

Sitting Less AND Moving More – A Contemporary Approach to Physical Activity Promotion

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Regular exercise is good for us – in many ways



- ✓ Improved cardiorespiratory and muscular fitness
- ✓ Lower risk of type 2 diabetes
- ✓ Lower risk of metabolic syndrome
- ✓ Lower risk of early death

≥ 150 min/week moderate/vigorous PA = **ACTIVE**

< 150 min/week moderate/vigorous PA = **INSUFFICIENTLY ACTIVE**

Chronic Disease: Australia's Biggest Health Challenge

- * Arthritis
- * Asthma
- * Back pain and problems
- * Cancer
- * Cardiovascular disease (CVD)
- * Chronic obstructive pulmonary disease
- * Diabetes
- * Mental health conditions

Source: AIHW: Australia's Health 2016 Fact Sheet

Quick facts

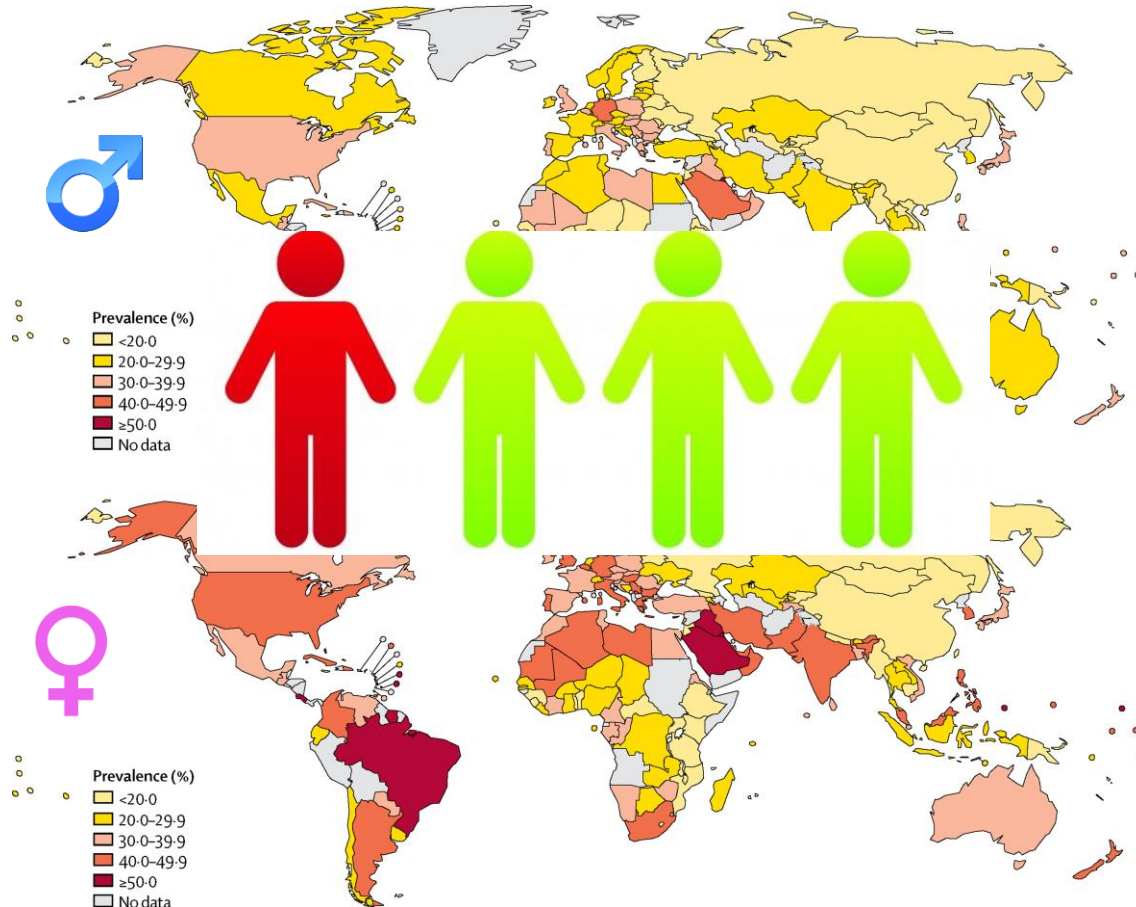
In 2014–15, more than **11 million** Australians had at least one of eight selected chronic diseases.

Chronic diseases are associated with:

- more than **7 in 10** deaths
- around **1 in 3** problems managed in general practice
- more than **1 in 3** potentially preventable hospitalisations.

Almost **1 in 3** (29%) people aged 65 and over report having three or more chronic diseases, compared with 2.4% of people aged under 45.

