HEALTH, WORKPLACE, AND ENVIRONMENT: CULTIVATING CONNECTIONS
October 17, 2013

Featured Speakers

Dr. John Howard, Director, National Institute for Occupational Safety and Health
Ms. Rosalyn Cama, President, Cama Inc.
Dr. Michele Gelfand, Professor, University of Maryland
Martin Cherniack, Professor, UConn Health Center

The afternoon speakers are grantees of the CPH-NEW Pilot Grant Program. The RFA for the request for applications can be found on the CPH-NEW website. Deadlines for letters of intent is October 15, 2013.
A Qualitative Evaluation of a Three Modality Treadmill Workstation
Sit, Stand, Walk. Will it be used?

Manuel Cifuentes
Jin Qin
Scott Fulmer
Anila Bello

Work Environment Department
Office work and sedentarism

Sub Heading

- Sedentarism is a risk factor
  - Cardiovascular diseases
  - Metabolic disorders: obesity, diabetes, hypertension, high blood lipids

- Office work promotes sedentarism

- Biomechanical instructions: Sit, look at the screen, answer the phone, type, move the mouse and relax
Office work and office chair

- Wicked comfortable chairs
- Good to prevent musculoskeletal disorders
- It was heard that some people even can sleep on them
- Only near basal metabolism is required to work in a modern office
Can we exercise sedentarism out?

- Some studies say that bad consequences of sedentarism could not be compensated with exercise.
- Therefore, we should reduce exposure to sedentarism.
- The middle between sedentarism and exercise is a neat place: **Non-Exercise Activity Thermogenesis** (pun intended).
Finding the neat middle place

N.E.A.T.

- What about standing and moving every 20 minutes? Breaks.
- Bike workstation (stationary bicycle)
- Standing workstation (adjustable desk)
- Walking workstations (treadmill)
Treadmill workstations are hot

Using them has been associated with:

- Less exposure to sedentarism: less time sitting
- Weight loss: 100 extra calories burned per hour of use
- 5 hr. a day $\times$ 5 days a week $\times$ 4 weeks a month $\times$ 12 months a year = 120,000 calories
- 1 pound of fat = 3,500 calories
- $120,000 \div 3,500 = 34\frac{1}{4}$ pounds lost in a year
- Improvement in waist, hip circumference, LDL, total cholesterol.
But we know better

- Benefits were conditional to USING the treadmill workstation
- Physical activity is not the only determinant of weight
- Almost half of exercise devices are not used after the first month of acquiring them (expensive dust collectors)
Old healthier times
What is known?

- Height-adjustable electric desks are well-received and used by workers.

What is not known?

- What factors (barriers and facilitators) may affect usability of treadmill workstations?
Methods

Design

- A walking treadmill (up to 4 mph) (US$300)

- Electric height-adjustable desk (US$1,000)
  - 22 to 48 inch high
  - Surface of 72 by 32 inches
  - Support up to 275 pounds

- The same chair they were using already

- The same office
Methods

Three-Modality Workstation

- Sit: in the chair
- Stand: on the floor or on the treadmill belt
- Walk: on the treadmill (no more than 2 mph)
Methods

Workstation Set Up
Methods

Participants

- Five medically certified healthy enough female office workers (two departments, one institution).
- Department or Unit supervisor prior authorization
- IRB approved informed consent
Methods

Procedure

- We set up the workstation following worker’s instructions (location)
- Contact the research team as much as you want
- Show us that you know how to use it
- Visits by ergonomist
- Measurement of nano-particles (indoor pollution)
Methods

Data collection (six months)

- Individual monthly interview
- Monthly group meetings
- Short casual visits (5 minutes)
- Data gathered in previous interactions used to prepare following interviews
Methods

Data Analysis

- **Usability**: the ease of use and learnability
- **Safety**: protection against or prevention of any physical injury
- **Comfort**: sense of physical and psychological ease
- **Productivity**: any change in the efficiency of their work
Results

Usability

Four barriers

• Difficult set up: work surface to sit is not the same than work surface to walk

• Communication: noise and height (hierarchy)

• Floor uneven or office too small

• Need for motivation
Results

Usability: Difficult set up

- Displacing keyboard, monitor, phone, paperwork, etc. side to side

- Make change of modality less likely

Solutions:
- Two of everything
- Wireless keyboard and mouse
- Sit on a large ball on top of the treadmill
Results

Usability: communication affected

Noise:
• Low noise but not pleasant
• May affect others (in person or in the phone)

“Change in height” experience:
• Six to seven inches taller
• Feelings of being disrespectful
• Challenging high hierarchies. Condescending with those with lower hierarchical position.
• No participant received any comment from anybody else about this. “It was just in their minds.”
Results

Usability: floor uneven or office too small

- Yep. The building is old and the floor was tilted enough to affect the functioning of the treadmill.

- Participant opted for a less desirable location

- Office too small: It seems that the treadmill was the price to pay to keep the adjustable desk
Results

Usability: need for motivation

- Pretty surprising

- Participants assumed there was a correct time and sequence to walk, stand, and sit.

