

To sit or not to sit? – Fad or Future? Adjustable height desks in the office

An Evidence Review and A New Zealand Case Study

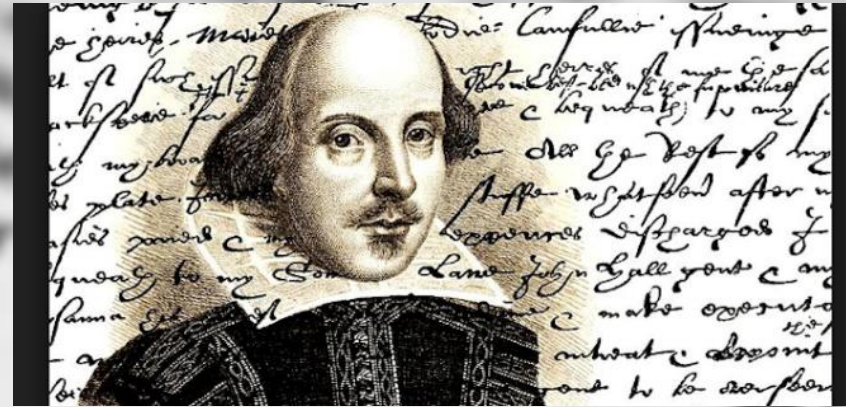
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POLONIUS. I hear
HAMLET. To be, or not to be: that
Whether 'tis nobler in the mind
The slings and arrows of outrage
Or to take arms against a sea of
And by opposing end them? To
No more; and, by a sleep to say
The heart-ache and the thousand
That flesh is heir to, 'tis a
Trevor



To sit, or not to sit - that is the question

Whether 'tis nobler in the mind to stand or to suffer the slings and arrows of outrageous posture, or to arise and take arms against a sea of convention, and by opposing, end it.

To sit – to stand? To sit - perchance to move: ay, there's the rub! For in that sitting of death what dreams may come when we have shuffled off this mortal coil, must give us pause to sit alone.

For who would bear the whips and scorns of sitting time, th' oppressor's seat, the proud man's executive chair, the pangs of despis'd sitting, the insolence of the sitting office, and the spurns that patients of th' unworthy makes, when he himself might both sit and stand with an electronic height-adjustable desk?

Who would these fixed seats bear, to grunt and sweat under a weary life, with musculoskeletal discomfort dread, or even death – the undiscover'd country, from whose bourn no constant sitter returns.

It puzzles the will that we rather bear those ills we have, than fly to others that we know not of?

Thus sitting conscience does make standing cowards of us all.

Soft you now! The fair sitter - nymph-like - should also stand and in thy motion sitting pains will be only sins rememb'red.

Prolonged sitting is very prevalent

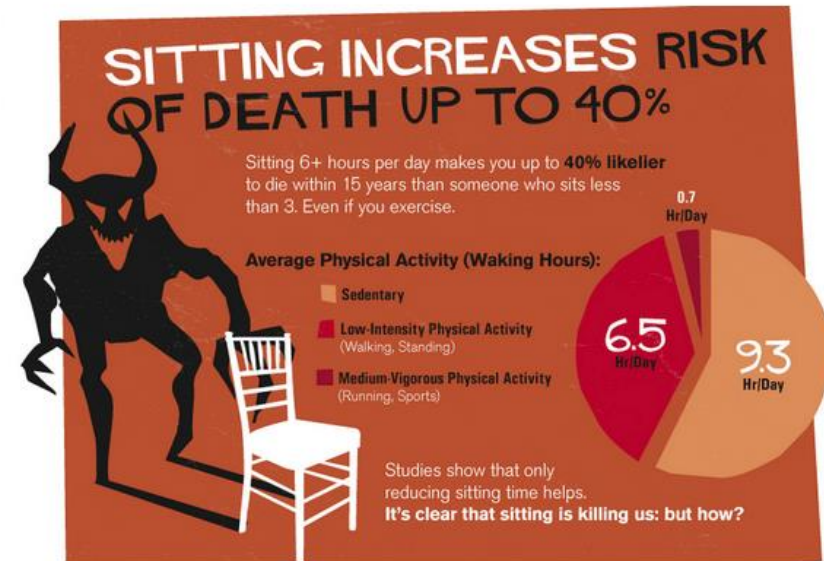
- Of 15 hours of waking day for working population, more than half is sedentary – work, leisure, travel
- Up to 40% of workers in EU work at computer workstations
- Work is a potential avenue for change
- Prolonged sitting has been linked to serious health effects – diabetes, cardiovascular disease, possible cancer, obesity



