Premus 2016

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9th International Scientific Conference on the Prevention of Work-related Musculoskeletal Disorders

20-23 Juni
Toronto, Canada

Maaike Huysmans, Senior onderzoeker, Vumc, afdeling Sociale Geneeskunde

Topics

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- Risicofactoren voor CTS (Keynote dr. Brad Evanoff)
- Biomarkers voor RSI
- Motor variability
- Mobiele telefoons/tablets
- Interventies ter preventie van RSI
- Zitten op het werk
  - Waarom van belang?
  - Meten van zitten en fysieke activiteit in het veld
  - Interventies om zitten op het werk te verminderen
- Huidig onderzoek

Keynote dr. Brad Evanoff

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- Pooled data from 6 US research centers -> Upper Limb Musculoskeletal Disorder Consortium
- Following 4300 workers from 50 workplaces –blue collar workers
- Risk factors for CTS -> what do they mean for future prevention?
- => repetition alone is not the problem, when force comes up it is a problem:
  - Duration of force
  - Force + repetition
  - Peak forces
- Acceptable limits for force?

- **Interventions for CTS should focus on reduction of peak force and force exertion duration -> not repetition per se!**
- **No effect of wrist posture; maybe for forceful exertions, but not with lower amounts of force**

- **Job Exposure Matrices**

Review

Scand J Work Environ Health. 2016;42(2):103–124. doi:10.5271/sjweh.3533

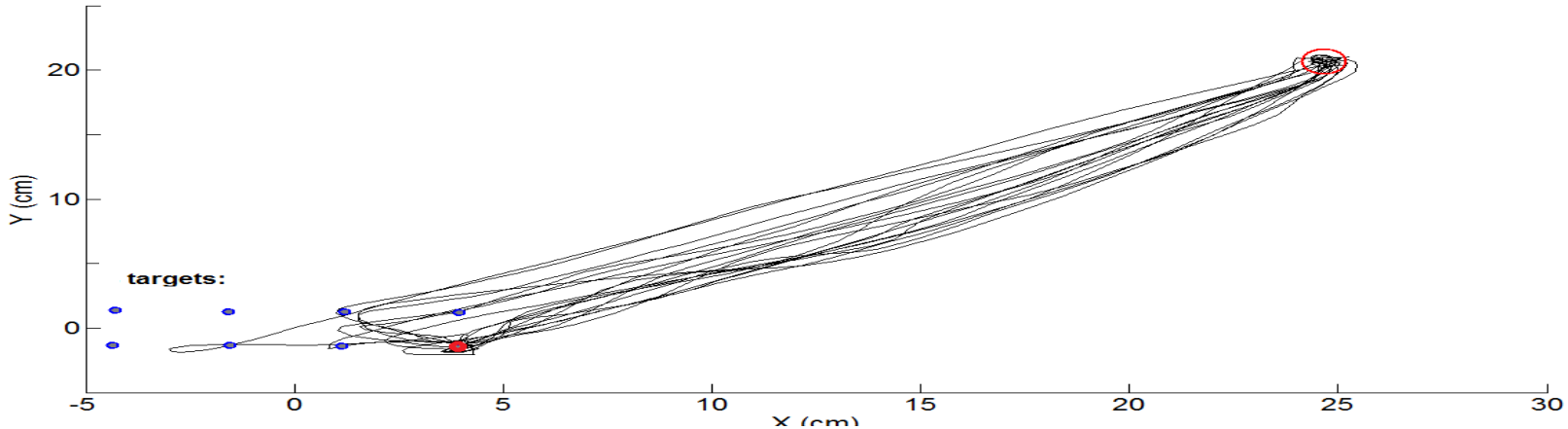
Systematic review of biochemical biomarkers for neck and upper-extremity musculoskeletal disorders

by Judith E Gold, ScD,[1] David M Hallman, PhD,[1] Fredrik Hellström, PhD,[1] Martin Björklund, PhD,[1, 4] Albert G Crenshaw, PhD,[1] Mats Djupsjobacka, PhD,[1] Marina Heiden, PhD,[1] Svend Erik Mathiassen, Ph George Piligian, MD,[2] Mary F Barbe, PhD [3]

Gold JE, Hallman DM, Hellström F, Björklund M, Crenshaw AG, Djupsjobacka M, Heiden M, Mathiassen SE, Piligian G, Barbe MF. Systematic review of biochemical biomarkers for neck and upper-extremity musculoskeletal disorders. *Scand J Work Environ Health*. 2016;42(2):103–124. doi:10.5271/sjweh.3533