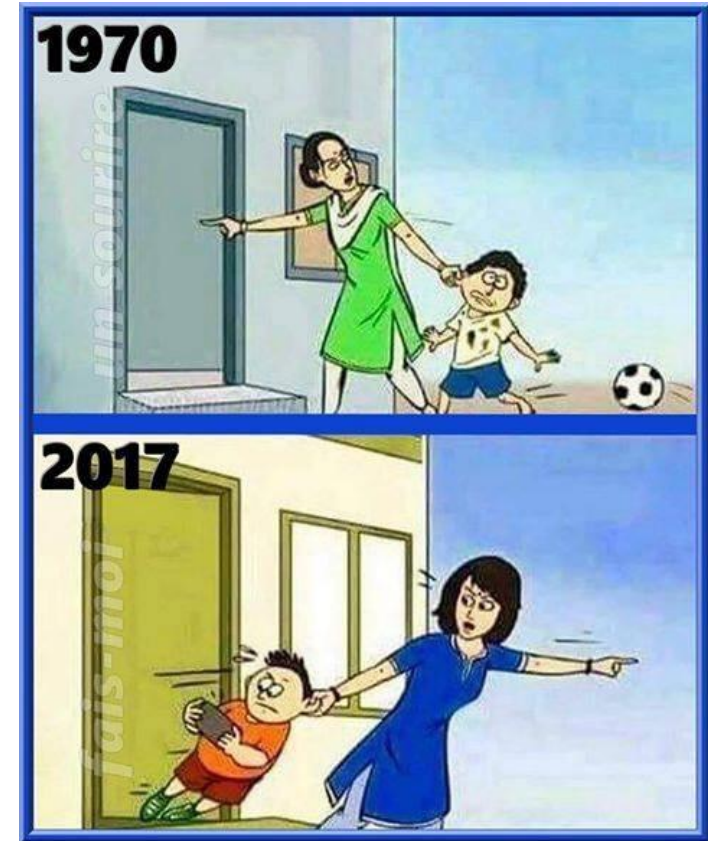
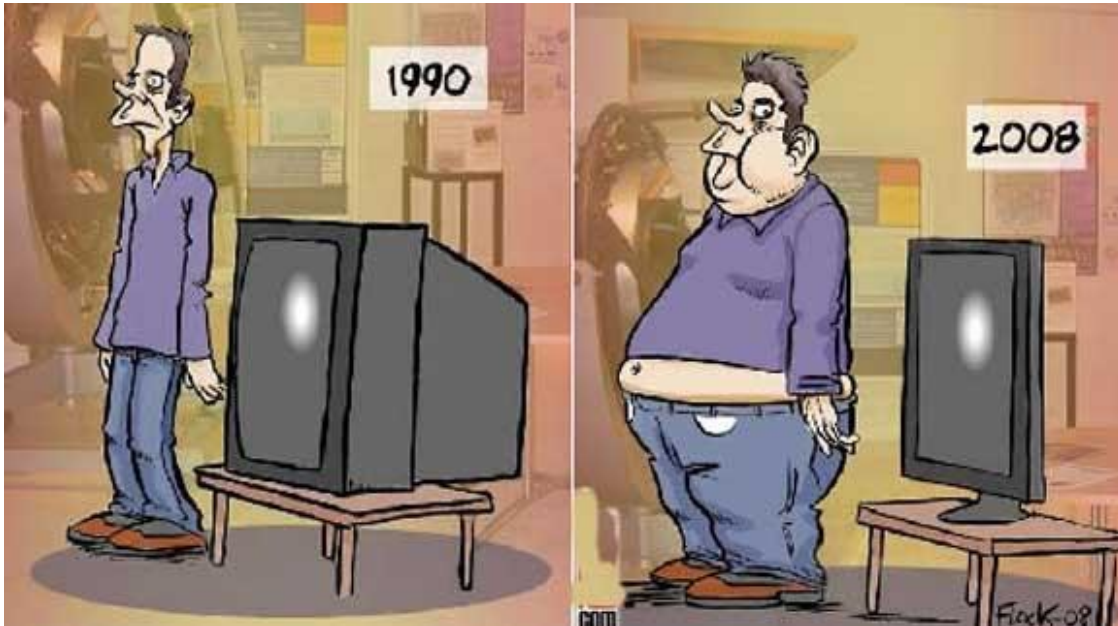
Global prevalence of insufficient PA – World Health Organization 2018

