



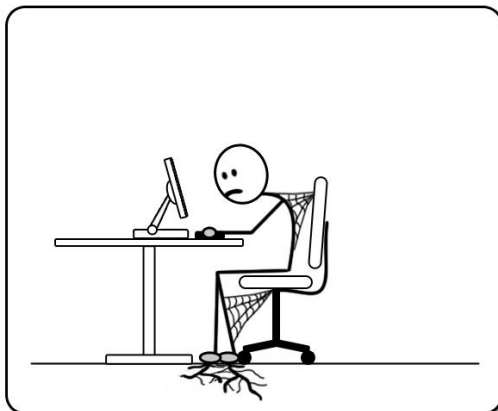
# **Physical inactivity interventions at office workplaces**

current scientific findings

# My message

- Yes; sitting does have health risks and... sitting less has health benefits
- Yes; having sufficient physical activity helps but... cannot fully counteract the sitting risks
- Please note: sedentary  $\neq$  inactive
- No; it's not sitting at work that kills you but... does seem to contribute to some risks
- No; there are no guidelines (yet) but there are some first recommendations

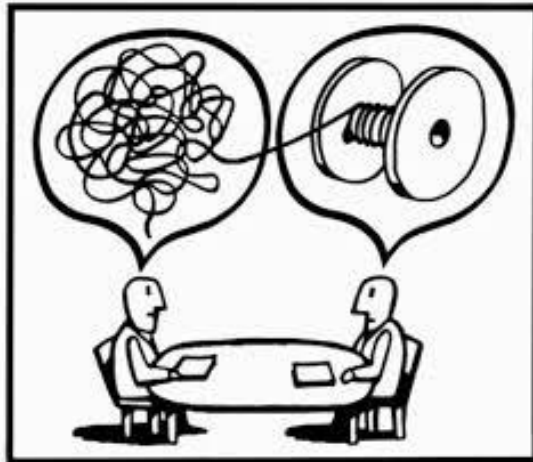
# Dr. Dianne Commissaris



# BTR coaching & consultancy

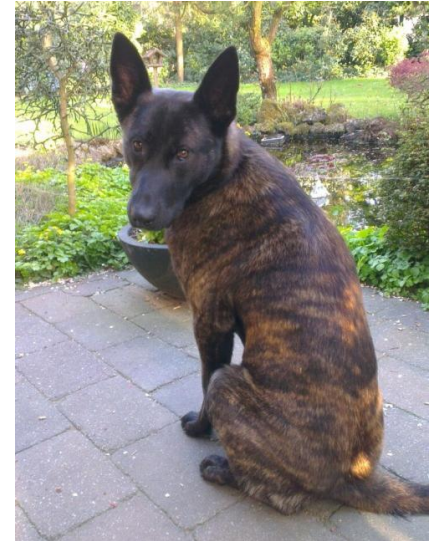


**BTR brings people in motion**





# Practice what you preach



# Many thanks to

**TNO** innovation  
for life

 **IFA**  
Institut für Arbeitsschutz der  
Deutschen Gesetzlichen Unfallversicherung

 **NISB**  
Nederlands Instituut  
voor Sport & Bewegen

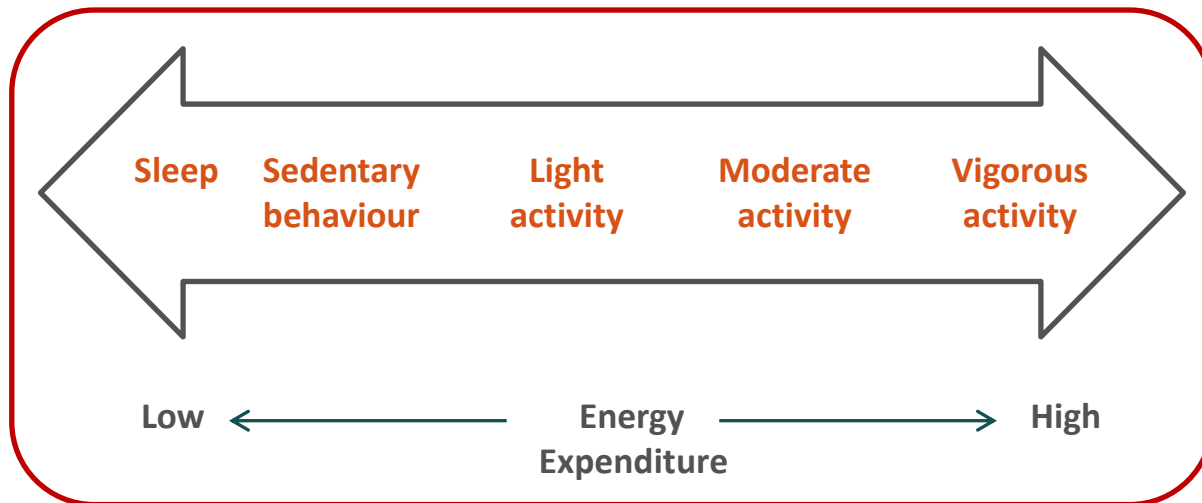
 **vormdrift**  
idee / ontwerp / realisatie

  
**HÖGSKOLAN  
I GÄVLE**

 **MARKANT** OFFICE FURNITURE

**VUmc**   
Samen kiezen voor beter

# When is behaviour 'sedentary'?



Sedentary behaviour – activities characterised by:

- a low energy expenditure ( $\leq 1.5$  MET)
- a sitting or supine position (but not sleeping)

# Sedentary behaviour $\neq$ physical inactivity

## Sufficient Physical Activity (PA):

- At least 5 days/week at least 30 minutes of moderate intensity PA (in bouts of >10 minutes)
- Or 20 minutes of high intensity PA