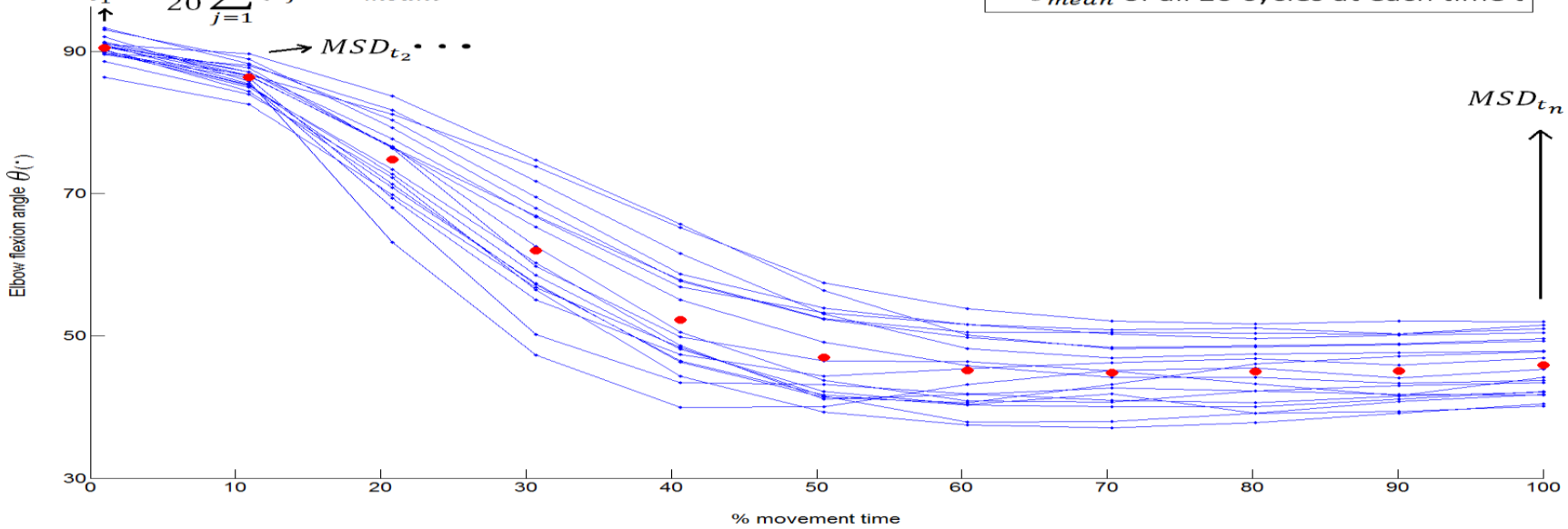
Objective This study systematically summarizes biochemical biomarker research in non-traumatic musculoskeletal disorders (MSD). Two research questions guided the review: (i) Are there biochemical markers associated with neck and upper-extremity MSD? and (ii) Are there biochemical markers associated with the severity of neck and upper-extremity MSD?

Finger tip trajectories - 20 repeats



$$MSD_{t_1} = \frac{1}{20}\sum_{j=1}^{20}(\theta_j - \theta_{mean})^2$$

θ_{mean} of all 20 cycles at each time t

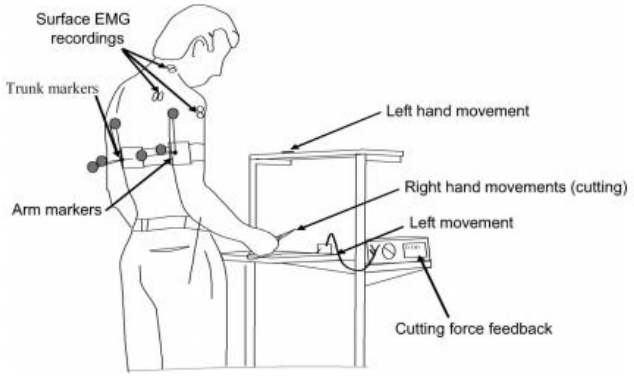


$$\theta_{RMSD} = \frac{1}{T}\sum_{t=1}^{T} MSD_t$$

Motor variability and pain

Acute vs. Chronic pain:

Madeleine et al. 2008:
Neck-shoulder pain in butchers



- **Acute experimental pain increased arm movement variability;**
- **Chronic pain decreased movement variability**

When pain first develops, MV increases, we look for new motor strategies to avoid pain
In later stages of pain, MV decreases to avoid pain

Is texting on mobile phones a risk factor for musculoskeletal disorders in neck and upper extremities?

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Ewa Gustafsson (presenter), Sara Thomée, Anna Grimby-Ekman, Mats Hagberg

Background. The use of mobile phones for text messaging is a common part of life for most young adults today. However, there is a lack of knowledge about how this immense amount of texting may affect their musculoskeletal health over time. The aim of this study was to examine whether or not texting on mobile phones is a risk factor for musculoskeletal symptoms in neck and upper extremities among young adults.
Methods. The study was a longitudinal, population-based cohort study with young adults (20-24 years). Data was collected via a web-questionnaire at baseline (n=7,092) and two follow ups (at one and five years). **Discussion**. In this study, cross-sectional associations were found between text messaging and reported musculoskeletal symptoms in neck and upper extremities for both men and women. In addition, text messaging was a prospective risk factor for reported symptoms in the hand/fingers in the one-year analysis.

