Ergonomics for the Health Promotion and Wellness Professional

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Why are we here?

To better understand:

- Basic ergonomics
- Risk factors related to MSDs.
- Methods for reducing MSD risk factors.
- Why combine wellness with ergonomics
- Assist in developing design changes.
- Create an ergonomic and wellness culture
What does Ergonomics at your business look like?
Fast Facts...

★ Repetitive strain injuries are the nation’s most common and costly occupational health problem affecting hundreds of thousands of American workers.

★ Repetitive strain injuries cost more than $20 billion a year in worker’s compensation.

★ Nearly two-thirds of all occupational illnesses reported, were caused by exposure to repeated trauma to workers upper body—the wrist, elbow or shoulder.

—Bureau Of Labor Statistics
What is Ergonomics?

Derived from 2 Greek words:

- ergon meaning **work**
- nomos meaning **laws**

Matching the work station to the individual by design and the individual to the work station by education and selection.

In other words,

“Making the workstation user friendly”
What’s this tea pot have to do with Ergonomics?
The Tale of 3 SUVs
Dashboard gages and controls
Bad Ergonomic Example
Jeep bodies and Jeep trailer bodies were turned out by Auburn Central for both Willys and Ford from 1941 until 1948. They were shipped by the boxcar load to Toledo and Detroit. From the Henry Blommel Collection.
Which one would you prefer to work on?
What does ergonomics do?

• Improve Productivity
• Improve Quality
• Increase Comfort/Decrease Fatigue
• Reduce Risk of Injury
What ergonomics *does not* do?

- Make people adjust
- Make people move
- Make people sit or stand in less demanding ways
- Make people pay attention to signals from their bodies
- Make people accountable for good choices
People are influenced less by the information they receive and more by the environment in which they live/work.

What kind of environment are we creating that supports health and wellbeing?
Ergonomics

- Work Physiology
- Medicine
- Anthropometry
- Behavioral Sciences
- Engineering

Ergonomics
“Ergonomic” Risk Factor

Ergonomic risk factors are exposures that increase the probability of the occurrence of a injury. Generally the greater the exposure to a single risk factor or a combination of risk factors, the greater the risk of injury.

Problem: Dose response levels are not exactly known.
Musculoskeletal Disorders

Disorders of the muscle-tendon unit, peripheral nerves or the vascular system caused or aggravated by repeated or sustain exertions or motions of the body.

Usually this is outside the normal range of motion for that particular body structure.
Examples of MSDs

• Low Back Pain
• Carpal Tunnel Syndrome
• Tendonitis
• Tennis Elbow
• Rotator Cuff Tear
• Arthritis
• Neck Pain
MSD Statistics

- 80% of all workers return to work within 6 to 8 weeks after the injury.
- 10 to 20% who do not return to work consume 80% of the costs.
- 60% of MSDs are back injuries
- 50 Billion Dollars in medical costs yearly.
- Takes 10 to 12 months longer to rehabilitate an individual on workers compensation than on that is not on workers compensation.
Current Trends in the Back Injuries

• Males injured more than females
• Age range most affected is 20 to 30 and above 55 years of age.
• Length of employment most affected by “backache” is 1 to 2 years.
• 85% of “backache” do not have a specific diagnosis (everything looks objectively normal).
Workers Compensation

• Indemnity claims costs have doubled since 1993.

• MSD’s are more than 30 % of all injuries
  – Age 20-35: number one claim remains low back
  – Age 40 and higher: number one claim is shoulder

• Soaring medical inflation and long term unemployed are threats
Disability

- 2006, total cost of workers compensation in the US was $87.6 Billion
- There is a correlation between disability costs and pre-existing health issues and wellbeing.