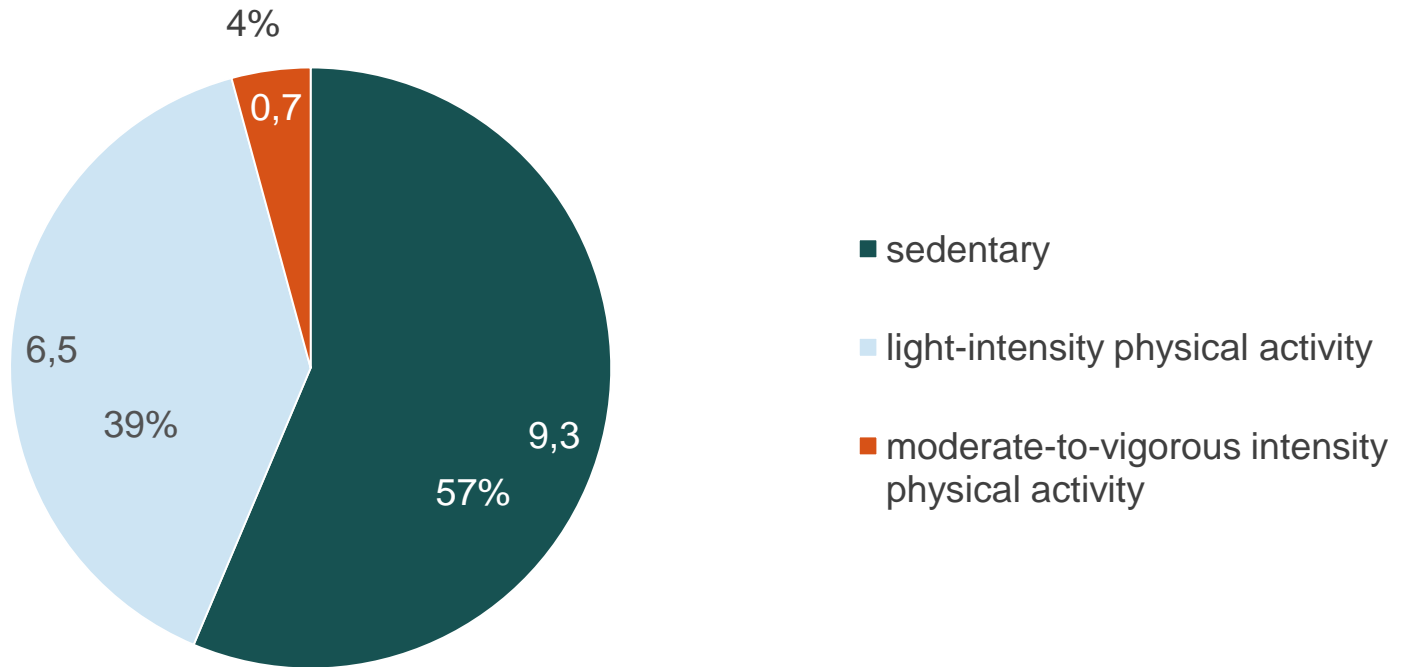


BTR

How much time  
do you sit each  
day?

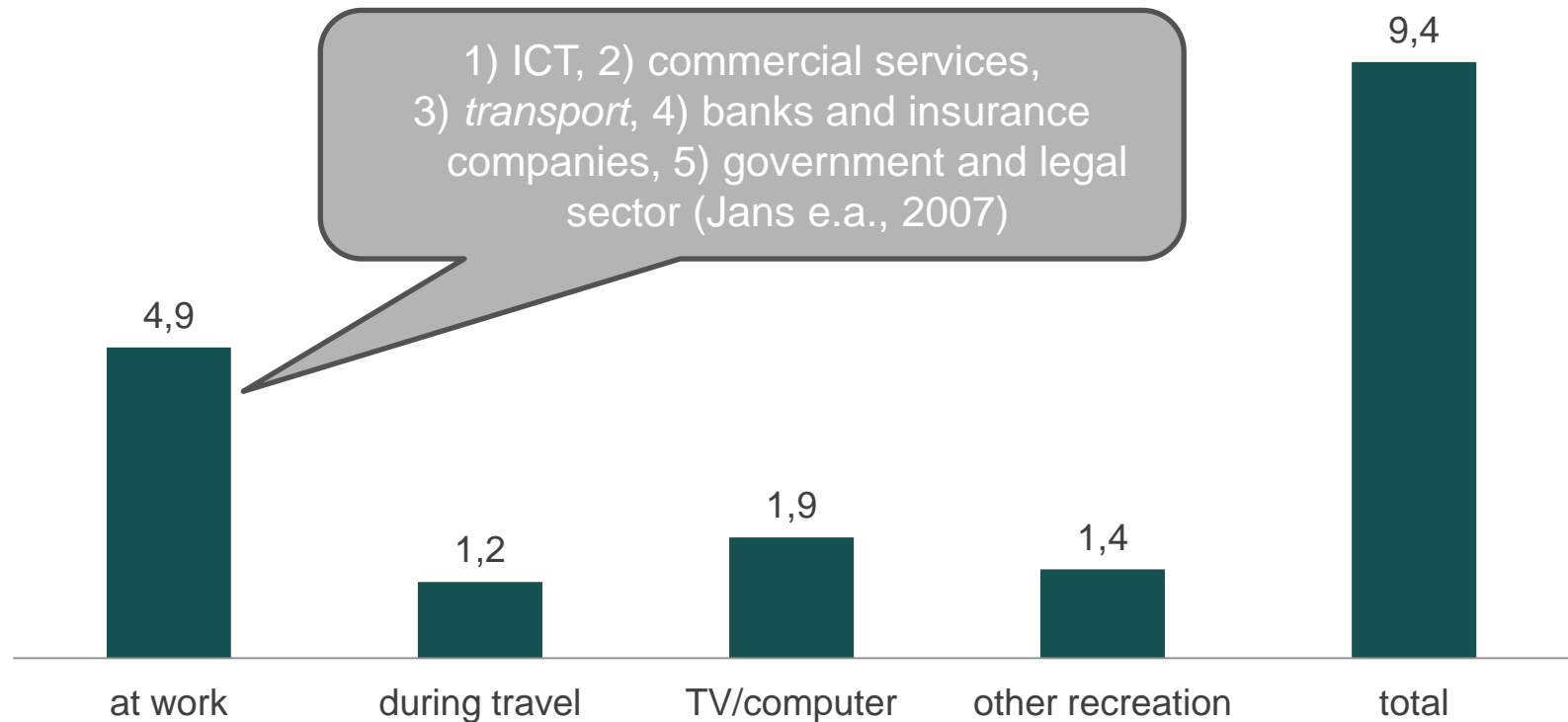


# Adults' waking time activities



Healy et al., 2008 (Diabetes Care; 31(4): 661-666)

# Distribution of sedentary time on weekdays (working adults)



Miller and Brown, 2004 (International Journal of Behavioral Medicine; 11(4): 219-224)

# The Netherlands beat Germany!



Bennie et al., 2013 (Int J Behav Nutr Phys Act 10(107) doi:10.1186/1479-5868-10-107)



