

Promoting a Comfortable Workstation Environment at Work and at Home

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Outline

- Why be concerned with workstation ergonomics
- Sampling Frames
- Assessment Procedure
- Summary of Office Study results for feedback
- Home Study Results
- Conclusions – Home advantages and disadvantages

Healthy Work Environments

- Musculoskeletal disorders are a threat to blue collar and white collar workers.
- Many mid-size and larger businesses do pay attention to occupational health and safety needs, including workstation ergonomics
- The increasing use of telework may mean less attention to workstation ergonomics when individuals rather than company experts set up their workstations
- Counter-balancing this shift from company to individual responsibility for ergonomics may be increased comfort experienced in the home

Office & Home Sampling Frame

- Full-time university employees at a large Southeastern university who spent at least part of their day at a computer workstation in their office

3711 Full-time Employees

1421 contact attempts; 909 successful & 296 screened

206 Fully Assessed:

Age > 50; M=58 yr, ♂=42, ♀=61

Age < 40; M=31 yr, ♂=45, ♀=58

Participants Re-Assessed: 87

Age > 50; M=58 yr, ♂=24, ♀=18

Age < 40; M=33 yr, ♂=20, ♀=25

Participants in Home Study: 64

Age > 50; M=57 yr, ♂=17, ♀=12

Age < 40; M=32 yr, ♂=12, ♀=13



Procedure

- 60 minute assessment of the participant's workstation for first office and first home visit
- Base posture assessed while viewing a document on the computer via the NIOSH Tray 5-G Computer Workstation Checklist (NIOSH, 1997) with items pooled initially into 11-item **posture** and **ergonomics** scales and also
 - **Posture scale**: 4 items tapping horizontal thighs, neutral wrists ...
 - **Chair scale**: 6 items tapping lumbar support, arm rests ...
 - **Environment scale**: 9 items tapping detachable keyboard, glare avoided, space for knees & feet, etc.
 - **Training scale**: 8 items tapping trained in proper postures, how to adjust workstation, etc.
- Observer took still photos and a video with participant in
 - “usual” posture (posture they are in majority of computer work time)
 - “most comfortable” posture
 - “ideal” posture

Procedure - continued

- Comfort (0-10 rating scale) was assessed for: temperature, glare, fonts for workstation, noise, light levels, eye strain, pain reported from arm/shoulder, pain from wrist
- Readings were taken for many of those variables and for distance to monitor, screen resolution, screen size, screen contrast ratio, operating system, a number comparison task, etc.
- After assessment was completed and evaluated in the lab
 - feedback form sent to participant with recommendations based on NIOSH checklist, still photo, video and luminance measures
- One year after initial assessment employees were contacted and re-assessed with a shorter 30 minute visit
 - NIOSH checklist, distance to screen, comfort ratings, pain ratings
- Participants were recontacted and invited to have a home workstation evaluated.

Results for Feedback from 1st Office Assessment

- Most feedback for
 - Ergonomics
 - lighting issues
 - amount of lighting inadequate
 - monitor issues
 - monitor too close or too far
 - Posture
 - lower body posture
 - feet not on floor
 - wrists
 - not in horizontal position
- No significant age differences

Results of Feedback

- Employees are sensitive to feedback
 - almost half indicated that they implemented changes
- Changes did not generally result in better assessments at time 2

Before feedback	After feedback
Ergonomics	Ergonomics
Lighting issues	Lighting monitor increased
Monitor distance	Monitor distance somewhat greater
Position of monitor	Monitor position changed somewhat
NIOSH score high	NIOSH score high
Posture	Posture
Wrist and feet issues	Torso & feet changes, not wrist
NIOSH score high	NIOSH score high

Home Workstation Assessment

- A subset of those contacted in the first assessment consented to have a home workstation setup evaluated
 - Younger: $n = 30$, $M = 32$ yr, $SD = 4.9$
 - Older: $n = 34$, $M = 57$ yr, $SD = 4.6$

