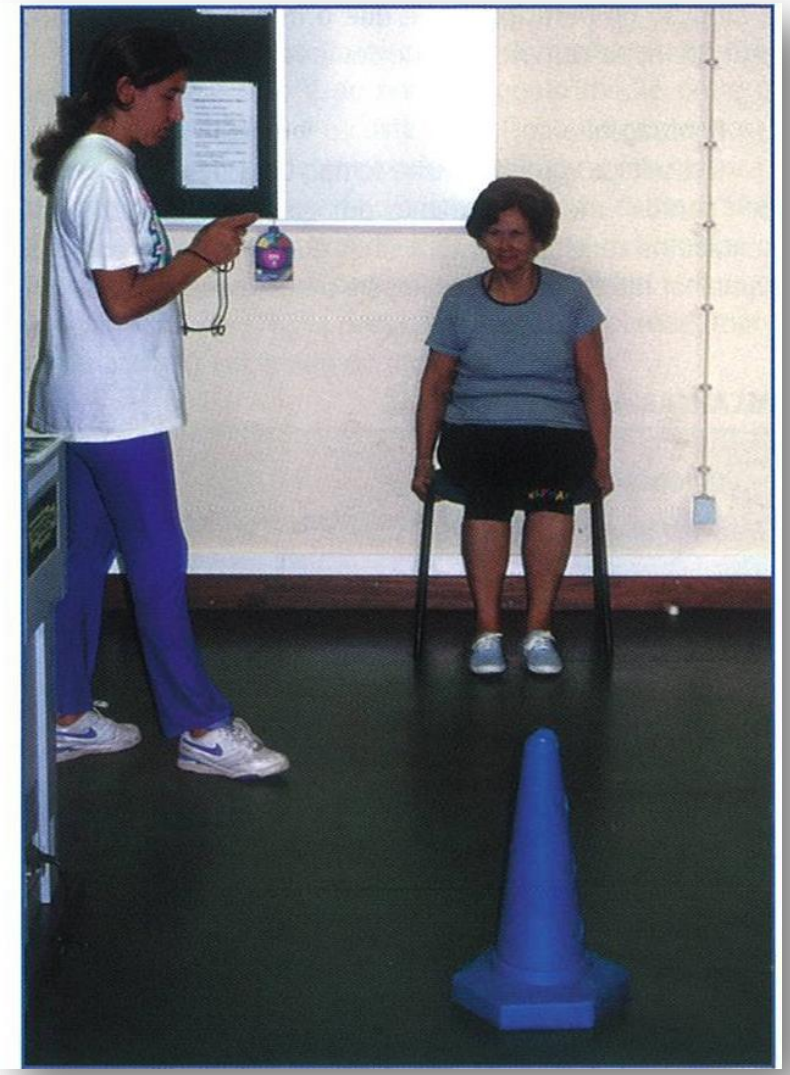


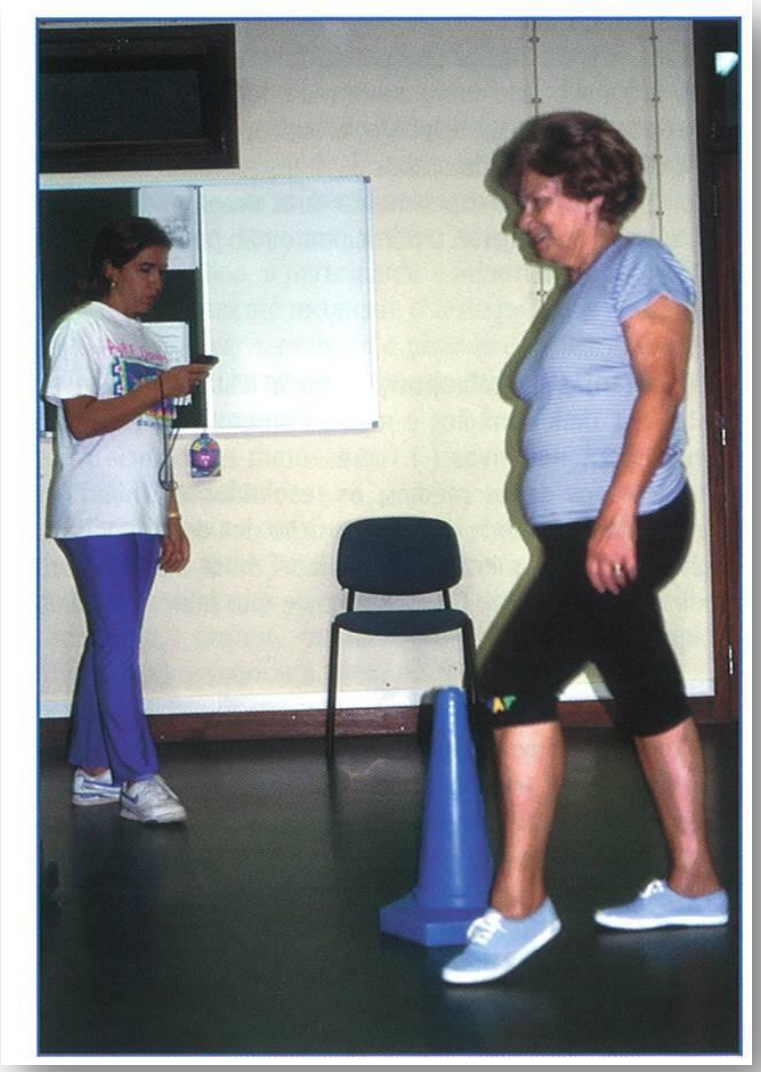


CHAIR STAND (REPETITIONS/30 S)