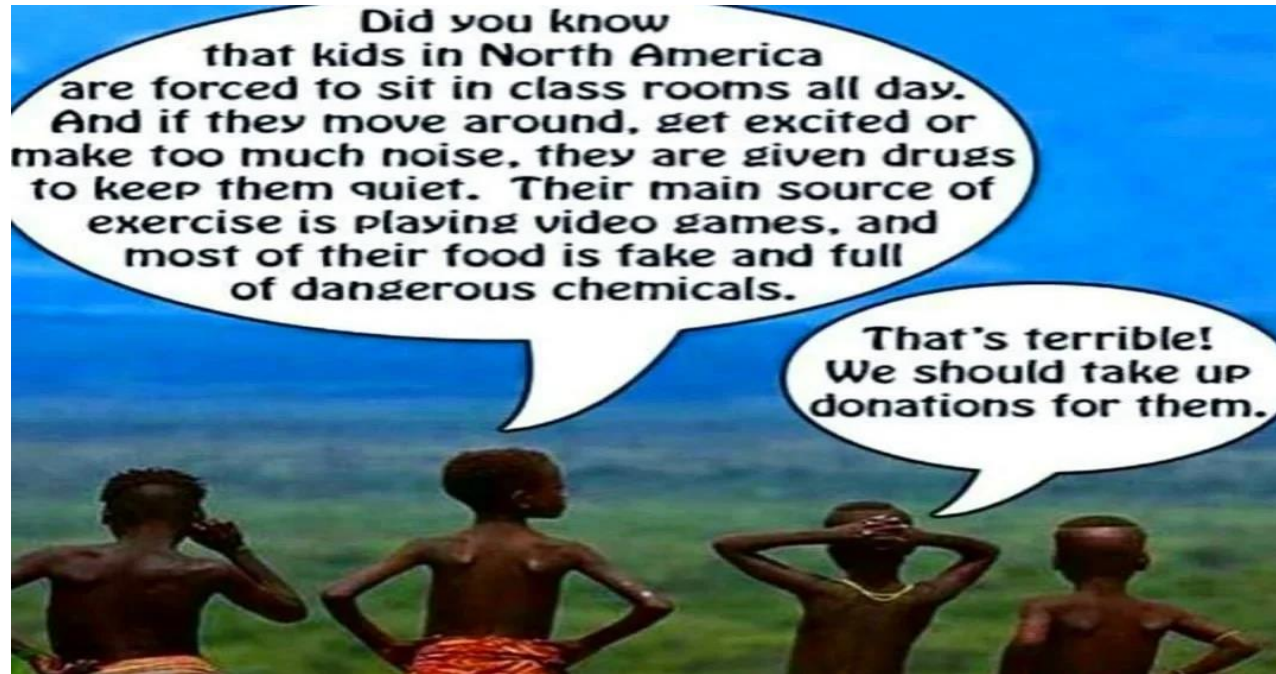


Source: Guthold R. *et al.*
Lancet Global Health

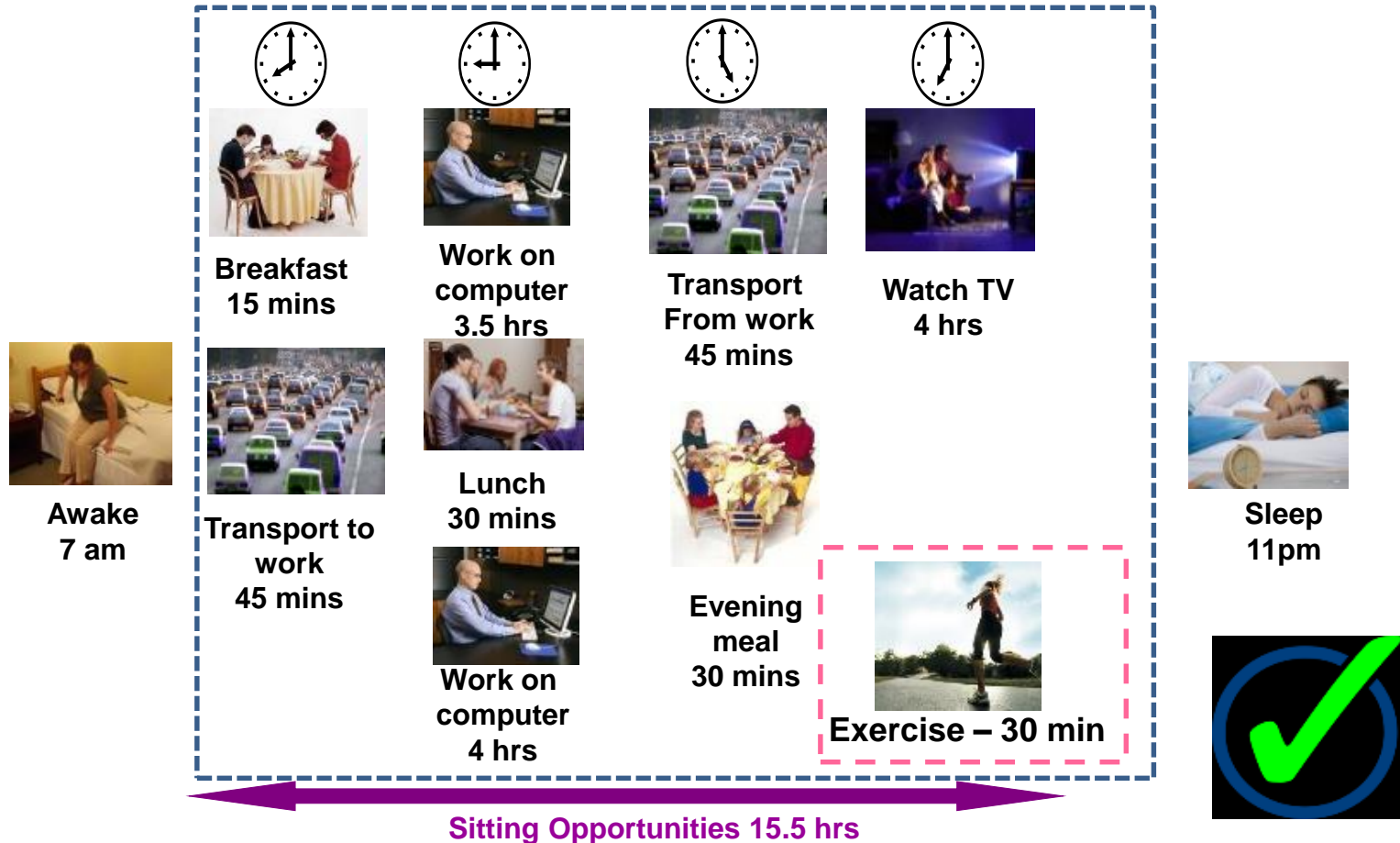
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Our Changing World

