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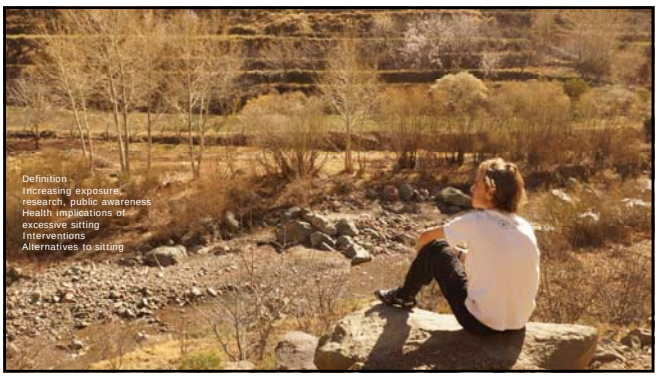
Occupational Sedentary Behaviour

& musculoskeletal implications of control options

23rd May 2016, AAMHP, Fremantle

Professor Leon Straker, Physiotherapy and Exercise Science, Curtin University



Sedentary behaviour

- posture (sitting/reclining)
- AND low energy expenditure (<1.5 x resting level)
- WHILST awake

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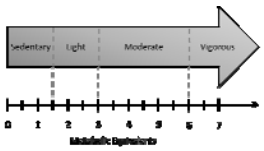
Part of a spectrum of awake 'activity'



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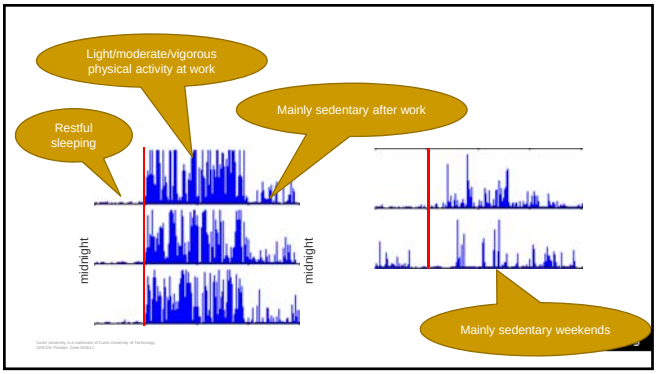

Occupational sedentary behaviour increasing

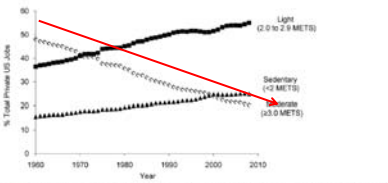

Figure 2. Trends in the prevalence of sedentary, light and moderate intensity occupations from 1960 to 2008.
doi:10.1371/journal.pone.0019657.g002

- Desk-based work
- Vehicle/plant/machine operation work

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(Church et al 2011)

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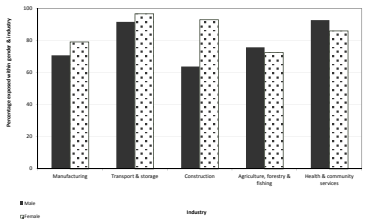
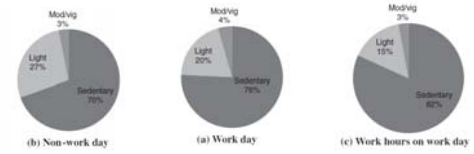
Occupational sitting common across industries

- 81% some exposure
- 52% often/all the time



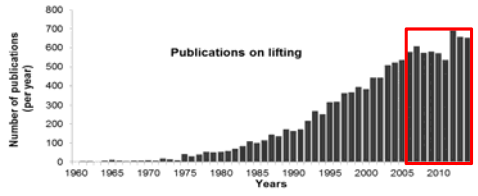
(Straker et al 2016)

Occupational sitting exposure high in office workers



(Parry and Straker 2013)

Increasing focus of research



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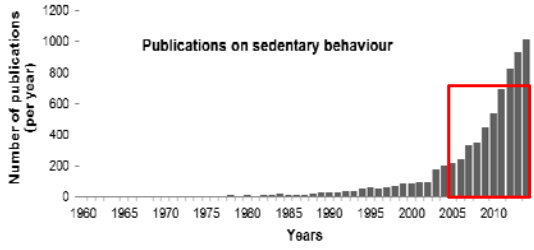