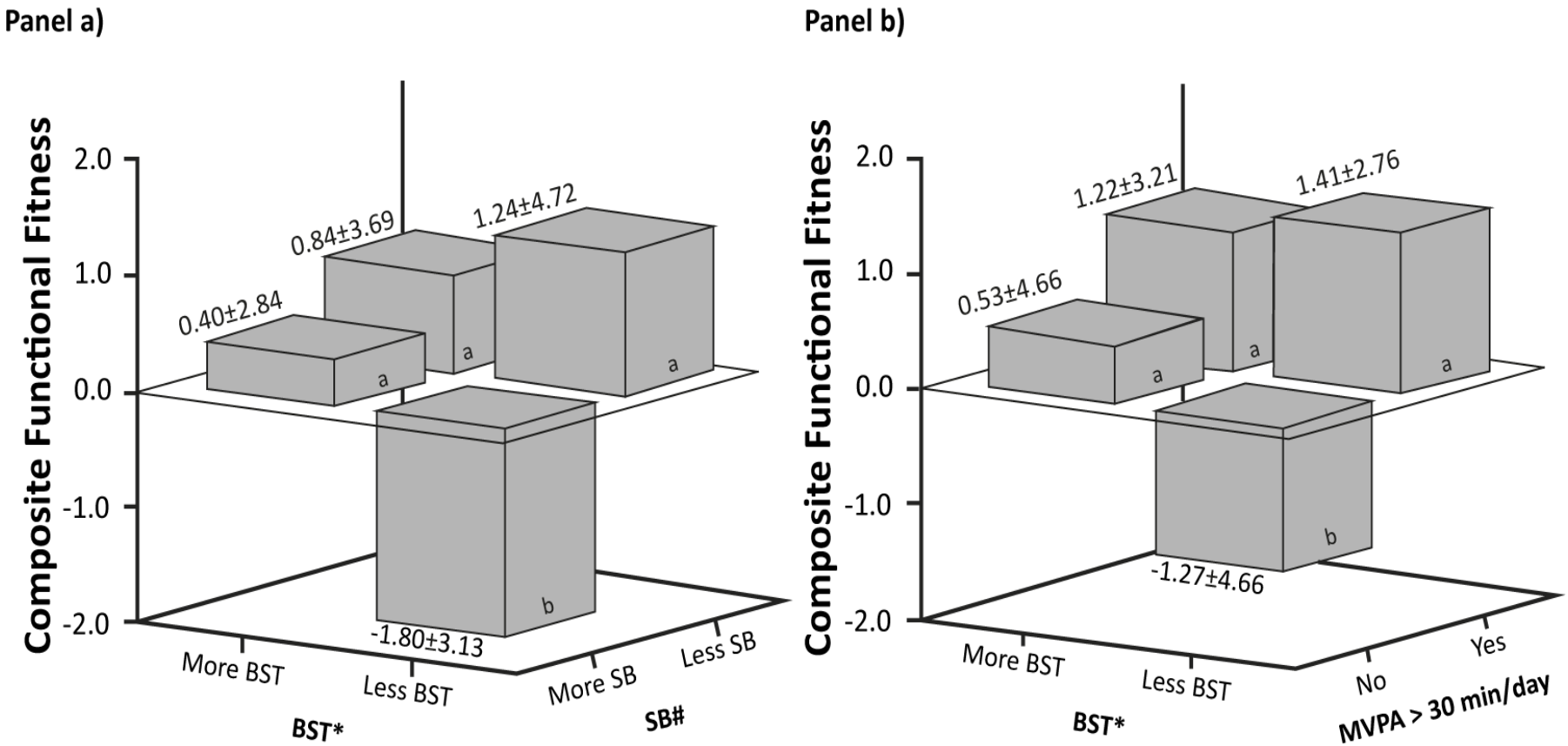


8-Foot up-and-Go (s)





Breaking Up and Physical Fitness in Older Adults



Abbreviations: BST, breaks in sedentary time; SB, sedentary behavior; MVPA, moderate-to-vigorous physical activity.
*More BST: ≥ P50; Less BST: < P50 (P50=80.4 BST/day); #More SB: ≥ P50; Less SB: < P50 (P50=518 min/day)
Significant differences between a) and b) ($p<0.05$)

Sardinha et al., *Journal of Gerontology: Medical Sciences* (in press)

Lower Extremity Function MVPA, Sedentary Time and Breaks

	Model 4			Model 5		
	β	95% CI	p	β	95% CI	p
Gender	.707	(.184, 1.230)	.008	.763	(.239,01.288)	.005
Age	-.075	(-.126, -.024)	.004	-.069	(-.120, -.017)	.009
BMI (kg/m^2)	-.010	(-.067, .047)	.725	-.010	(-.067, .047)	.729
Education	.300	(-.032, .633)	.076	.293	(-.038, .625)	.082
MVPA (min.reg h^{-1}) Trans.	1.682	(1.013,2.352)	<.001	1.398	(.650, 2.147)	<.001
Sedentary Time (min.reg h^{-1})				-.050	(-109, .010)	.100
Sedentary Time breaks (min.reg h^{-1})	**.721**	**(.463, .978)**	**<.001**	**.583**	**(.278, .887)**	**<.001**
R^2		.410			.415	

Model 4, adjusted for (as model 2 +) breaks in sedentary time (.reg h^{-1}).
Model 5, adjusted for (as model 4+) sedentary time (min.reg h^{-1}).

Davies et al., *J Aging Physical Activity* 2013 Oct 1. [Epub ahead of print]

Clinical Care/Education/Nutrition/Psychosocial Research
ORIGINAL ARTICLE

Breaking Up Prolonged Sitting Reduces Postprandial Glucose and Insulin Responses

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Genevieve N. Healy, PhD[1,3]
Ester Cerin, PhD[6]
Marc T. Hamilton, PhD[7]
Jonathan E. Shaw, MD[1,2]
David A. Bertovic, FRACP[1]
Paul Z. Zimmet, MD[1,2]
Jo Salmon, PhD[4]
Neville Owen, PhD[1,3]

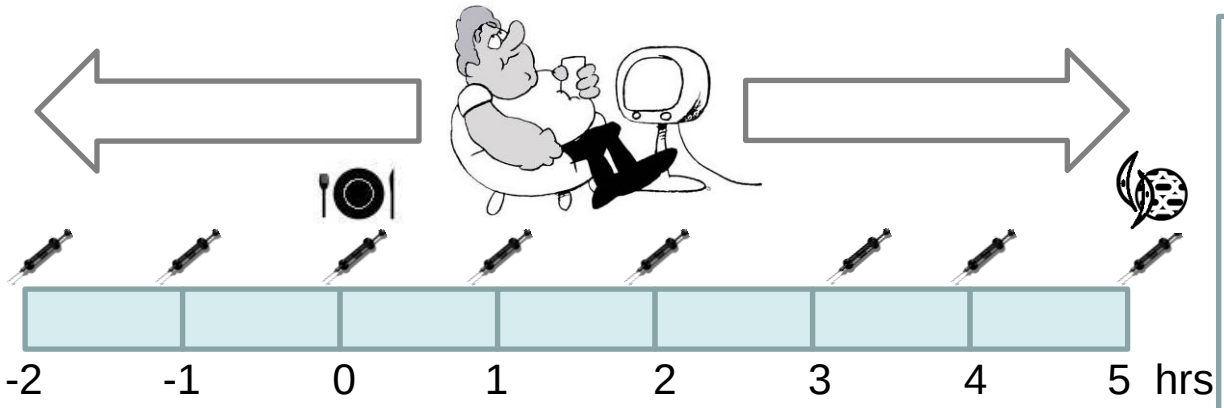
IDLE Breaks
(Intensity Defined Little Exercise)

