Healthy Office Work: Rest Breaks and Movement

Michelle M. Robertson, Ph.D., CPE

Acknowledgements:
V. Ciriello, L. Schleifer; Y.H. Huang, B. Amick
Mission:
To advance scientific, business-relevant knowledge in workplace and highway safety, and work disability

- Center for Injury Epidemiology
- Center for Physical Ergonomics
- Center for Behavioral Sciences
- Center for Disability Research
Creating safe, healthy and productive office environments

• Complexities of office & computer environments and their impact

• Holistic – Macroergonomics/Socio-technical systems approaches to prevention

• Office ergonomics intervention research
  – 1 longitudinal field study
  – 1 extended lab study

• Impact of interventions

• Take away
Problem: Unsafe working environments and poor performance

• Computer and office based work is associated with an increase in Work-Related Musculoskeletal Disorders (WMSDs) and visual discomfort (Bernard, et al., 1994; Bongers, 1993; Jmker et al., 2007; Geer, et al., 2006, Aaras, et al., 2001)
  – Lack of Job Control, High workspace, and low supervisory support associated with MSD (Bonger et al.,2009)
  – Prolonged mouse use related to increased risk of upper extremity MSD (Katz 2000, Schlossberg 2004, Jmker 2007)

• Multiple contributing factors:
  – Physical workspace design
  – Technology design
  – Work organization and psychosocial factors
  – Organizational practices
Purpose of research studies

Study the effects of **ergonomic training** and **adjustable workspace design** on:

- Musculoskeletal and visual discomfort
- Computing behavior
- Workspace satisfaction and comfort
- Job & Environmental Control
- Group effectiveness
- Ergonomics climate
- Performance: Business process efficiency

**Overall, characterize the cumulative effects of performing computer work over time**
Training and Flexible workplace design => Control over environment (and job)

Control as a function of:
- Training to enhance opportunities for control
- Availability of workspaces
- Adjustability/flexibility
- Management culture
- Conceptual underpinnings
Conceptual Model

Office Ergonomics Training

Workspace Change

Ergonomic Knowledge

Performance Collaboration Culture

Computing Postures & Behaviors

Discomfort

Job Control

Workplace Satisfaction

Robertson, et al., 2008
Field Intervention Study:
Training and Workplace Design

Field Intervention Study Design: Workspace + Training

- **Control Group:**
  Employees who did not move into the new workspace or receive training.

- **Experimental Group 1:**
  Employees who moved/received either a *New experimental Workspace-only*.

- **Experimental Group 2:**
  Employees who moved into the *new Workspace and received Ergonomic Training*.

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<tr>
<th></th>
<th>Trial 1</th>
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<td>Group 1</td>
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<td>Control Group</td>
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<td>Experimental Workspace</td>
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<td>Group 1</td>
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<td>Experimental Workspace and Training</td>
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- Time 1: 2 mos. pre-intervention
- Time 2: 4 mos. post-intervention
- Time 3: 8-12 mos. post-intervention
Goals of Workplace Design and Training

• Increase Ergonomics
• Improve Business process
• Improve Communication, Collaboration & Group Effectiveness
• Increase Ergonomic Culture
• Enhance corporate identity
Methods: Assessments, Data Collection and Measures

• Interviews and Organizational, Training and Facilities Assessments
  – Human Resources, Safety, and Facility Managers
  – Senior Management Commitment & Involvement

• Web-based questionnaire
  – Workplace features, psychosocial, work organization, ergonomics climate, MSDs, collaboration and communication

• Observations:
  – Office Ergonomics Assessment (OEA) (Robertson et al., 2009)
  – Rapid Upper Limb Assessment (RULA) for computer work

• Business Process Analysis (BPA)
## Office Ergonomics Training: Instructional Systems Design

### Training Objectives

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<th>Training Objectives</th>
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<tr>
<td>• Recognizing work-related musculoskeletal disorders and risk factors</td>
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<td>• Understanding the importance of varying work postures</td>
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<td>• Knowing how to rearrange the workstation to maximize the “comfort zone”,</td>
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<td>• Recognizing and understanding visual issues in the office environment and reducing visual discomfort</td>
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<td>• Understanding computing habits (rest breaks) and knowing how to change work-rest patterns</td>
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<td>• Knowing how to use the various workspaces for individual and group work</td>
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<td>• Being aware of the company’s existing health and ergonomic programs</td>
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<td>• Knowing how to obtain ergonomic accessories through the company’s programs</td>
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Results of Field Intervention:
Training and Workspace Design
Musculoskeletal discomfort changes over time for each group

Means of the overall musculoskeletal discomfort outcome variable for each group over the three study periods.