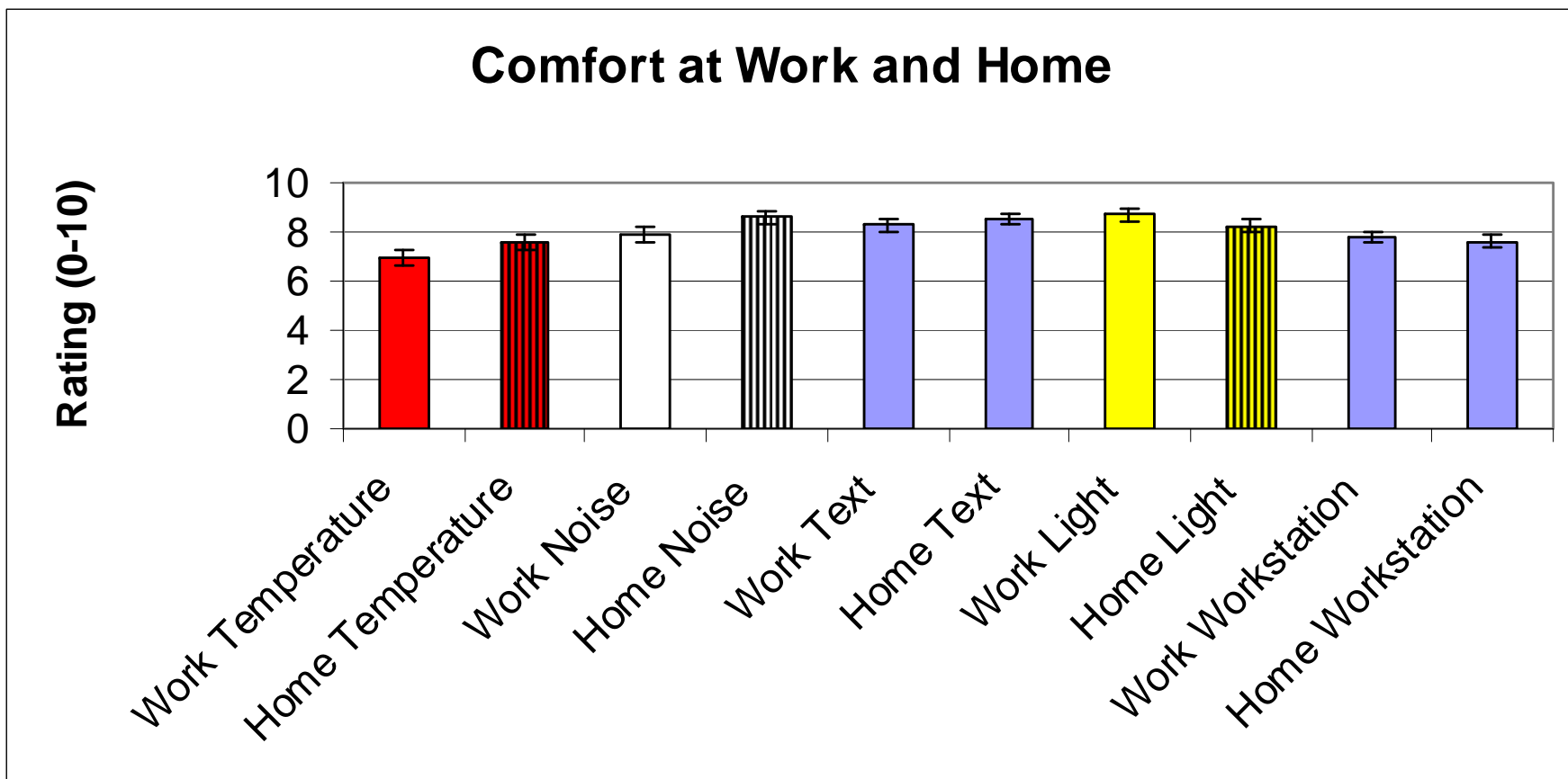
Caveats

- Home workstation was assessed about a year after the office workstation
 - Time and location are confounded
 - Given better knowledge about postures and availability of better equipment the bias may be in favor of the home workstation setup
- Those consenting to a home visit may be more confident about their workstation setup
 - Also would bias towards better ergonomics
- A check shows that the sample from the home study did not differ in ergonomics at work from the sample that was not assessed at home
 - M NIOSH overall = .803 for non-home sample vs .807 for home group

