



**Baker IDI**  
HEART & DIABETES INSTITUTE

# Health Hazards of Sedentariness

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# Outline

- State of knowledge (evidence base)
  - Introduction to the sedentary behaviour paradigm
  - Health impact, implications for workplaces
- Current & future research directions towards building the evidence-base in relation to sedentary behaviour in the workplace

# Acknowledgements

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# How times have changed

**Then**

**Now**

**Transport**



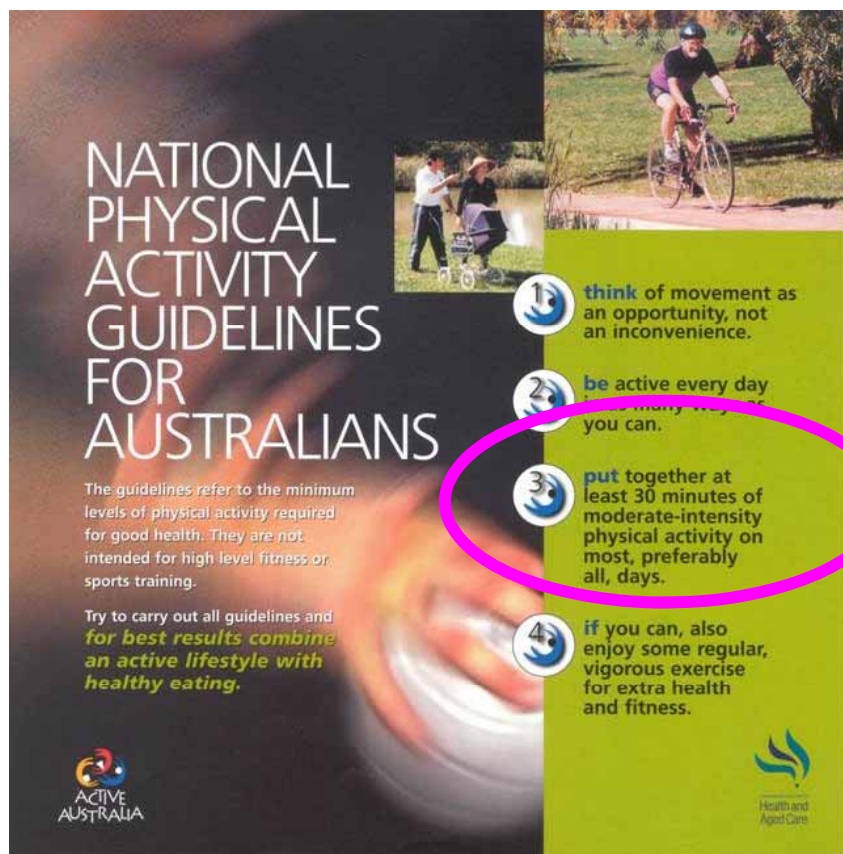
**Work**



**Domestic**



## 'Purposeful Exercise'



NATIONAL PHYSICAL ACTIVITY GUIDELINES FOR AUSTRALIANS

The guidelines refer to the minimum levels of physical activity required for good health. They are not intended for high level fitness or sports training.

Try to carry out all guidelines and **for best results combine an active lifestyle with healthy eating.**

- 1 think of movement as an opportunity, not an inconvenience.
- 2 be active every day in any way you can.
- 3 **put together at least 30 minutes of moderate-intensity physical activity on most, preferably all, days.**
- 4 if you can, also enjoy some regular, vigorous exercise for extra health and fitness.

ACTIVE AUSTRALIA

Health and Aged Care

## 'Non-exercise time' behaviours



Aka: Prolonged Sitting

Active =  $\geq 150$  mins moderate-intensity activity / wk  
Inactive = 0-149 mins moderate-intensity activity / wk

# Sedentary<sup>1</sup>

adj (from Latin sedere: to sit)

A: Of habits, occupations, etc.:

*Requiring continuance in a sitting posture (1603)*

B: Of persons:

*Accustomed or addicted to sitting still; engaged in sedentary pursuits; not in the habit of taking physical exercise (1662)*

