Sitting it Out: The Health Risks of Sedentary Behaviour

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Content

Definition of sedentary behaviour

Prevalence of sedentary behaviour

Health risk of sedentary behaviour

Reducing sedentary behaviour
Everything we do

Sedentary (≤1.5 MET; sitting, reclining)

Light (>1.5 to <3; standing)

Moderate activities (≥3 to <6; walking)

Vigorous activities (≥6; football)

Total energy expenditure
Everything we do

Sedentary (i.e. sitting, reclining) ≠ Inactivity

Light (i.e. standing)

Moderate activities (i.e. walking)

Vigorous activities (i.e. soccer)

Health enhancing physical activity
An Active Day? In the life of Homer Simpson

30 min

8 hours

30 min

4 hours

YES
A day in the life

[Diagram showing activity levels]

- Sedentary
- Light PA
- Mod + Vig PA

[min/day scale from 0 to 1600]
Figure 2. Trends in the prevalence of sedentary, light and moderate intensity occupations from 1960 to 2008. doi:10.1371/journal.pone.0019657.g002

Church et al. PLoS ONE 2011
Australian National Health Survey 2007-08

Inactive transport to school

Sitting in front of a screen during leisure

van der Ploeg et al. Am J Prev Med accepted
How much we sit throughout the day

Prevalence of sedentary behaviour

Population representative accelerometer studies

Canada (07-09): 68% (Colley et al. Statistics Canada 2011)
England (08): 70% (Health Survey for England 2008)
Sweden (01-02): 59% (Hagströmer et al. AJE 2010)
US (03-04): 55% (Matthews et al. AJE 2008)

~8-9 hr/d of sedentary behaviour

Average accelerometer wear time = 14 hr/d
PREVENTION

Standing Up on the Job: One Way to Improve Your Health
Possible working mechanisms

Reduced metabolic and vascular health

Disrupt metabolic function

↑ plasma triglyceride levels

↓ high-density lipoprotein cholesterol

↓ insulin sensitivity (Δ lipoprotein lipase activity)
TV viewing
TV viewing & all-cause mortality

TV viewing & CVD mortality

TV viewing & T2DM, CVD, mortality

Source

<table>
<thead>
<tr>
<th>Type 2 diabetes</th>
<th>Weight, %</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hu et al, 7 2001</td>
<td>18.9</td>
<td>1.20 (1.08-1.32)</td>
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<tr>
<td>Hu et al, 8 2003</td>
<td>29.8</td>
<td>1.16 (1.09-1.24)</td>
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<tr>
<td>Krishnan et al, 17 2009</td>
<td>36.6</td>
<td>1.17 (1.12-1.23)</td>
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<tr>
<td>Ford et al, 16 2010</td>
<td>14.7</td>
<td>1.37 (1.21-1.55)</td>
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<tr>
<td>Total</td>
<td>100</td>
<td>1.20 (1.14-1.27)</td>
</tr>
</tbody>
</table>

Test for heterogeneity: $P = .11$; $I^2 = 50.4\%$

Cardiovascular disease (fatal or nonfatal)

<table>
<thead>
<tr>
<th></th>
<th>Weight, %</th>
<th>RR (95% CI)</th>
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<tbody>
<tr>
<td>Dunstan et al, 19 2010</td>
<td>7.3</td>
<td>1.30 (0.98-1.69)</td>
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<tr>
<td>Warren et al, 20 2010</td>
<td>5.0</td>
<td>1.06 (0.75-1.46)</td>
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<tr>
<td>Stamatakis et al, 16 2011</td>
<td>59.2</td>
<td>1.13 (1.02-1.24)</td>
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<tr>
<td>Wijndaele et al, 21 2011</td>
<td>28.4</td>
<td>1.17 (1.02-1.35)</td>
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<tr>
<td>Total</td>
<td>100</td>
<td>1.15 (1.06-1.23)</td>
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</tbody>
</table>

Test for heterogeneity: $P = .73$; $I^2 = 0\%$

All-cause mortality

<table>
<thead>
<tr>
<th></th>
<th>Weight, %</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunstan et al, 19 2010</td>
<td>10</td>
<td>1.17 (1.00-1.37)</td>
</tr>
<tr>
<td>Stamatakis et al, 16 2011</td>
<td>47.6</td>
<td>1.14 (1.06-1.23)</td>
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<tr>
<td>Wijndaele et al, 21 2011</td>
<td>42.4</td>
<td>1.10 (1.02-1.19)</td>
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<tr>
<td>Total</td>
<td>100</td>
<td>1.13 (1.07-1.18)</td>
</tr>
</tbody>
</table>

Test for heterogeneity: $P = .74$; $I^2 = 0\%$

Grontved & Hu JAMA 2011
Occupational sitting time
Review
Is occupational sitting adversely associated with health?

Health risks

43 studies included

BMI
N=12

Cancer
N=17

Mortality
N=6

Diabetes Mellitus
N=4

CVD
N=8
Weighing up the evidence

Is occupational sitting and health

Evidence is accumulating

Heterogeneity in study designs, measures, findings

Future studies:
- Adjust for PA and other confounders
- Better measures of sitting time
Measurement of sedentary behaviour

During the last 7 days, please estimate how much time you usually spend SITTING in each of the following activities on a WORKING day and a NON-WORKING day. (please write your answers in the spaces provided)

<table>
<thead>
<tr>
<th></th>
<th>WORKING day</th>
<th></th>
<th>NON-WORKING day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours</td>
<td>Minutes</td>
<td>Hours</td>
</tr>
<tr>
<td>a. For TRANSPORT</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(e.g. in car, bus, train, etc)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>b. At WORK</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(e.g. sitting at a desk or using a computer)</td>
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<tr>
<td>c. Watching TV</td>
<td></td>
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<tr>
<td>d. Using a computer at home</td>
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<tr>
<td>(e.g. email, games, information, chatting)</td>
<td></td>
<td></td>
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<tr>
<td>e. Other leisure activities</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(e.g. socialising, movies etc. but NOT including TV or computer use)</td>
<td></td>
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</tbody>
</table>

Total sitting time
van der Ploeg et al. Arch Intern Med 2012

All participants n=222,497
Adjusted for: sex, age, education, urban/rural, BMI, smoking, self-rated health and disability
NIH-AARP Diet and Health Study (n=240,819)

Conclusions

• Large volumes of sedentary behaviour are bad for health, independent of physical activity

• Methodological improvements needed (measurement)

• Too early for public health recommendations
Solutions?

- Reduce total volume of sitting? Breaking up sitting?
- Replace sitting with standing and physical activity
- Sit-stand workstation, standing meetings
- Reduce inactive forms of transport
- Reduce leisure time sedentary behaviour
Stand @ Work pilot

- Cross over RCT (n=41)
- Desk-based office workers in Sydney
- Workstation for 4 weeks
- Women, high educated, open plan
- Objective, self report outcomes
- Focus groups

- 1-2 hr/d less sitting at work

Alkhaja et al. AJPM 2012
Pronk et al. Prev Chronic Dis 2012