

Healthy Office Work: Rest Breaks and Movement

Michelle M. Robertson, Ph.D., CPE



Acknowledgements:

V. Ciriello, L. Schleifer; Y.H. Huang, B. Amick



Liberty Mutual[®]

RESEARCH INSTITUTE FOR SAFETY

Liberty Mutual Research Institute for Safety

generating knowledge to help people live safer and more secure lives



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 workplace, 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)
 - Related physical exposure: non-neutral posture and static muscle loading; lack of movement and varying of work posture (Burgess-Limerick 1999, Fagarasanu 2004, Hagg 2000)
- 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

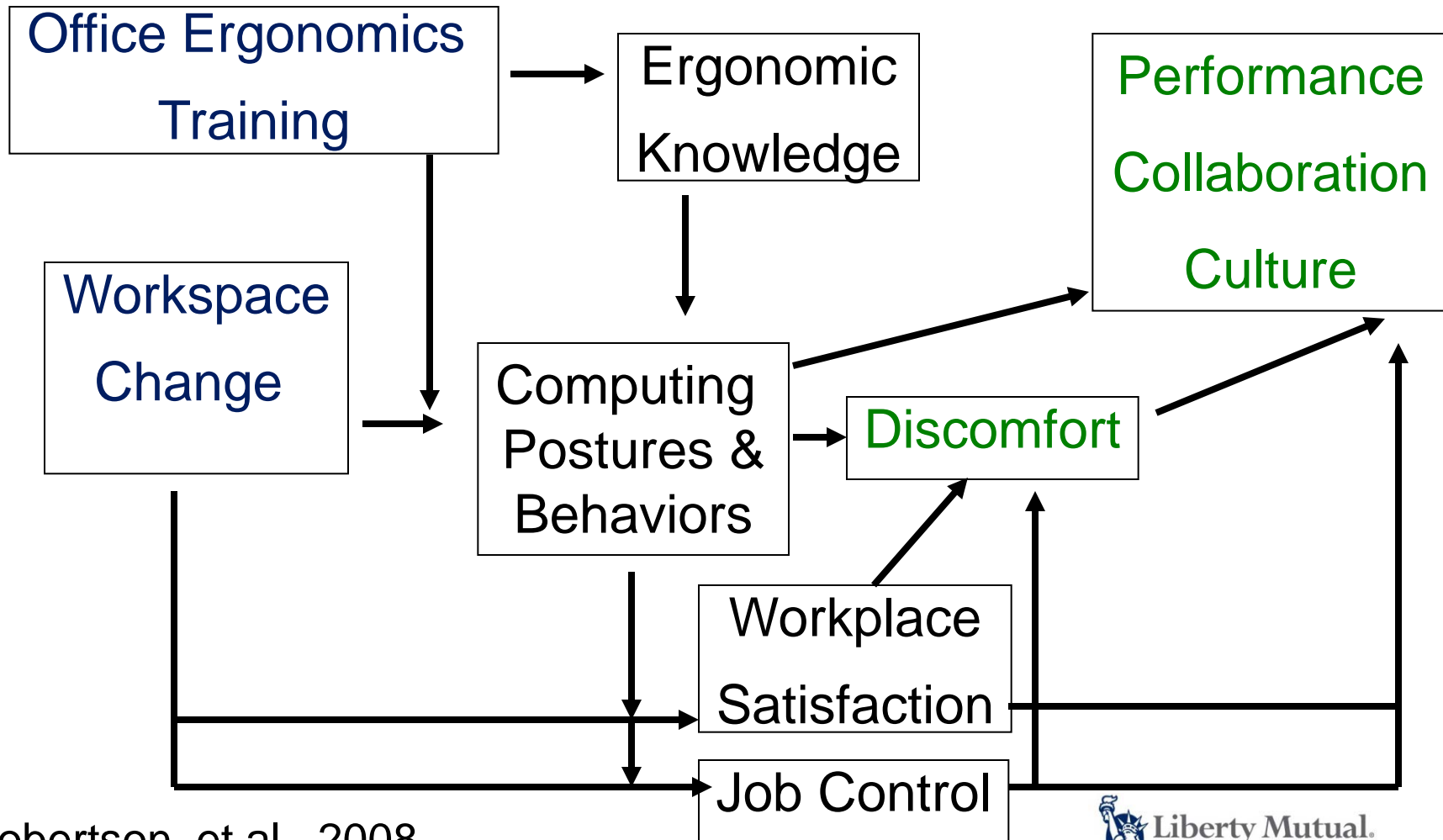
Key Construct: Environmental Control

**Training and Flexible workplace design =>
Control over environment (and job)**

Control as a function of:

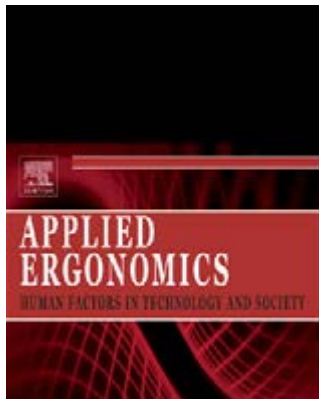
- Training to enhance opportunities for control
- Availability of workspaces
- Adjustability/flexibility
- Management culture
- Conceptual underpinnings

Conceptual Model



Field Intervention Study: Training and Workplace Design

Published: Robertson et al., 2008. *Applied Ergonomics* 39 (2008) 482– 494



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.