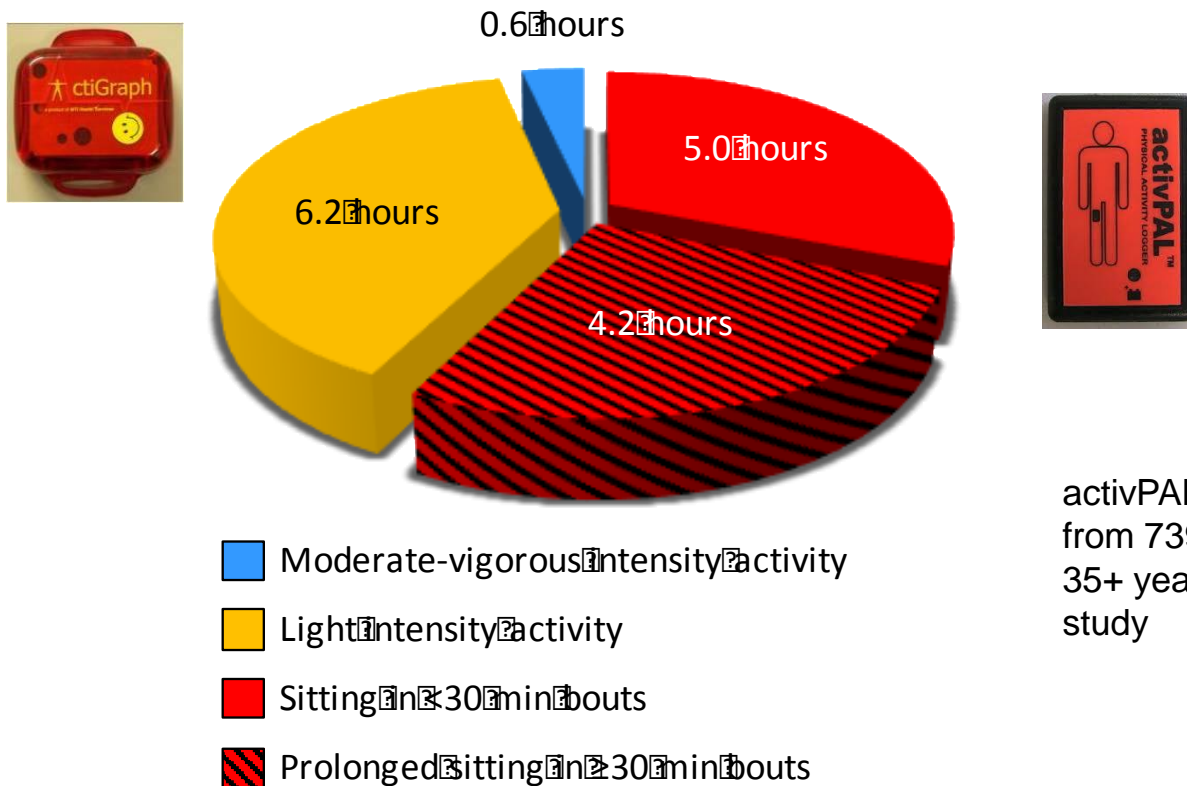




Our modern sitting-oriented society



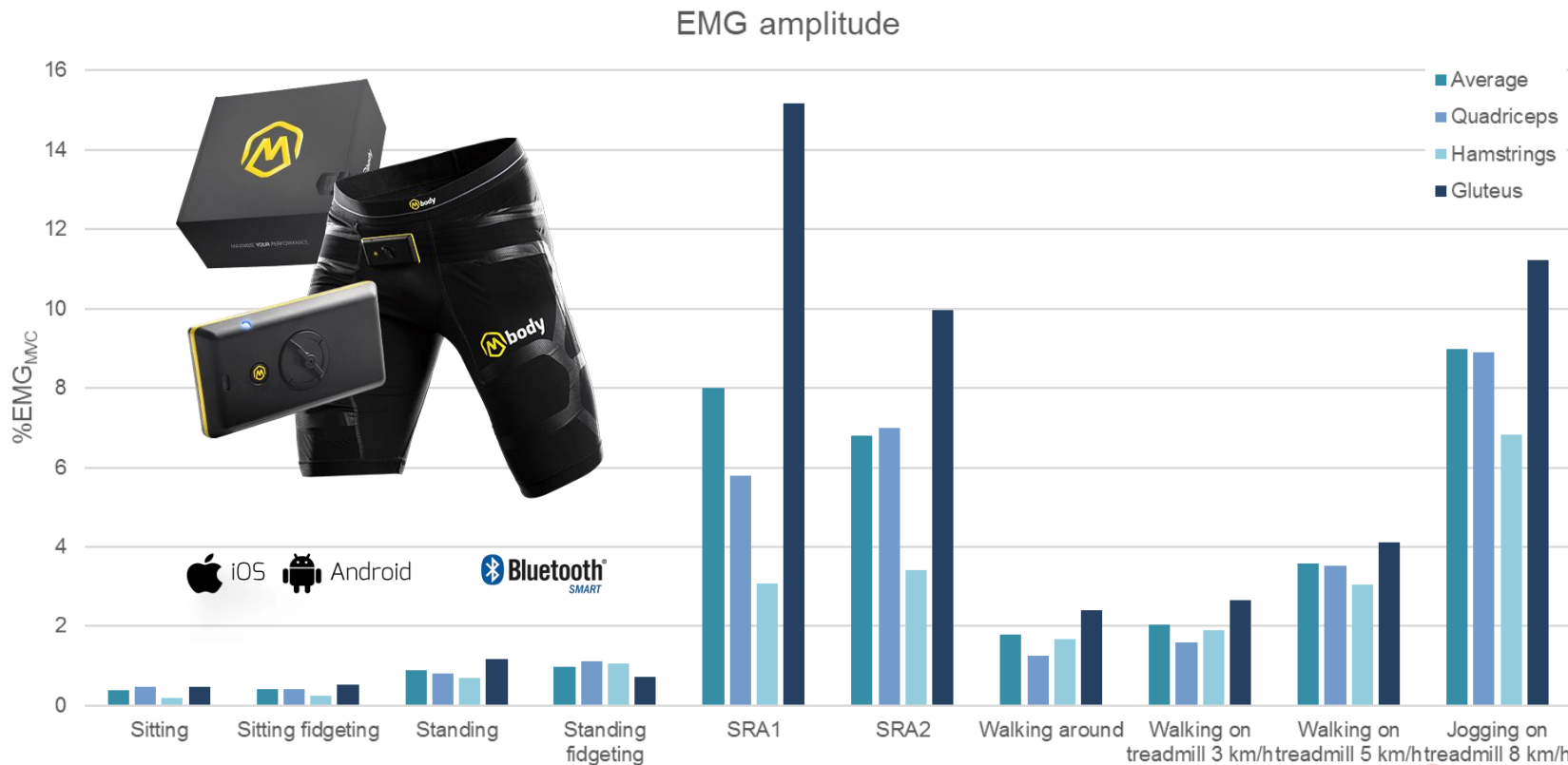
Fast Fact # 1: Sitting is now the predominant waking behaviour



activPAL3 and Actigraph data from 739 Australian adults aged 35+ years from the AusDiab3 study

Source: Healy *et al.* 2015 *Eur Heart J* 36 (39) 2643-9

Fast Fact # 2: Sitting = minimal skeletal muscle activity



Special thanks: Dr Arto Pesola and Christian Brakenridge

Fast Fact #3: **High sitting is associated with increased risk of chronic diseases**

Health Outcome	Level of evidence for association	Level of evidence for dose-response	Level of evidence for variation in association by physical activity
All-cause mortality	Strong	Strong	Strong
CVD mortality	Strong	Strong	Moderate
Cancer mortality	Limited	Limited	Not assignable
Incident T2D	Strong	Limited	Not assignable
Weight status	Limited	Limited	Not assignable
Incident CVD	Strong	Strong	Not assignable
Incident cancer	Moderate	Limited	Not assignable



Source: US 2018 Physical Activity Guidelines Advisory Committee Scientific Report:
<https://health.gov/paguidelines/second-edition/report.aspx>

Fast Fact #4: High sitting may be particularly detrimental in older adults

Circulation

ORIGINAL RESEARCH ARTICLE

Sedentary Behavior and Cardiovascular Disease in Older Women

The OPACH Study

BACKGROUND: Evidence that higher sedentary time is associated with higher risk for cardiovascular disease (CVD) is based mainly on self-reported measures. Few studies have examined whether patterns of sedentary time are associated with higher risk for CVD.

METHODS: Women from the OPACH Study (Objective Physical Activity and Cardiovascular Health; $n=5638$, aged 63–97 years, mean age 79 ± 7 years) with no history of myocardial infarction or stroke wore accelerometers for 4 to 7 days and were followed up for up to 4.9 years for CVD events. Average daily sedentary time and mean sedentary bout duration were the exposures of interest. Cox regression models were used to estimate hazard ratios (HRs) and 95% CIs for CVD using models adjusted for covariates and subsequently adjusted for potential mediators (body mass index, diabetes mellitus, hypertension, and CVD risk biomarkers [fasting glucose, high-density lipoprotein, triglycerides, and systolic blood pressure]). Restricted cubic spline regression characterized dose-response relationships.

RESULTS: There were 545 CVD events during 19350 person-years. With adjustment for covariates, women in the highest (≥ 11 h/d or more) versus the lowest (≤ 9 h/d or less) quartile of sedentary time had higher risk for CVD (HR, 1.62; 95% CI, 1.21–2.17; P trend < 0.001). Further adjustment for potential mediators attenuated but did not eliminate significance of these associations (P trend < 0.05 , each). Longer versus shorter mean sedentary bout duration was associated with higher risks for CVD (HR, 1.54; 95% CI, 1.27–2.02; P trend $= 0.003$) after adjustment for covariates. Additional adjustment for CVD risk biomarkers attenuated associations, resulting in a quartile 4 versus quartile 1 HR of 1.36 (95% CI, 1.01–1.83; P trend $= 0.10$). Dose-response associations of sedentary time and bout duration with CVD were linear (P nonlinear > 0.05 , each). Women jointly classified as having both high sedentary time and long bout durations had significantly higher risk for CVD (HR, 1.34; 95% CI, 1.08–1.65) than women with low sedentary time and short bout duration. All analyses were repeated for incident coronary heart disease (myocardial infarction or CVD death), and associations were similar, with notably stronger HRs.