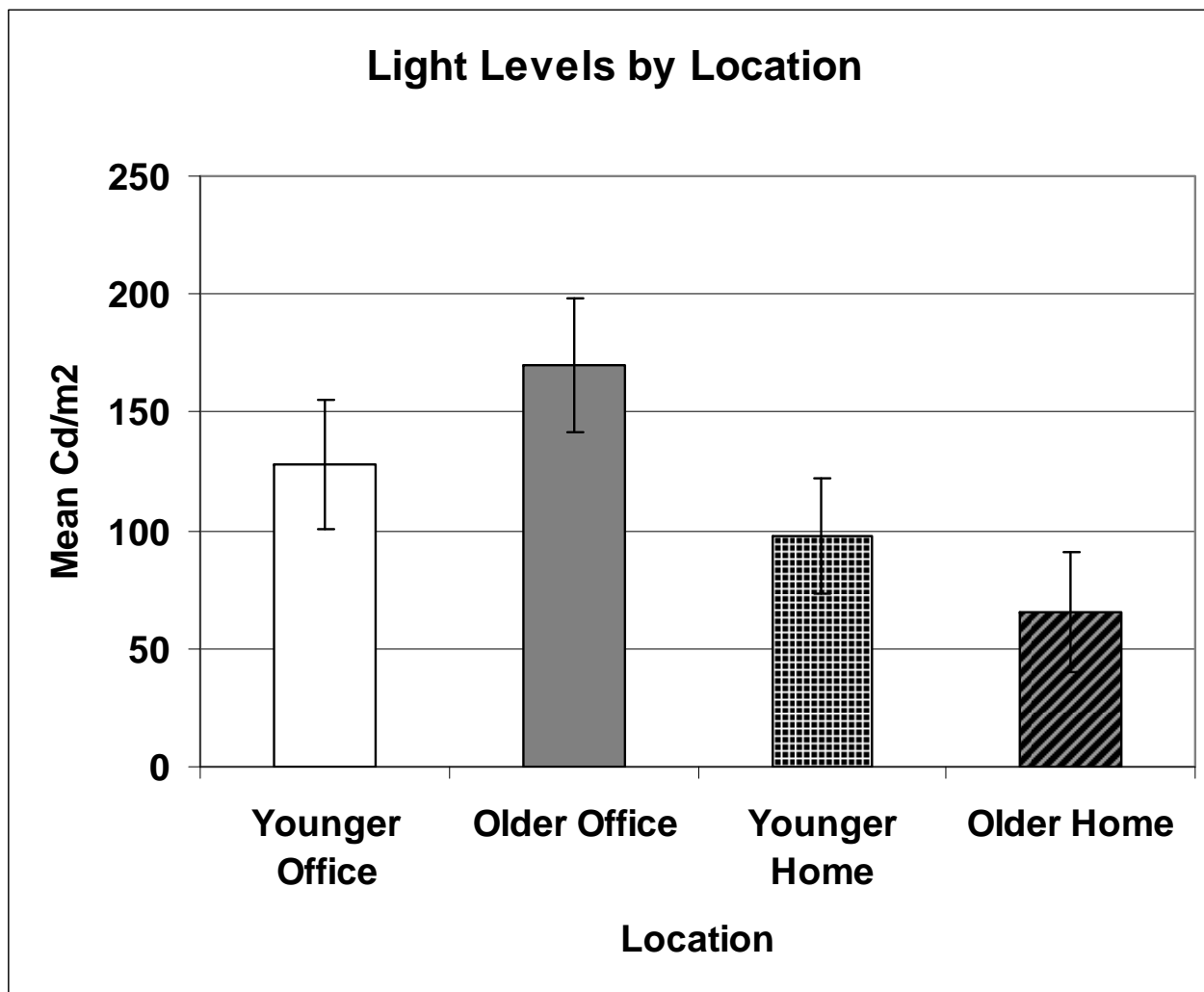
Results

- Virtually no age main effects or interactions
- Comfort ratings higher at home for some variables
- Ergonomics measures higher for office than home