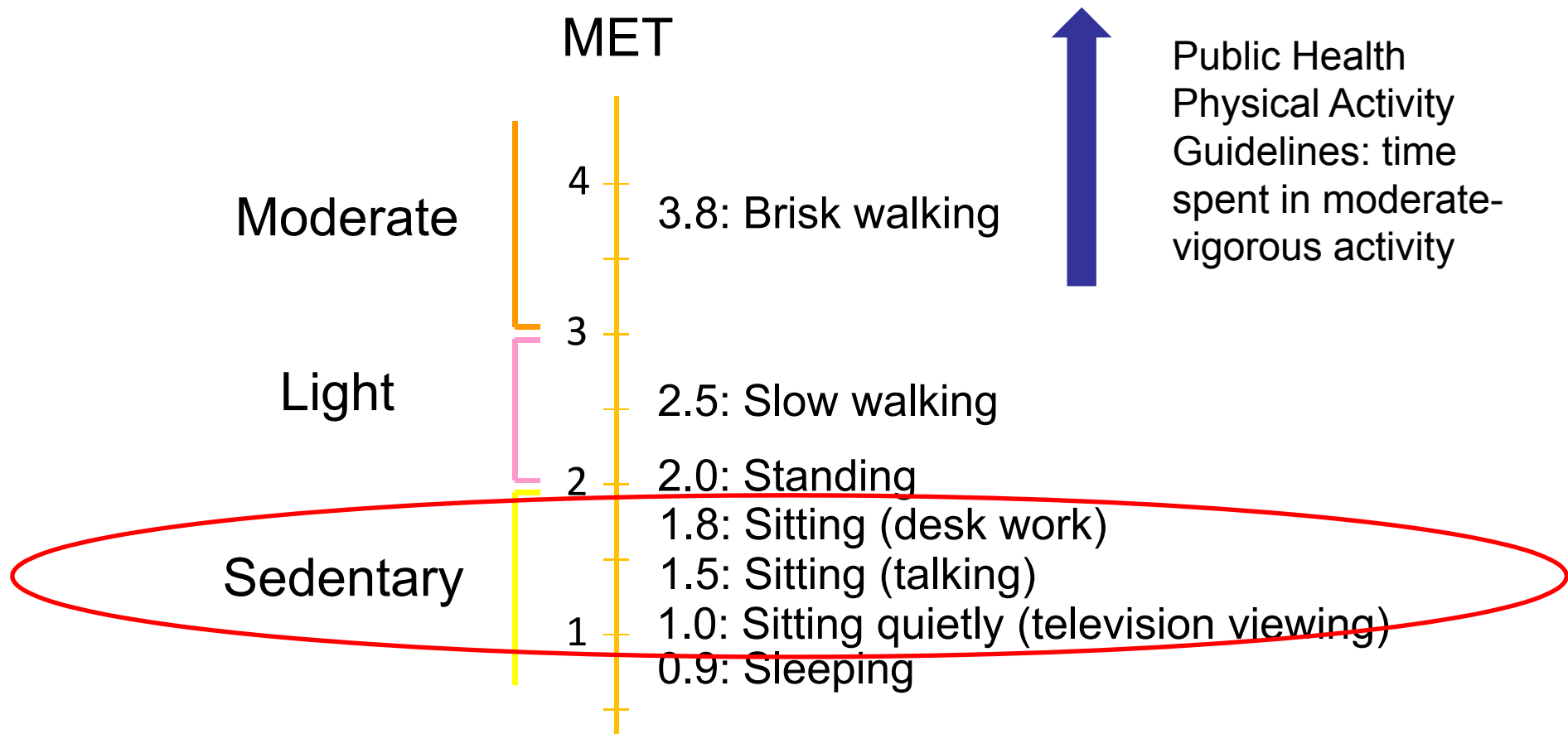
# Sedentariness<sup>1</sup>

*The quality or condition of being sedentary*

<sup>1</sup>Compact Oxford English Dictionary

# Sedentary Behaviour

Activities of low energy expenditure, characterised by sitting

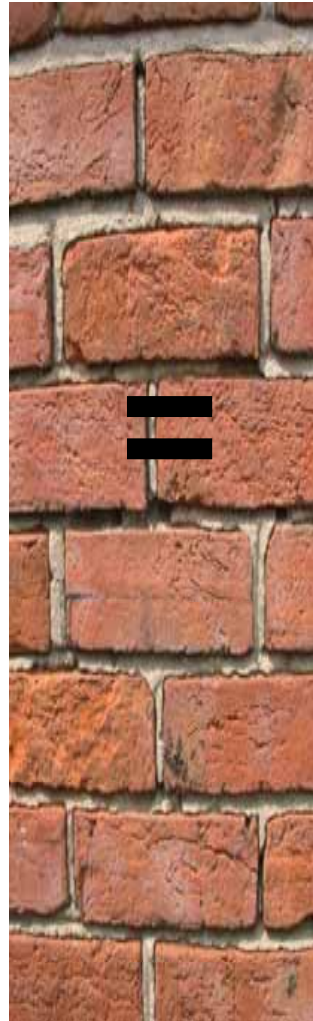


# A Key Distinction

Physically Inactive  
*'Sedentary Lifestyle'*



**Too little moderate-  
intensity physical activity  
( $< 150$  mins per week)**



Sedentary Behavior<sup>1,2</sup>  
*'Sedentary Time'*



**Sitting too much**

<sup>1</sup>Owen et al. *Ex Sports Sci Rev* 2000, <sup>2</sup>Pate et al. *Ex Sports Sci Rev* 2008

# The Proposition

Sedentary behaviour (**too much sitting**) may be a deeply-embedded public health problem, which is additional to lack of physical activity (**too little exercise**)