Mechanisms of motor control during smartphone texting contributing to neck pain

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Grace Szeto (presenter), Yanfei Xie

Background. Multi-touch smartphones have rapidly become a powerful communication tool common in our daily lives. This study aimed to examine the muscle activity and neck kinematics comparing one-handed versus two-handed texting tasks in those with chronic neck pain compared with healthy controls.

Method. Participants were assigned to case or control groups (mean age=23.9±3.2, n=20 each). Surface electromyography (sEMG) and 3D motion were recorded in the cervical and shoulder areas during 10 minutes of texting using the same smartphone device (iPhone 4). The order of texting with one or both hands was randomized.

Results. Median muscle activity in the upper trapezius (UT) and cervical erector spinae bilaterally were consistently increased during both texting tasks in the case group compared to the control group. In terms of spinal posture, there was no apparent difference in cervical spine flexion angle between the two groups, but the case group showed increased rotation range during texting with both hands. There was a trend of group difference in thoracic flexion in bilateral texting. In texting with one hand, there was no apparent difference in cervical and thoracic spine posture between groups.

Discussion. Our previous research on office workers using desktop computers demonstrated increased activity in cervical postural muscles and increased forward head postural angles as part of the mal-adaptive motor control mechanisms that contribute to musculoskeletal disorders. People who use computers at work and then continue to use mobile devices after work would be most susceptible to developing such motor control malfunctions and aggravating their symptoms.

Preventie van RSI
Interventies op de werkplek

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Review

OPEN ACCESS

Effectiveness of workplace interventions in the prevention of upper extremity musculoskeletal disorders and symptoms: an update of the evidence

D Van Eerd,[1,2] C Munhall,[1] E Irvin,[1] D Rempel,[3] S Brewer,[4] A J van der Beek,[5] J T Dennerlein,[5,6] J Tullar,[7] K Skivington,[1,8] C Pinion,[4] B Amick[1,9]

▸ Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/oemed-2015-102992)

For numbered affiliations see end of article.

Correspondence to
D Van Eerd, Institute for Work & Health, 481 University Ave, Suite 800, Toronto, Ontario, Canada M5G 2E9; dvaneerd@iwh.on.ca

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ABSTRACT
The burden of disabling musculoskeletal pain and injuries (musculoskeletal disorders, MSDs) arising from work-related causes in many workplaces remains substantial. There is little consensus on the most appropriate interventions for MSDs. Our objective was to update a systematic review of workplace-based interventions for preventing and managing upper extremity MSD (UEMSD). We followed a systematic review process developed by the Institute for Work & Health and an adapted best evidence synthesis. 6 electronic databases were searched (January 2008 until April 2013 inclusive) yielding 9909 non-duplicate references. 26 high-quality and medium-quality studies relevant to our research question were combined with 35 from the original review to synthesise the evidence on 30 different intervention categories. There was strong

significant causes of disability claims cost, and lost productivity in many economic sectors worldwide.[7 13–16] In summary, UEMSDs are prevalent and costly demanding focused prevention campaigns.

The peer-reviewed literature about workplace prevention describes a variety of interventions that have been implemented and evaluated.[17–25] However, few studies show sustainable positive effects on symptom, claim and disability outcomes. Overall, the studies and reviews to date reveal that there is no 'magic bullet' to deal with the significant burden of UEMSD.[18–23] Consequently, systematic reviews, to date, have not been able to provide strong guidance for practice.

Despite the lack of guidance from literature, Occupational Health and Safety (OHS) practitioners have created workplace-based interventions