Daily Sitting Time and All-Cause Mortality: A Meta-Analysis

Josephine Y. Chau, Anne C. Grunseit, Tien Chey, Emmanuel Stamatakis, Wendy J. Brown, Charles E. Matthews, Adrian E. Bauman, Hidde P. van der Ploeg

(Chau et al 2013)

Sedentary time and cardio-metabolic biomarkers in US adults: NHANES 2003–06

CLINICAL RESEARCH

Genevieve N. Healy, Charles E. Matthews, David W. Dunstan, Elisabeth A.H. Winkler, and Neville Owen

(Healy et al 2011)

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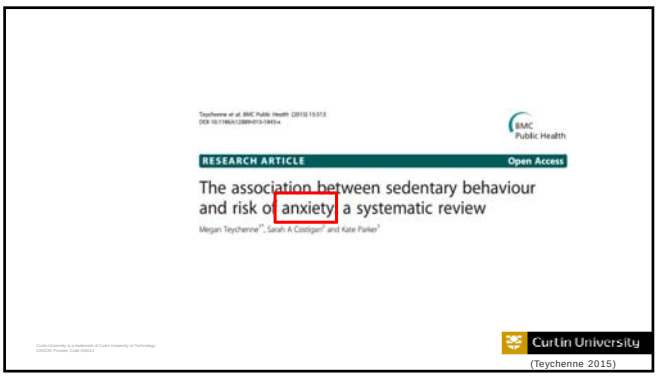
(Lynch 2011)



(Teychenne 2015)

Increasing public awareness

Overall Sedentary Behaviour

- >7-8 hrs/day (self reported) increased risk of all-cause mortality
- Increased risk of diabetes, cardiovascular disease, metabolic syndrome and obesity
- Increased risk of colon, endometrial, lung and breast cancer
- Increased risk of depression, anxiety, distress
- No clear epidemiological evidence of association with musculoskeletal symptoms

Occupational Sedentary Behaviour

- No clear epidemiological evidence of association with mortality
- Mixed evidence of association with cardiometabolic problems
- Some evidence of increased risk of colon and breast cancer
- Mixed evidence of association with mental health
- Mixed evidence of association with musculoskeletal symptoms

Surge of interest in workplace interventions to reduce sitting

- Individual
  - Education, prompts
- Environment
  - Workstation, building
- Organisation
  - Meeting policies
- Before and after work
  - Cycle lockers and showers
- Active breaks
  - Lunch time walks
- Change productive tasks
  - Standing workstations

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Workplace sitting reduction intervention questions

- Can the behaviour be reduced?
  - Self report
  - Activity/posture monitor
- Are there effects on health outcomes?
  - Mainly cardiometabolic
- Are there effects on work outcomes?
  - (Perceived better cognitive performance)

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Surge of reviews on workplace interventions to reduce sitting

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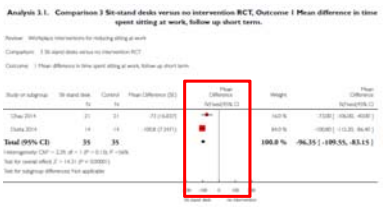
- Sit-stand workstations
  - 30-120 mins
- Treadmill workstations
  - 29 mins
- Cycle workstations
  - 12 mins
- Counselling
  - 28 mins
- Mindfullness
  - 2 mins



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Alternatives to sedentary work tasks

Static Postures
- standing

Dynamic 'Postures'
- 'active' sitting
- walking

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Alternatives to sedentary work tasks

Standing
- Related to lower mortality (Katzmarzyk et al. 2014)
- Small increase in thigh muscle activity (Tikkanen et al. 2013)
- Small increase in heart rate and energy expenditure (MacEwen et al. 2015; Reiff et al. 2012)

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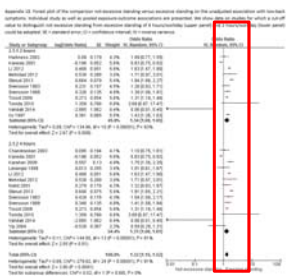
Alternatives to sedentary work tasks