# Our modern 'sitting orientated' society



Awake  
7 am



Breakfast  
15 mins



Transport to  
work  
45 mins



Work on  
computer  
3.5 hrs



Lunch  
30 mins



Work on  
computer  
4 hrs



Transport  
From work  
45 mins



Evening  
meal  
30 mins



Watch TV  
4 hrs



Walk – 30 min

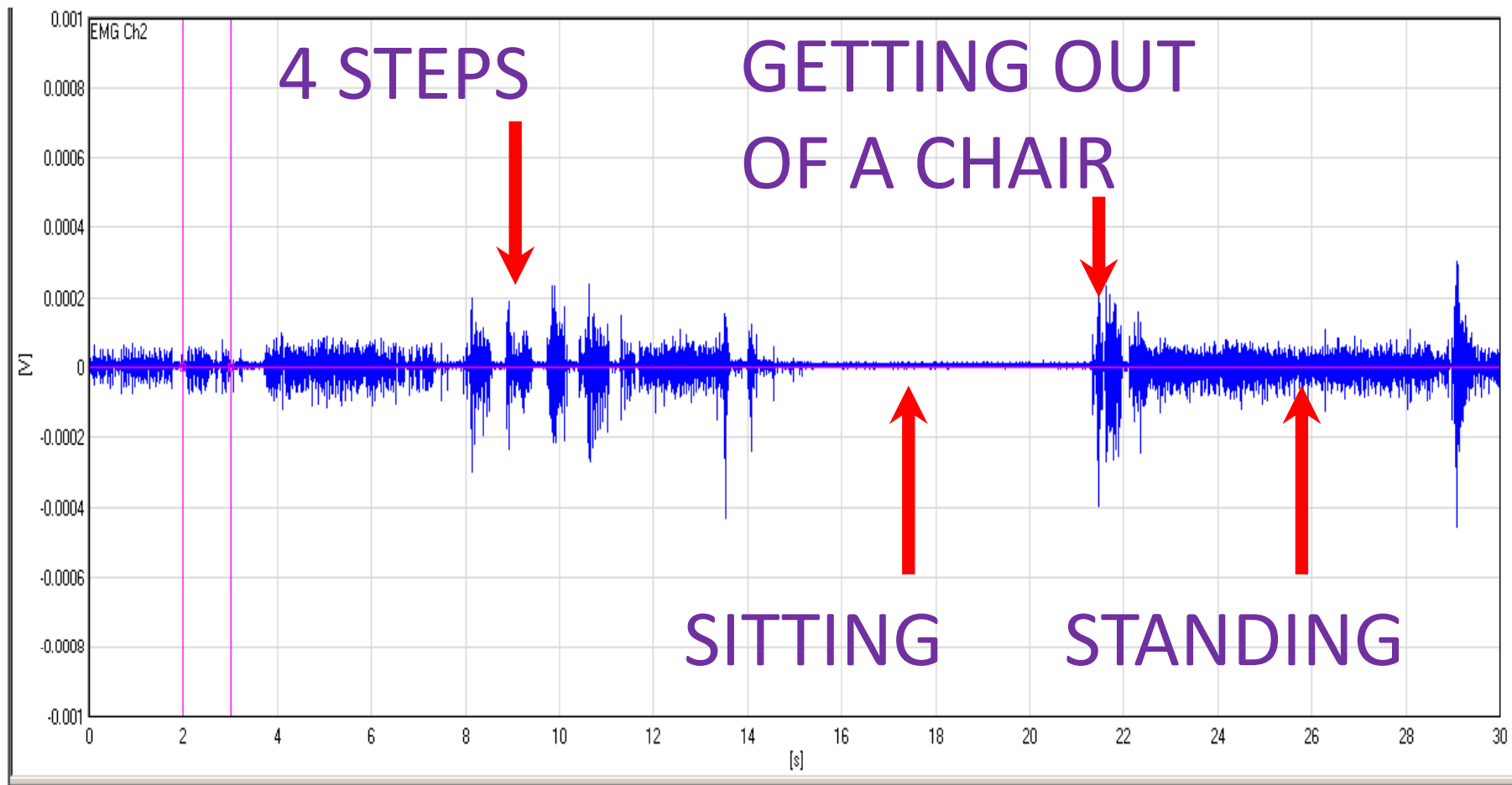


Sleep  
11pm



Sitting Opportunities 15.5 hrs

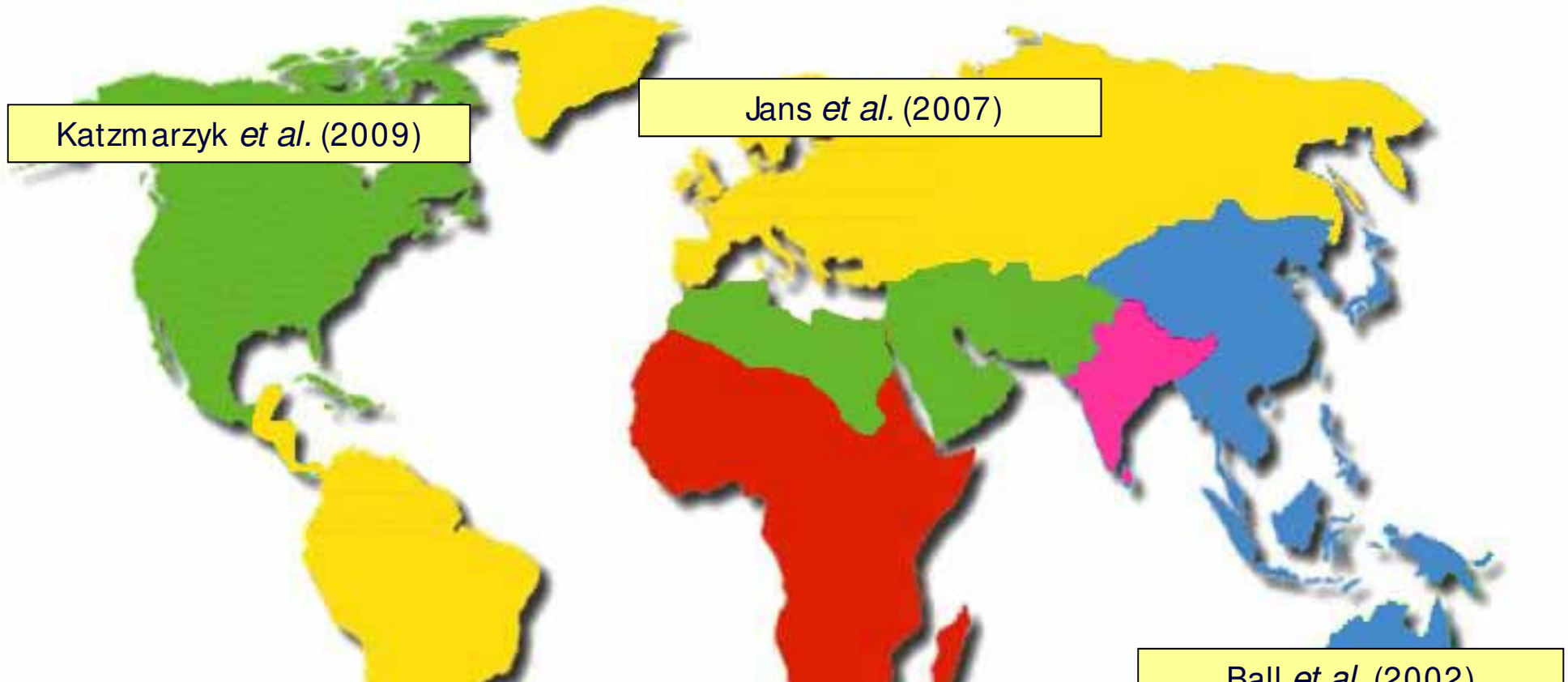
# Sitting induces muscular inactivity



Source: Hamilton, M.T., Hamilton, D.G. and Zderic, T.W. (2007) *Diabetes*, 56, 2655-2667

# Self-reported Sitting time

## Health outcomes



Katzmarzyk *et al.* (2009)

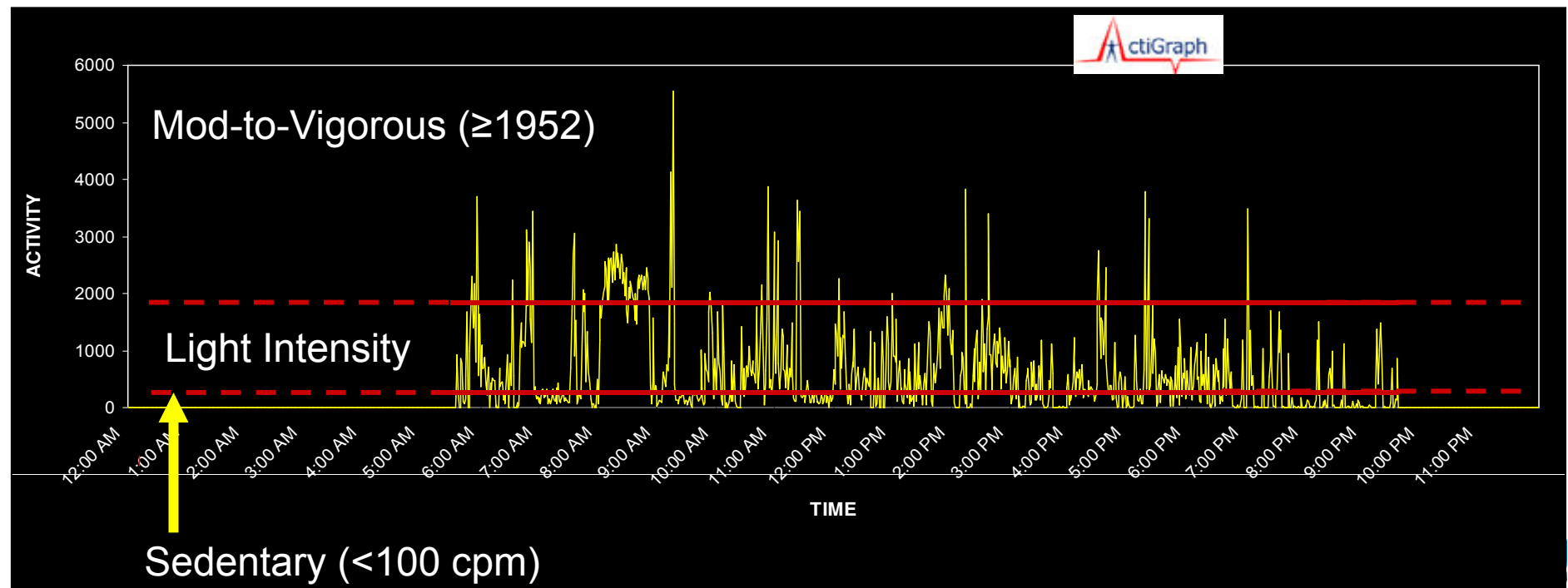
Jans *et al.* (2007)