*Significant differences between the workspace+training group compared to the workspace-only and control group.
F(4,378)=2.9, p<.001; GR2>GR1 (p<.001); GR3>GR1 (p<.001); GR3>GR2, p=.06
Office Ergonomics Climate

Awareness and understanding of ergonomic principles and practices

Significant differences between the workspace + training group compared to workstation-only and control group for time 3

Employees' needs related to office ergonomics issues are listened to and acted upon
## Business Process Results

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Process Time Saved (as a percentage of pretreatment process time)</th>
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<tbody>
<tr>
<td>Control</td>
<td>.46%</td>
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<tr>
<td>Exp. Workspace only</td>
<td>5.62%</td>
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<tr>
<td>Exp. Workspace + Training</td>
<td>10.55%</td>
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</table>
Summary of Findings

- **Increase** in office ergonomics knowledge for Trained + Workspace group
- **Increase** in job control for Trained + Workspace group
- **Decrease** in musculoskeletal discomfort for workspace + trained group
- Business Process Analysis the process cycle time was reduced for the Trained + Workspace group
- Support for our theoretical model of the relationship of the work environment (flexibility and control), and training on ergonomic and safety impacts
Extended Laboratory Intervention Study: 
Training and Sit/Stand Workstation Design

Published: Robertson, Ciriello, & Garabet, Applied Ergonomics 44 (2013) 73-85
Research Questions

• Will musculoskeletal and visual discomfort be minimal as a function of training and workspace adjustability in the Trained group?
• Will performance be higher for the Trained group?
• Will office ergonomics knowledge and intent to arrange office workstation set-ups increase for the Trained group?
• Will the alternation between sitting and standing computing postures and the amount of time standing be higher for the Trained group?
## Study Design: Randomized Control Trial

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<th>Pre-experimental</th>
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<th>DayBlock 2</th>
<th>DayBlock 3</th>
<th>DayBlock 4</th>
<th>DayBlock 5</th>
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<td><strong>Minimally Trained</strong></td>
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<td><strong>Control Group</strong></td>
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<td><strong>Ergonomics Trained</strong></td>
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<td><strong>Pre-experimental</strong></td>
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**Ergonomics Training**

**“Ergo Reminders”**

Randomized schedule of 3 cognitive demand levels
Methods: Participants and Tasks

• Participants:
  – 22 healthy females
  – Basic administration computing skills
  – No significant difference between groups for age; BMI (p>.05)

• Experimental task and cognitive demand levels:
  – Simulated customer service representative job
  – Based on a job analysis the following were determined:
    • Task Complexity (cognitive demands)
    • Quality control and proficiency
  – 7 hour day; 15 days
Ergonomic Training & Experimental Set-up

**Trained Group** received two-phase ergonomic training

- **Phase I:**
  - 1.5 hr. workshop
    - Slide and video presentation
    - Case studies & de-briefing
    - Hands-on practice periods

- **Phase II:**
  - Practice period & Standing
  - Ergonomics reminders

**Minimally Trained Group** received:

- Brief, standard orientation of work setting
- Manufacturer pamphlet of chair adjustments
Methods: Data Collection and Outcomes

• **Musculoskeletal symptoms:**
  • Scale Range: 0-10 anchored by 8 descriptors
    » No Pain/Discomfort, Just Noticeable Pain/Discomfort, Very Little Pain/Discomfort, ….Extreme Pain/discomfort

• **Visual discomfort/pain rating:**
  – Yes/No response
  – 6 symptoms (*blurry, difficulty focusing, itching, aching, sensitive, & burning*)

• **Performance Data:**
  • Quantity
    – Number of faxes completed daily
  • Quality Control
    – Daily accuracy score

• **Administered:**
  – Baseline
  – Hourly; 7 sessions per day
  – 15 days
Results

Extended Laboratory Study:
Training and Sit/Stand Workstation Design
Number of reported musculoskeletal discomfort for Top 7 significant body parts across all days.

Top 7 Body Parts: Back lower neck right & left; Back upper neck left & right; Back left & right shoulder, Back lower back

All significant at \((p < 0.05)\)

![Bar chart showing the number of symptom reports for 7 significant body regions by groups over experimental days and orientation days.](image-url)
Reported Musculoskeletal Discomfort for Top 7 Body Parts all Daily Sessions

Number of Symptom Reports for 7 Significant Body Regions by Groups

- Minimally Trained
- Ergonomics Trained

Symptom Reports vs. Daily Sessions:

- **p<.01
- *p<.05
Visual Discomfort

**Eye Symptoms Across all Days and Sessions**

Types of Eye Symptoms

*\(p < .05\) for Blurry & Difficulty focusing
Performance Results: Quantity and Quality

• No significant difference found between groups for the number of faxes completed

• Significant difference found between groups for accuracy across all 15 days
  – Trained group exhibited higher quality scores
Behavioral changes: Varying computing postures of sitting and standing

Minimally Trained group did not stand at all during the experiment
Behavioral changes: Varying computing postures of sitting and standing

Minimally Trained group did not stand at all during the experiment
Research Findings Summary

- Significantly *greater* reporting of musculoskeletal symptoms for the Minimally group compared to the Trained group
- Display of musculoskeletal symptoms was *minimal* for the Trained group
- Workload was *equal* across groups; no significant difference between groups for number of faxes completed
- Performance accuracy (quality control) was significantly *higher* for the Trained group
- Significant changes in behaviors for the Trained group as reflected in standing *more often* and *longer*
- Greater *sense of control* over the work environment given the increase in ergonomic knowledge for the Trained group
Take-away: Designing office ergonomics and safety programs

– Systems-based approach
  • Comprehensive training
  • On-going, long-term management commitment.

– Providing flexible work equipment, while important, is not sufficient

– Interesting relationship between MSDs and Visual symptoms

– Leveraging the concept of environmental control
  • allows employees to knowledgeably exert control over their physical environment

– Employees gain a higher sense of control over their workspace
  • all levels of the company, part of a process that can have a positive impact on health, safety and performance
Generating knowledge to help people live safer, more secure lives

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