BTR

# Trend: more sedentary hours

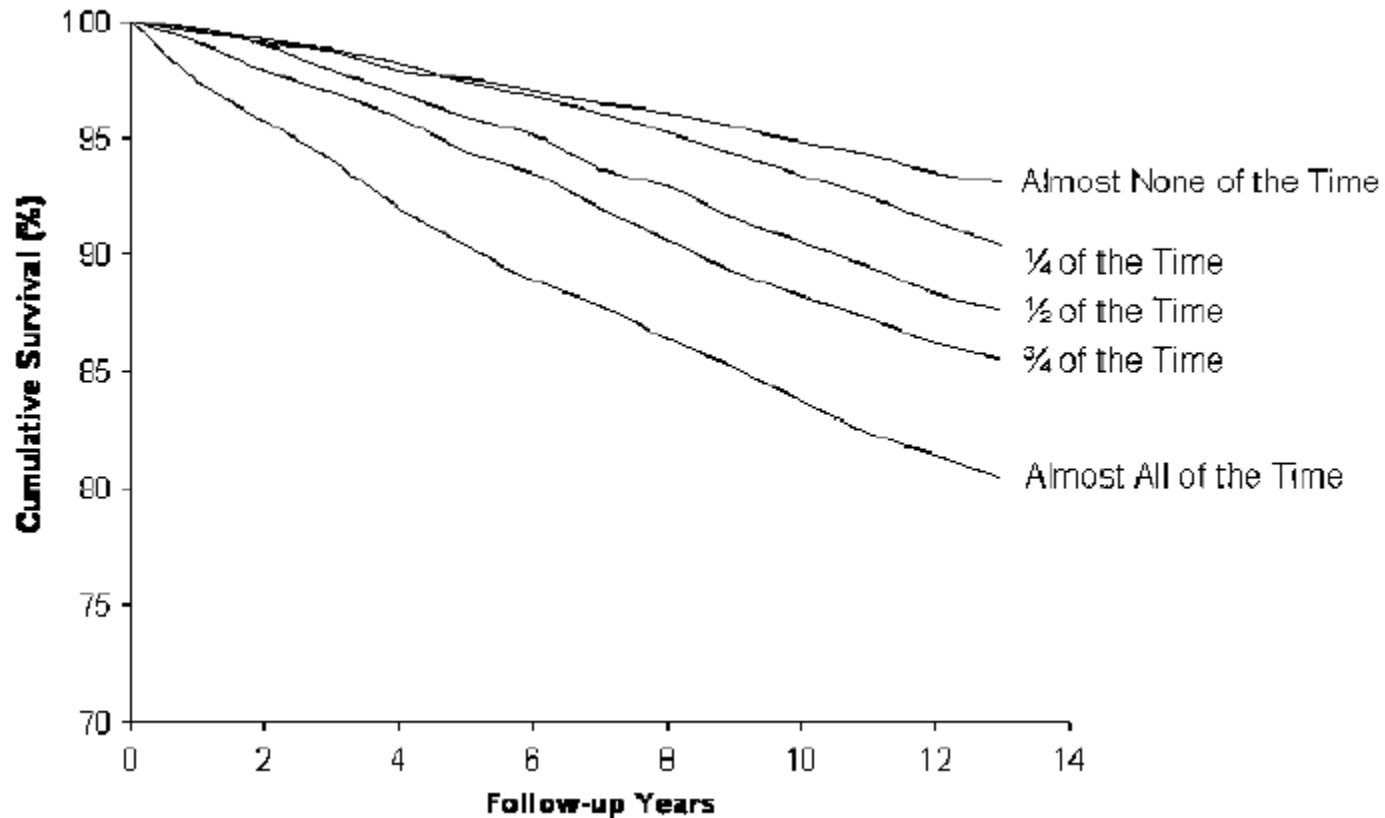
# Health risks of sedentary *life*

## Increased risks for:

- Premature death => strong evidence
  - 8-11h/day sitting: 15% ↑
  - >11h/day sitting: 40% ↑
  - higher risk relative to <4h/day sitting
- Type II diabetes and cardiovascular diseases => moderate evidence
- Cancer => increasing evidence for breast, lung, colon and ovarian cancer, but not strong yet
- Depression and weight gain adults => indications, but insufficient evidence



# Less hours sitting – longer life



Katzmarzyk et al., 2009 (Medicine and Science in Sports and Exercise 41(5): 998-1005)

# Inactivity versus obesity

## Premature death risk:

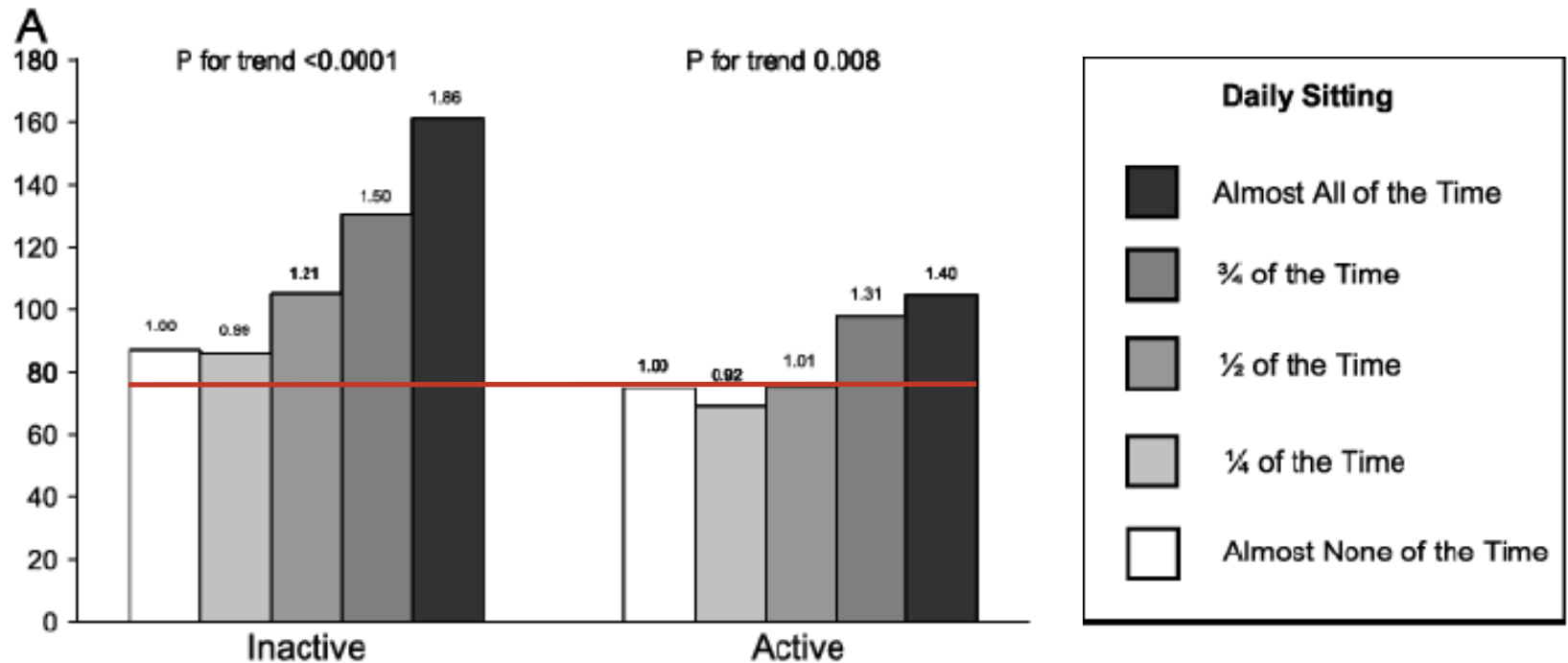
- lower in active vs. inactive people
- consistent in every BMI category
  - ✓ few people are fat and fit
  - ✓ excess weight around waist matters more than BMI

