

Standing Workstations: Experience, Acceptability, and Effects on Occupational Sedentary Behaviour and Metabolic Health of Office Workers

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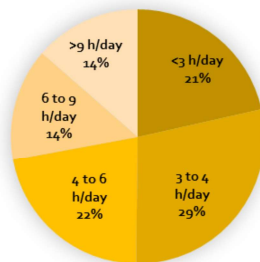


Thank you for having me here today to talk about my research. This weekend you'll hear a lot about being active, but I'm going to talk a little about being inactive.

the sedentary problem

New Zealand Median Daily sitting time

(Bauman et al., 2011)



Computer SB higher in young people, higher education, professional and white collar (Rhodes, Mark and Temmel, 2012; Mummery et al., 2005)

Third of NZ adults may spend 3.5 – 4.1 h/day in occupation SB (Statistics New Zealand, 2015)

SB linked with increased BMI, waist circumference, blood pressure and decreased HDLC, increased cardiovascular events and all-cause mortality independent of PA (Mummery et al., 2005; Wijndaele et al., 2009; Bertrais et al., 2005; Stamatakis et al., 2011)

So what is SB and when do we do it?

- SB is <1MET
- SB in adults occurs in three phases throughout the day; during transport, occupationally and leisure time.
- SB higher in younger, educated, white collar

Prevalence:

- 50% of population median sitting time >4h/day (Bauman et al., 2011), close to 25% >6 h/day
- Very limited evidence occupational sitting time that 30% of full time employed NZ adults occupational sitting 3.5-4 h/day (Statistics New Zealand, 2015 + drawing in Mummery data)

Links:

- SB linked with increased levels of **psychological disorders** SB linked with
- increases in **colon, rectal, ovarian and endometrial cancer** often independent of PA
- What interested me is SB linked with increased **BMI, waist circumference, blood pressure and decreased HDLC, increased cardiovascular events and all-cause**

mortality (Mummery et al., 2005; Wijndaele et al., 2009; Bertrais et al. 2005; Stamatakis et al. 2011)

metabolic syndrome

Cluster of clinical symptoms strongly implicated in the development of CVD, T2DM and all-cause mortality (Alberti et al., 2006; Ford, 2005; Grundy, Brewer, Cleeman, Smith, & Lenfant, 2004; Roger et al., 2011)

Poorly understood and not gold-standard, but useful field tool

Sedentary behaviour mechanisms may include decreased energy expenditure, low lipoprotein lipase activation, or GLUT4 down-regulation (Reiff, Marlatt & Dengel, 2012; (Hamilton et al., 2007; Phillips et al., 2004)

The Metabolic Syndrome Joint Interim Statement

(Alberti et al., 2009)

Central obesity	Elevated waist circumference
Raised triglycerides	≥ 1.7 mmol/l
Reduced HDL cholesterol	< 1.0 mmol/l in males < 1.3 mmol/l in females
Raised blood pressure	Systolic: ≥ 130 mmHg and/or Diastolic: ≥ 85 mmHg
Raised fasting glucose	Fasting plasma glucose ≥ 5.6 mmol/l

Method of measuring impacts:

- Joint Interim Statement
- A 'crude' measurement for a complicated spectrum of an inability to maintain homeostasis
- Exact prevalence unknown in New Zealand, estimated to be between 15 and 25%

(International Diabetes Federation, World Health Organisation, The National Heart, Blood and Lung Institute, American Heart Association and the International Association for the Study of Obesity)

stop sitting

Negative effects of health as a result of sedentary behaviour are not mitigated after adjusting for physical activity (Healy et al., 2011; Stamatakis et al., 2011; Wijndaele et al., 2009).

Interrupting sedentary behaviour through LIPA breaks may significantly decrease the risks of developing METs (Healy, Wijndaele, et al., 2008).

Sedentary behaviour is likely to be a unique and independent influencer of health beyond the continuum of physical activity (Healy, Dunstan, et al., 2008).

Important to remember:

- Impacts of SB not mitigated by physical activity.
- Findings present even after adjusting for PA suggesting that SB is likely a unique and independent influencer of health beyond the continuum of PA (Healy, Dunstan, et al., 2008).
- Decreasing SB is associated with a reduction in the risks of developing the markers of METS
- ACSM guidelines of 30m x5 maybe not enough. Need to increase PA and decrease SB

study aims

Can the use of standing desks effect the markers of metabolic syndrome in occupational sitters

Pilot study to fit within a Masters level thesis

Lack of research at time of study suggested the need to examine plausability

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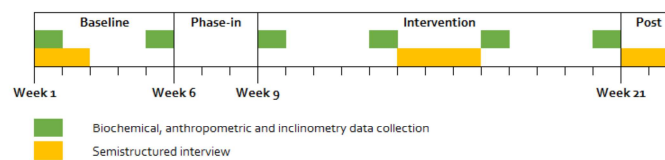
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study design

Single case series (N-of-1) AB model with no withdrawal or repeat phases.

Data interpretation performed through visual analysis to focus on clinical significance (Gross, 2008; Kratochwill et al., 2010).

Fixed frequency anthropometric and biochemical measurements.



Single case AB model with no withdrawal or repeat phases, time and financial constraints of a 90 credit thesis

Three phase study of baseline, phase-in and intervention with

- anthropometric, biological, inclinometric data collected every 4 weeks
- lived experience data collected through set point interviews.