	Trial 1	Trial 2	Trial 3
Group 1 Control Group			
Group 2 Experimental Workspace			
Group 1 Experimental Workspace and Training			

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)

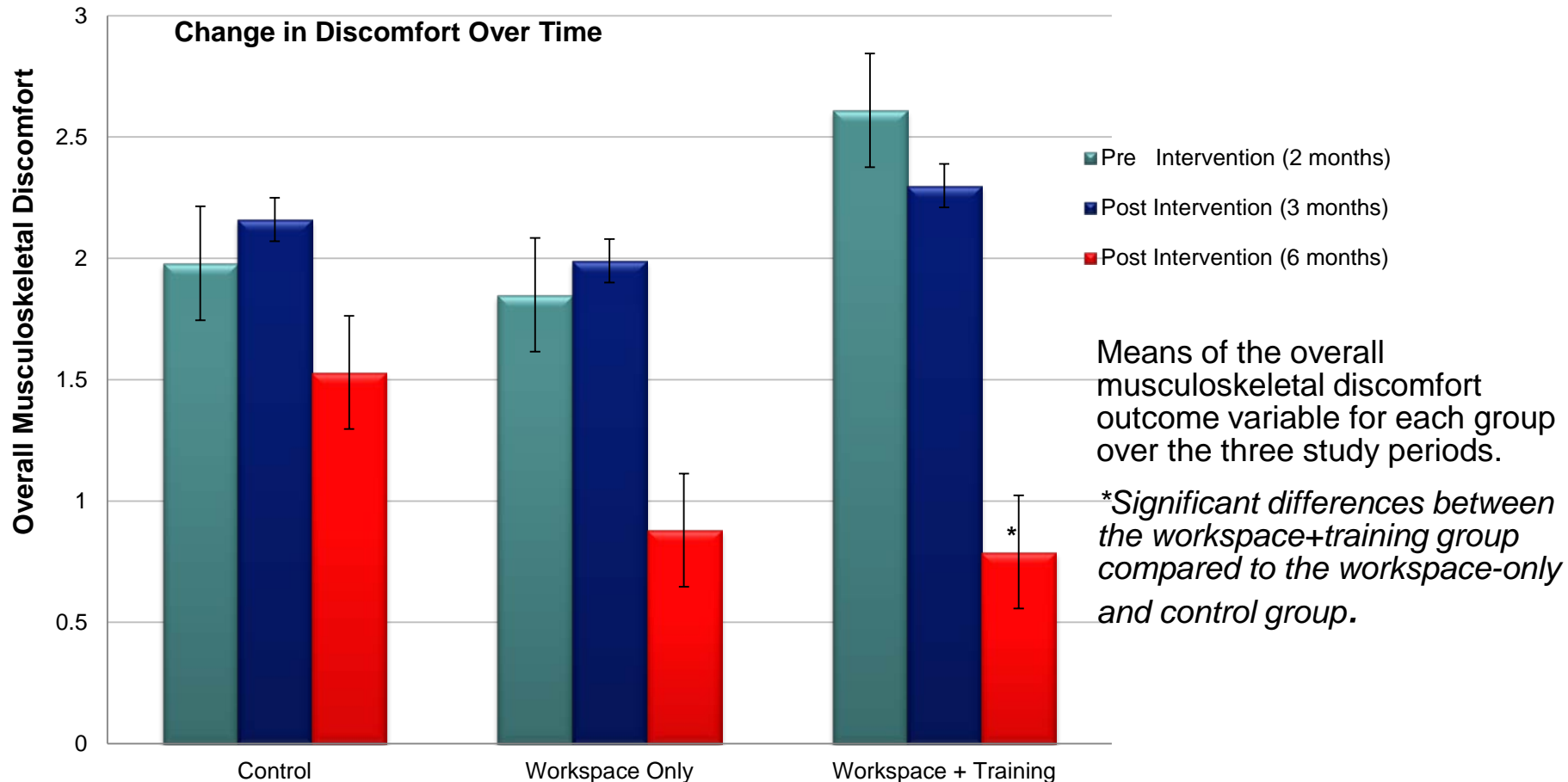
Office Ergonomics Training: Instructional Systems Design