## How to decrease the risk of premature death?

- inactive -> moderately active
- high -> normal waist circumference

**334,161 Europeans (12 years follow-up)** Ekelund et al., 2014 (Am J Clin Nutr doi: 10.3945/ajcn.114.100065)

# Leisure time sports and physical activity decrease the risks



Katzmarzyk et al., 2009 (Medicine and Science in Sports and Exercise 41(5): 998-1005)

# Health risks of sedentary work

- **type II diabetes:** strong evidence for positive relation
- **premature death:** moderate strong evidence for positive relation
- **musculoskeletal disorders:** evidence for relation
- **cancer:** strong evidence for ~~absence of causal relation~~
- **mental health:** evidence for ~~absence of causal relation~~
- **BMI:** insufficient evidence for ~~causal relation~~ ?
- **cardiovascular diseases:** conflicting evidence

However: few prospective studies; sedentary work not measured but self-reported (in categories, not hours)

Van Uffelen et al., 2010 (American Journal of Preventive Medicine 39(4): 379-388)

Proper et al., RIVM. Unpublished data Doetinchem Cohort Study

# Dutch recommendations

In addition to ACSM guidelines:

- Limit total daily sitting time
- Interrupt sitting on a 'regular basis'

# Recommendations UK (June 1, 2015)

... to promote the avoidance of prolonged periods of sedentary work ...

“for those occupations which are predominantly desk based, workers should aim to initially progress towards accumulating 2 h/day of standing and light activity (light walking) during working hours, eventually progressing to a total accumulation of 4 h/day (prorated to part-time hours)”

“these recommendations should be interpreted in relation to the evidence from which they were derived, largely observational and retrospective studies, or short-term interventional studies showing acute cardiometabolic changes”

Buckley et al. 2015 (Br J Sports Med Published Online First, published on June 1, 2015 as 10.1136/bjsports-2015-094618 bjsports-2015-094618



# Why is not-sitting better?



## More leg muscle activity

- Less glucose and insulin in blood
- Steady level of ‘good’ cholesterol in blood
- ‘Bad’ lipids transported from blood to muscles
- Glucose burnt by muscles
- Stimulate cardiovascular system

Dunstan e.a., 2011 (Medicine & Science in Sports & Exercise 43(5): S371)

Lyden e.a., 2011 (Medicine & Science in Sports & Exercise 43(5): S368)

Duvivier e.a., 2013 (PLoS ONE 8(2): e55542)



# Summary 1

Prolonged sitting = long term health problems  
Work seems to contribute to some health risks  
Active large leg muscles seem key to solution

# Alternatives to sitting

- Sit-stand desks
- Dynamic workstations
- More 'PA opportunities'  
(‘Beweegmomentjes’)

Healthy alternatives will only work when:

- chosen by employees – participatory approach and personal goals/choices
- part of the company culture
- supported and propagated by management
- multi-level approach

# Test of dynamic workstations



# Response at first sight mainly “pleasant”

19 TNO-employees with sedentary jobs

15 participants have a pleasant expectation:

- “working and moving at the same time seems fun”
- “curious to experience such a workstation”

3 participants have an unpleasant expectation:

- “working and moving at the same time will be hard”
- “I wonder whether it is appropriate to do fitness at the office”

Treadmill sign. less “pleasant” than bicycle and elliptical trainer

# Response after 10 minutes of testing more diverse

N=19	Treadmill	Bicycle ergometer	Elliptical trainer
# and reasons of (a lot) more discomfort	<b>16 participants</b> Hands move too much (7x) Head moves too much (6x)	<b>9 participants</b> Seat not comfortable (2x) Too instable (1x) Too demanding (1x)	<b>15 participants</b> Too tough for knees / knees hit desk (5x) Desk too high (3x) Posture and motion legs not comfortable (2x)
# and reasons of (a lot) better performance	<b>2 participants</b> Feel energised (1x)	<b>14 participants</b> Feel energised (5x) Nice to be able to move (2x)	<b>9 participants</b> Feel energised (1x) Nice to be able to move (1x) More concentrated (1x)
# and reasons of choice of workstation	<b>2 participants</b> I can move without loss of performance (1x)	<b>13 participants</b> Most pleasant / least disturbing (6x) I want to give it a try (2x)	<b>3 participants</b> More concentrated (1x) Nice to have feedback on energy expenditure (1x)

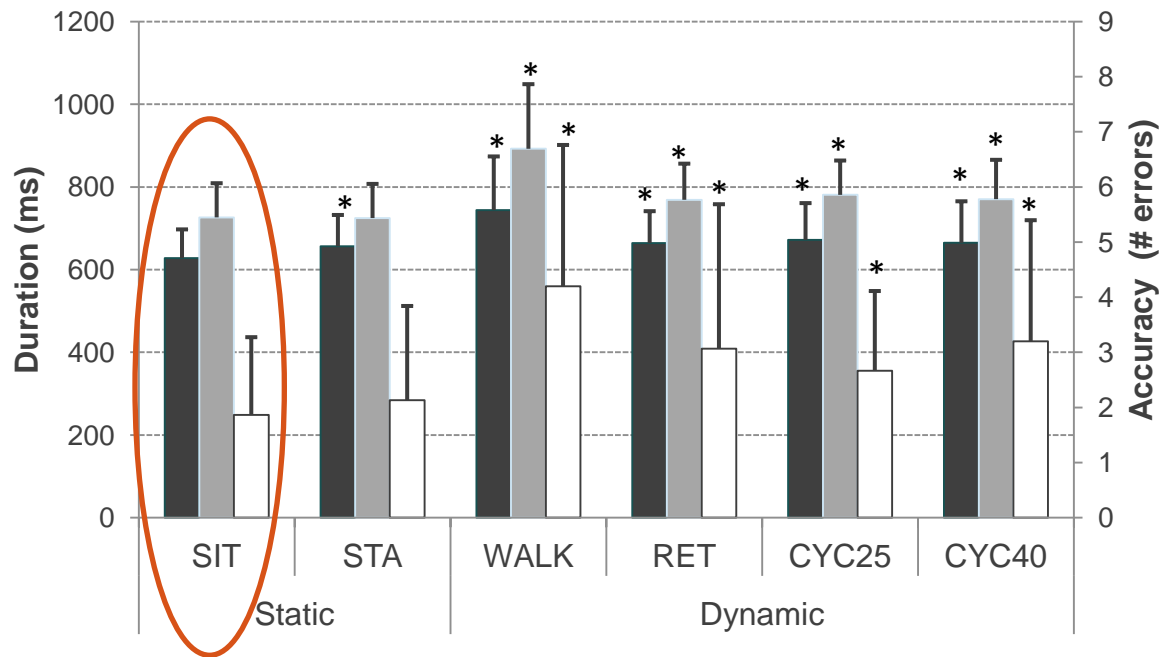
Commissaris et al., 2013 (Tijdschrift voor Ergonomie 38(2): 29-35)