Aim: To examine the **acute** effects of postprandial glucose and insulin levels of uninterrupted sitting compared with sitting interrupted by brief bouts of light- or moderate-intensity walking

Design: Randomised Cross-Over Trial

Dunstan et al., *Diabetes Care, 35, 976 - 983,* 2012

IDLE BREAKS EXPERIMENTAL PROTOCOL

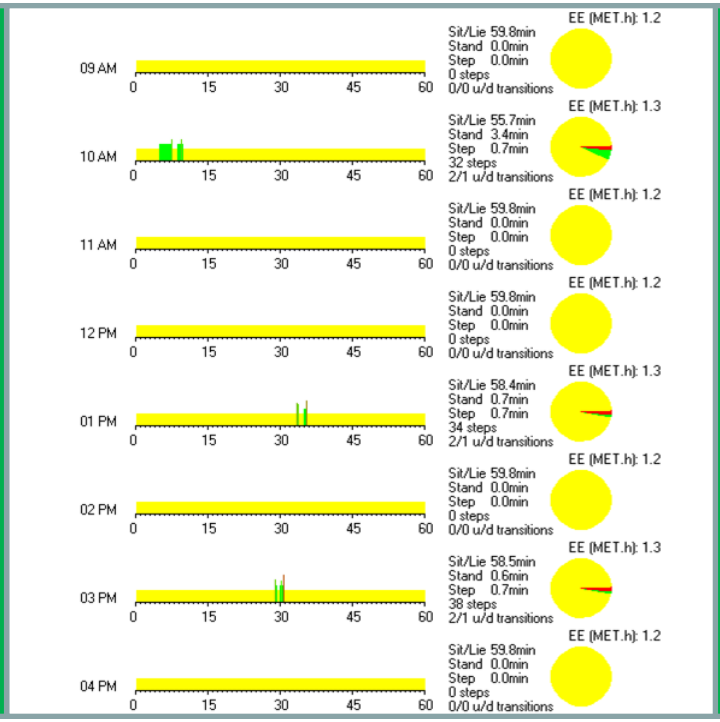


Standardised mixed meal: ~75g CHO and ~50g Fat

Blood sample: glucose, insulin, triglycerides, FFA's

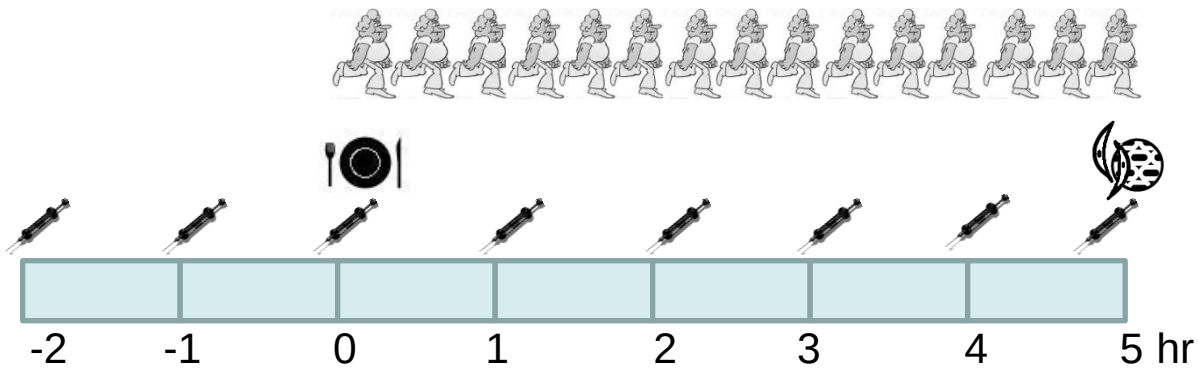
Muscle and adipose tissue biopsy (optional)