Training Objectives

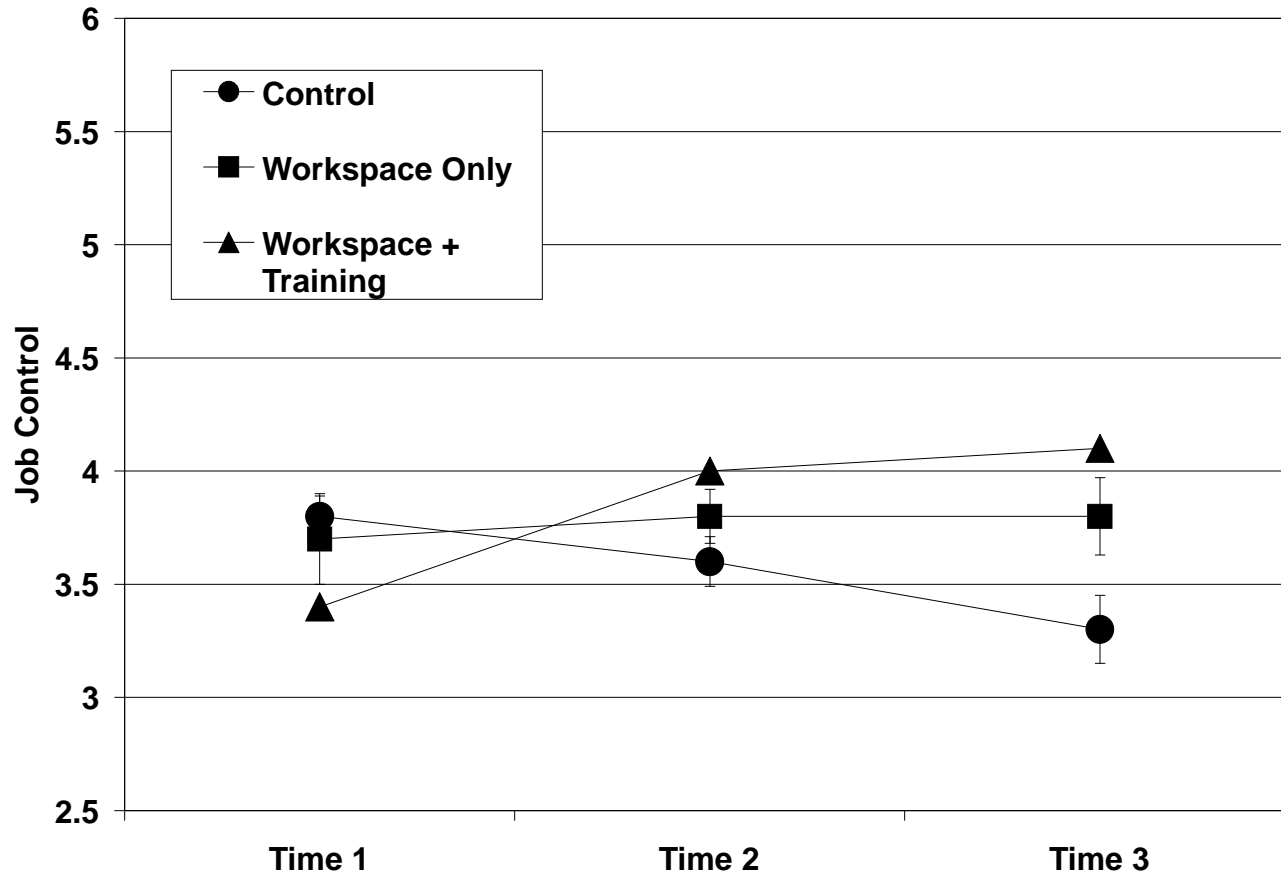
- Recognizing work-related musculoskeletal disorders and risk factors
- Understanding the importance of varying work postures
- Knowing how to rearrange the workstation to maximize the “comfort zone”,
- Recognizing and understanding visual issues in the office environment and reducing visual discomfort
- Understanding computing habits (rest breaks) and knowing how in to change work-rest patterns
- Knowing how to use the various workspaces for individual and group work
- Being aware of the company’s existing health and ergonomic programs
- Knowing how to obtain ergonomic accessories through the company’s programs