CONCLUSIONS: Both high sedentary time and long mean bout durations were associated in a dose-response manner with increased CVD risk in older women, which suggests that efforts to reduce CVD burden might benefit from addressing either or both components of sedentary behavior.

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Key Words: aging ■ epidemiology ■ lifestyle ■ patterns of sedentary behavior ■ physical activity ■ sedentary time

Sources of Funding, see page 1045
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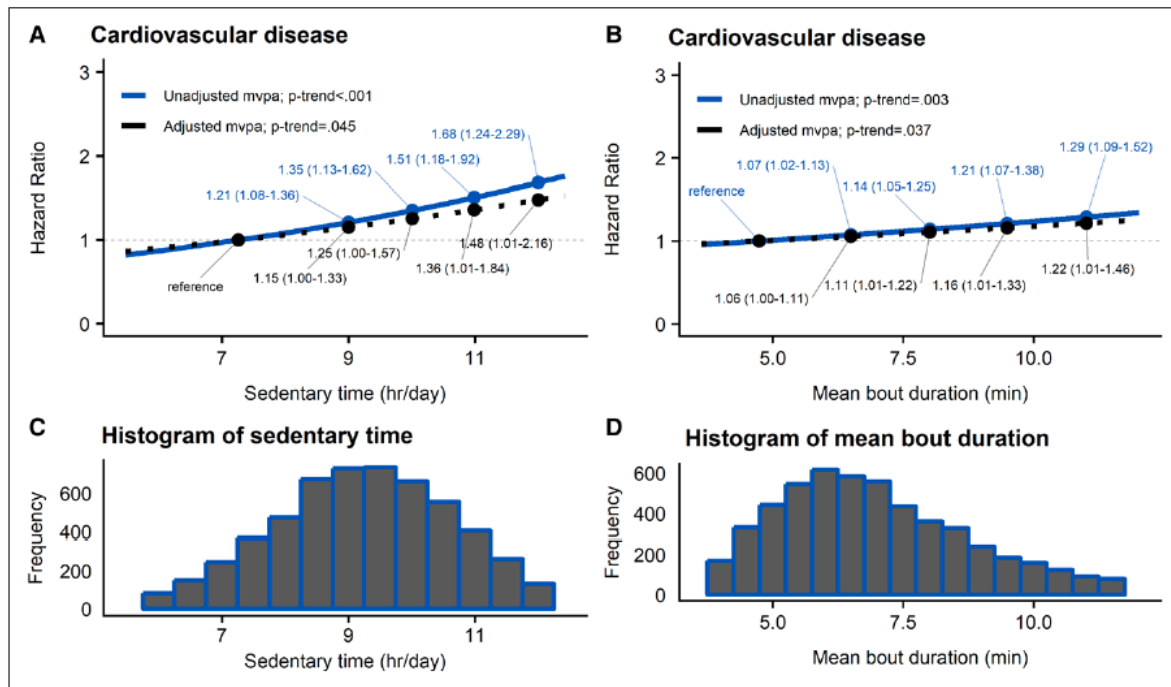
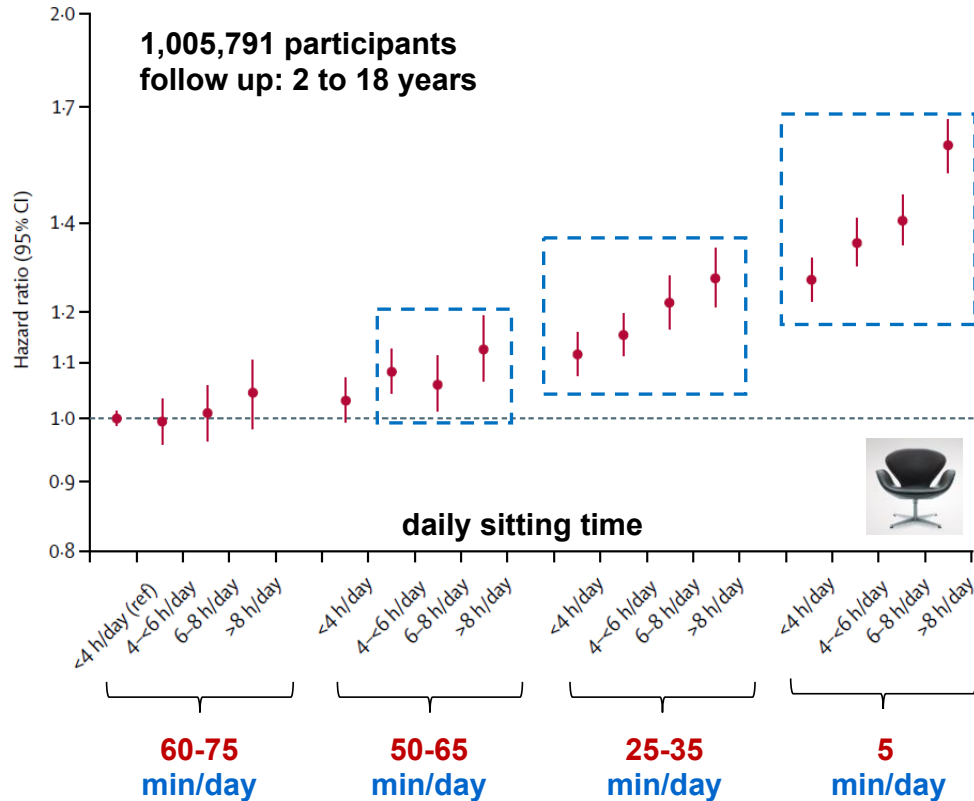


Figure 1. Continuous dose-response relation of sedentary time and mean sedentary bout duration with cardiovascular disease events, estimated using linear Cox regression models.

Results after adjustment for age, race/ethnicity, education, smoking status, alcohol consumption, self-reported health, multimorbidity, physical functioning, and family history of myocardial infarction (blue lines) and after additional adjustment for moderate-to-vigorous physical activity (mvpa; black dotted lines) are shown. The reference category was set to the 10th percentile of each exposure (sedentary time=7.3 h/d; mean bout duration=4.7 minutes). Results for sedentary time (A, C) were trimmed at the 1st and 99th percentiles, and results for mean bout duration (B, D) were trimmed at the 1st and 95th percentiles.