- Majority report detrimental associations with waist
- Thorp *et al.* detrimental associations with CVD risk markers
- Katzmarzyk *et al.* – increased risk of early death
- None report beneficial association

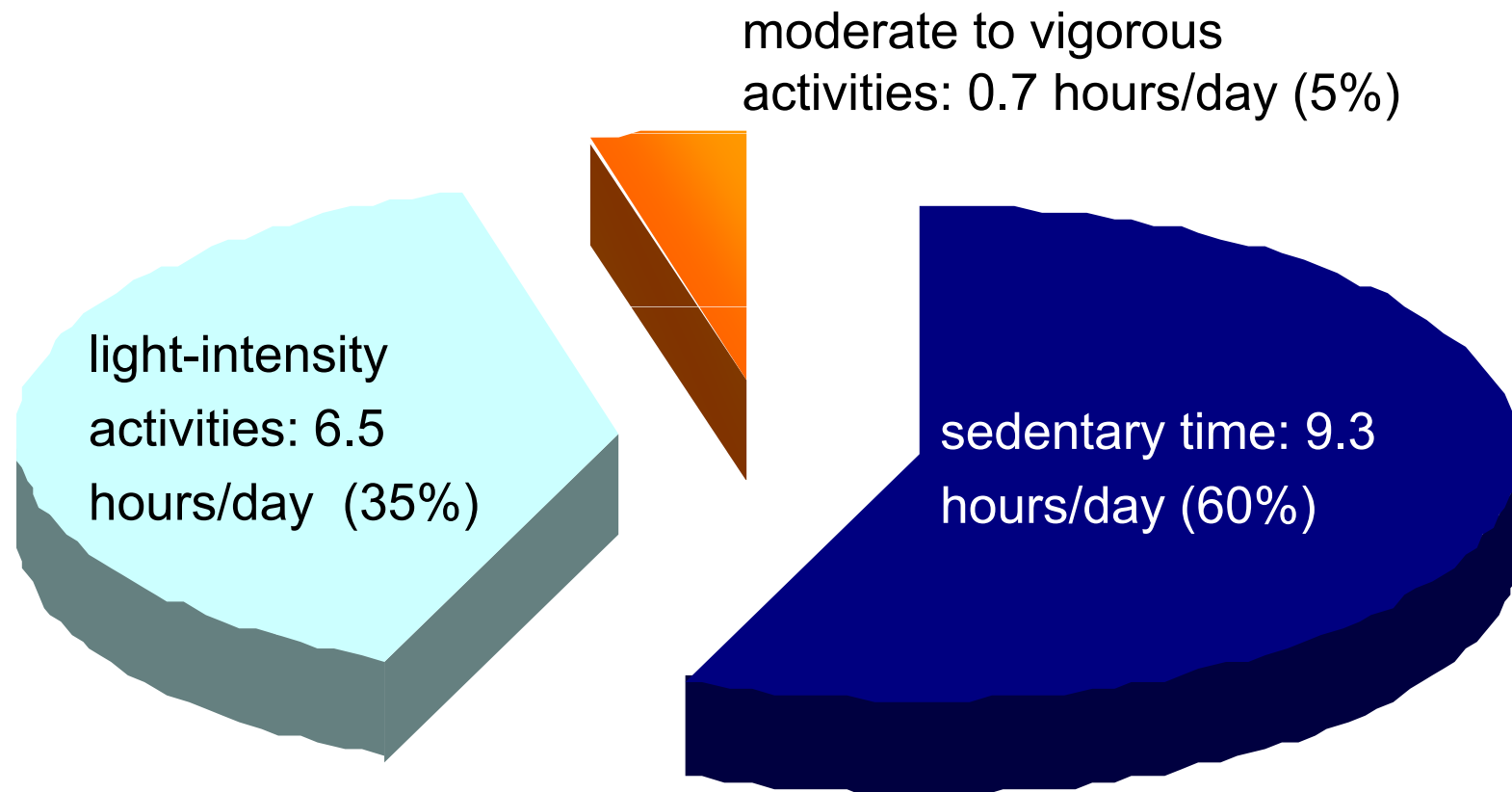
Ball *et al.* (2002)  
Brown *et al.*(2003)  
Mummery *et al.* (2005)  
Thorp *et al.*(Under review)

# Accelerometers

- Small, lightweight, unobtrusive
- Record the time, duration, frequency, & ***intensity*** of walking or running movements



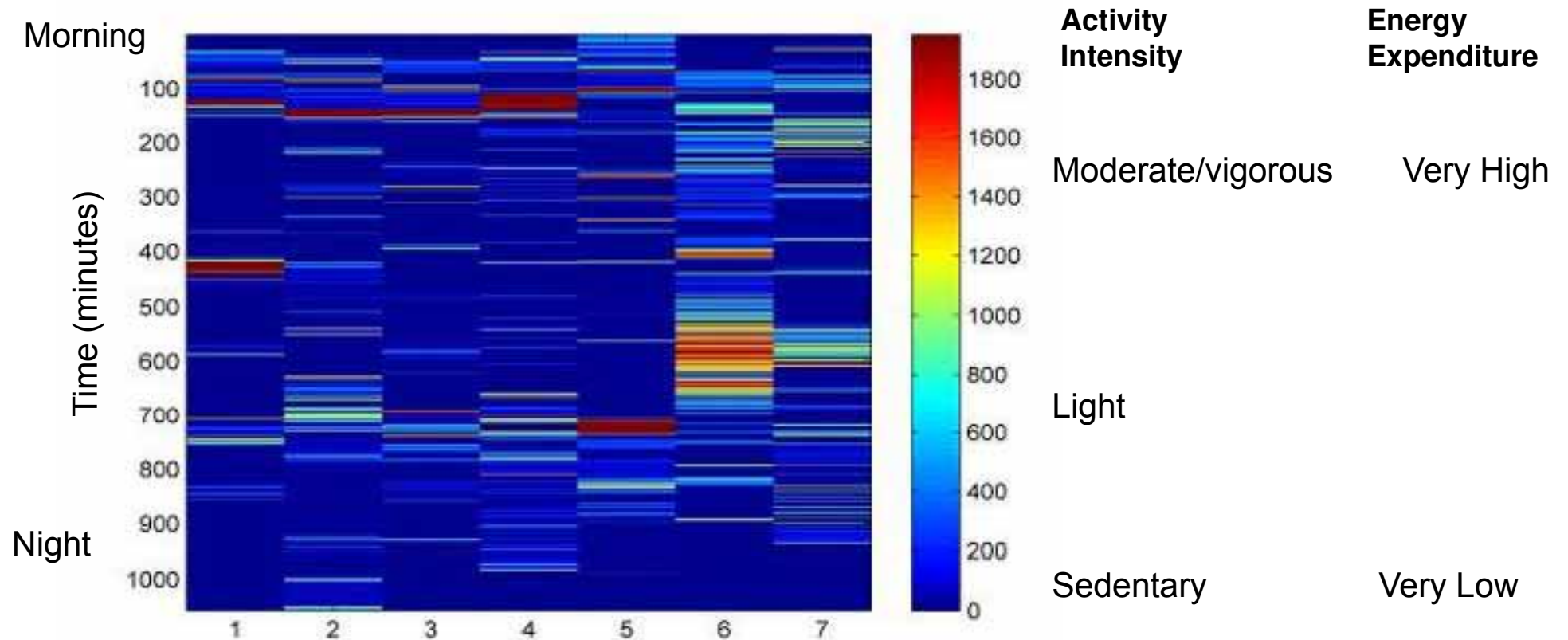
# How Australian adults' overall daily behaviour patterns are distributed between physically-active and sedentary time