ACTIVPAL PROFILE



EXPERIMENTAL SET UP

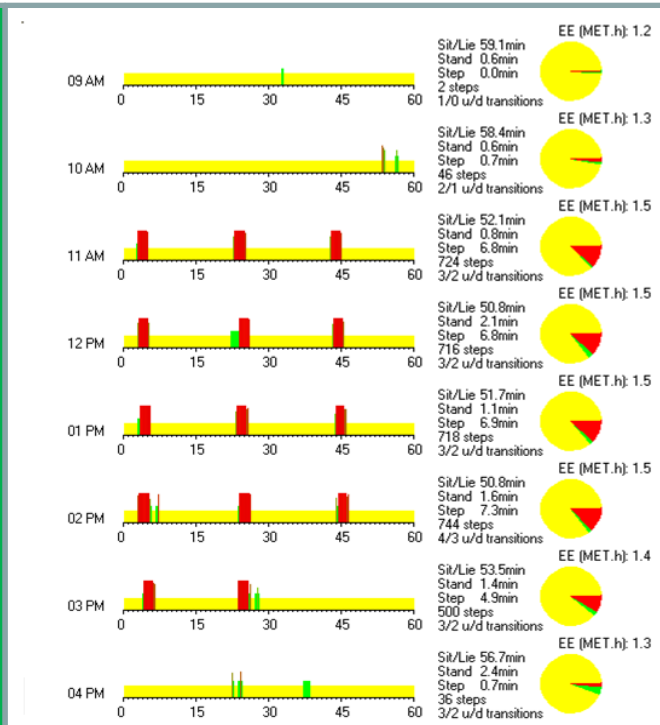
IDLE BREAKS EXPERIMENTAL PROTOCOL



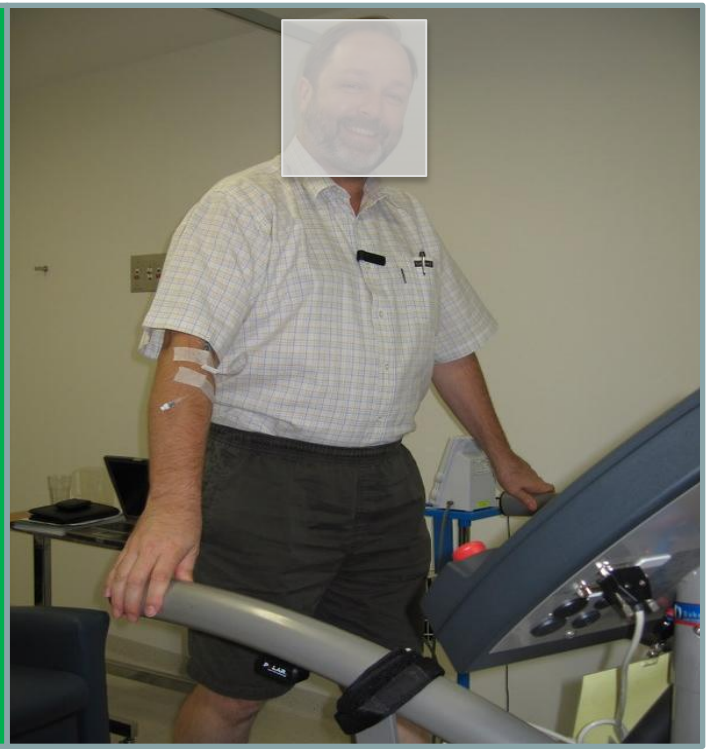
Light-intensity walking (2 min):
Treadmill Speed = 3.2 km/hr