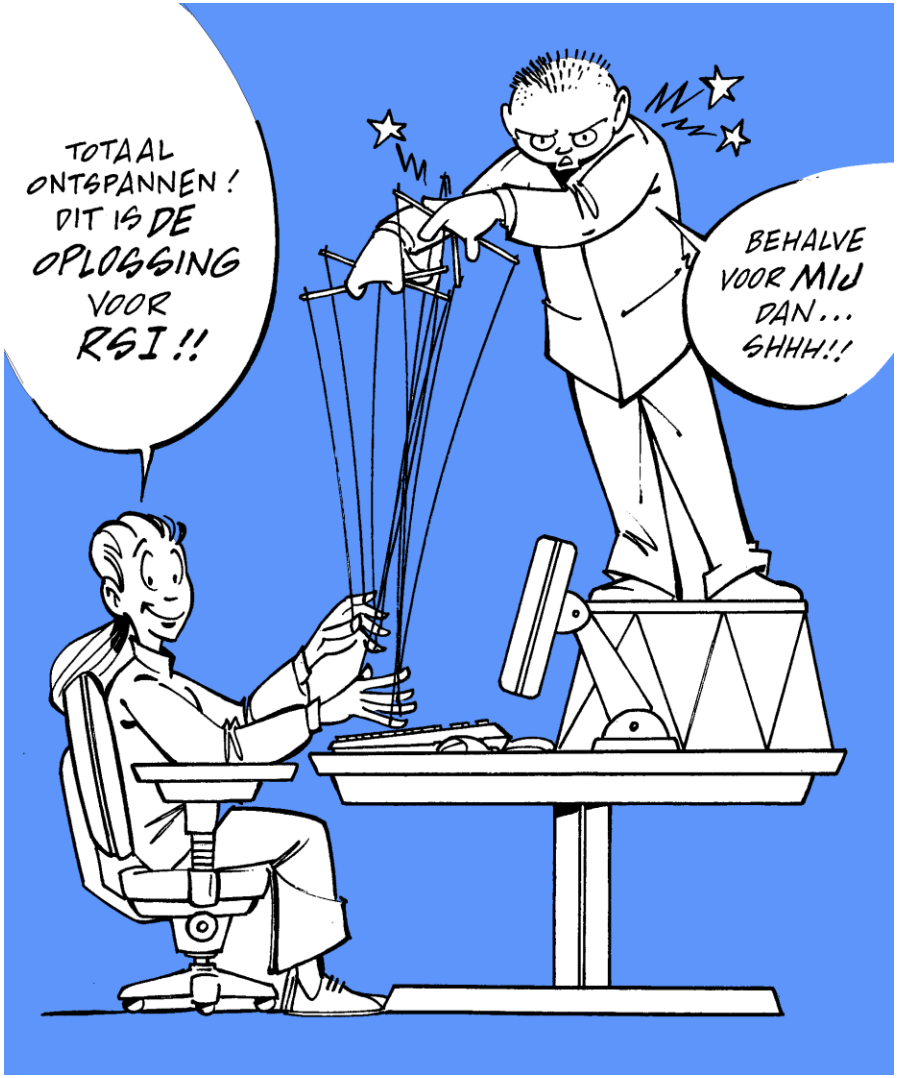

TOTAAL ONTSPANNEN! DIT IS DE OPLOSSING VOOR RSI!!
BEHALVE VOOR MIJ DAN... SHHH!!

Table 2 Level of evidence for UEMSD interventions and accompanying messages

Level of evidence (direction of effect)*	Intervention (number of studies)†	Message
Strong (positive)	▶ Resistance training (7)	Implementing a workplace-based resistance training exercise programme, policy or practice can help manage and prevent UEMSD symptoms and disabilities
Moderate (positive)	▶ Stretching exercise programmes (includes UE component) (6) ▶ Vibration feedback on static mouse use (3) ▶ Forearm supports (workstation) (3)	Consider implementing in practices if applicable to the work context
Moderate (no effect)	▶ Job stress management training (UE outcomes) (2) ▶ Biofeedback (EMG) training (5) ▶ Workstation adjustment alone (minimal worker engagement) (5)	Seek alternative interventions based on OHS experience/knowledge
Limited (positive)	▶ Aerobic exercise programmes (3) ▶ Alternative keyboard (force profile) (1) ▶ Trackball pointing device (+/− arm supports) (1) ▶ Rest breaks (5) ▶ Postural exercise programme (1) ▶ Specialised exercise program (Feldenkrais) (1) ▶ Curved seat pan chair (non-office) (1) ▶ Lighter/wider dental tools (1) ▶ Neuromuscular exercise (non-office) (1)	Not enough evidence from the scientific literature to guide current policies/practices
Limited (no effect)	▶ Work redesign to minimise shoulder load (non-office) (4) ▶ Joystick pointing device (+/− arm supports) (1) ▶ Neck school programme (1) individualised exercise programme (+/− stress management) (1)	Not enough evidence from the scientific literature to guide current policies/practices
Mixed	▶ Ergonomics training+workstation adjustment (8) ▶ Low-intensity participatory ergonomics (PE) programmes (4) ▶ Cognitive behavioural training programme (2) ▶ Ergonomics training (2)	Not enough evidence from the scientific literature to guide current policies/practices
Insufficient	▶ Rest breaks plus exercise (1) ▶ Reduced hours (1) ▶ Alternative keyboard (split) (1) ▶ Individual interventions (office) (1) ▶ Patient handling programme (1) ▶ OHS training (2–3 h) and/or ergonomic advice/change and/pr exercise and/or medical examination (1)	Not enough evidence from the scientific literature to guide current policies/practices