Source: Hitti, Miranda, Obesity Costly in Workers Compensation, Archives in Internal Medicine, April 2007
The Current State of Ergonomics Regulation

- In 2002 OSHA announced that it would begin formulating and implementing “guidelines” (rather than regulations).
- Each such guidelines will address a specific industry or task.
- You can still be cited for ergonomic issues
You Can Still Be Cited Under The General Duty Clause if:

- You have employees with cumulative trauma disorders.
- There are workplace risk factors associated with cumulative trauma disorders.
MSD Risk Factors

- Repetition
- Duration
- Recovery Time
- Awkward Postures
- Body Mechanics
- Excessive Force
- Excessive Loads
- Static Loads

- Pressure Points
- Use of Power Tools
- Continuous Keyboard Use
- Vibration
- Cold
- Poor Lighting
Some non-work related factors to keep in mind...

**Personal Factors**

- Smoking
- Weight / Body mass index
- Age
- Gender
- Diabetes and hypothyroid
- Orthopedic issues
- Fatigue / Lack of sleep
- Anxiety and depression
Aging

- 13% of the population is over 65
- 25% if the population is over 50
  - the age of decline
- In 30 years, the 65+ population will double to 66 million people
Current trends to prevent Aging

- Cosmetics
- Plastic Surgery
- Hair transplantation
- The Fitness Craze
- Rogain!
Ergonomic Effects of Aging

- Loss of strength
- Loss of muscular flexibility
- Loss of joint range of motion
- Diminished postural steadiness
- Reduced grip strength
- Reduced nervous system responses
- Reduced blood flow and tactile feedback
- Reduced visual capacity
- Slowing of mental processing
Aging Workforce

- Aging workers
  - Strong work ethic
  - Lower absenteeism, greater reliability
  - May take work activities more seriously than younger workers
  - Loyal and dependable
  - Experience to perform the work
  - Invaluable trainers/mentors for younger workers
  - Tend to sustain less injuries/illnesses than younger workers yet treat more
Workers’ Compensation
Emerging Risks/Trends

- Obesity
- Age
- Job dissatisfaction
- Depression
- Diverse workforce
Can you give me one reason why health insurance is so high?
Workers Compensation and Obesity

- Obese workers average 11.65 claims per 100 employees vs 5.8 claims per 100 employees at normal weight.
- Obese employees had $51,091 in medical claims per 100 employees vs $7,503 in medical claims per 100 employees at normal weight. (Ostbey, 2007)
Workers Compensation Costs Related to BMI

Worker Comp Costs per 100 Employees

- BMI < 25
- BMI 25-29.9
- BMI 30-39.9
- BMI > 40

Olmsted Medical Center
It’s NOT an Obesity Epidemic

• Obesity is a condition
• Caused by:
  – Inactivity epidemic
  – Poor nutrition epidemic
Some non-work related factors to keep in mind...

Psychosocial Factors

- High job demands
- High job stress
- Low decision latitude
- Rapid work
- Monotonous work
- Low job satisfaction
- Job stress
- Low social support
- Depression
What is being Assessed?

These 3 questions are part of a screening that is 80% accurate at predicting what?

1. Would you describe your work as monotonous?
2. How satisfied are you with your job?
3. How tense or anxious have you been in the past week?
Off the job: daily activities, hobbies & sports

1. Activity that is awkward
2. Activity that is repetitive
3. Activity that is heavy
4. Activity that causes contact stress
5. Activity that is both awkward & heavy
The body does not like to go the extreme range of motions for a prolonged period of time.
Who should be involved with ergonomics?

• Engineers
• Maintenance
• Sanitation
• Workers
• Management
• Safety/Medical/Wellness
• Human Resources
The Remarkable Hand

- retinaculum flexorum
- m. abductor pollicis brevis
- m. flexor pollicis brevis
- tendine m. flexoris
- mm. lumbricales

m. abductor digiti minimi
m. flexor digiti minimi brevis
m. opponens digiti minimi
The motion and action of the hand is controlled by the muscles in the forearm.
Positions to avoid during repetitive motions

- Extreme Flexion
- Extreme Extension
- Moving toward little finger side
- Any combination of these
Work in “Neutral” as much as possible

Note: the wrist and forearm are straight
Use tools that help maintain your wrist and hand in a neutral position.