Results of Field Intervention: Training and Workspace Design

Musculoskeletal discomfort changes over time for each group

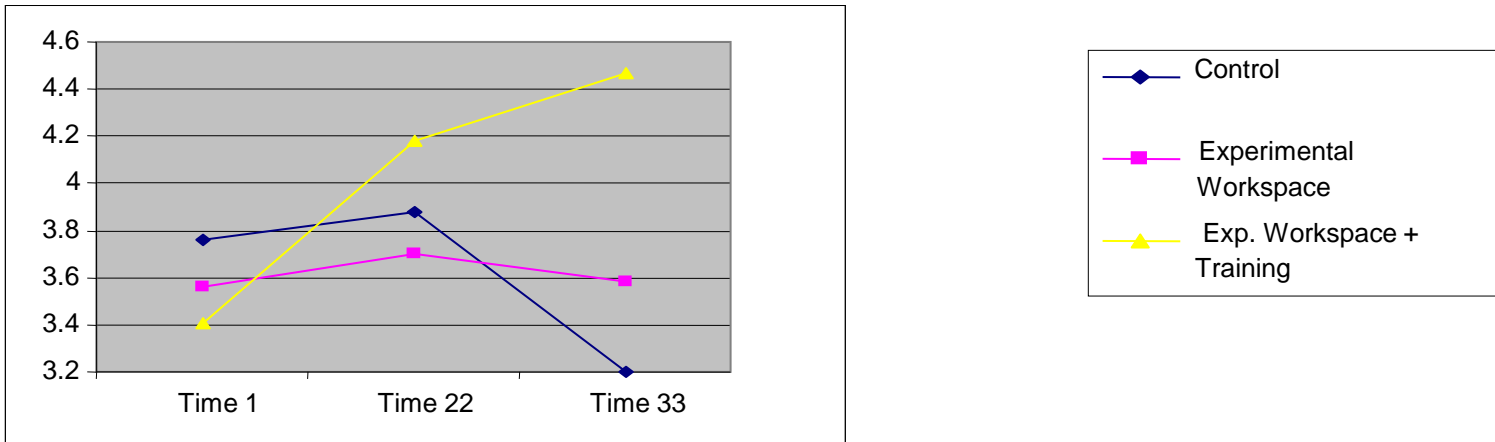


Job Control



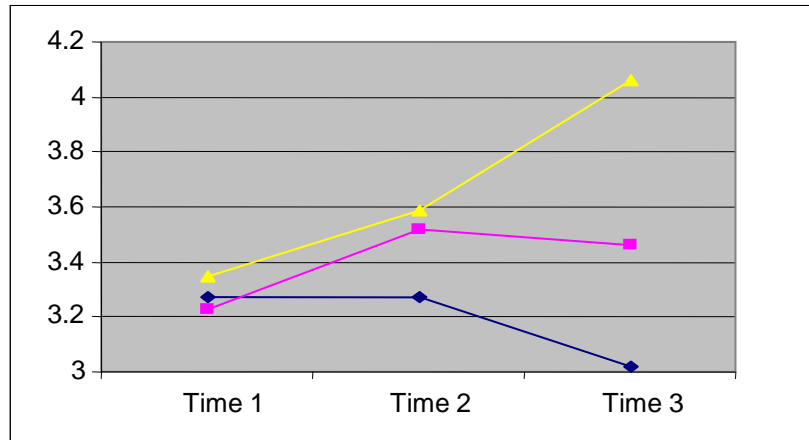
$F(4,378)=2.9, p<.001$; $GR2>GR1 (p<.001)$; $GR3>GR1 (p<.001)$; $GR3>GR2, p=.06$

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

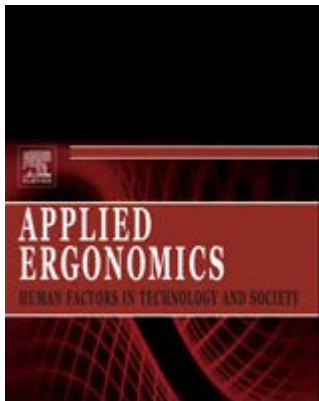
Treatment Group	Process Time Saved (as a percentage of pretreatment process time)
Control	.46%
Exp. Workspace only	5.62%
Exp. Workspace + Training	10.55%

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

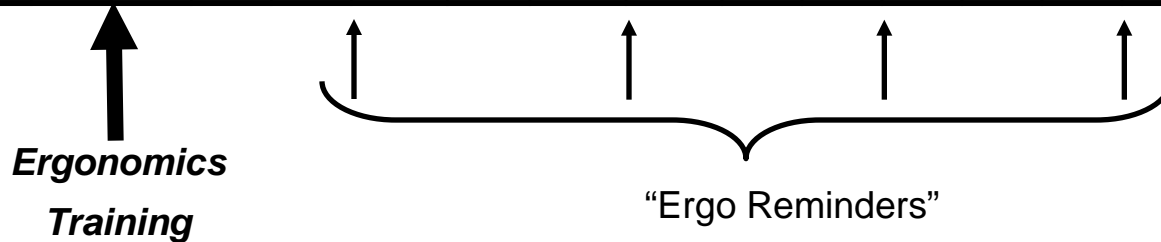


Research Questions

- 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

	<i>Pre-experimental</i>				DayBlock 1			DayBlock 2			DayBlock 3			DayBlock 4			DayBlock 5		
Minimally Trained Control Group	Day 1	Day 2	Day 3	Day 4	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15
Ergonomics Trained Experimental Group	<i>Pre-experimental Task Orientation 4 days</i>				Free Choice			Free Choice			5 Minute Mandatory Standing			20 Minute Mandatory Standing			Free Choice		
	Day 1	Day 2	Day 3	Day 4	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15