Moderate-intensity walking (2 min):
Treadmill Speed = 5.8-6.4 km/hr

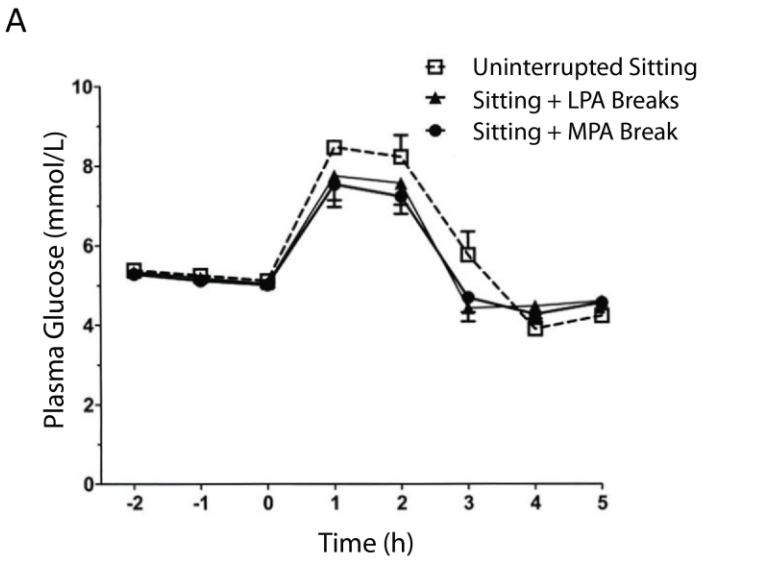
ACTIVPAL PROFILE

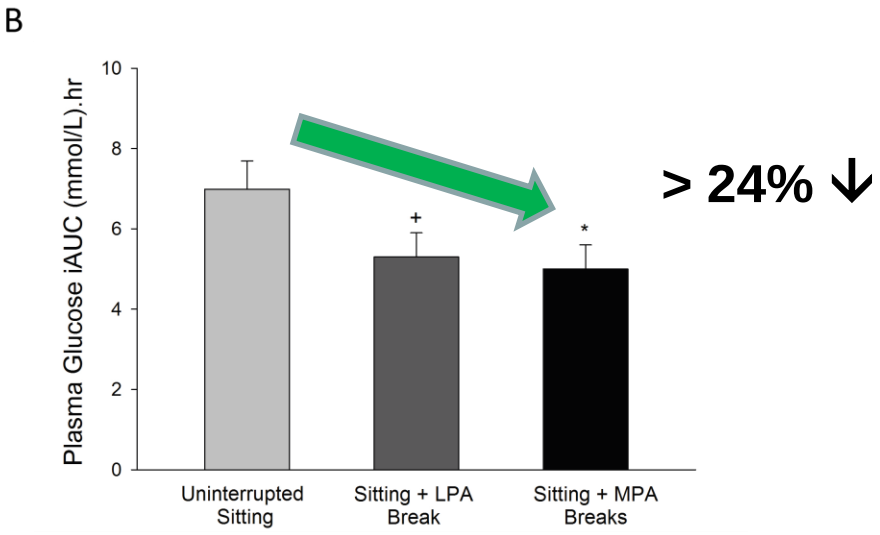


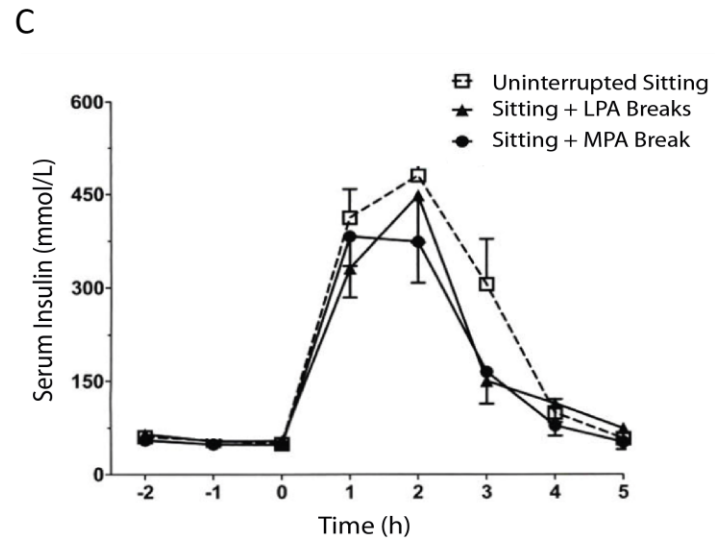
EXPERIMENTAL SET UP

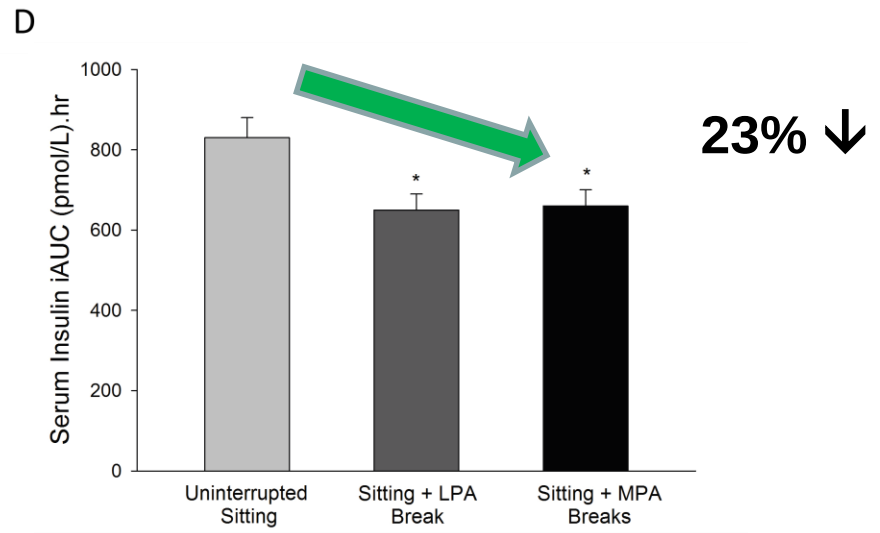


BREAKING UP SEDENTARY BEHAVIOUR



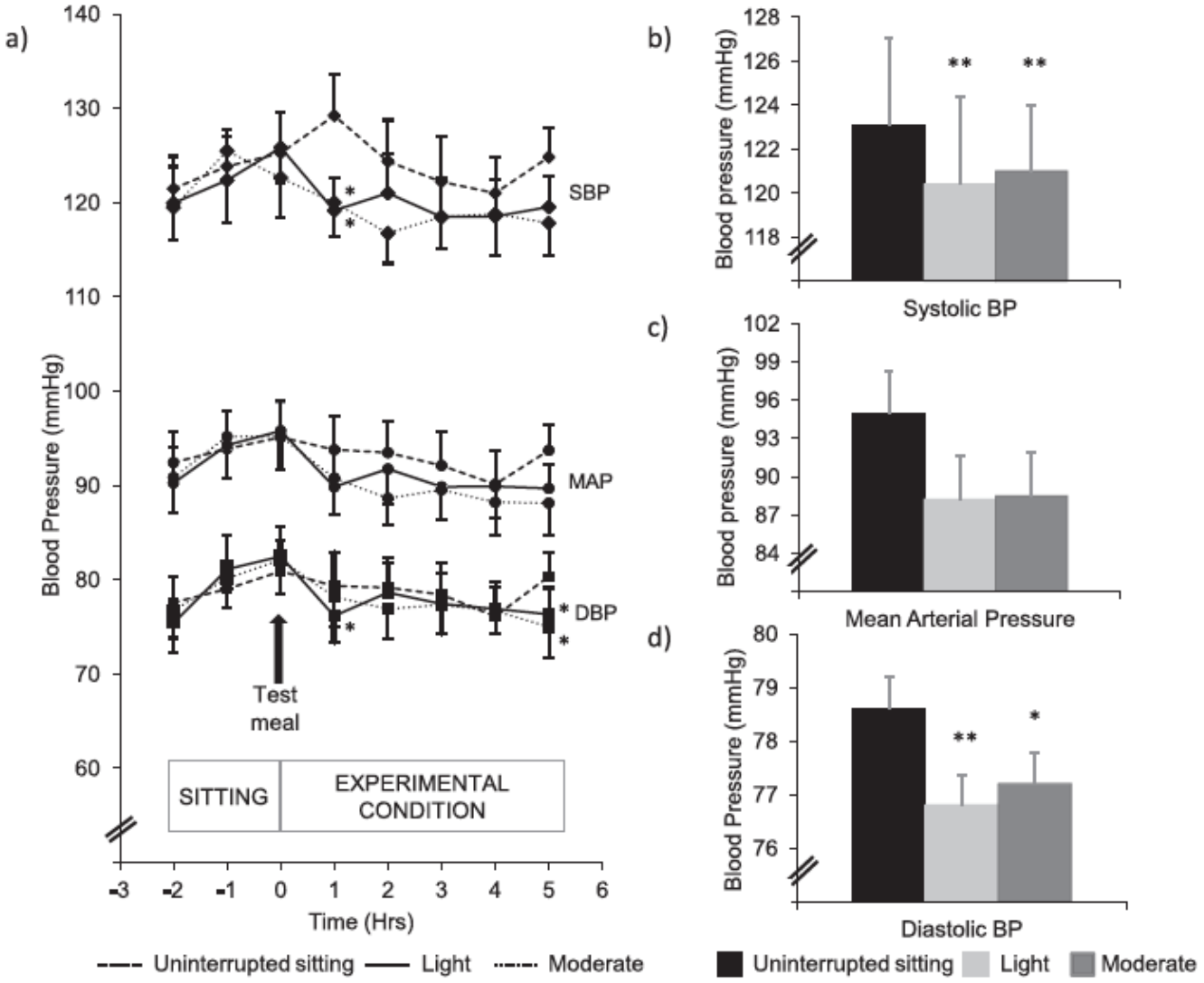






Dunstan et al., *Diabetes Care, 35, 976 - 983,* 2012

BREAKING UP SEDENTARY BEHAVIOUR



Larsen et. al., *Nutr Metab Cardiovasc Dis, 9,* 976-982, 2014

SUMMARY AND INTERPRETATION

- **Interrupting sitting time with frequent short bouts of light- or moderate-intensity activity (breaks):**
  - acutely lowers postprandial glucose and insulin levels, blood pressure and attenuates the increased plasma fibrinogen associated with uninterrupted sitting in overweight/obese adults
  - is associated with changes in expression of skeletal muscle genes involved in cellular development, growth and proliferation, and lipid and carbohydrate metabolism
- Potential for reducing CVD risk through breaking up sitting time
- BUT – limited to effects of one day exposure??