Sources: Brown *et al* 2003; Waxman 2004; Levine 2007; Matthews 2008; Owen 2009; Gilson 2011; Healy *et al* 2011; Ellegast *et al* 2012; Dunstan *et al* 2012

Scaremongering

- Prolonged bouts of sitting are **a killer**, not just lack of exercise alone - *British Journal of Sports Medicine*, 19 January 2010
- Is Sitting a **Lethal Activity** — *New York Times*, 14 April 2011
- The **Dangers** of Sitting at Work — and Standing — *Time Magazine*, 13 April 2011
- Sitting all day is **deadly** — *Bizshift* 2013
- Do you have Sitting **Disease**? Take a Stand! - www.computingcomfort.org, 16 May 2013
- Sitting will **kill** you, even if you exercise. *CNN*, 2015



Are there benefits of standing?



Standing desks



Sit-stand desks



Prolonged standing

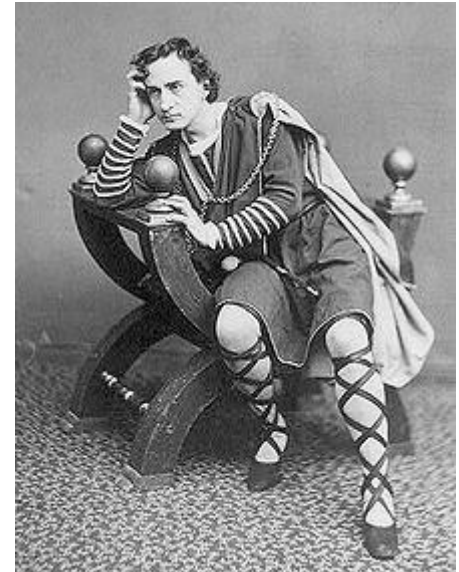
- 2005 - 58% of Quebec working population stand to work
- 2010 European Survey of Working Conditions noted 50% of respondents reported having to stand for at least $\frac{3}{4}$ of their work time
- 50% of UK workforce vulnerable to health problems related to prolonged standing

Prolonged standing is associated with low back pain, varicose veins, pregnancy issues, lower limb discomfort, plantar fasciitis, cramping

Sources: Tomei 1999; Tüchsen *et al* 2000; Mazurkewich *et al* 2000; Best *et al* 2002; Riddle 2003; Tissot *et al* 2005; Werner *et al* 2010; Waters *et al* 2014, 2015; Messing *et al* 2015

Standing desks – do they really make a difference???

- Productivity – increasing evidence on improved cognition and output
- Increased performance – mainly subjective
- Weight loss – poor evidence, high inference
- Leg swelling – minimal
- Health – growing evidence, high inference
- Compliance – inconclusive
- Discomfort – inconclusive
- Increased standing – well, of course - yes...!



Sources: Nerhood & Thompson 1994; Hasegawa *et al* 2001; Roelofs & Straker 2002; Hedge & Ray 2004; Hedge *et al* 2005; Wilks *et al* 2006; Ebara *et al* 2008; Vink *et al* 2009; Davis *et al* 2009; Pronk *et al* 2012; Robertson 2013; Karakolis & Callaghan 2014; Garrett *et al* 2016

Misconceptions about sit-stand desks

- They are just a fad
- If you have a sit-stand desk you need to stand all day
- Only short term results and people end up sitting most of the day anyway
- Not private
- Expensive



Prolonged static postures must be interrupted by movement

Callaghan & McGill 2001 – “standing appears to be a good rest from sitting given the reduction in passive tissue forces. However, the constant loading with little dynamic movement which characterizes both standing and sitting would provide little rest/change for muscular activation levels or low back loading”

Ramazzini in 17th century recommended that
prolonged postures be interrupted by movement



Campaigns

- Heart Foundation – Stand up for your health
- USA - Take a Stand
- Victoria – Stand Up Victoria
- Australia - Stand Up Australia
- South Australia – Sit less, ***Move more***
- Australia – Stand up, Sit less, ***Move more***
- UK - Sit Less, **Get Active**



Some ideas to mitigate the effects of standing



- Mats – subjective evidence only
- Compression stockings
- Shoe inserts
- Activity workstations

BUT WHAT IS THE EVIDENCE?
What helps?