Location x Comfort Interaction



Light Levels: Age x Location Interaction



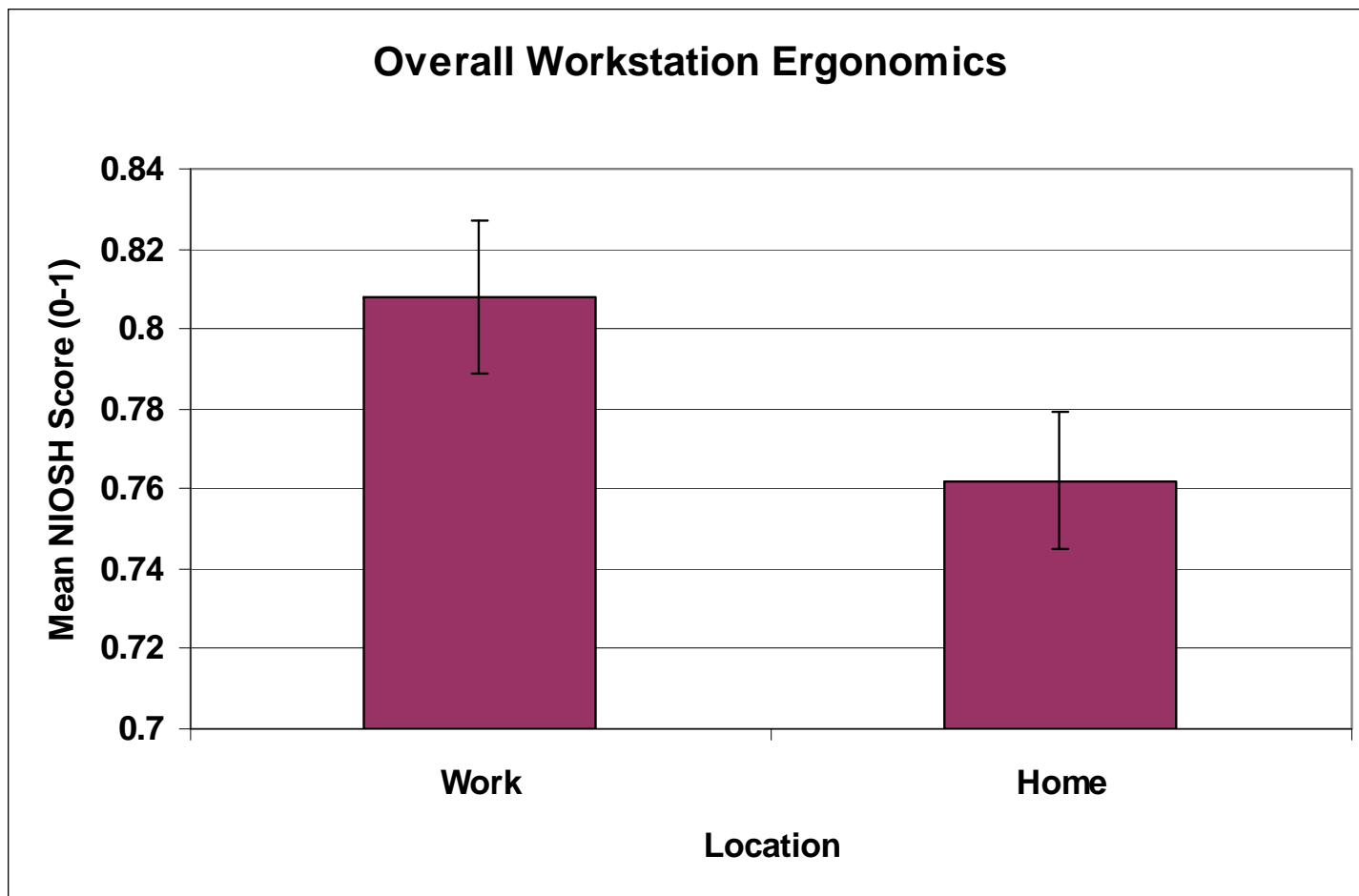
Temperature & Noise Levels

- Did not vary significantly across setting or age group or interact with those variables
- Did not correlate significantly with comfort with temperature or comfort with noise ratings
- Mean temperature = 24 C
- Trend ($p < .08$) for sound levels to be higher in the office (43.5 db) than in the home (42 db)