# Measured work performance (short term) worse for mouse task

Mouse task

■ RC-spe ■ MD-spe □ RC-acc

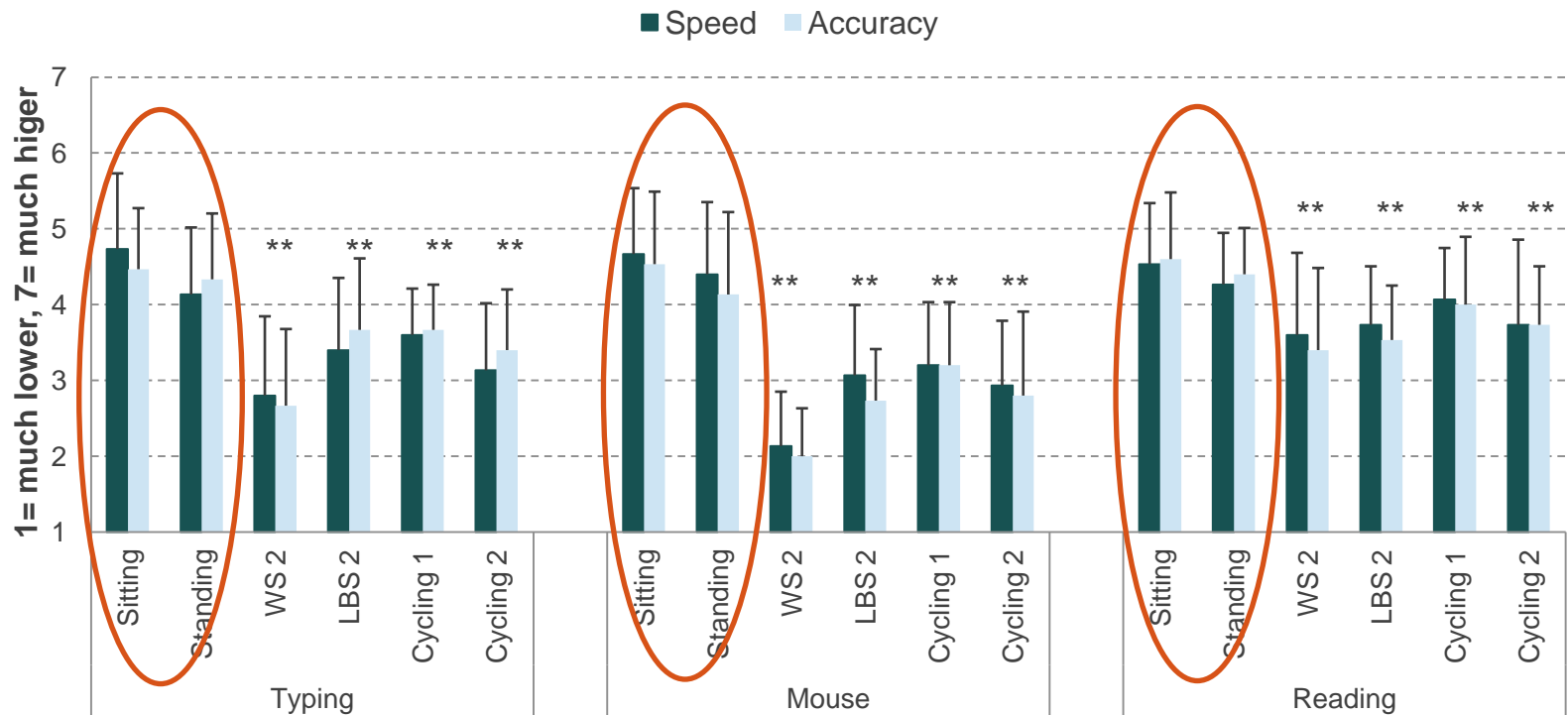


N=15

Cognitive tests & Reading task: no difference in speed and #errors  
 Typing task: slower in WALK, but just as many errors

Commissaris et al., 2014 (Applied Ergonomics 45: 1570-1578)

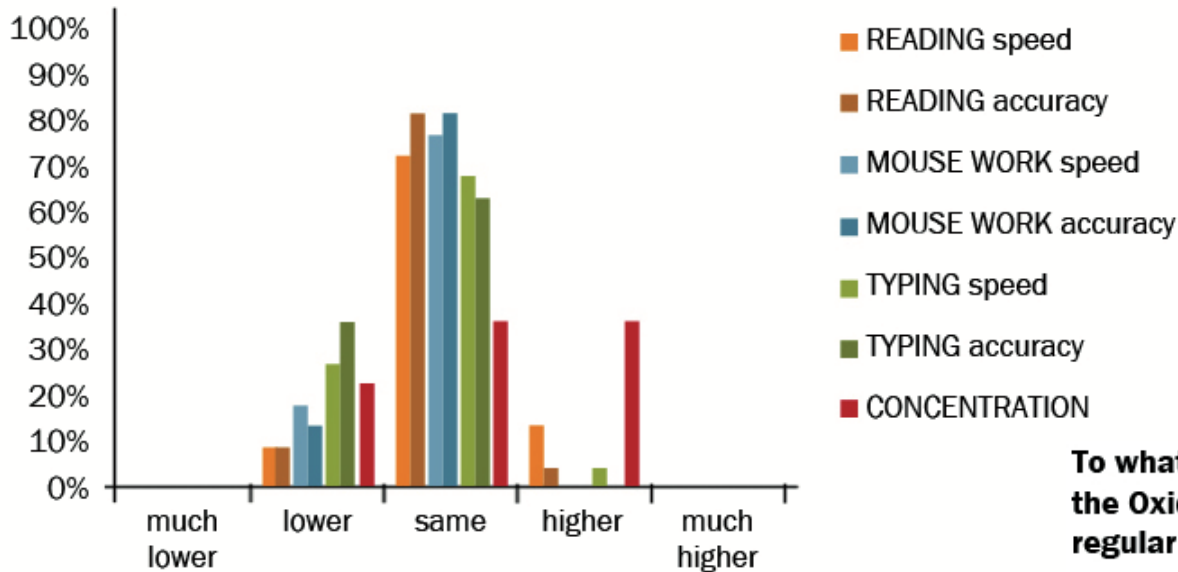
# Perceived work performance (short term) worse for all tasks



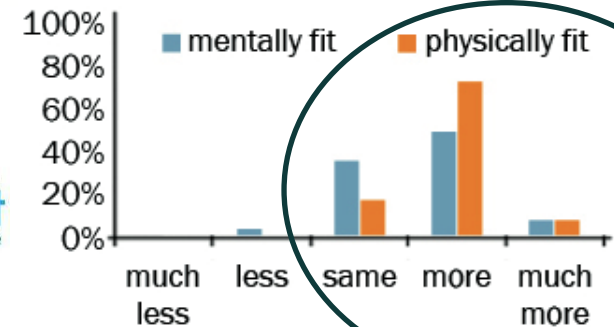
Commissaris et al., 2014 (Applied Ergonomics 45: 1570-1578)

# Perceived work performance after a period of habituation

My work performance at the OxiDesk in comparison to my regular work station is...