- Explicitly asked for external motivation ("a coach") to increase standing and walking modalities
Results

Usability

- Two facilitators:
  - Electric height-adjustable desk
  - Easy to learn how to use
Results

Safety

- Two barriers
  - Trips and falls
  - Foot and knee pain

- One facilitator
  - No increase in air pollution (nano-particles)
Results

Safety: trips and falls

- Probes were used to detect trips
  - “Accidental kicks” to the side of the treadmill
  - “Only a few times”
  - This was considered an “almost-tripping” indicator
Results

Safety: foot and knee pain

- Three participants reported pain during the second month
- Related to standing on the treadmill belt
- Rapidly solved with use of anti-fatigue mat placed on top the belt
- No other pain was reported
Nano-particles were measured before, during and after using the treadmill.

There was variability neither in central nor dispersion measures of nano-particles.

Participants expressed satisfaction for our concern and for the fact there was no increased air pollution.
**Results**

**Comfort**

- **Two barriers:**
  - Peer pressure to always use the treadmill
  - Initial adaptation to walking/standing

- **Two facilitators**
  - Feelings of enjoyment around the fourth month
  - No additional reports of discomfort afterwards
Results

Comfort: peer pressure

- Casual visitors making light comments “why you are not using the treadmill?”

- Participants interpreted it as “disrespectful derogatory and pushy” comments.

- Participants expressed their desire that everybody had access to these workstations.
Results

Comfort: Initial adaptation to walking/standing

- First two weeks there was discomfort symptoms in feet and knees
- Later receded with no intervention
- Other aches were prevented by greatly appreciated early ergonomic visits to adjust angle of keyboard and monitor and height of monitor
- Shoe heights determined adjustment of desk height
Results

Comfort: feelings of enjoyment around the fourth month

- Nobody was high.

- After or during a day of high treadmill use participants reported
  - “more energy”
  - “higher concentration”
  - “better mood”

- No usage log was kept
Results

Productivity

Barriers

• Speed is counterproductive
• Nature of job

Facilitator

• Standing does not affect productivity
• Planning work in advance
Results

Productivity: speed is counterproductive

- At any speed, the faster the belt, the lower the productivity

- Two mph is too much. Convergence $\sim .7-.8$ mph

- No intention of increasing speed “because it may affect my work.”

- Walking does not allow drawing or working with spreadsheets
Results

Productivity: nature of job

- Two job characteristics prevented the use of the walking modality
  - Need for communicating about sensitive issues
    - Body language is impacted
  - Need to often leave the office
    - Meetings at other locations
Results

Productivity: standing does not affect productivity

- After initial weeks, standing was considered desirable and as productive as sitting.

- Contrary to expected, fourth month god feelings were not related to increased productivity.
Results

Productivity: planning work in advance

- Decision latitude affects use of walking modality
- Interruptions contributed to using walking modality less than the desired time
- Interruptions were particularly hated
### Summary of results

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Barriers</th>
<th>Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Usability</strong></td>
<td>Difficult set up</td>
<td>Electric desk</td>
</tr>
<tr>
<td></td>
<td>Communication affected</td>
<td>Easy learning of use</td>
</tr>
<tr>
<td></td>
<td>Floor uneven/Small office</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Need for motivation</td>
<td></td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Trips and falls</td>
<td>No increase in air pollution</td>
</tr>
<tr>
<td></td>
<td>Foot and knee pain</td>
<td></td>
</tr>
<tr>
<td><strong>Comfort</strong></td>
<td>Peer pressure</td>
<td>Enjoyment</td>
</tr>
<tr>
<td></td>
<td>Initial adaptation</td>
<td>No later discomfort</td>
</tr>
<tr>
<td><strong>Productivity</strong></td>
<td>Speed</td>
<td>Job control (planning)</td>
</tr>
<tr>
<td></td>
<td>Nature of some jobs</td>
<td>Standing modality</td>
</tr>
</tbody>
</table>
UMass Lowell Researchers Test Treadmills at Work
Discussion

- Design must be improved
- Impact on human interaction must be considered
- Workers’ control over their own job
- Need for motivation may represent difficulty to overcome external barriers
Discussion

Design must be improved

- Sitting and walking should use the same desk surface location
- Current commercial designs offer only a walking/standing modalities
- A thicker belt, anti-fatigue-mat like, could help with foot and knee pain
Discussion

Impact on human interaction must be considered

- Noise must be minimized
- Needs to evaluate what to do with hierarchical challenges due to becoming taller in the walking and standing modality
- No feasible use when talking about sensitive issues
Discussion

Workers’ control over their own job

- Concerns about productivity represented lack of control over own work pace

- Interruptions were hated
  - Belief that only prolonged sustained activity will result in health benefits?
  - Relaxing psychological effects are achieved only after uninterrupted long walking bouts?
Discussion

Need for motivation and overcoming eternal barriers

- Need for motivation was difficult to understand

- Two (non-exclusive) possibilities
  - A trend to (self) blaming the victim?
  - Asking for help to overcome (internalized) external barriers?

- The availability of a treadmill workstation might generate conflicting demands (the need/duty to use it versus the impossibility to use it)
Conclusion

- Design: set up and noise

- Human interaction: hierarchies and closeness

- Treadmill workstation users need to have control over their own jobs

- Treadmill workstation availability might generate internalized conflicting demands