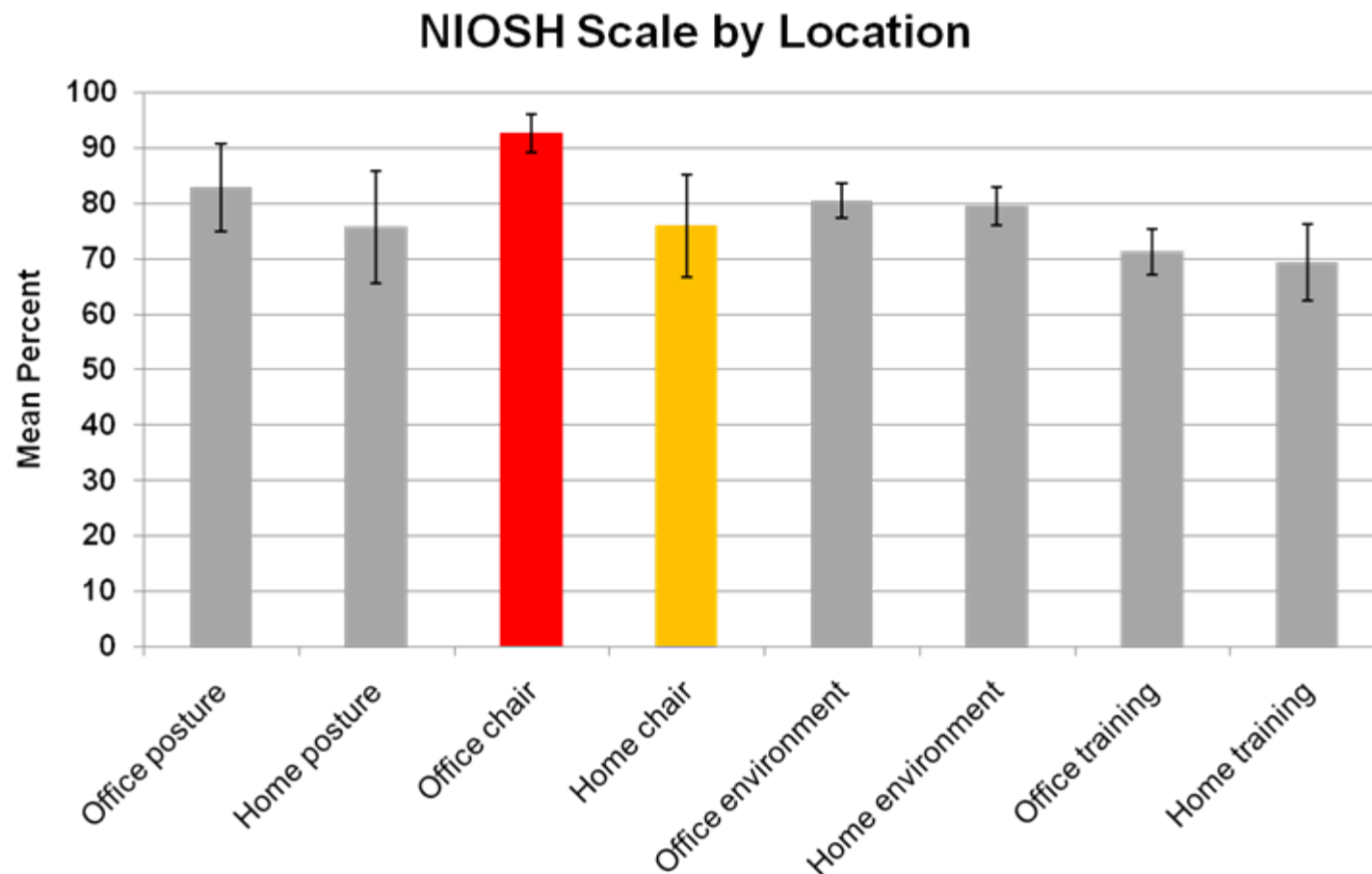
Eye Strain

- We asked people to rate their eye strain on a 0-10 scale and found a significant location effect for $n = 55$, though generally levels were low
 - M Home = 1.6 (SD = 2.15)
 - M Office = 2.6 (SD = 2.87)