21 weeks

participants

Inclusion:

- Aged 25-40 yo
- Self reported BMI 25-30 kg/m²
- Self estimated >5 h/day occupational sitting

Exclusion:

- Previous diagnosis of CVD, Diabetes or MetS
- History of angina, stroke
- Metabolic specific medication
- Smoker

	Age	Gender	Weight (kg)	Waist Circumference (cm)	Body Mass Index (kg/m ²)
Participant A	40	Male	91	104	31
Participant B	31	Female	68	87	29
Participant C	40	Female	58	78	25
Participant D	34	Male	79	82	25
Participant E	30	Female	83	97	33
Participant F	25	Female	81	85	27

At-risk occupational sitters.

Recruited using a custom website as well listing the study on a participant recruitment website

Approached local Fairfax news outlet which was then covered through the lifestyle section of Stuff. 'pop science'

- 43 registrations of interest
- 14 were eligible to complete
- 6 selected, complete baseline and phase-in
- 2 withdrawals – 12, 18 weeks
- 4 complete full study

data collection and analysis

Anthropometric data collected by researcher at participants' workplace

Biochemical data collected by Labtests New Zealand using Siemens Advia 2400

Inclinometry data collected using Actigraph GTX3+ or a wGTX3+ worn on thigh

Lived experience data collected through semi-structured interviews in-person or via Skype

Data were analysed using linear regression and effect sizes (Cohen's D) calculated between baseline and intervention period

Changes only considered meaningful if they exceeded biological variance or technical error for measurement



- Anthropometric - workplace
- Biochemical – labtests
- Inclinometry
- Semi-structured interviews

Metabolic changes were only considered significant if they exceeded the known Technical error of measurement or biological variances.

markers of METs

Waist Circumference

- A meaningful **decrease** that exceeded measurement error in three participants between the baseline and intervention periods (PA = 5.2cm, PB = 6.7cm, PC = 2.5cm)

BMI

- a meaningful **decrease** in two participants (PA = 1.4 kg/m², PB = 0.4 kg/m²)
- a meaningful **increase** in two participants (PC = 0.5 kg/m², PF = 1.4 kg/m²)

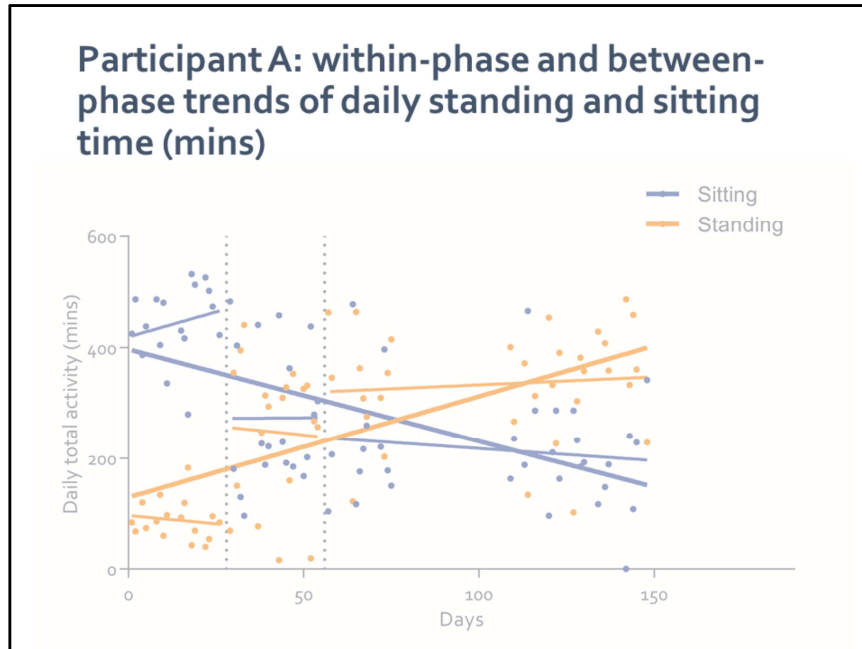
Triglycerides

- A **decrease** of 1.3 mmol/l in Participant A

Blood Glucose

- An **increase** of 0.75 mmol/l in Participant D

Not very much!



Tendency for all participants to decrease daily sitting time and increase daily standing time

Participants maintained changes to SB throughout intervention period suggesting acceptability of standing desks even with the opportunity to sit

experience

Physical

Perceived increases in energy, tolerance to standing, improved posture and decreased discomfort associated with standing

Mental

Improved emotional wellbeing, tolerance to stress, proactive attitude towards health

Environmental

Improved perception of interaction with others in office

Need for an adjustment period

Desire to stand too-much too-soon lead to discomfort which was eased with short periods of sitting

Standing became 'normal' with some participants reporting a reduction in physical discomfort

The use of standing desks was a positive experience that helped to improve stress tolerance and more positive about their environment

Reinforced the need for an adjustment period to allow transition to standing in order to reduce discomfort.

discussion

- **Increase in daily occupational standing** between 111 min/day and 341 min/day for all participants
- **Decrease in daily occupational sitting** between 107 min/day and 311 min/day in all participants
- **High acceptability** suggested through both qualitative and quantitative data
- A lack of meaningful change to markers of METs may be indicated by short period of study or nature of mechanisms

Change in sedentary behaviour maintained for the duration of the study even with the option to sit down

Complicated metabolic processes

Short period of time

No monitor or control of diet or exercise

with thanks



- Todd Foundation award for excellence
- Grant Schofield - AUT Human potential centre
- Todd Lay – Linak New Zealand