Breaking Up Sedentary Behaviour

ABLE Breaks

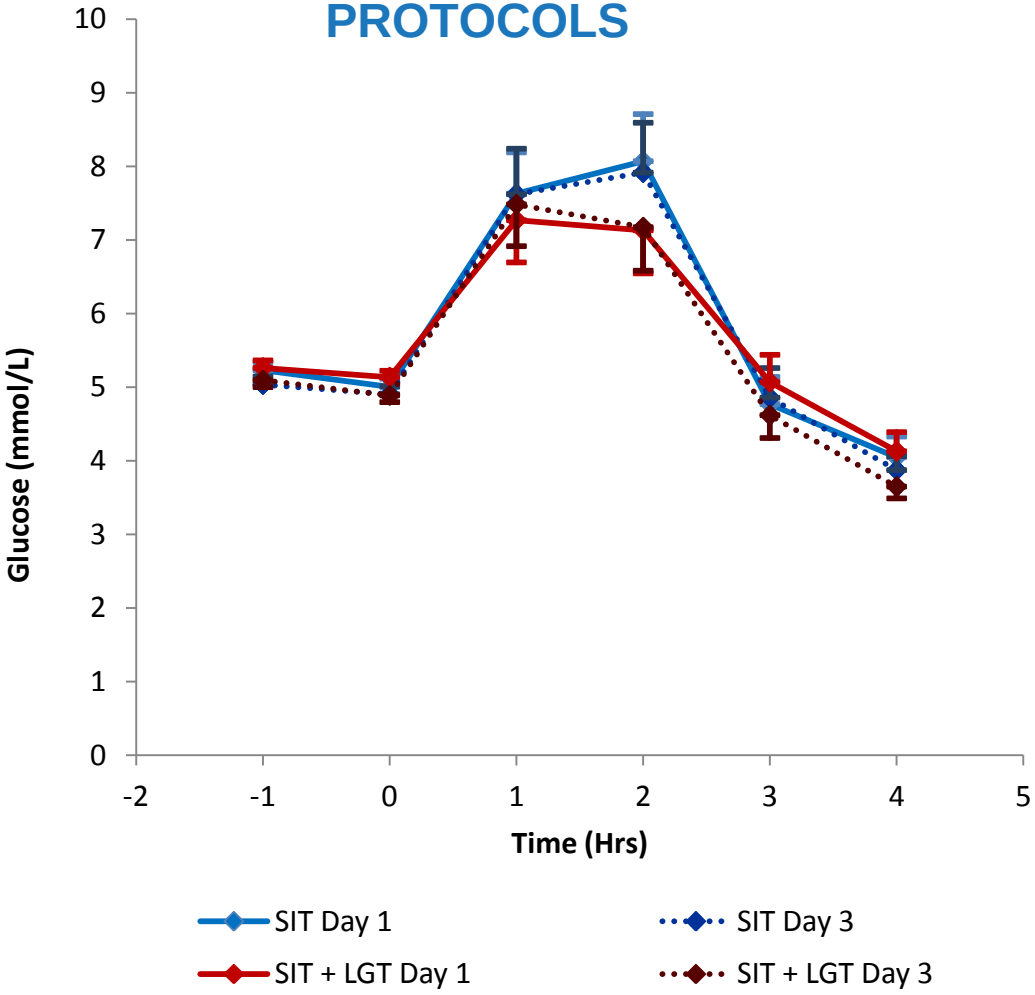
(Accumulative Benefit of Little Exercise)

Aim: To examine the **cumulative** effects of repeated bouts of prolonged sitting (with and without intermittent activity) on post-prandial glucose, insulin levels