Main Effect of Location for NIOSH Workstation Ergonomics average



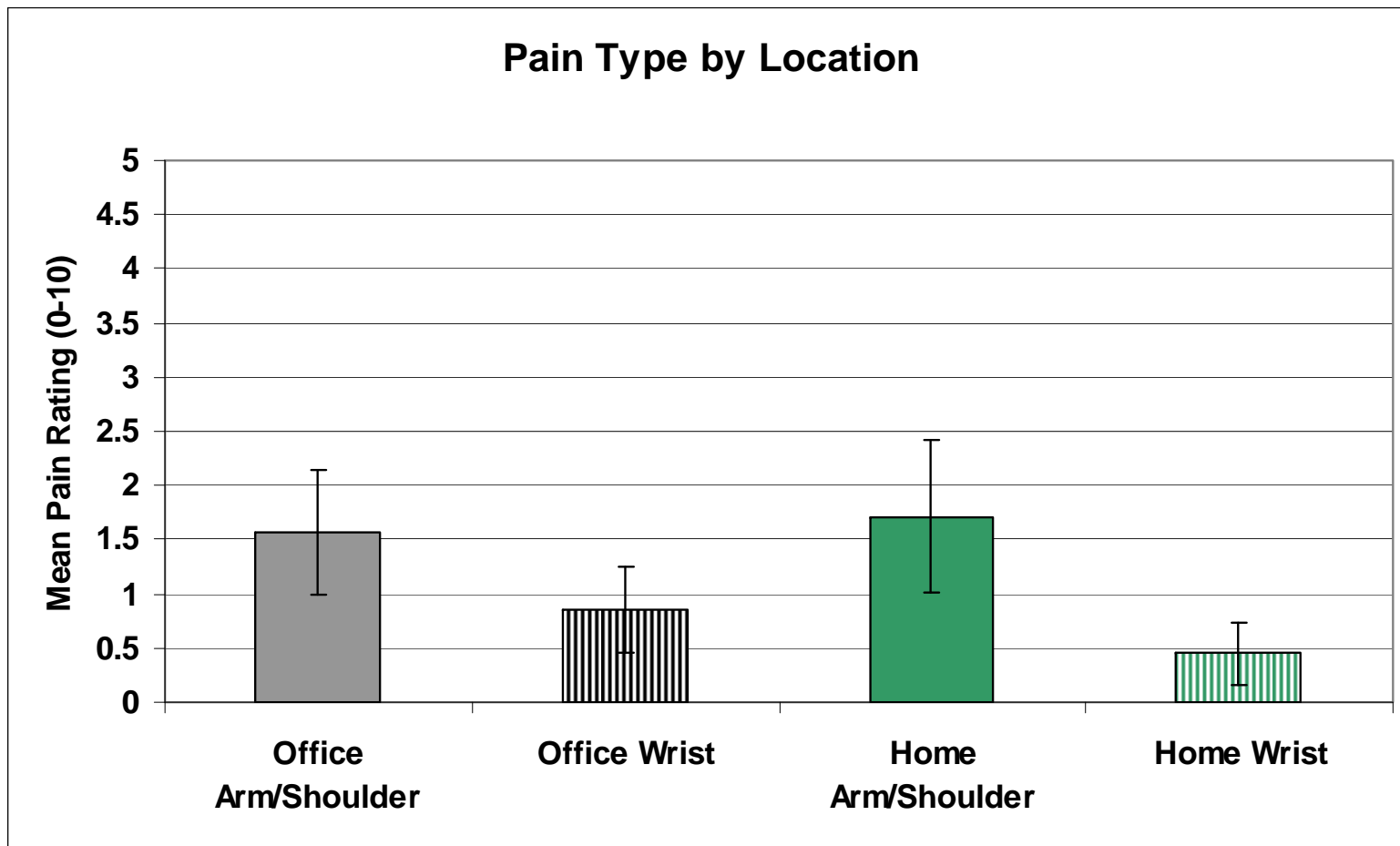
Interaction of Location and NIOSH Scales



Time at Workstation

- “How many hours per day are spent at a workstation”
 - M home = 4.3 (SD = 3.32)
 - M work = 6.8 (SD = 1.74)
- Higher variability for the answer at home may mean that some interpreted the question as intended for home workstation time, rather than workstation time.
- There was a significant relation between reports but it suggest unreliability in this rating
 - $r(51) = .45$.
- Time at workstation was significantly correlated with pain reported in the arm/shoulder ($r = .28$ for office, $r = .295$ home) but not the wrist