To what extent do you feel fit when using the OxiDesk in comparison to using your regular work station?



**N=22, customer contact centre insurance company**  
**5 weeks of use**  
**at least 6x30 minutes**



Markant Office furniture, 2013 (public factsheet)

# Are our findings supported by other studies or just one 'swallow'?

## Review study of dynamic workstation interventions:

- walk station & desk bike: work performance accurate mouse tasks ↓ (all studies)
- walk station: work performance typing task ↓ (half of studies)

## Review study of sit-stand and standing desk interventions:

- no decline in performance various computer tasks

Tudor-Locke et al., 2013 (International Journal of Obesity doi:10.1038/ijo.2013.223)

Neuhaus et al., 2014 (Obesity reviews doi: 10.1111/obr.12201.)



# What do users want?

- easy to access, easy to use, easy to book
- in a separate room or corner (with air conditioning)
- within view of other workstations (and not in a room far away)
- with adequate and stimulating feedback about the physical activity performance (with a smart phone app)
- better dynamic workstations:
  - bicycle ergometer => more comfortable seat
  - recumbent elliptical trainer => better fit of the knee-desk distance
  - treadmill => less noisy

14 TNO-employees with sedentary jobs / 2-3 weeks of 'free' use of favourite dynamic workstation  
Commissaris et al. 2013 (Tijdschrift voor Ergonomie 38(2): 29-35)

# Are our findings supported by other studies or just one 'swallow'?

## **Review study of dynamic workstation interventions:**

- users say they like them ... but do not frequently use them

## **Review study of sit-stand and standing desk interventions:**

- positive judgements about acceptance and usability

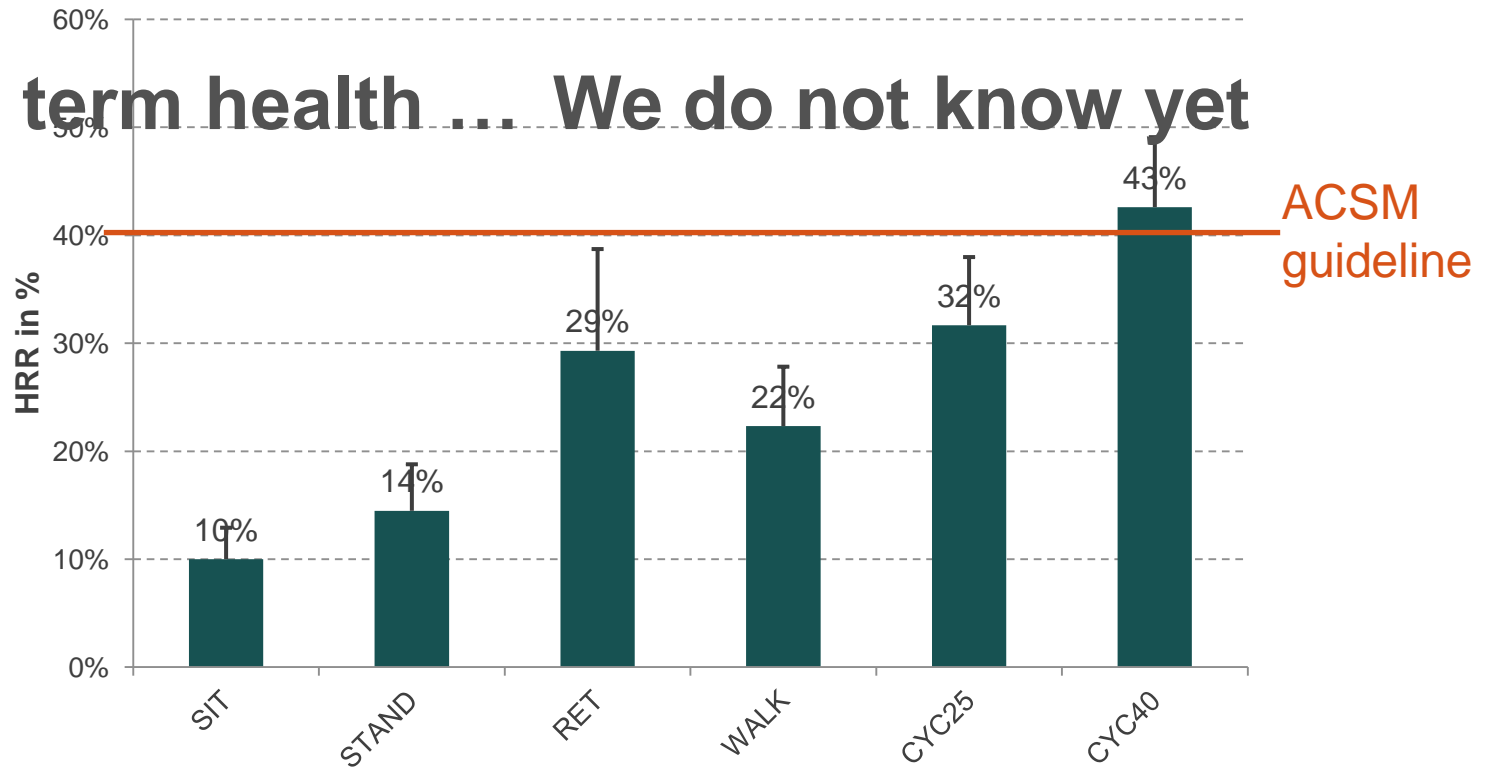
Tudor-Locke et al., 2013 (International Journal of Obesity doi:10.1038/ijo.2013.223)  
Neuhaus et al., 2014 (Obesity reviews doi: 10.1111/obr.12201.)



# Do the alternatives benefit health?

Average Heart Rate Reserve (HRR)

Long term health ... We do not know yet



Zwetsloot, 2013 (Master thesis VU Amsterdam)

# Do the alternatives benefit *indicators* of health?

- sitting time at work ↓
  - 77 minutes/8h
- energy expenditure ↑
  - waist circumference ↓
  - weight loss (some studies)

Other results confidential  
until paper is published

Commissaris et al., review submitted Scand  
J WEH

Tudor-Locke et al., 2013 (International Journal of  
Obesity doi:10.1038/ijo.2013.223)  
Neuhaus et al., 2014 (Obesity reviews doi:  
10.1111/obr.12201.)



# How to stimulate use?

- attractive / inviting alternative
- personal goal + feedback along the way
- social support (change in company culture)
- -/- 89 minutes sitting time  
sit-stand desk + info health benefits + coaching employees + training management
- -/- 33 minutes sitting time (NS!)  
sit-stand desk + info health benefits

Neuhaus et al., 2014 (Am J Prev Med 46(1): 30–40)

# How to create awareness?



**Wat Beweegt Jou?**

**Met deze vragenlijst kun je nagaan of je niet te veel zit tijdens je werk.**

Waarom is dat nodig? Is veel zitten slecht dan? Ja, recent onderzoek heeft laten zien dat mensen die veel en lang achtereen zitten een grotere kans hebben op diabetes type II ('ouderdoms'-suikerziekte) en op overgewicht. Daarnaast hebben ze meer kans om eerder te overlijden. Deze risico's bestaan zelfs voor mensen die in hun vrije tijd voldoende sporten en bewegen. Langdurig en veel zitten is dus niet goed voor je gezondheid!