Design: Randomised Cross-Over Trial

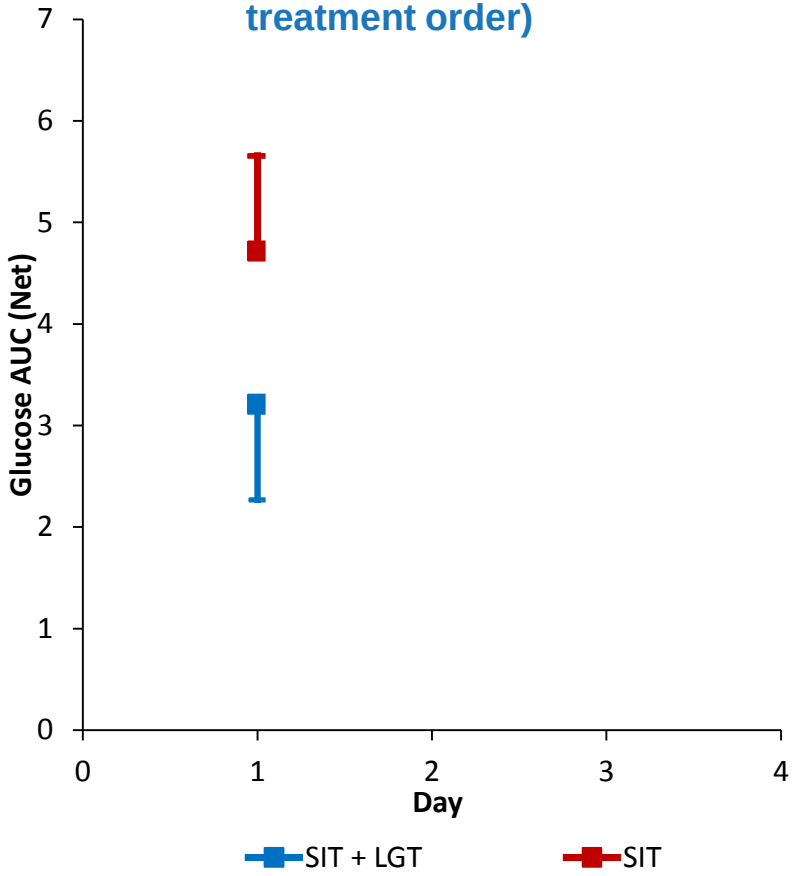
BREAKING UP SEDENTARY BEHAVIOUR

BLOOD GLUCOSE PROFILES DURING EXPERIMENTAL PROTOCOLS



ESTIMATED MARGINAL MEANS

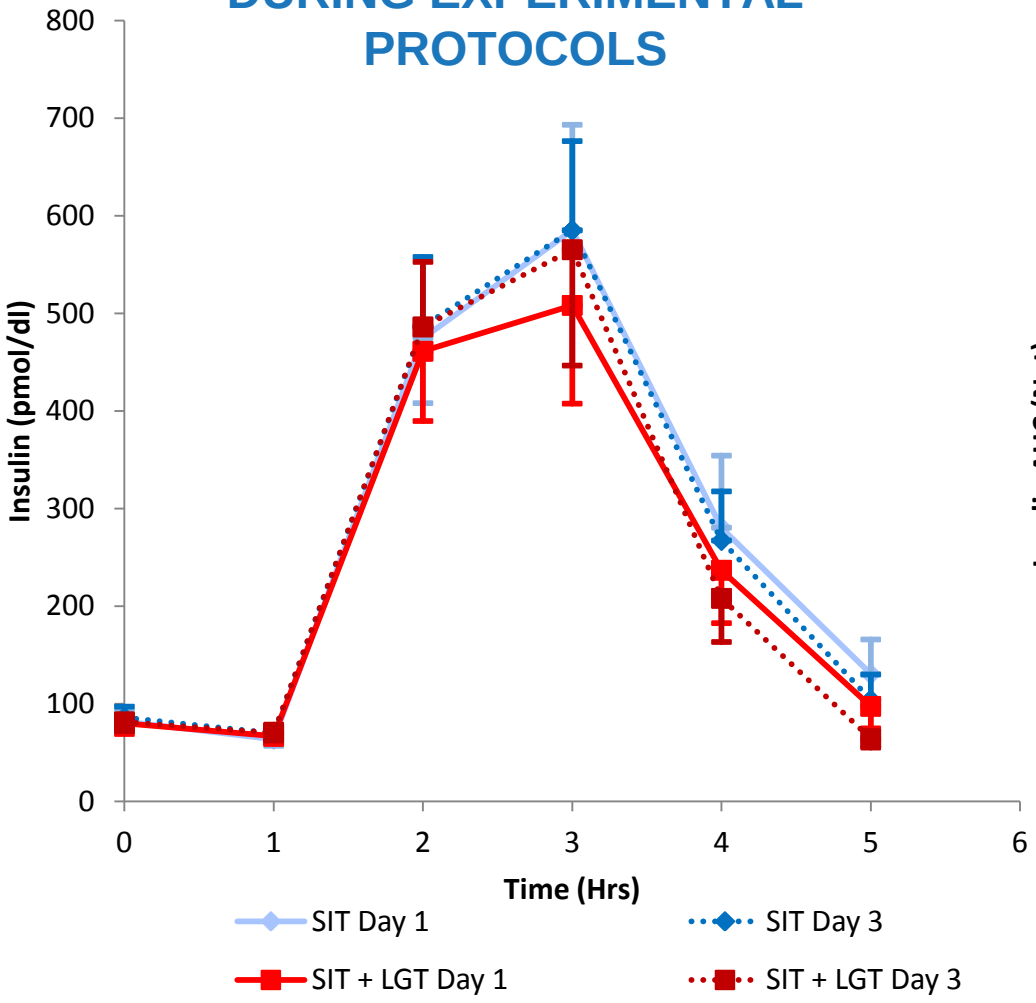
(adjusted for age, fasting glucose, pre-condition energy intake, weight, sex and treatment order)



* Significant difference between conditions, P<0.001
No effect of time and no difference in the time course between groups (time x condition)

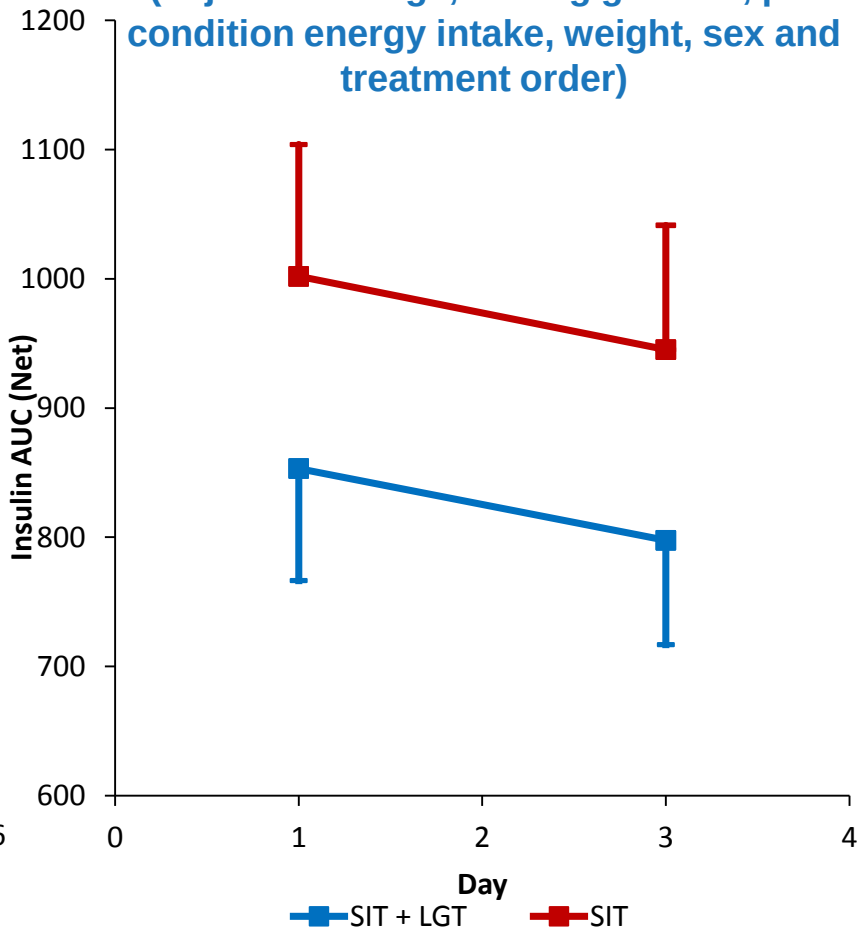
BREAKING UP SEDENTARY BEHAVIOUR

BLOOD INSULIN PROFILES DURING EXPERIMENTAL PROTOCOLS



ESTIMATED MARGINAL MEANS

(adjusted for age, fasting glucose, pre-condition energy intake, weight, sex and treatment order)