Sources: King, 2002; Flore *et al* 2004; Partsch *et al* 2004; Moseley *et al* 2006; Chiu *et al* 2007; Sahar *et al* 2007; Balasubramanian *et al* 2009

Recent Recommendations

Predominantly desk based occupations – 2 hours increasing to 4 hours a day of standing and light activity during working hours (prorated to part-time hours)

- Regularly break seated work with standing work
- Use adjustable height desks
- Take standing or walking breaks

Dutch Ergonomic Guidelines – The ‘safe zone’ is:

- Prolonged standing of ≤ 1 hour and a total day stand of ≤ 4 hours

Evidence Review - 1

(Straker et al 2016)

Substitution alternatives to sitting

- Standing, walking and desk-based cycling
- Long term feasibility and extent to which these alternatives can be used is yet to be determined
- 'Active' sitting provide little cardio-metabolic benefit, but may provide some musculoskeletal benefit
- Active commuting and 'being active' during non-productive breaks at work
- Substitution of work and non-work sitting tasks with standing and moving tasks throughout the day

Evidence Review - 2

(Straker et al 2016)

Options to interrupt occupational sitting and minimise prolonged periods of sedentary behaviour

- **Sedentary task bouts of no longer than 20-30 minutes - to obtain musculoskeletal and metabolic benefits**
- **Use task variation** to interrupt prolonged sitting by substituting sitting with a non-sedentary task or a brief non-sedentary activity
 - Use a standing or walking workstation for computer work
 - Stand to read a document
 - Standing meetings
 - Walk with friends at lunch time
 - Stand for some of the public transport work commute
 - Stand to talk on the phone
 - Walk to deliver a message to a colleague rather than emailing
 - Walk to get a drink or visit the bathroom
- **Good job design can use substitution and interruption to minimise the harm from excessive occupational sitting**

Evidence Review - 3

(Straker et al 2016)

Effectiveness of interventions to reduce occupational sitting

- Most research has been conducted on office workers but we need to consider other sedentary occupations such as drivers
- **Interventions can reduce office sitting exposure by over an hour each work day**
- **Interventions targeting multiple aspects of the office work system are likely to be more effective** than those targeting just a single aspect

The biggest barrier to change is management concern about productivity

- **Successful and sustainable interventions** include:
 - ✓ Participative approaches that engage workers
 - ✓ Creating social and physical environments to support/facilitate less sitting
 - ✓ Communication about the purpose and evidence for the intervention to employees
 - ✓ Champions to support the intervention messages

A New Zealand Study of Adjustable Height Desks

**“The effects of introducing adjustable height desks in an office setting on workplace
and leisure physical activity levels – a randomised control field trial”**

MPhil (Sci) (Ergonomics) Thesis by Jane Pierce

Study Design

- Medium sized company in Hawkes Bay, over 16 weeks, July to November 2013
- 23 participants – 12 female, 11 male office workers, 0.8FTE or more
- Age range 22-58 years
- **Control group:** n = 12 (7♀, 5♂) - Used own fixed height desks
- **Intervention group:** n = 11 (5♀; 6♂) – Used electronically adjustable-height desks (AHD)
- **Random allocation** of AHDs

Equipment Used

Electronic Adjustable Height Desk
(AHD) (Espace Blake)

Pedometers



Measurements

- **Step counts**
 - Work-day pedometer readings
- **Physical activity**
 - Daily diaries
 - Sitting/standing/moving<1.5/moving>1.5
- **Pre and post questionnaires**
 - Qualitative questions about physical activity

Step counts

	Average	SD
Control group	3988	3042
Intervention group	4287	2379
P – value	$p < 0.001$	

Activity levels

	Intervention Male	Intervention Female	Control Male	Control Female
Walk >1.5m				
Weeks 1-2#	26%	27%	15%	20%
Weeks 3-8	35%	28%	14%	19%
Walk <1.5m				
Weeks 1-2#	14%	5%	8%	7%
Weeks 3-8	15%	28%	6%	3%
Stand				
Weeks 1-2#	1%	1%	0	2%
Weeks 3-8	33%	15%	<1%	<1%
Sit				
Weeks 1-2#	60%	67%	77%	72%
Weeks 3-8	17%	30%	80%	77%

Findings

- Light physical activity increased with allocation of AHD
- Gender differences in pattern of movement – inconclusive
- Leisure activity *reported* increase with increase in workplace activity
- No increase in subjective tiredness with increased activity at work

Conclusion

*To sit – to stand? To sit - perchance to **move**: ay, there's the rub!*

*The fair sitter - nymph-like - should also stand and in thy **motion**,
sitting pains will be only sins rememb'red!*



Charles Schultz