Methods: Participants and Tasks

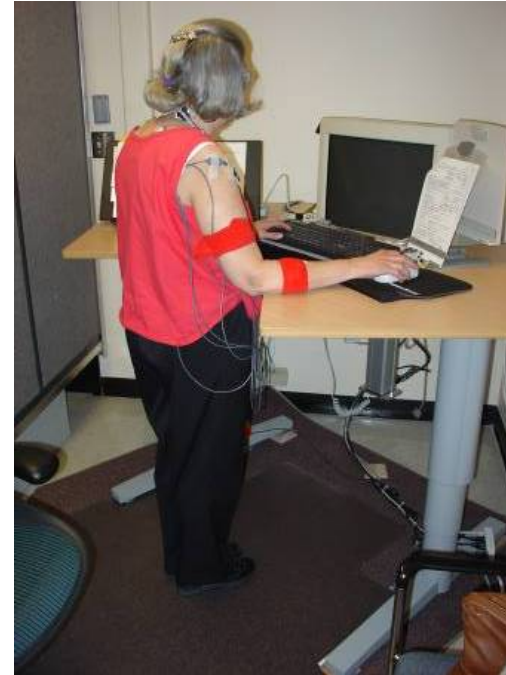
- Participants:
 - 22 healthy females
 - Basic administration computing skills
 - No significant difference between groups for age; BMI ($p > .05$)
- Experimental task and cognitive demand levels:
 - Simulated customer service representative job
 - Based on a job analysis the following were determined:
 - 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

