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Introduction of new technology

1700s:
• ‘weaver’s bottom’

1800s:
• ‘telegrapher’s wrist’
When work changes, new problems are created.
Tablets: awkward positions in the dominant hand and...
...unanticipated awkward postures in the other hand.
Good ergo anticipates changes in equipment and technology over time
Good Ergo Involves Planning!

Too low for a 6’6” man

Too low for a 5’4” guy!
Q: Why are we working like this?

A: The ironworkers got here first!
Barriers to successful ergo programs

• Denial:
  ‘If I ignore/hide the problem, maybe it will go away’
  ‘It won’t happen to me’ ➔ Panic!!

• Focusing on one simple explanation:
  ‘I’m just out of shape’
  ‘It’s the Aging Workforce’

• Getting emotional:
  ‘All these complainers are just lazy’
  ‘I’m too embarrassed to tell anyone about this’
Fear of reporting discomfort

• Sense of failure, vulnerability, blame
• “Costing Supv/Division time & money”
• “Falling behind in my work”
• Worried about retaliation

➡ Delayed action
Pipe wrench not enough

220 lbs. force required
A Human Performance Approach: Systems Analysis vs. Blame

Blame Game

- 80% Human Error
- 20% Equipment Failures

Human Performance Approach

- 70% due to Organizational Weaknesses
- 30% Individual Errors

DOE, HPI Handbook, 2009
Organizational & Individual Resilience

“Human error/injury is caused not only by normal human fallibility, but also by organizational weaknesses in work processes and values.”

• People cannot perform better than the organization supporting them

• Many error- & injury-prone situations are predictable.
Ergo problems often fly ‘under the radar’, especially if there’s no middle ground.
What we can do

1. Develop ‘middle ground’ bet. **inaction** and **reports**
2. ‘Lower the volume’ re: problems & discomfort
3. Increase use of early warning systems:
   - Walk-throughs for moves; testing new software
4. Look at multiple ways to reduce risk, speed recovery
   - ID activities that trigger discomfort
   - Rapid response for (temporary) ergo modifications
5. Follow-up to assess progress, need for next steps
Rapid response system

Before

After
Rapid response kit for computer use

- Resolve Table: Height Adjustable
- Kinesis Freestyle
- Morencyrest Forearm Support
- Evoluent Mouse
Ergo Display Room:
• Frequent upgrade of items- feedback from users
• Ergonomics Technician
American College of Occupational & Environmental Medicine Recommendations

• “...demedicalization” of Early Discomfort Period
• Give ergonomics, work practice changes, & basic self-care (ice/hot packs) a chance to work during the Early Discomfort Period
• “Early intervention is key to prevent disability”

ACOEM (2006)
Ergo Advocate Program

‘Basic Training’ ➔ First level of an early detection system

- Aware of ergonomics situation in their area
- ID basic problems, implement “quick fixes”
- Assist employees in ordering/setting up equipment
- When needed, escalate problems to Ergonomist, IT, FA
- Monitor progress of ergo modifications for employees
Myth: 90/90 is best

- “Sit up straight!”
- “Keep your elbows, hips & knees at 90°”
- “It’s proper, correct”
- “It’s ergonomic!”
- It’s…BS!!
Most people unload their bodies one way or another
Ergonomics ≠ Rules
ANSI/HFES 100-2007, Human Factors Engineering of Computer Workstations

“… correct the misunderstanding that the 90° posture [is] the correct working posture.”
## Chair Selection Guide

<table>
<thead>
<tr>
<th>Activity Based Posture</th>
<th>Chair Options</th>
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<tbody>
<tr>
<td><strong>Reclined Sitting:</strong></td>
<td></td>
</tr>
<tr>
<td>Computer-focused work</td>
<td>Aeron</td>
</tr>
<tr>
<td></td>
<td>Leap</td>
</tr>
<tr>
<td><strong>Upright/Mild Reclined Sitting:</strong></td>
<td></td>
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<tr>
<td>Variety of work activities</td>
<td>Leap</td>
</tr>
<tr>
<td>Moderate reaching</td>
<td>Soma</td>
</tr>
<tr>
<td><strong>Forward Sit or “Perch Sit”</strong></td>
<td></td>
</tr>
<tr>
<td>- Mix of computer &amp; paper-work</td>
<td>Soma Comfort</td>
</tr>
<tr>
<td>- Frequent reach, write and reference on desktop</td>
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</table>
Research Flash:

2.5-year prospective study of 652 computer users

- With forearm support, an ‘open’ angle at the elbow (>120°), resulted in fewer arm/hand problems

- Chair armrests need to pivot

Marcus AIHAJ 2002
Arm Support

Arm support is not needed for repetitive typing, but *is* needed for static postures.

**Alternatives:**
- Chair armrests
- Push the keyboard farther away, use the desk for arm support
- Arm support attached to the desk
  *Morencyst forearm support ➔*
- Open space under wrist
Need new glasses?
Vision Issues - Glasses

- Bifocals/Progressive lenses change everything!
- ‘Cheaters’ don’t work for computer use (16” focal length)
- Many people are better off with ‘single vision prescription lenses’ vs. bifocals or progressive lenses
**LBNL EH&S Culture Questionnaire:** Indicate below the 3 most important factors you feel contribute to your discomfort:

- Repetitive mouse use: 57%
- Peaks in workload (e.g. with deadlines): 50%
- Repetitive keyboard use: 48%
- Continuous high workload: 32%
- Poor ergonomic work setting or chair: 22%
Mousitis!

Click+drag = 3x strain in tendons:
• Scrolling, Selecting (e.g., highlighting)
• Dragging (e.g., file to folder; resizing graphics)

Eliminate click+drag:
• Use 2 mice – one to click, other to drag
• ‘Drag-lock’ button on pointing device
• Keyboard shortcuts for common click+drag
Problems with Laptops

Before

- Use a laptop riser or external monitor to raise the screen
- Use external keyboard & mouse at a comfortable height

After- Keyboard tray & riser

After- External screen + forearm pad
Work Patterns:

- Take Breaks?
- Hours per week?
- Computer + telephone?
- Overtime & deadlines!
- Use of KB shortcuts?
Evidence-based break times
Myth: Stretching exercises...

1. Can prevent work-related MSDs
2. Useful as warm-ups before an exertion

Best break: get up & MOVE!
My recommendation... STRETCHING EXERCISES!
Stretching the *Other* Way...
Myth: Training in ‘Proper Lifting Techniques’ will make the job safe

“Remo! Lift with your knees, not your back!”
Pipetting- manual

Frequent pipette use (>300 hrs./yr.) is associated with high risk of hand & shoulder problems
Desktop pipettor
Additional awkward grips throughout the cycle of aspiration and dispensing
Test-drive it first!!
Ergo problems- *symptoms* of larger issues
Improvement is everybody’s job

Mixed workgroups working together to solve real problems
Bench top DNA Hood before modification: Inadequate legroom & long reach distances
Mock-up for group input & collaboration w/ Ergo Team
Sinking & tilting + better pipette to reduce awkward postures

Before: Bent wrist
After: straight wrist
Bench top DNA Hood design

Ergonomic features:
1. Recessed area & tilted receptacles reduce awkward wrist postures
2. Padding protects elbows & forearms
3. Programmable pipette (Eppendorf Xstream) improves hand position, reduces force & repetitive movement
Awright!