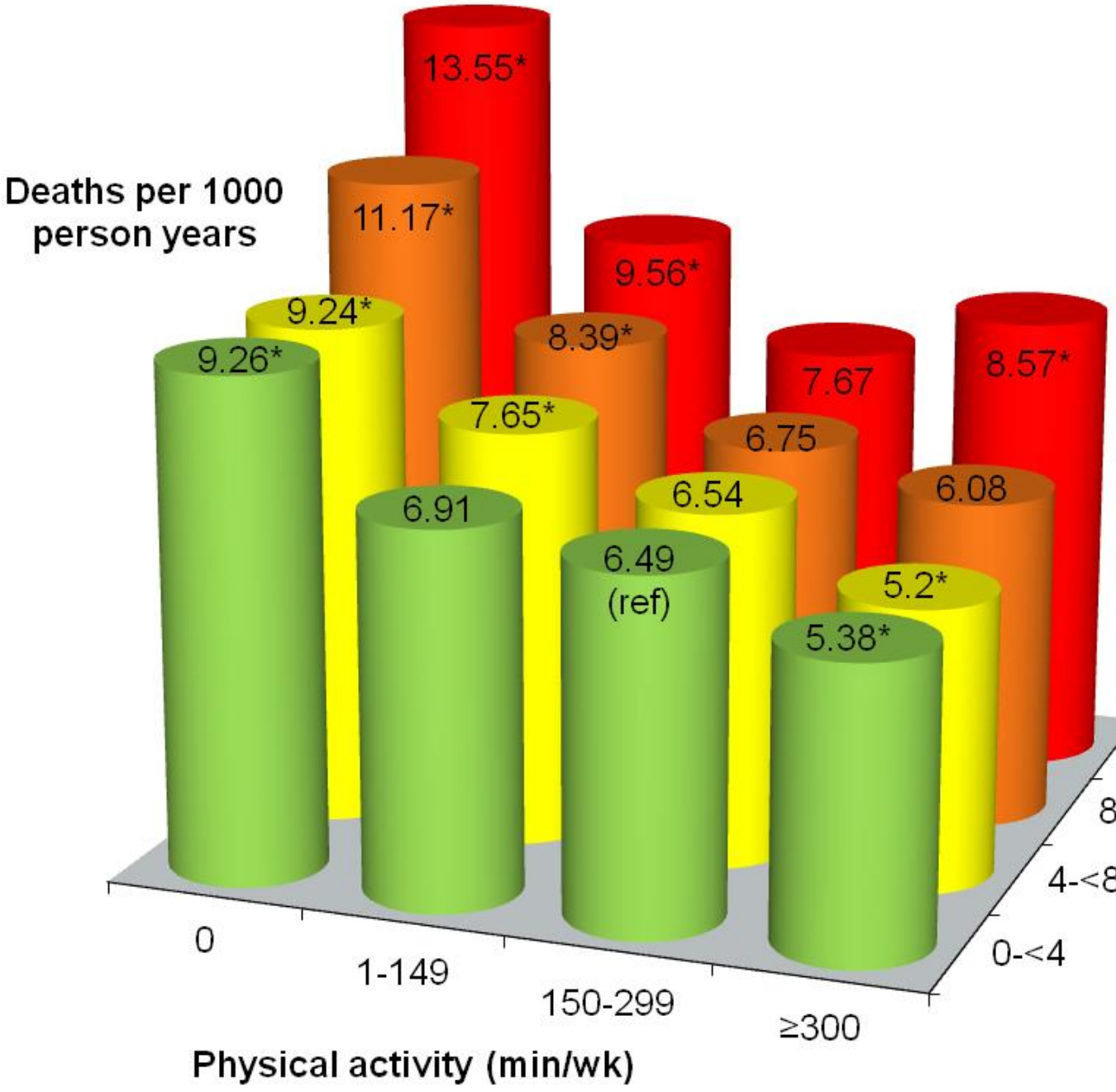
*No studies reported a negative effect.