Fast Fact # 4: Only very high levels of exercise provide protection



Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women

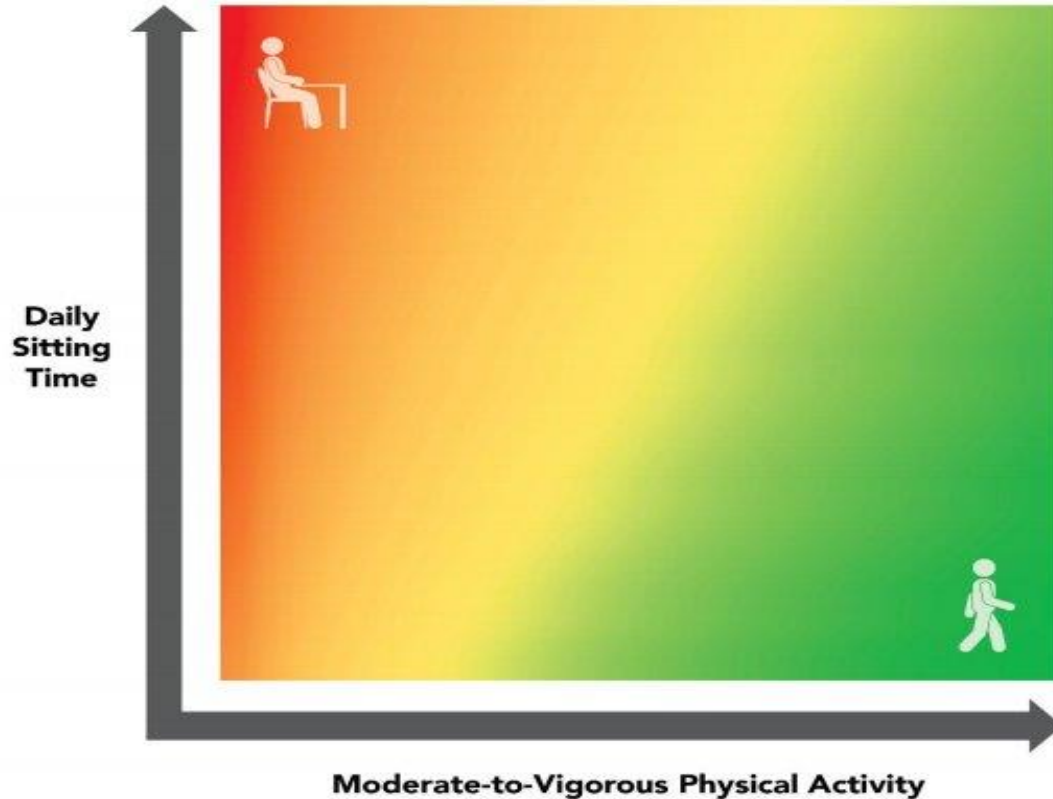
Ulf Ekelund, Jostein Steene-Johannessen, Wendy J Brown, Morten Wang Fagerland, Neville Owen, Kenneth E Powell, Adrian Bauman, I-Min Lee, for the Lancet Physical Activity Series 2 Executive Committee* and the Lancet Sedentary Behaviour Working Group*

Ekelund *et al.* 2016 *The Lancet* 388: 1302-10

Sitting time, physical activity and mortality



Figure D-2. Relationship Among Moderate-to-Vigorous Physical Activity, Sitting Time, and Risk of All-Cause Mortality



*Thanks to Peter Katzmarzyk
(Pennington Biomedical
Research Centre) and US
Physical Activity Guidelines
Taskforce*

Australian Public Health Guidelines (2014)



Australia's Physical Activity and Sedentary Behaviour Guidelines for Adults (18–64 years)

PHYSICAL ACTIVITY

- Doing any physical activity is better than doing none. If you currently do no physical activity, start by doing some, and gradually build up to the recommended amount.
- Be active on most, preferably all, days every week.
- Accumulate 150 to 300 minutes (2 ½ to 5 hours) of moderate intensity physical activity or 75 to 150 minutes (1 ¼ to 2 ½ hours) of vigorous intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week.
- Do muscle strengthening activities on at least 2 days each week.

SEDENTARY BEHAVIOUR

- Minimise the amount of time spent in prolonged sitting.
- Break up long periods of sitting as often as possible.

What are the feasible 'counter-measures'?

Don't just sit there!

We know sitting too much is bad, and most of us intuitively feel a little guilty after a long TV binge. But what exactly goes wrong in our bodies when we park ourselves for nearly eight hours per day, the average for a U.S. adult? Many things, say four experts, who detailed a chain of problems from head to toe.

Illustration by Bruce Bannister/Science in Partnership Clinic

ORGAN DAMAGE

Heart disease
Muscles burn fat and blood-borne stress signals during a long sit, allowing fatty acids to more easily enter the blood. Prolonged sitting has been linked to higher blood pressure and elevated cholesterol, and even with a low level of physical activity, those who sit more than 10 hours a day have a 30% greater risk of heart disease than those who sit less.

Overproductive pancreas
The pancreas produces insulin, a hormone that enables glucose to enter the body's cells. But when it sits, the pancreas produces more insulin than the body needs, leading to higher blood sugar levels and, over time, to type 2 diabetes and other diseases. A 2010 study found that a 1-hour sit after a meal was linked to a 37% increase in blood sugar levels.

Cancer
Sitting is linked to higher rates of cancer, including breast, colon and endometrial cancers. The reason is unclear, but one theory is that prolonged sitting encourages fat growth. Another is that regular movement helps reduce inflammation, which is linked to cancer. — Lisa Kistner

MUSCLE DEGRADATION

Muscle atrophy
When you sit, your muscles lose up to 1% of their strength each day. After 10 days, you lose about 10% of your muscle mass. This is why it's important to get up and move every 30 minutes to keep your muscles from atrophying. — Lisa Kistner

Tight hips
Prolonged sitting can lead to tight hips, which can lead to lower back pain. Tight hips can also lead to a higher risk of falls. — Lisa Kistner

Longer lifespan
Sitting is linked to a higher risk of death. A 2010 study found that people who sit for more than 10 hours a day have a 30% greater risk of death than those who sit for less than 10 hours a day. — Lisa Kistner

Leg disorders
Prolonged sitting is linked to leg disorders, including varicose veins and deep vein thrombosis (DVT). — Lisa Kistner

Soft bones
Sitting is linked to lower bone density, which can lead to osteoporosis. — Lisa Kistner

Metabolic syndrome
Sitting is linked to metabolic syndrome, a cluster of conditions that increase the risk of heart disease and stroke. — Lisa Kistner

So what can we do? The experts recommend ...