Note: bent wrist toward little finger side

Wrist is in “neutral” position
Ergonomic Tools
So what’s so cool about this Gatorade bottle?

Shape and function of the lid

Grip for the hand
Which has the better mirror and windows controls?
Causes of Back Pain

- Posture
- Poor Body Mechanics
- Poor Flexibility
- Poor Physical Condition
- Wear and Tear
- Trauma
Mechanics of the Spine...

- The spine works most efficiently when you maintain a good neutral posture.
- The spine is in a balanced position when the 3 natural curves are present.
- When balanced, the pressure on the discs is distributed evenly and the muscles are in their strongest position.
POSITION OF OBJECT AT START OF LIFT
WHEN BACK INJURY WAS REPORTED

%  
50  
40  
30  
20  
10  

Floor  Waist  Knee  Ankle  Chest  Overhead

Position of Object

Source: U.S.D.L., 1982
When Lifting

- Keep it Close
- Keep the Curve
- Feet first!
- Build a bridge
- Frequent mini breaks when forward bending
Levers and the back
Who is “Average”? 

[Image showing a family and a group of people]
Anthropometry:

- From *anthro*: man
- and *metrics*: measurement
  - anthropometry is the measurement of people: a statistical compilation of the sizes and dimensions of humans.
  - a tool for effective workplace design
5% Female & 95% Male
Frequency Distribution for Height
## Anthropometric Charts Standing and Sitting

<table>
<thead>
<tr>
<th>MEASUREMENT</th>
<th>MALES</th>
<th>FEMALES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SIDE VIEW STANDING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Forward Functional Reach</td>
<td>35.6</td>
<td>31.7</td>
</tr>
<tr>
<td>2. Elbow Height</td>
<td>46.5</td>
<td>42.7</td>
</tr>
<tr>
<td>3. Waist Height</td>
<td>45.4</td>
<td>43.3</td>
</tr>
<tr>
<td><strong>FRONT VIEW STANDING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Knuckle Height</td>
<td>32.3</td>
<td>30.6</td>
</tr>
<tr>
<td>5. Shoulder Height</td>
<td>60.5</td>
<td>56.3</td>
</tr>
<tr>
<td>6. Eye Height</td>
<td>68.7</td>
<td>63.2</td>
</tr>
<tr>
<td>7. Siature</td>
<td>73.0</td>
<td>67.7</td>
</tr>
<tr>
<td>8. Functional Overhead Reach</td>
<td>87.9</td>
<td>84.0</td>
</tr>
</tbody>
</table>

*Figure 2a Anthropometric Data Tables for a Standing Posture*
Human Factors

• Design for expectations
  – Alarms
  – Colors
  – Knobs
  – Switches

• Avoid confusion
Human Factors: Expectations
Human Factors: Expectations
Prevent MSDs, 4 step approach:

ANALYZE
MINIMIZE
NEUTRALIZE
WELLNESS
## ANALYZE:
### Observation Methods

<table>
<thead>
<tr>
<th>Passive Method</th>
<th>Active Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA 300 Log</td>
<td>Physical job descriptions</td>
</tr>
<tr>
<td>Workers’ Compensation Data</td>
<td>List of Job Titles and Related Risk Factors</td>
</tr>
<tr>
<td>Safety Performance</td>
<td>Walkthrough</td>
</tr>
<tr>
<td>Medical Records</td>
<td>- Job Checklists</td>
</tr>
<tr>
<td></td>
<td>- Job Analysis</td>
</tr>
<tr>
<td></td>
<td>Employee Questionnaires</td>
</tr>
</tbody>
</table>

*Olmsted Medical Center*
MINIMIZE:

• Repetition:
  ▪ job rotation (between muscle groups)
    ▪ Administrative Controls
  ▪ reduction of unnecessary motions

• Force:
  ▪ reduce the weight
  ▪ minimize the distance
  ▪ push, don’t pull heavy loads
NEUTRALIZE:
Awkward postures and joint positions.