Participant Workstation



Data Collection



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

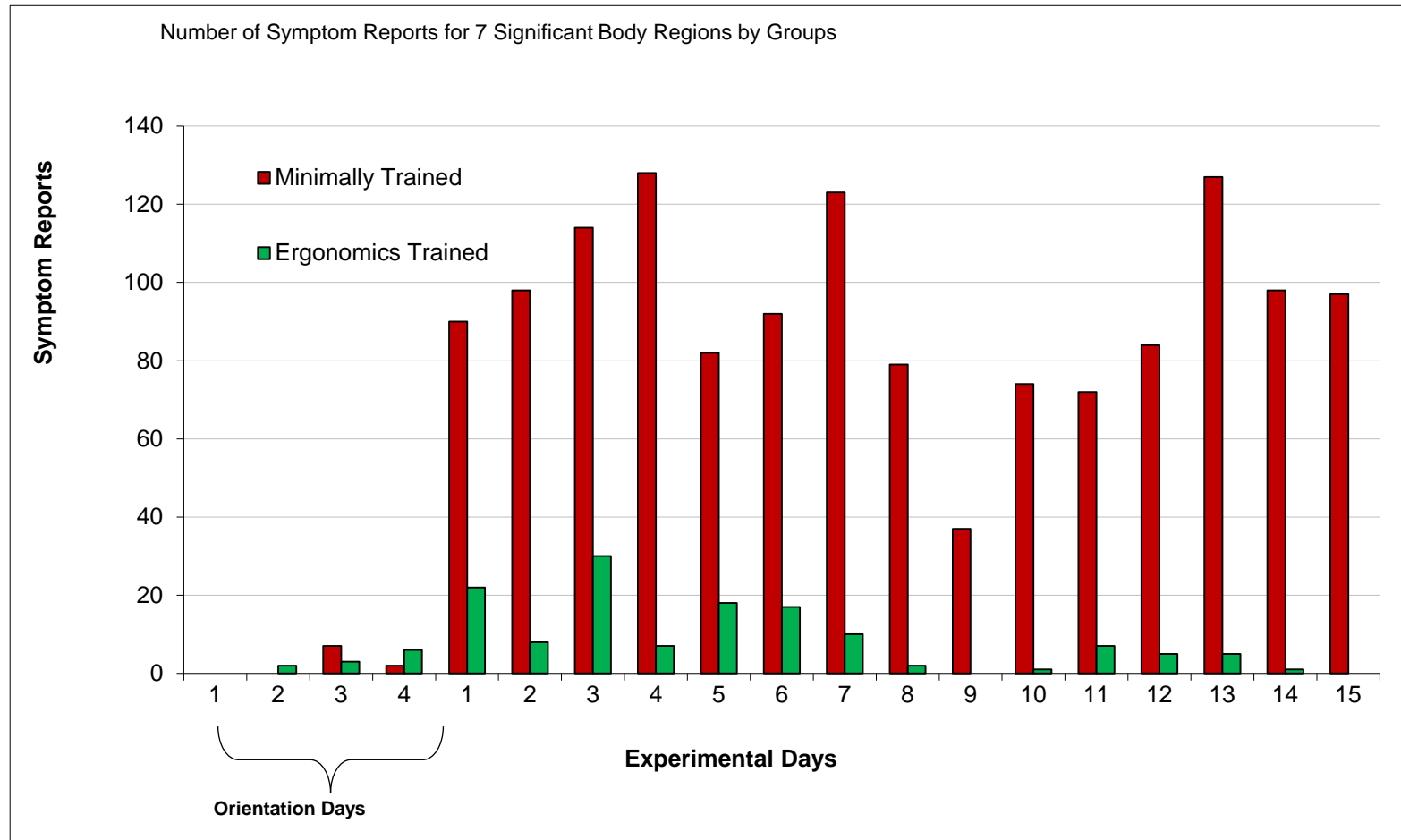
- **Administered:**

- Baseline
- Hourly; 7 sessions per day
- 15 days

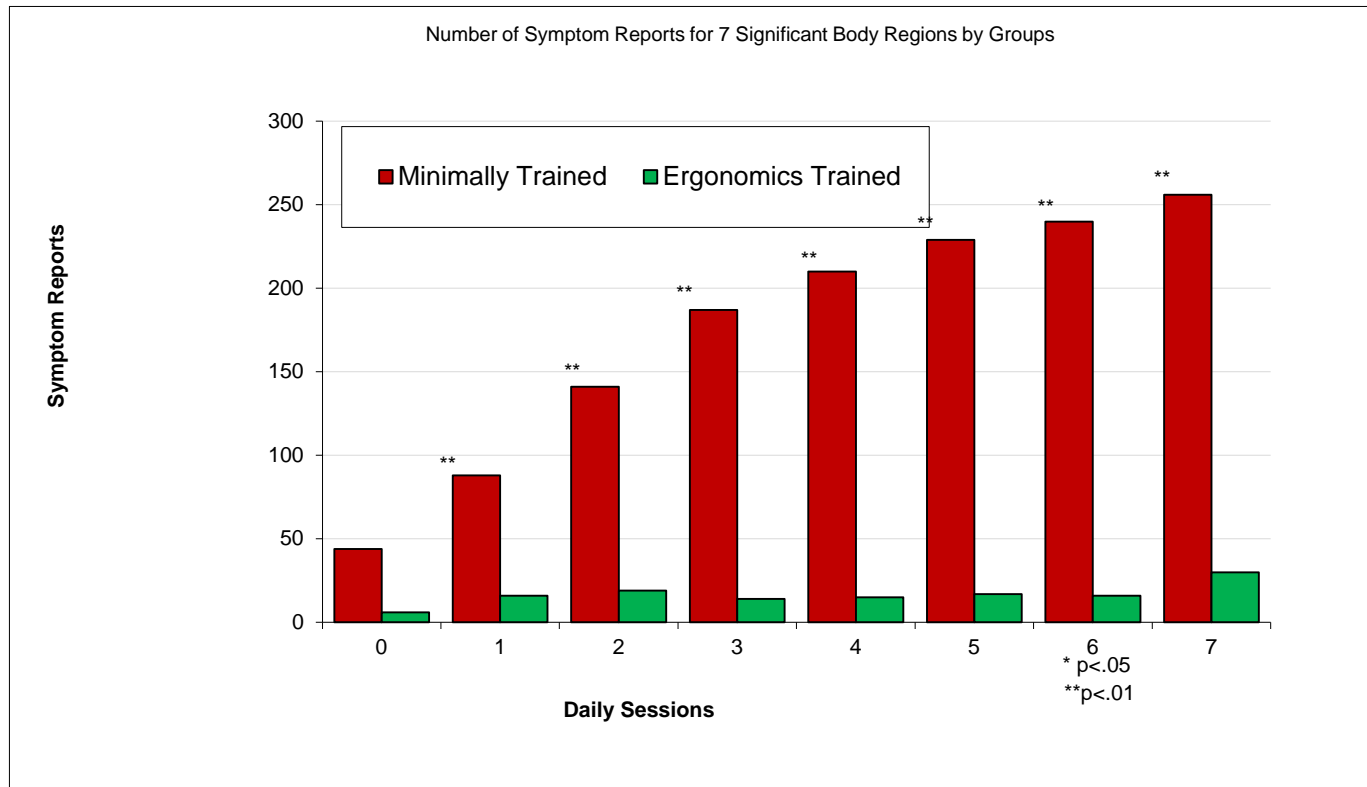