Sitting on something wobbly
Sitting on something wobbly, like a wobble board, can help keep your muscles active. — Lisa Kistner

Stretching the hip
Stretching the hip can help keep your muscles active. — Lisa Kistner

Walking during sitting
Walking during sitting can help keep your muscles active. — Lisa Kistner

Interacting between sitting and walking
Interacting between sitting and walking can help keep your muscles active. — Lisa Kistner

Using stairs
Using stairs can help keep your muscles active. — Lisa Kistner

The experts
The experts recommend ...

Inactive (sitting)



Active (reduced or non-sitting)

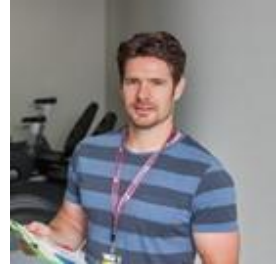
Solutions



Benefits for Type 2 Diabetes of Interrupting Prolonged Sitting with Brief Bouts of Light Walking or Simple Resistance Activities

PC Dempsey, RN Larsen, P Sethi, JW Sacre, NE Straznicky, ND Cohen, E Cerin, GW Lambert, N Owen, BA Kingwell, DW Dunstan

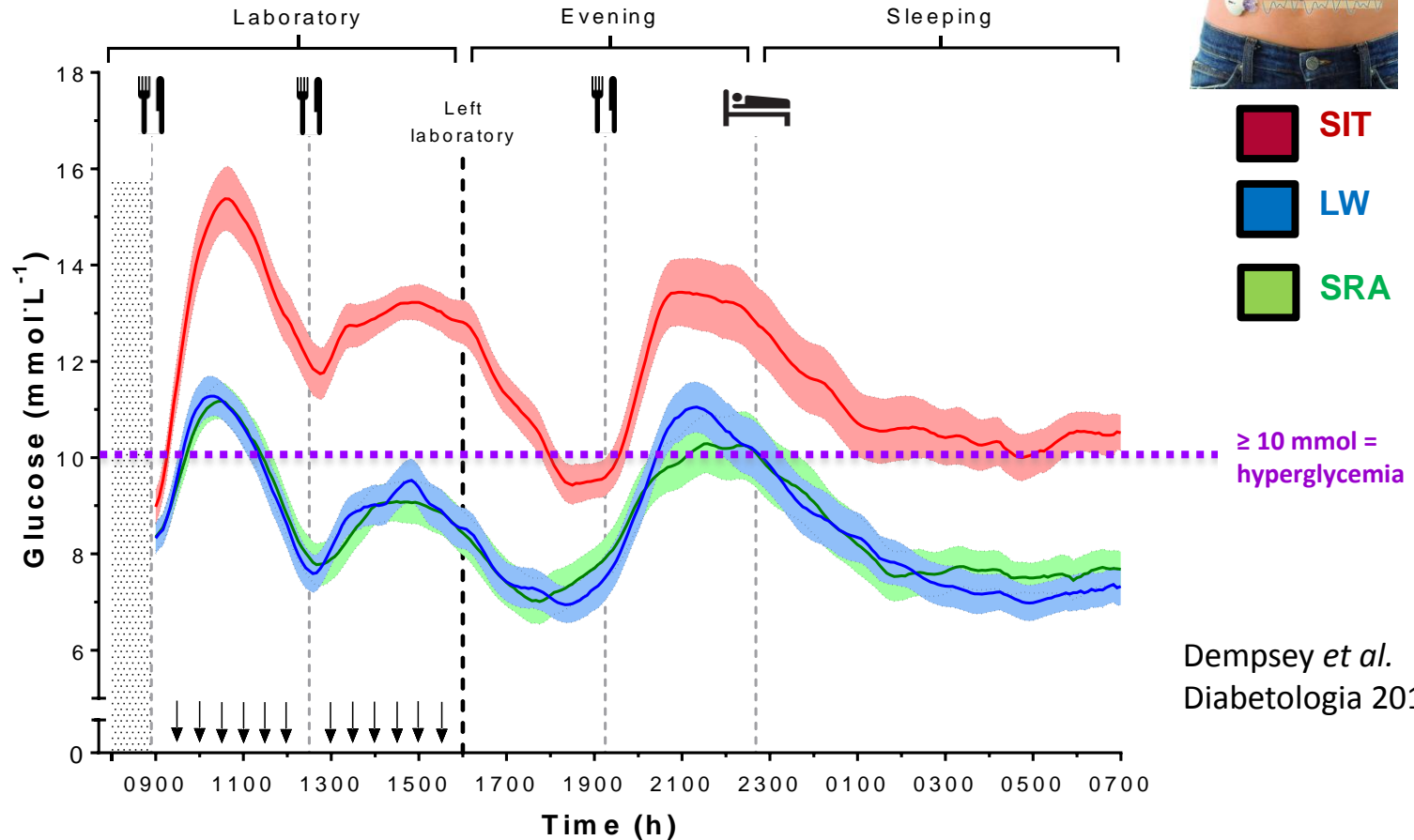
Diabetes Care (2016) 39: 964-72



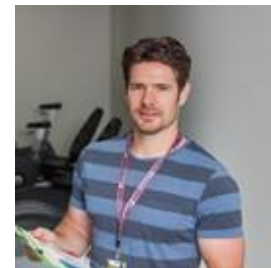
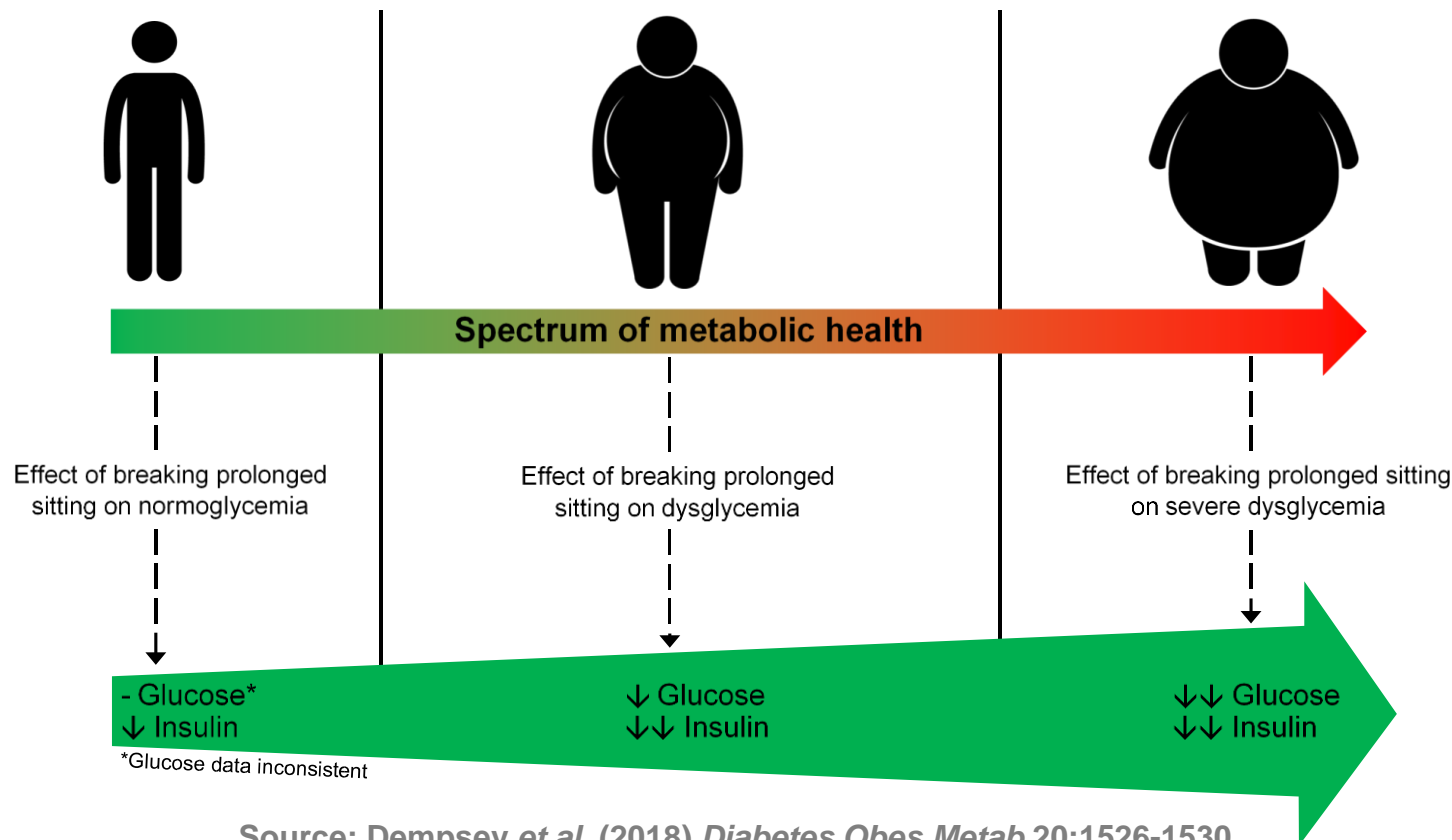
Paddy Dempsey



Results: ↓ hyperglycemia (CGM)



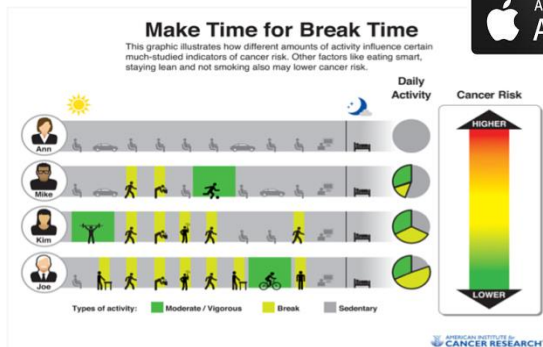
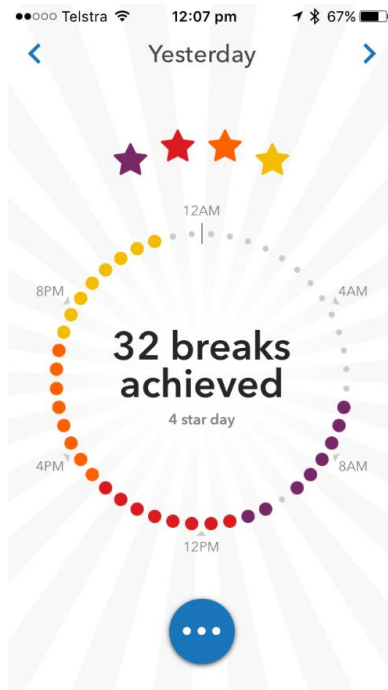
Benefits may be proportional to degree of metabolic impairment