NRC

WETENSCHAP

Zaterdag 7 september& Zondag 8 september 2013

EN VERDER

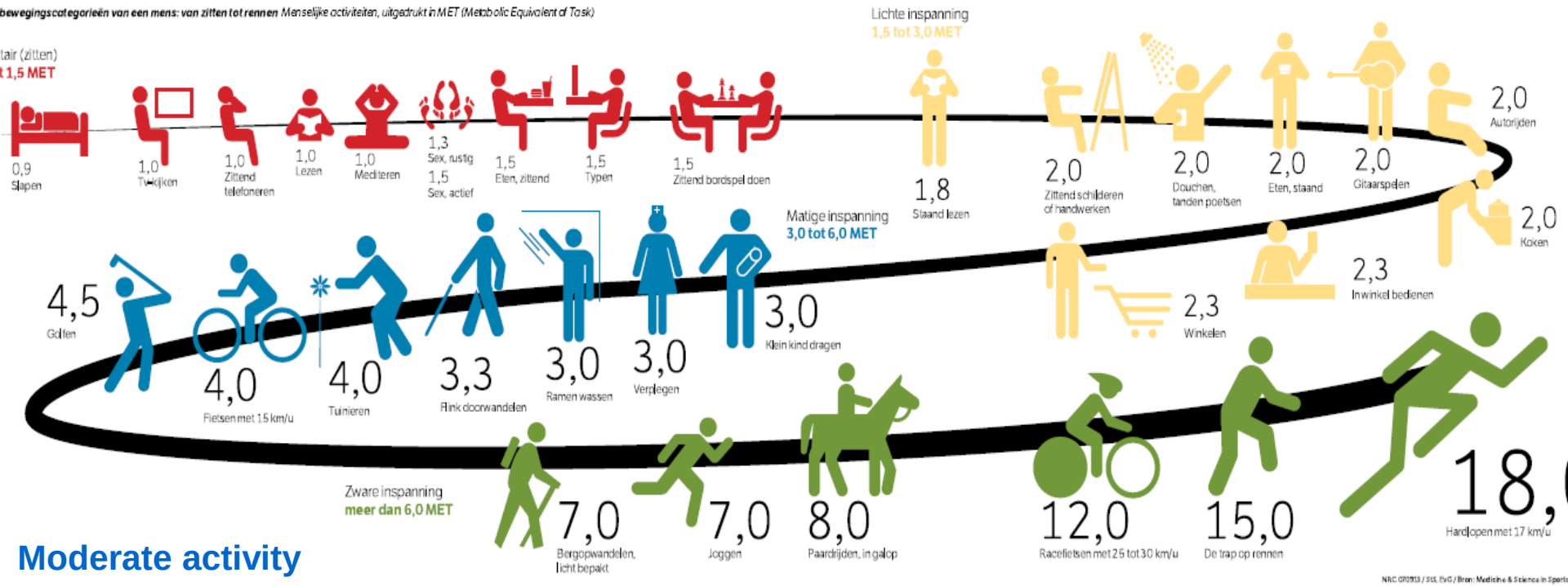


All participants
n=222,497
Adjusted for:
sex, age, education, urban/rural, BMI, smoking, self-rated health and disability

van der Ploeg et al., Arch Intern Med 2012

Sedentary

Light activity



Moderate activity

Vigorous activity

Meten van zitten en fysieke activiteit in het veld

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- **Zelf-rapportage**

The last question is about the time you spent sitting on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading traveling on a bus or sitting or lying down to watch television.

4. During the last 7 days, how much time in total did you usually spend *sitting* on a week day?

   ____ hours _____ minutes

- **"Objectief" meten: Accelerometer/ ActivPal**
  - **Meten van duur, frequentie en intensiteit van bewegingen**
  - **Kan gebruikt worden om de totale tijd die "sedentair" wordt doorgebracht te meten**
  - **Kan gebruikt worden om variatie en patronen in**
  - **sedentair gedrag te meten**