Standing
- Excessive standing is detrimental (Messing et al. 2015)
  - Lower limb venous pooling, varicose veins (Chester et al. 2002; Pinto 2012)
  - Miscarriage, preterm delivery, pre-eclampsia (Bonde et al. 2013; van Beukering et al. 2014; Bonnzini et al. 2007)
  - Fatigue (Chester et al. 2002)
  - Lower limb and low back discomfort (Allen et al. 2010; Tissot et al. 2009)



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Alternatives to sedentary work tasks

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  - Fatigue (Chester et al. 2002)
  - Lower limb and low back discomfort (Allen et al. 2010; Tissot et al. 2009)
- Effects reduced by
  - Cushioned floor, soft shoe insoles, foot rest bar (Gallagher et al. 2014; Ganesen et al. 2014)

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Bi-directional relationship between musculoskeletal symptoms and increased standing

Standing impact on MSS

- Evidence that sustained standing increases back and lower limb symptoms

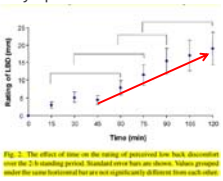

Fig. 2. The effect of time on the rating of perceived low back discomfort over the 2-h standing period. Standard error bars are shown. Values grouped under the same horizontal bar are not significantly different from each other.

MSS impact on standing

- Preliminary evidence that people with back pain are less able to change their behaviour
  - Sit-stand desk intervention 2 ½ hrs less sitting for those without back pain and only 2 hrs less for those with back pain at baseline

(Gregory et al 2008)

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Musculoskeletal issues with alternatives to sedentary work tasks

Dynamic 'Postures'

- 'active' sitting
  - Chair without backrest
  - Chair with unstable base
  - Cycling chair

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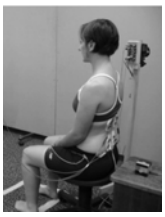
Alternatives to sedentary work tasks



Unstable chair

- Minimal acute change in trunk muscle activity and movement (Ellegast et al. 2012; O'Sullivan et al. 2006; van Dieen et al. 2001)

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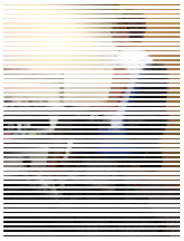
Alternatives to sedentary work tasks



Cycling chair

- Increases in muscle activity and heart rate and energy expenditure (Elmer et al. 2014; Altenburg et al. 2013; Straker et al. 2009)
- Minimal decrement in computer task performance (Commissaris et al. 2014; Straker et al. 2009)
- Lower limb discomfort issues (Baker et al. 2015; Straker et al. 2009)

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Musculoskeletal issues with alternatives to sedentary work tasks

Dynamic 'Postures'

- Walking
  - 'free' walking
  - treadmill walking

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Alternatives to sedentary work tasks

'Free' walking

- Related to health benefits (Hansen et al. 2015)
- Increases muscle activity, energy expenditure, body movement
- Beneficial cardiometabolic effects
  - Resting heart rate and blood pressure, blood lipids, waist circumference (MacEwen et al. 2015)

MSS???

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Alternatives to sedentary work tasks

Treadmill walking

- Increase in heart rate and energy expenditure
- Some reduction in computer productivity (Commissaris et al. 2014; Straker et al. 2009)
- Expense, space, noise, trip hazard

MSS???

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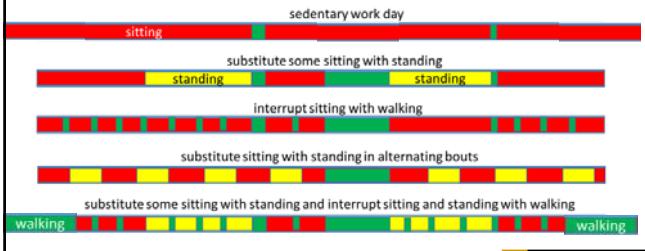
So, in summary

We know excessive sitting is bad, and that for desk based workers there are some interventions that can reduce sitting, at least in the short term
But some of these have additional positive and negative consequences

So what is the ideal office job?



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Acknowledgements

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- Nick Gilson, Genevieve Healy, David Dunstan
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Google 'SWA' and 'sedentary'

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