Paddy Dempsey



Ashleigh Homer



Project Grant: 2018-2022

“Can reducing sitting AND increasing daily moving time influence sustained glycaemic control in middle-aged and older office workers with Type 2 Diabetes”

‘The OPTIMISE Your Health study’

CI's: David Dunstan, Neville Owen, Elizabeth Eakin, Stuart Biddle, Genevieve Healy, Robin Daly, Daniel Green, Marj Moodie, Elisabeth Winkler, Neale Cohen

Recruitment commenced: June 2019

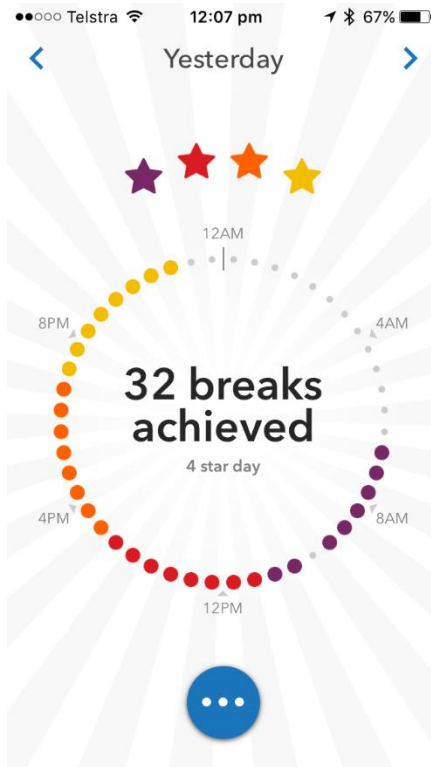
<https://www.baker.edu.au/research/clinical-trials/optimize-study>

Take Home Messages

- Excessive sitting AND physical inactivity is highly prevalent across society
- There is now strong evidence linking excessive sitting to chronic disease risk
- Solutions need to be sought to overcome the ‘normal’ state of prolonged, uninterrupted patterns of sitting in various contexts – particularly workplace/schools
- **The Key Message:** In addition to engaging in health-enhancing exercise, people should be encouraged to minimise the time spent in prolonged sitting and break up long periods of sitting as often as possible

“Sit Less, Move More, More Often

Thank You For Listening



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