Results

Extended Laboratory Study: Training and Sit/Stand Workstation Design

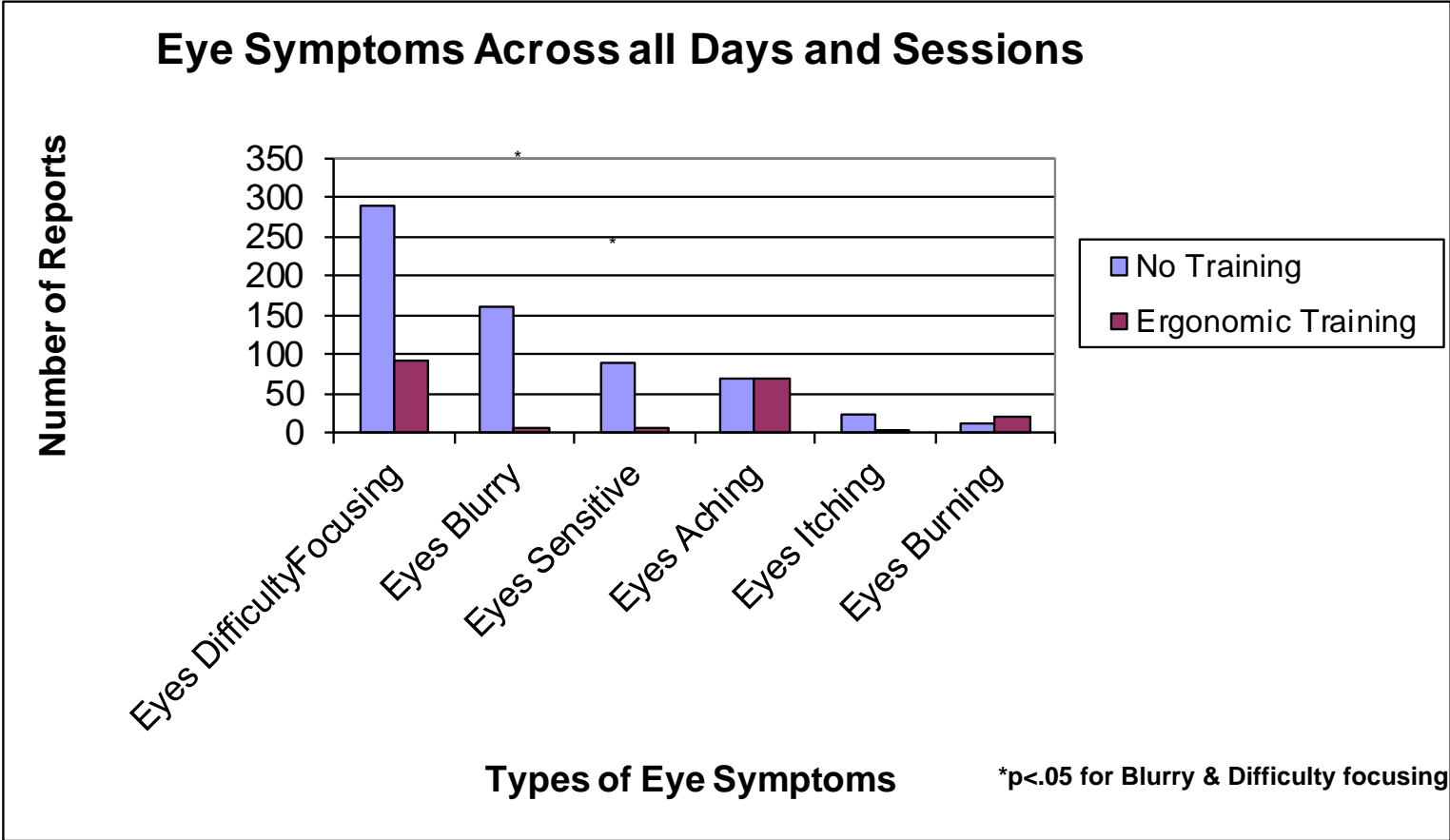
Number of reported musculoskeletal discomfort for Top 7 significant body parts across all days