Healy, G.N., Wijndaele, K., Dunstan, D.W., Shaw, J.E., Salmon, J, Zimmet, P.Z. and Owen, N. (2008). Objectively-measured sedentary time, physical activity and metabolic risk: the AusDiab study. *Diabetes Care*, 31, 369-71

# You can be 'active', but also highly sedentary!

## The 'Active' Couch Potato

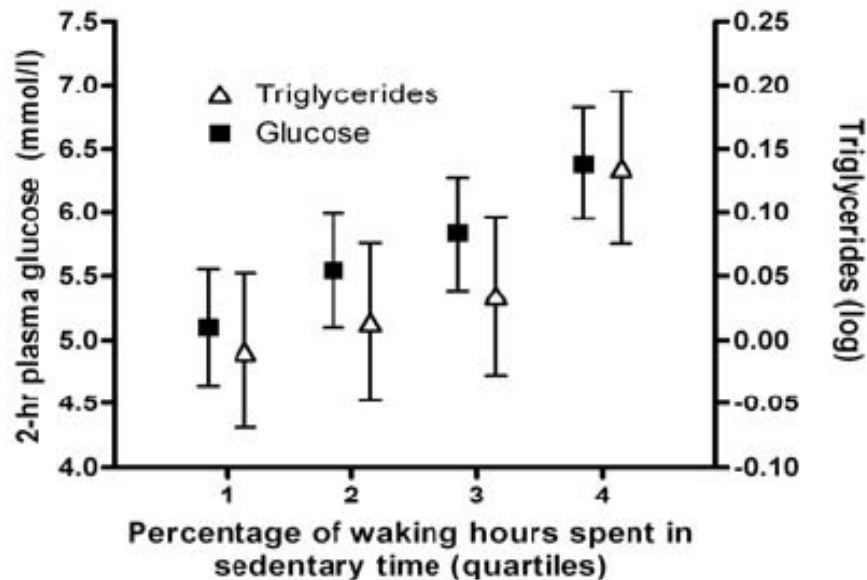


Mean mod-to-vigorous time = 31 mins/day  
% Waking hours spent in Sedentary = 71%

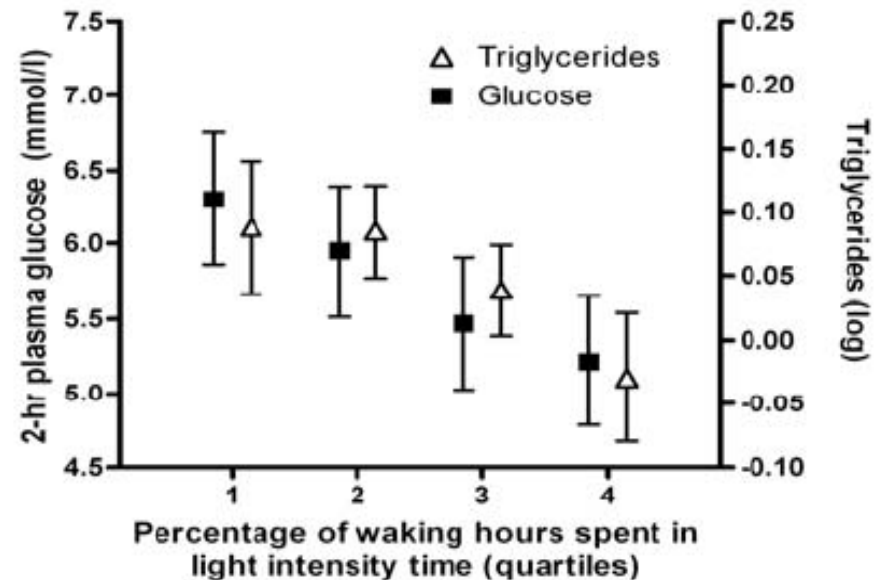
# Ground-Breaking Findings

- Sedentary time –associated with risk factors for CVD and type 2 diabetes (independent of physical activity levels)<sup>2</sup>