Summary: The LBNL Ergo Program did not represent a net cost, but a savings of nearly $1,000,000 per year

<table>
<thead>
<tr>
<th>Ergo–Related Injuries/ FY</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
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<tr>
<td></td>
<td>35</td>
<td>35</td>
<td>19</td>
<td>20</td>
<td>11</td>
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Comparison of baseline (FY07) to FY12

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<tr>
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<th>FY07-FY08</th>
<th>FY09-FY12</th>
<th>Savings</th>
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<tr>
<td>Average Annual Ergo-Related Recordable Injuries</td>
<td>35</td>
<td>16</td>
<td>--</td>
</tr>
<tr>
<td>Annual Cost of Ergo-Related Recordable Injuries¹</td>
<td>$700K</td>
<td>$320K</td>
<td>$380K</td>
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2007: Formation of Ergo Team: 2 FTE Ergonomists, 0.9 FTE Consultant, 1 Ergo Technician = ~4 FTEs
2010-2011: Ergo Technician RIF, 3rd Ergonomist hired, Ergo consultants discontinued, = ~3 FTEs
2013: Ira Janowitz retires, Ergo Team = ~2 FTEs

Current Metrics:
1. FY2012: Ergo evals 100% effective when used as first line of defense to PREVENT discomfort from progressing to RECORDABLE INJURY for 246 high-risk ’ees.
2. FY2012: 95% customers with discomfort indicated they maintained their WORK PERFORMANCE level after an ergo evaluation and quick-fix products. 12% Performance decrements are typical for employees with musculoskeletal discomfort² = $560K Cost Avoidance per year
3. FY 2009 to FY 2012: Increased MOVE EVALS resulted in an 86% reduction in related Recordable Injuries (6 to 1 injury/yr.) = $120K Cost Avoidance/yr.
4. FY2012: Partnership with Facilities to create Lab-wide Office Furniture Standards reduced cost/workstation by $600; ergo performance features were improved. During FY12: installation of 600 sit-stand workstations x $600 each = $360K Savings
5. FY2012: Lab-wide Office Furniture Standards created with the goal of moving people and their belongings vs. moving ergo desks and equipment. Savings per move = $800 - $480 = $320 x 600 moves/year with new Standard Furniture = Projected annual savings of $192K

Quality of Service Metrics (based on survey of high-risk evaluations) | FY12
---|---
Reduced discomfort..., effective to very effective | 94%
Ergo Eval & Quick Fix maintained work performance..., effective to very effective | 95%
Ergo Eval performed quickly..., within a few days | 88%
Overall Satisfaction with ergo services..., good to excellent | 100%

Outcome: Projected Annual Cost Savings = $1,492,000 - ~$500,000 Program Cost = ~$992,000
### Ergo Team Quality of Service Metrics

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<th>Responsiveness and Effectiveness</th>
<th>FY12</th>
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The Ergo Program = net cost, but is SAVING LBNL approximately $1,000,000 per year

Ergo Program Cost:Benefit = 1:3; ROI = 3:1

<table>
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<th>Projected annual savings</th>
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<tr>
<td>Decreased Discomfort &amp; Maintained Work Performance</td>
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<tr>
<td>Cost of Ergo-Related Recordable Injuries (incl. Work Comp claims)</td>
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<tr>
<td>MOVE EVALS</td>
</tr>
</tbody>
</table>
| Roll-out new Office Furniture Standards (less $, lower risk) | = $360K Savings  
= $192K Projected savings/yr. |
| **PROJECTED ANNUAL SAVINGS**                      |  = $1,549,000 - $500K program cost |
Everything I learned about teamwork I learned playing baseball:

- Communication
- Feedback
- Respect
- LISTENING!
Organizational Maturity

Integration w/business processes, planning, design & procurement

Collaboration across silos & division barriers

Driver: Recordables

Evaluations of work groups w/ risk factors in common
Preventive ergo evaluations
Lean/continuous improvement
Ergonomics case management
Individual ergo evaluations triggered by discomfort
Incident investigation

Evaluations of software/IT
Ergo screening w/ procurement

TIME

EFFECTIVENESS

PROACTIVE

ADVANCED
Where Does *Your Organization* Fall on This Curve?
References

American College of Occupational and Environmental Medicine, Preventing Needless Work Disability by Helping People Stay Employed. J. Occ. & Environmental Medicine, 09-2006.

ANSI/HFES 100-2007, Human Factors Engineering of Computer Workstations. hfes.org/publications