Maar gelukkig is er iets aan te doen. Door minder langdurig te zitten en het zitten regelmatig te onderbreken verminder je de risico's. Hoe dat kan, daar kun je hier achter komen. Vul daarvoor een korte vragenlijst in.

De vragenlijst begint met 8 vragen over 'hoeveel je zit'. Daarna komen 10 vragen over mogelijkheden om het zittende werk te onderbreken met zogenaamde 'beweegmomentjes'. Vul de vragenlijst eerlijk in. De toelichting bij de eindscore vertelt je dan wat jou beweegt.

[http://tools.nisb.nl/beweegmomentjes.html?  
beweegmomentjes](http://tools.nisb.nl/beweegmomentjes.html?beweegmomentjes)

Vul de vragenlijst in →

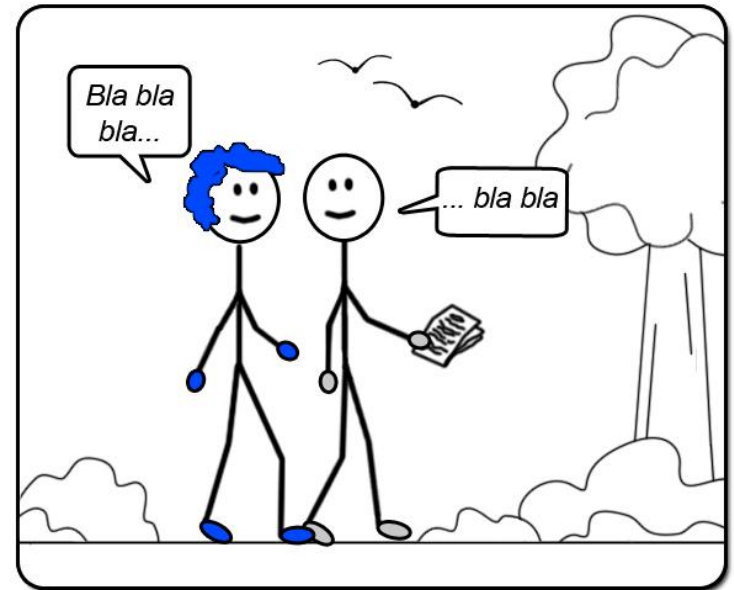
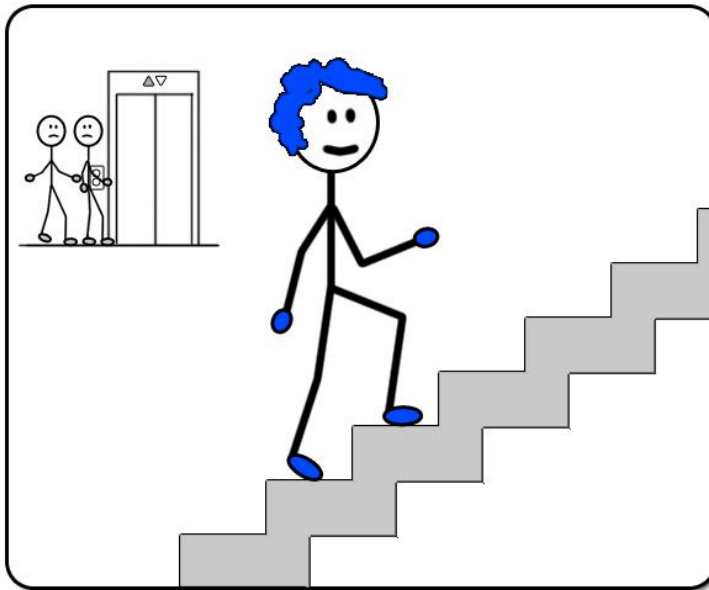
Tell a friend  
Hoe staat je collega er voor?  
Stuur hem of haar een uitnodigingsmail!