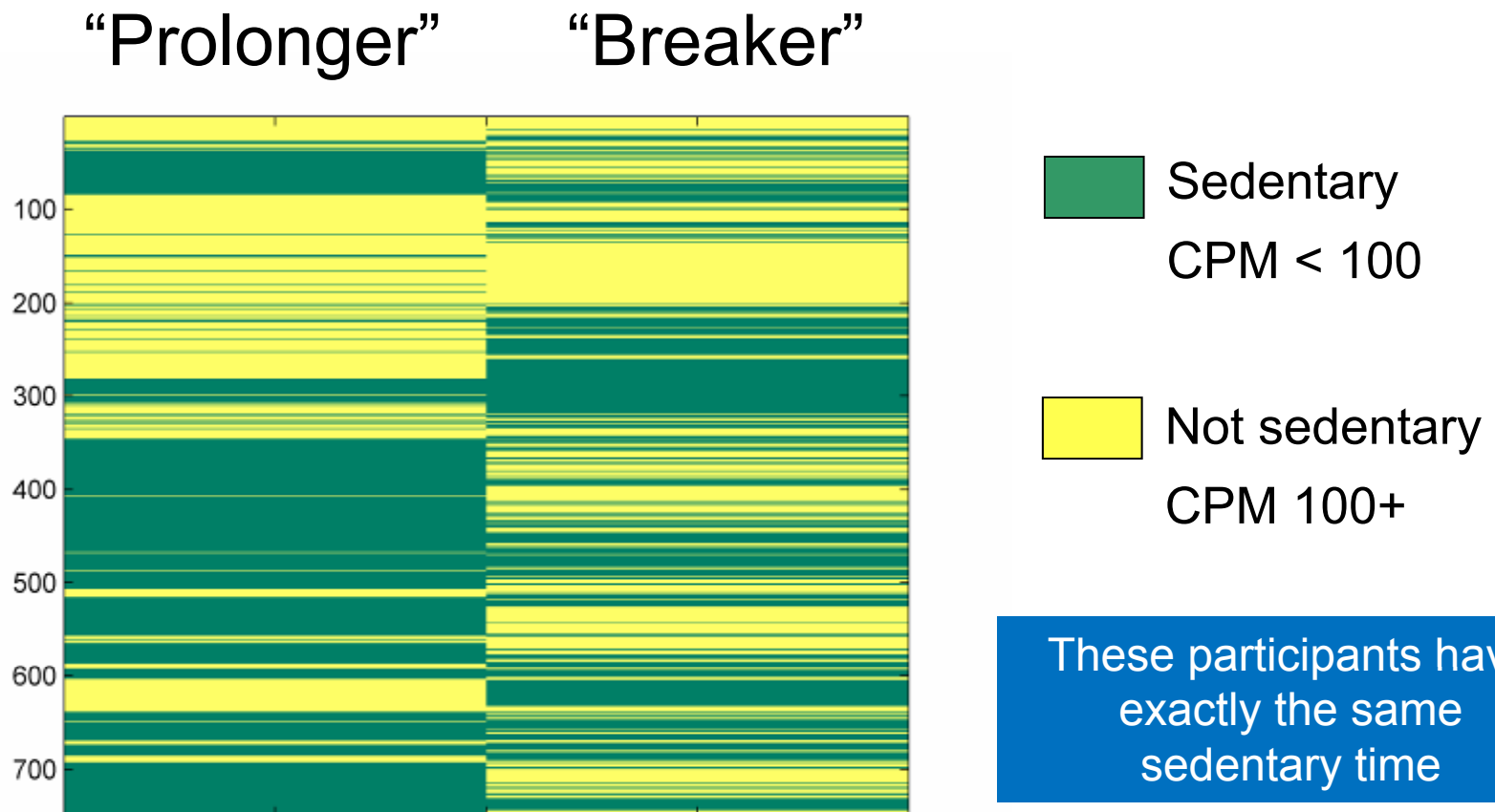
Sedentary time



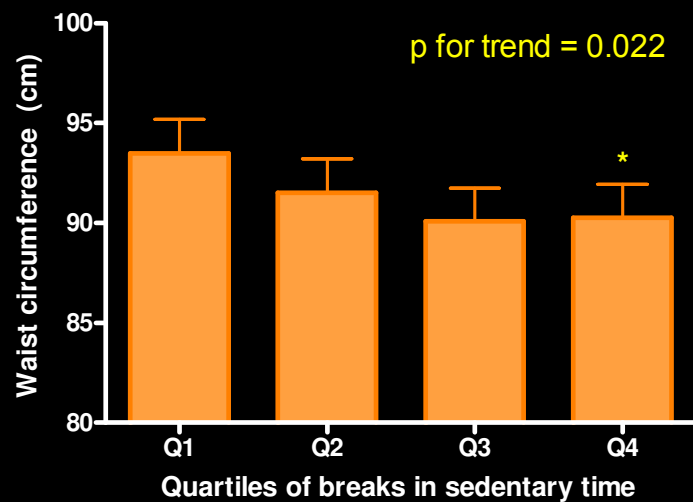
Light-intensity activity



# Variations in sedentary behaviour patterns are also important



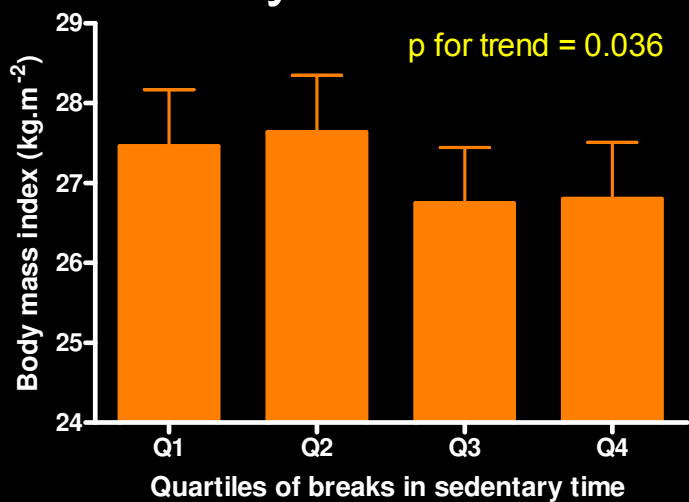
## Waist Circumference



Prolongers

Breakers

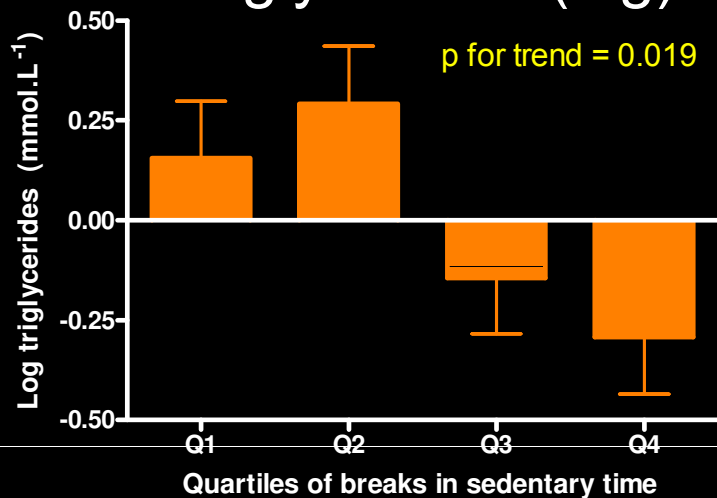
## Body Mass Index



Prolongers

Breakers

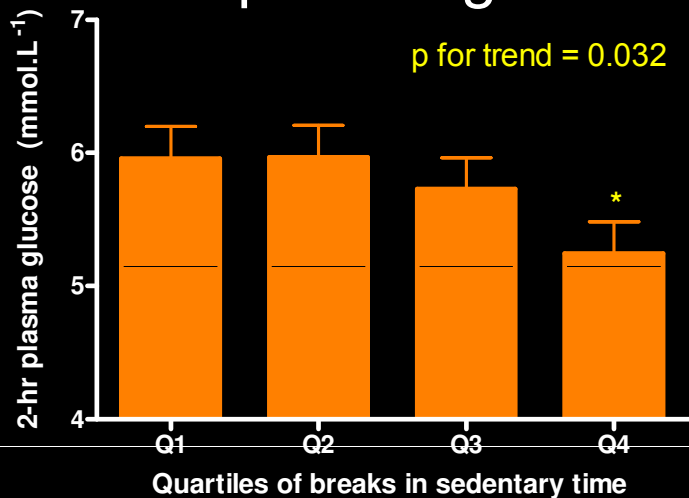
## Triglycerides (log)