Output accelerometer

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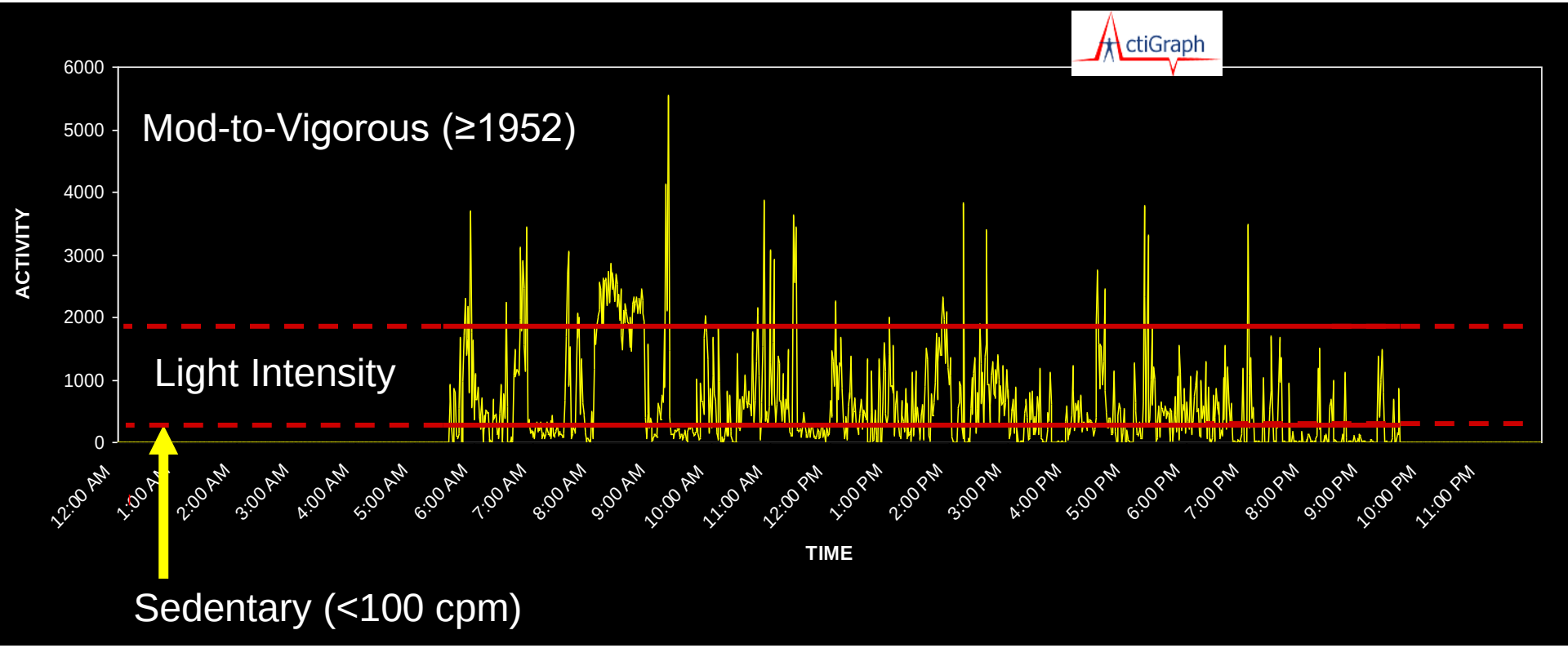
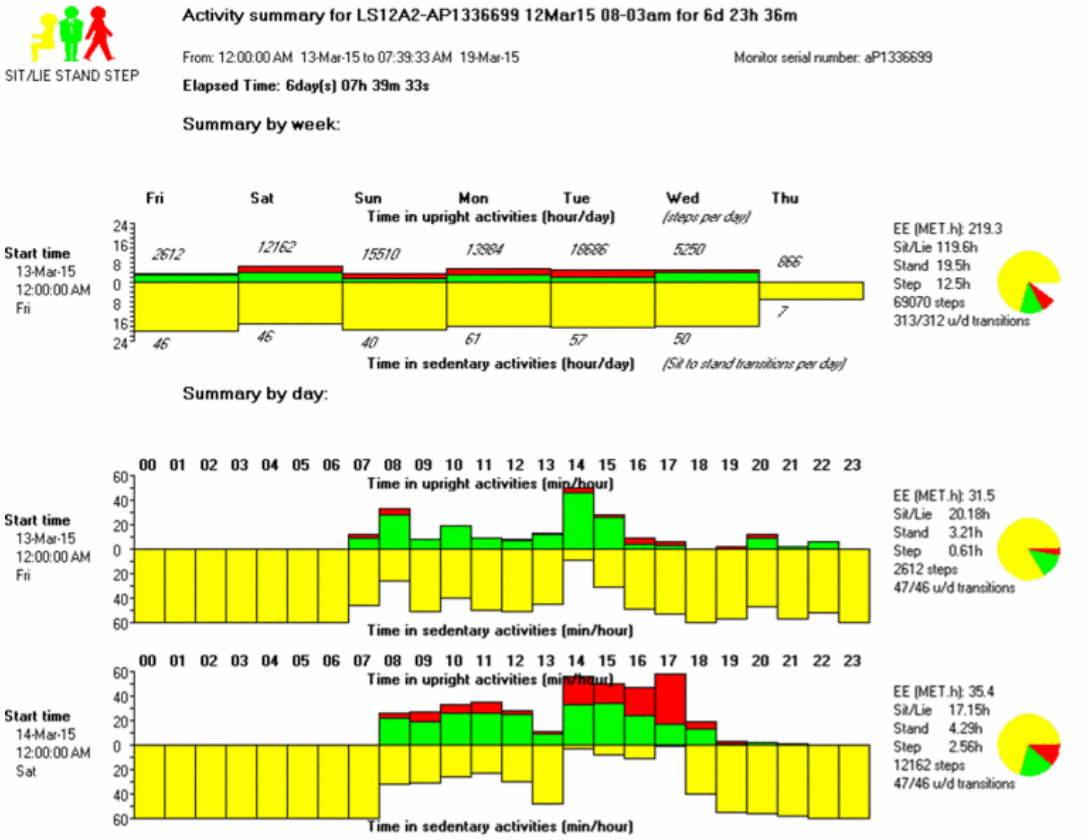


Output ActivPal



Interventies om zitten te verminderen

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Scand J Work Environ Health 2016;42(3):181–191. doi:10.5271/sjweh.3544

Interventions to reduce sedentary behavior and increase physical activity during productive work: a systematic review

by Dianne ACM Commissaris, PhD,[1, 2, 3] Maaike A Huysmans, PhD,[4, 5] Svend Erik Mathiassen, Professo Divya Srinivasan, PhD,[2] Lando LJ Koppes, PhD,[1, 6] Ingrid JM Hendriksen, PhD[1, 5]

Commissaris DACM, Huysmans MA, Mathiassen SE, Srinivasan D, Koppes LLJ, Hendriksen IJM. Interventions to reduce sedentary behavior and increase physical activity during productive work: a systematic review. *Scand J Work Environ Health*. 2016;42(3): 181–191. doi:10.5271/sjweh.3544

Objectives Many current jobs are characterized by sedentary behavior (SB) and lack of physical activity (PA). This review addresses the effectiveness of workplace interventions that are implemented during productive work and are intended to change workers' SB and/or PA.