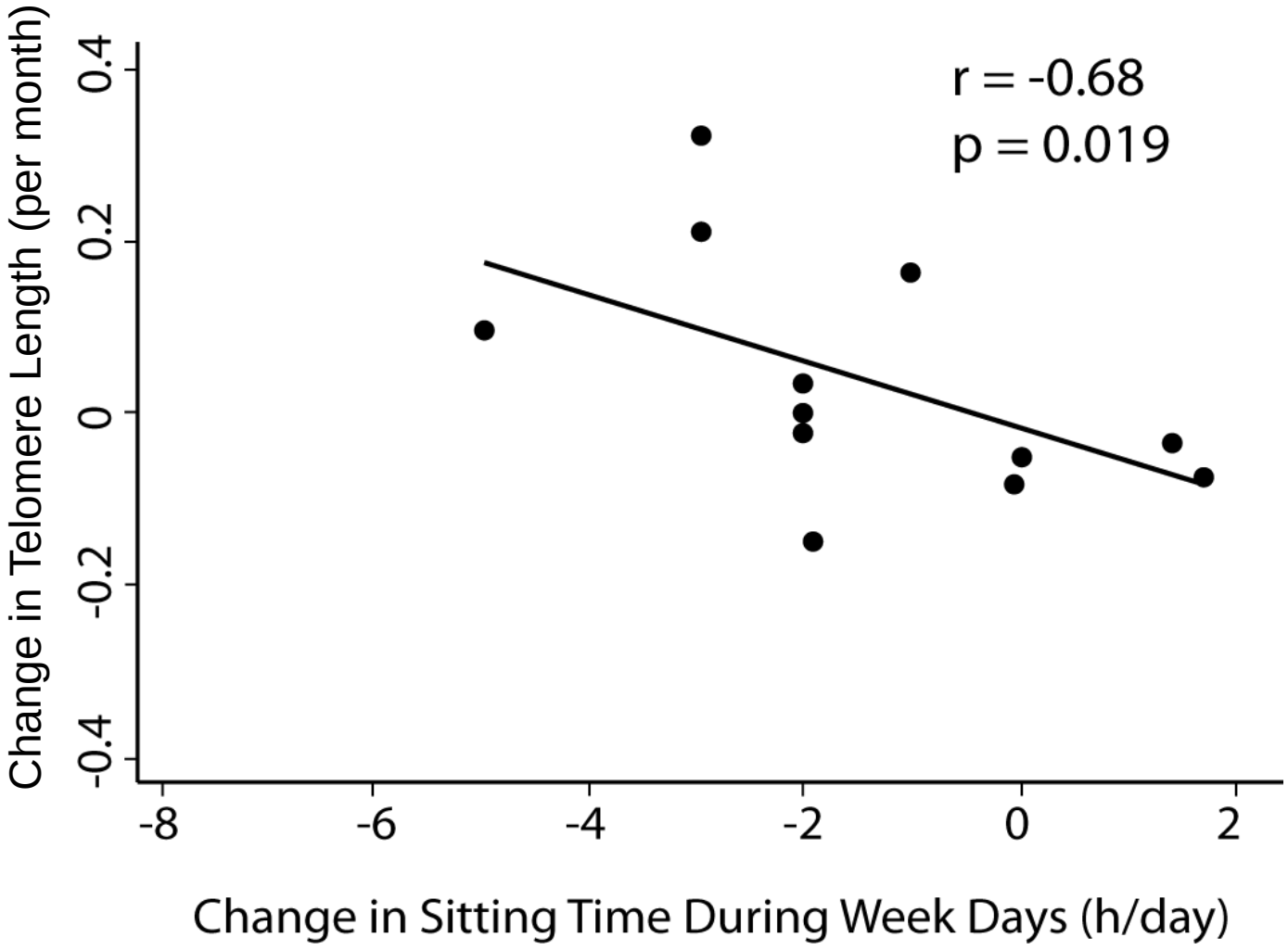


* Significant difference between conditions, P=0.001
No effect of time and no difference in the time course between groups (time x condition)

SUMMARY AND INTERPRETATION

- Confirms that interrupting sitting time with frequent short bouts of light activity leads to the acute lowering of postprandial glucose/insulin levels
- BUT – no cumulative effects
- Breaking up prolonged sitting time - an everyday consideration
- BUT – is 3 days exposure sufficient to ascertain accumulation of risk?

Sedentary Behaviour and Telomere Lenght



Sjögren et al., *British Journal Sports Medicine, 48,* 1407-1409, 2014

MAIN FINDINGS

- Reduction in the amount of time spent sitting down in the group on the exercise program was significantly associated with telomere lengthening in blood cells
- The increases in physical activity seemed to have less of an impact than reductions in sitting time, the findings showed
- It was hypothesized that a reduction in sitting ours is of greater importance than an increase in exercise time for elderly risk individuals

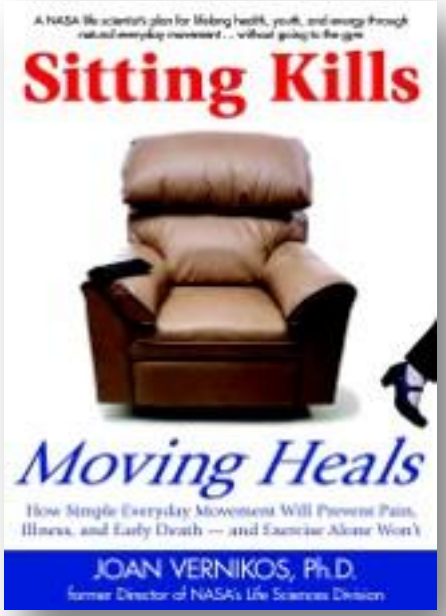
Sjögren et al., *British Journal Sports Medicine, 48,* 1407-1409, 2014

CONCLUSIONS FROM/FOR A PARADIGM SHIFT

- Epidemiological and experimental physiological data suggest that not only is it important **to reduce SB** among older adults, but **minimizing prolonged bouts** of uninterrupted SB and **increasing breaks** during SB may also be protective
- In practice, this may be achieved by taking brief **activity breaks** to disrupt prolonged periods of sitting or by increasing movements while sitting
- Frequent **short breaks** may be the easiest and most manageable way for them to change their SB

Too Much Sitting

- A ***paradigm shift*** in understanding chronic disease risk
- A ***paradigm shift*** in environmental initiatives for chronic disease prevention
- A ***paradigm shift*** for counseling approaches
- A ***paradigm shift*** for policy-relevant evidence for chronic disease prevention



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