Prolongers

Breakers

## 2-hr plasma glucose



Prolongers

Breakers

# The Workplace – A key target



Awake  
7 am



Breakfast  
15 mins



Transport to  
work  
45 mins



Work on  
computer  
3.5 hrs



Lunch  
30 mins



Work on  
computer  
4 hrs



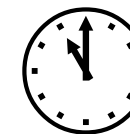
Transport  
From work  
45 mins



Evening  
meal  
30 mins



Watch TV  
4 hrs



Sleep  
11pm

# Workplace sitting.....Economic Impact

## Prolonged sitting

- Increased risk of chronic disease and premature mortality

## People with Chronic Disease

- 60% less likely to participate in the workforce
- Days off work - doubled
- Annual loss due to CD: 537,000 person years (FT); 47, 000 person-years (PT)

# What is the Extent of the Sitting Problem in the Workplace?

- Limited evidence
- Dutch Workers<sup>1</sup> (n = 7,720) 7 hrs/day
- Australian workers<sup>2</sup> (n = 243 ) 4.2 hrs/day
- Australian workers<sup>3</sup> (n = 1,579) 3.3 hrs/day

**ALL HAVE BEEN BASED ON SELF-REPORT**

<sup>1</sup>Jans *et al.* *Am J Prev Med* 2007, <sup>2</sup>Brown *et al.* *Int J Obes* 2003, <sup>3</sup>Mummery *et al.* *Am J Prev Med* 2005



# Stand Up Australia to Improve Health and Productivity

## Re-engineering the 'sitting' generation

Aim: To understand the extent to which reducing sitting time in the workplace can improve the health and productivity of working Australians



# Stand Up Australia – Research Phases

## Phase 1 – Understanding the problem

Accurately characterise sitting/sedentary patterns in Australian workers

## Phase 2 – Acting on the problem

Trial and evaluate innovative strategies to reduce sitting time in the workplace

# Phase 1: Understanding the Problem



- First study to use objective measurement of sedentary and physical activity time in workers
- First study to combine objective measurements with self-report

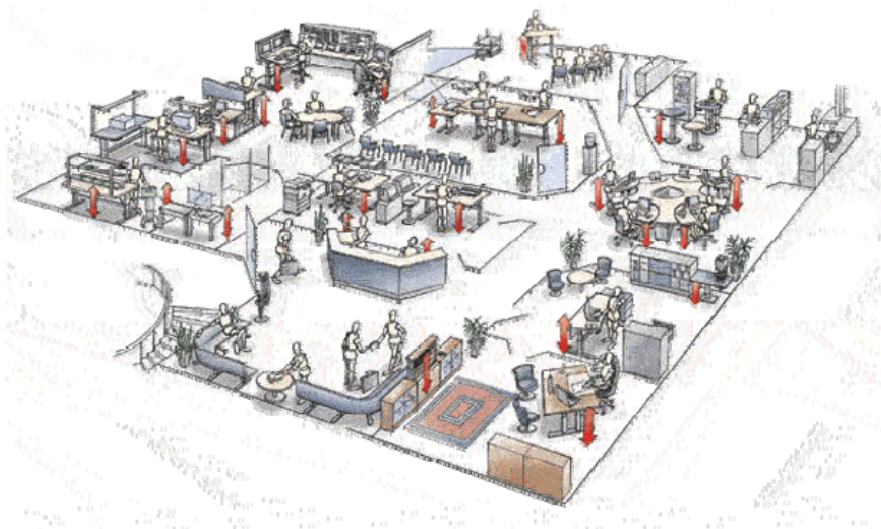


# Significance

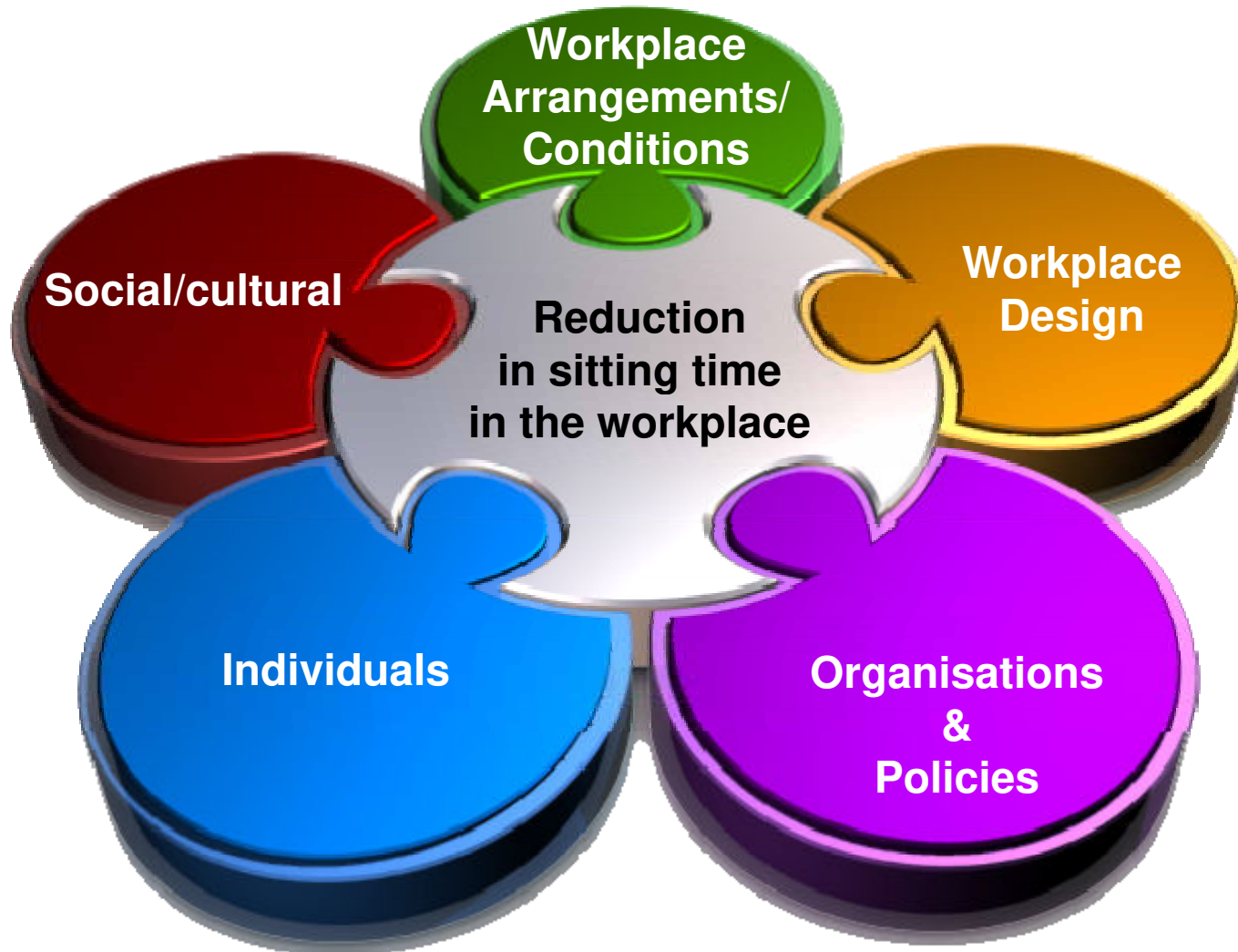
- Ground-breaking evidence on the extent to which sedentary time occupies the work day in employees
- Key evidence necessary for the development and evaluation of intervention strategies targeting the reduction of sitting time and breaking up of sitting time in the workday