Pain Type x Location Interaction

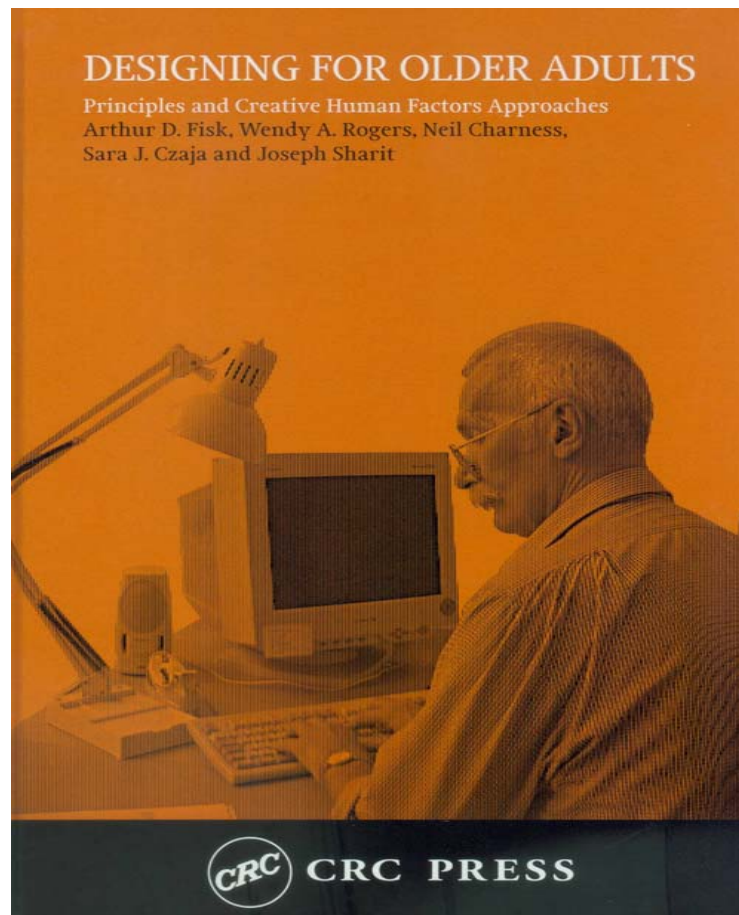


Conclusions

- Workstation ergonomics are pretty good in general for this sample of employees at work and at home and don't vary much by age
- As Dorothy said in the Wizard of Oz: "There's no place like home" <http://www.youtube.com/watch?v=zJ6VT7ciR1o>
 - for comfort with temperature, noise levels, eye strain
- However, the work office environment is significantly better for ergonomics
 - Given the correlation between time at workstation and arm/shoulder pain, good ergonomics may be an important tool in avoiding musculoskeletal disorders
 - A better quality chair at home would reduce this gap
 - Employers could consider providing or subsidizing this equipment for teleworkers, along with the usual provision of computers, monitors, broadband and telephone connections.

CREATE source for Guidelines

- Designing for Older Adults: Principles and Creative Human Factors Approaches (2004)
- http://www.crcpress.com/s hopping_cart/products/product_detail.asp?sku=TF1537&parent_id=&pc=
- From CRC Press
- See CREATE web site: www.create-center.org



“Ergo-guide” Ergonomic Tips to maximize your comfort when computing

CHAIR

- Make sure your chair allows **clearance behind your knees** when seated against the backrest.
- **Use the backrest of the chair** to provide full support to your lower back.

LIGHTING

To **reduce glare and shadows** on your work surface:

- **adjust window shades or decrease overhead lighting.**
- **adjust the monitor screen** or add an anti-glare filter.
- **add a task light** to properly illuminate paper references.

DOCUMENT HOLDER

Use an adjustable document holder to:

- place reference materials as **close to the computer screen** as possible.
- keep materials at the **same height and distance** as your computer screen.

References: www.libertymutual.com
www.mmm.com; www.pc.ibm.com/ww/Healthycomputing; www.hermanmiller.com,
www.compaq.com/comfortguide/index.html

POSTURE

- **Maintain proper body posture** by:
 - sitting with your hips and knees at a **90 degree or greater angle.**
 - keep your **feet flat** on the floor or on a footrest.
 - keep your **arms relaxed** at your sides; ideally with elbows at 70-135 degrees.



HEALTHY COMPUTING HABITS

- **Use a softer touch** when keying; relax your grip on the mouse.
- Avoid working too long **in one position.**
- **Change body your posture** frequently.
- Take frequent breaks. **Stretch periodically.**
- Give your **eyes a visual break.**

MONITOR

- **Place the monitor directly in front of you** about an arm's length away.
- Position the top of the monitor screen **at or below eye level.**

KEYBOARD/INPUT DEVICES

- Adjust the keyboard or chair height to **keep forearms, wrists and hands in a straight line.**
- Place mouse and other input devices **near to and at the same height** as your keyboard.
- Keep your **elbows close to your body.**

WORK AREA

- **Allow ample clearance to move your knees and legs** under the keyboard and desk.
- **Avoid contact stress** with the edge of the desk and keyboard.

ACCESSORIES

- **Use your ergonomic accessories** to support body posture (e.g. lumbar support, arm rests, monitor blocks, external keyboard).
- Get a **head-set if you regularly talk** for extended periods of time on the phone. Use a lowered voice.

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