Methods We searched Scopus for articles published from 1992 until 12 March 2015. Relevant studies were evaluated using the Quality Assessment Tool for Quantitative Studies and summarized in a best-evidence synthesis. Primary outcomes were SB and PA, both at work and overall (ie, during the whole day); work performance

Alternative workstation interventions

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- 20 studies

- 6 times only placement of alternative workstation
- 5 times placement and intructions on use or information on benefits of use
- 9 times placement and motivational support/ use of feedback/ prompts (more multicomponent interventions)

Sit-stand workstation:
10 studies

Treadmill workstation:
8 studies

Pedal workstation:
2 studies

Content
Personalized behavioral interventions

- 10 studies

- 6 times pedometer with logbook
- 4 times (frequent) e-mail messages with tips and/or personal goals
- 3 times meeting with coach
- 3 times stimulating moving during work tasks, e.g “walk and talk meetings”
- 2 times eduction or newsletter
- 2 times promotion of stair use
- 1 time software prompts to stand up

Summary evidence

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	Alternative workstations	Personalized behavioral	Stair use promotion
SB at work	Conflicting	Conflicting	Insufficient
SB overall	Strong evidence for positive effect	Insufficient	Insufficient
PA at work	Conflicting	Conflicting	Moderate evidence for positive effect
PA overall	Conflicting	Moderate evidence for positive effect	Insufficient

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Workstation alternatives to reduce sitting time at work
Effects on work performance and MSDs

Lidewij Renaud

Summary alternatieve workstations

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	(work) performance	Musculoskeletal Complaints
Sit – stand desk	-No difference or an increase in performance. -lab studies were software measurement, filed studies self –reported (+ studies 2 in call centres objective outcomes)	-standing increases discomfort in legs and hips (lab) -alternation between standing and sitting: contradicting results: no effect (field) or decrease in complaints (lab)
Treadmill workstation	-Slower typing speed / mouse precision (lab) -no difference when measured in field (self-reported)	
Cycling workstations	-decrease in pointing the mouse (lab) -only 4 studies in total	

Summary alternatieve workstations

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Cycling workstations	-decrease in pointing the mouse (lab) -only 4 studies in total	

Keynote dr. Jack Callaghan

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“Sitting to death or at least until we’re injured”

Huidig onderzoek

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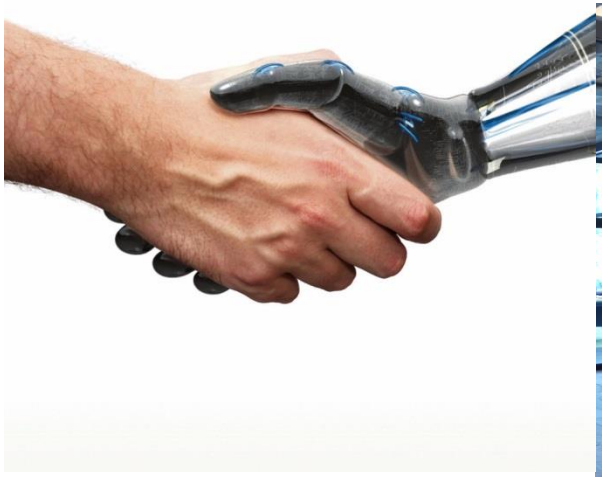
Promotie onderzoek Lidewij Renaud – Het ontwikkelen en evalueren van een implementatie strategie rondom zit-sta bureaus

End of sitting ->

- **RAAAF (Rietveld Architecture Art Affordances)**

Effect van robotisering op arbeidsbelasting (AKC)



Vragen?

Results

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Interventions promoting stair use -> 11 studies included	
SB at work	**Insufficient evidence**
	No studies
SB overall	**Insufficient evidence**
	No studies
PA at work	**Moderate evidence for positive effect**
	+: 11 studies (1S, 1M, 9*)
PA overall	**Insufficient evidence**
	=: 1 study (1M)

Sit-stand workstations

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- **MSD's**

	Complaints	Discomfort
Lab studies	+ +	- - +
Field studies	= = = +	+ + +
Lab studies standing solely		- - - -