# Stand Up Australia to Improve Health and Productivity



# 'Integrated' approach - considerations



## **‘Activity permissive’ workplaces - individuals**

- Stand whilst on the telephone
- ‘Standing’ progress meetings
- Walking progress meetings - incentives
- Incorporate breaks into prolonged meetings
- Support standing and movement during meetings
- ‘Standing’ hot desks
- Removal of in-office rubbish bins

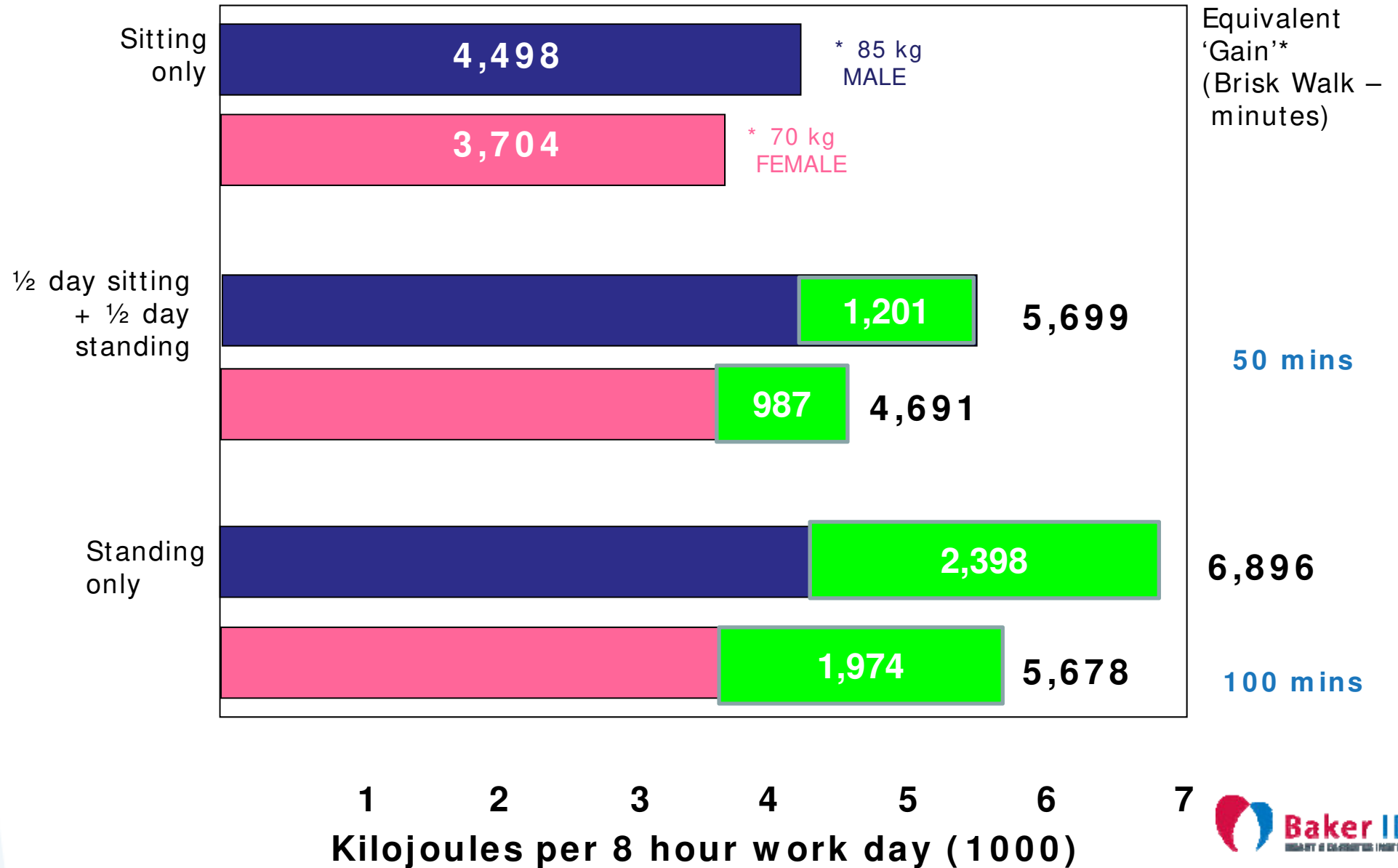
# 'Activity permissive' workplaces - design



# Energy Expenditure Estimates During the Workday

- Based on: Ainsworth BE, Haskell WL, Whitt MC *et al.* Compendium of Physical Activities: an update of activity codes and MET intensities. *Medicine and Science in Sports and Exercise* 32 (9) Suppl., S498-S516, 2000
- a universally accepted tool that lists specific physical activities by rate of energy expenditure (METs)
  - Sitting (Code: 11580) 1.5 METS
  - Standing (Code: 11600) 2.3 METS
  - Slow pace walking (Code: 17152) 2.5 METS
  - Brisk walk (Code: 17200) 3.8 METS

# “Gains” in workday energy expenditure through increased standing



# “Gains” in workday energy expenditure through increased light-intensity walking around the office