Reported Musculoskeletal Discomfort for Top 7 Body Parts all Daily Sessions



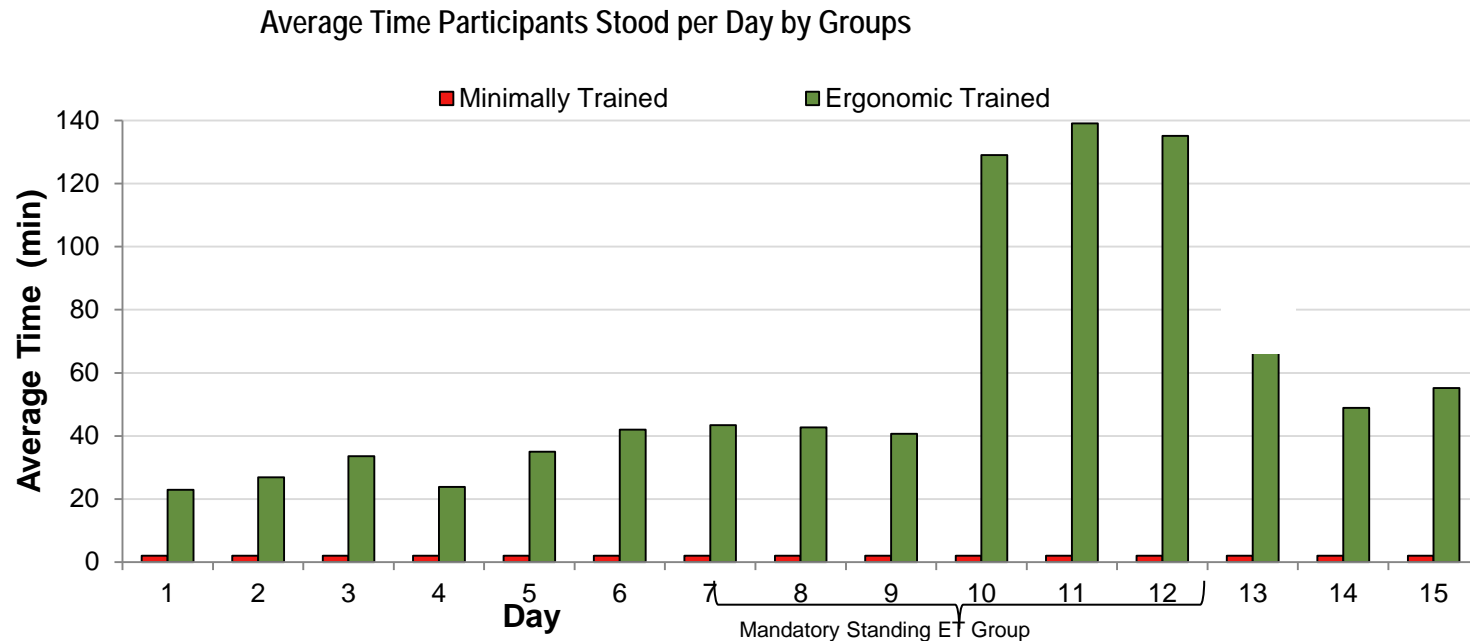
Visual Discomfort



Performance Results: Quantity and Quality

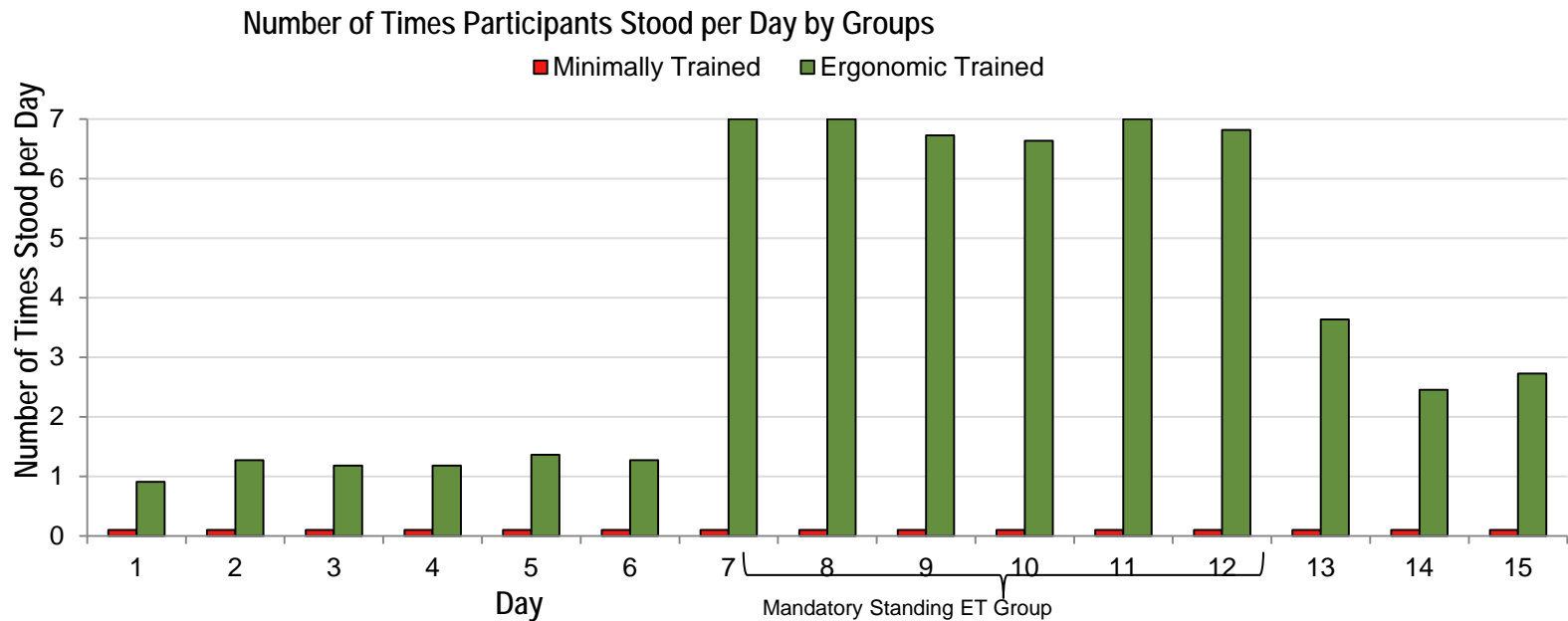
- No significant difference found between groups for the number of faxes completed
- Significant difference found between groups for accuracy across all 15 days
 - Trained group exhibited higher quality scores

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 taxes 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*



Liberty Mutual[®]

RESEARCH INSTITUTE FOR SAFETY

www.libertymutualgroup.com/researchinstitute