Share  

**TNO** innovation for life

**NISB**

# Physical activity opportunities



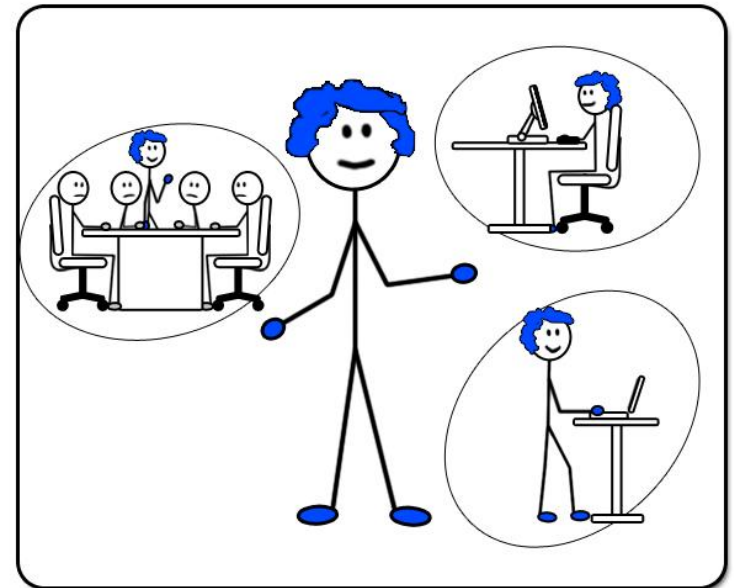
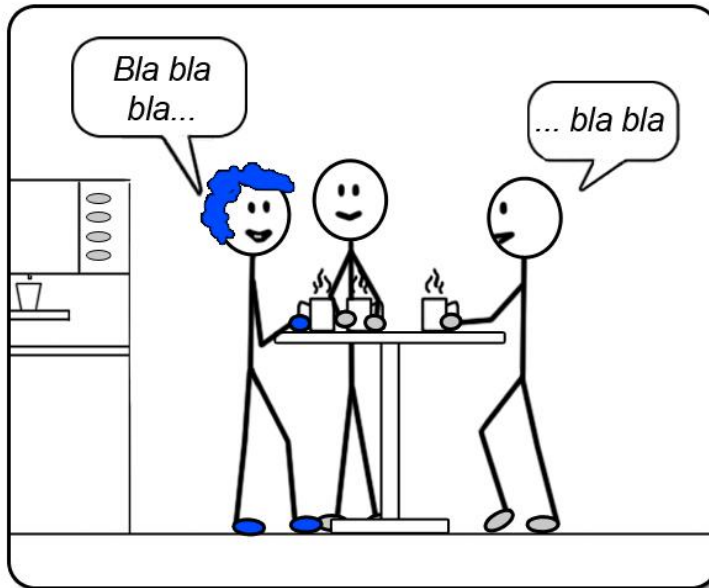
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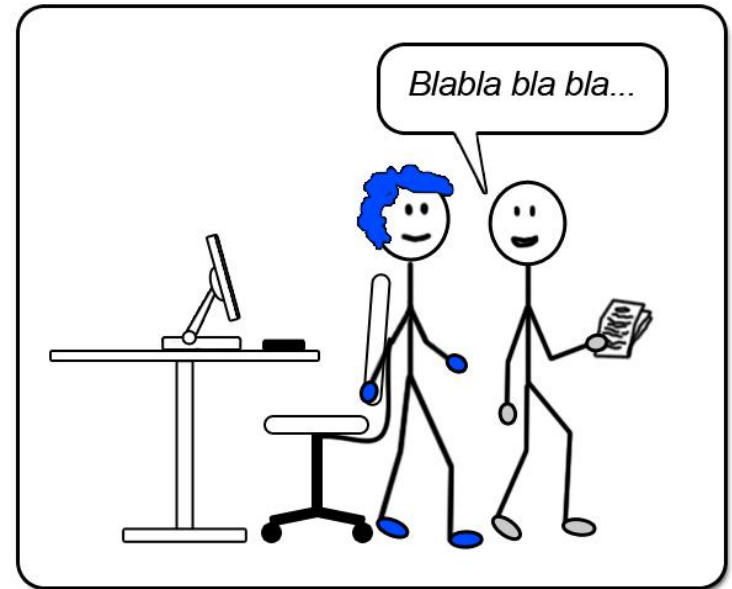
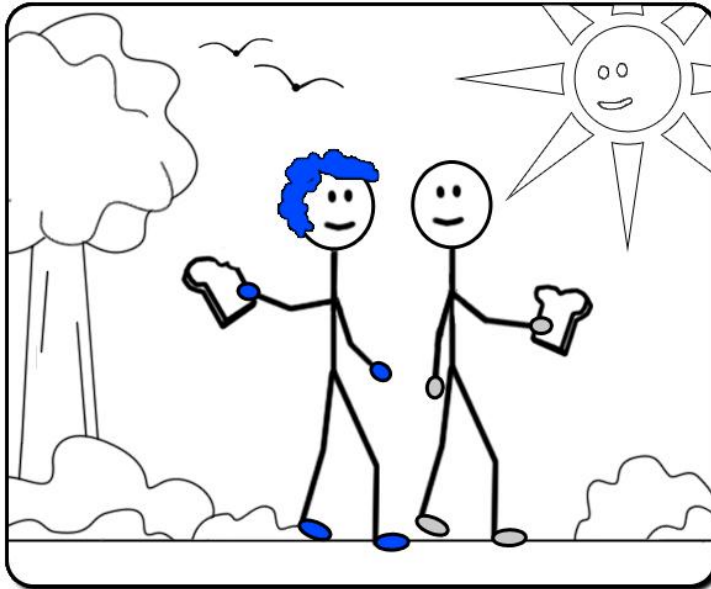
# Physical activity opportunities



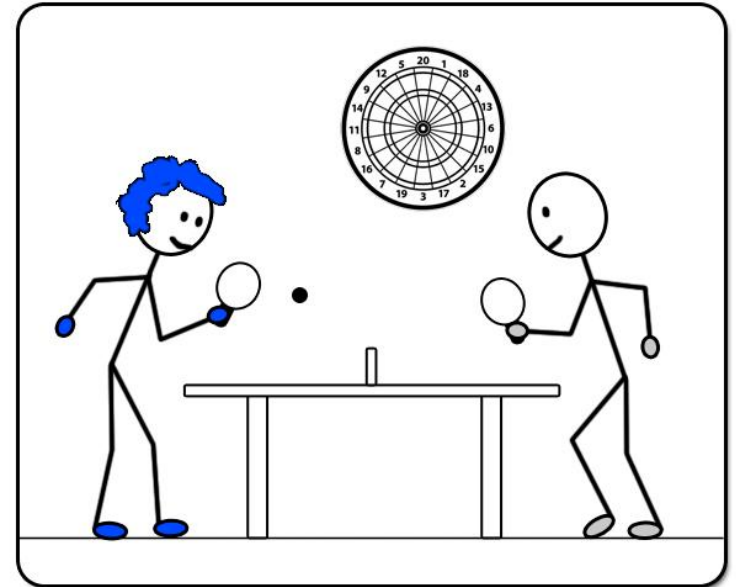
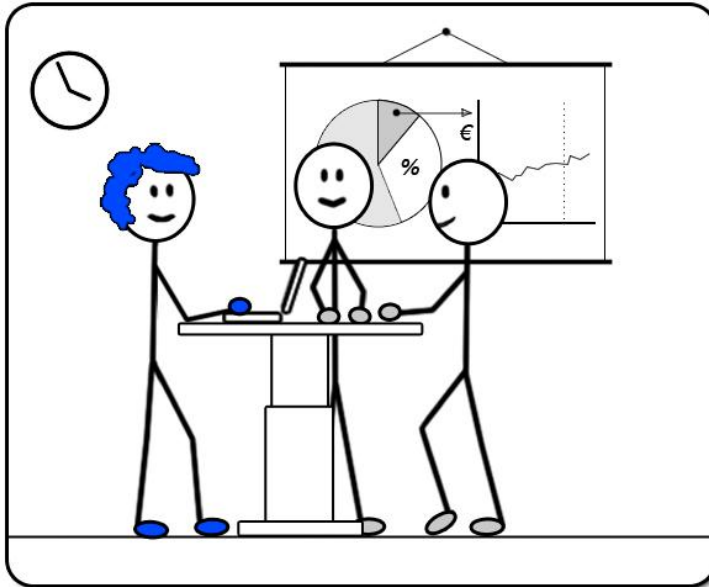
# Physical activity opportunities



# Physical activity opportunities



# Physical activity opportunities



# Interventions promoting stair use



- more attractive stair well
- info on health benefits
- stimulating messages on posters
- “point of choice prompt” near stairs (most effective)

Results confidential until  
paper is published

11 studies - Commissaris et al., review submitted Scand J  
WEH



# Personalized behavioral interventions

- activity monitor / pedometer + diary
- general info on health benefits
- personal goals + coaching
- “walk and talk meetings”
- computer prompt to stand up (1 min/30 min)

Results confidential until paper is published

10 studies - Commissaris et al., review submitted Scand J WEH



# Take home message

- **Prolonged sitting** => long term health problems
- **Work** seems to contribute to some health risks
- Activate large leg muscles => **light-intensive physical activity**
- **At the office:** combine sit-stand desks, dynamic workstations and “PA Opportunities”; provide activity-stimulating environment and seductive incentives; organise social/managerial support
- **Implementation requires:** change of company culture; support of and propagation by management; participatory approach; availability of personal choices
- Yes, we can!

# Thank you

Dr. Dianne Commissaris

- Passionate about sports and physical activity
- Cares about the well-being and personal development of office workers
- Expert in healthy solutions for seated office work
- Professional career coach



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