If it looks uncomfortable
It probably is!!!
Posture
Posture
Good Spinal Posture  Poor Spinal Posture

GOOD  POOR
Neutral Postures:

- Neutral postures are postures with minimal deviation from the midline of the body.
- An upright posture, with elbows held close to the body and hands in the "hand shake" position.
Space Walks / Sleeping
The Art of Standing

- Staggered Stance
- Slight Bend in the Knees
- Get a Foot Up
- Move!!!!
The Art of Sitting

- Get as close to neutral as possible
- Keep the trunk in a neutral position
- Move!
- Move!
- Move!
- Move!
Elbow Height:

• Elbow height is the distance from the floor to the elbow whether seated or standing.
• Most work should be positioned at elbow height, set precision work a 3 inches above elbow height and heavier work below the elbow.
The Ergonomic Zones
The Green Zone
In the Green Zone
The Yellow Zone
The Red Zone
The Red Zone
Workplace Solutions

Design / Engineering options:

- Minimize the horizontal reach
- Evaluate the vertical distance from the floor
- Change the employee’s position
- Reduce the weight of the material
- Change the workplace layout
- Change the frequency
- Consider an assistive device
- Automate or semi-automate
Workplace Solutions

Administrative options:

- Rotate
  - Muscle Groups
  - Employees
- Decrease length of time at position
- Add more employees
- Slow down the line
Workplace Solutions

Behavioral options:

- Education
  - What is ergonomics
  - Body mechanics / Lifting
  - Stretching
- Wellness programs
  - Activity based
  - Tobacco cessation
  - Stress management
  - Shiftwork management
  - Sleep
WELLNESS

• Maintain good physical condition
• Quit smoking
• Take frequent mini-breaks to relax, stretch and walk about
• Do warm up or stretching exercises prior to start of shift or during breaks
Can we have an impact on this guy?
Athlete and Industrial Worker
The Vikings, of course, knew the importance of stretching before an attack.
Workstation Exercises

- Blink!!
- Look away
- Stand up
- Bend backwards
- Reach for the sky
- Move your hands and fingers
- GET THE BLOOD FLOWING!!!
Stand up and bend backwards
Chin Tuck

• Look straight ahead and tuck your chin in.
• Use your index finger to guide.
• Hold for 5 seconds
• Repeat 5 times
Shoulder Shrugs

Shoulders
Relaxed

Shoulders
Tightened
Neck Stretch
Hand and palm stretch
Stretches to the Elbow and Forearm

Elbow out straight palm down, hold for 10 seconds. Elbow out straight palm up, hold for 10 seconds
Activity Based Wellness
Up or Down

The Upward Spiral
…the more you do, the better you feel, and the more energy you have; so the more you do…

The Downward Spiral
…the less you do, the less energy you have and the worse you feel, so the less you do…
Starting to Look a Little Like The Old Guy Himself? Sign Up For WOW Today!
Who's in first??
Work Place Health

- Repetitive Motion
- Sitting
- Blue Collar
- White Collar
Would You Believe...

★ If you type 40 words a minute, you press 12,000 keys per hour or 96,000 keys per 8-hour day.

★ Approximately 8 ounces of force is necessary to depress one key.

★ Almost 16 tons of force will be exercised by your fingers.
Poor Workstation Layout
Computer Workstation Layout

✓ Eyes near top of screen
✓ Shoulders relaxed
✓ Elbows at 90-110 degrees
✓ Arm and wrist rests
✓ Mouse at same level
✓ Chair with lumbar support
✓ Feet resting on floor
The Chair

- Adjustable
- Lumbar support
- Arm rests? (may not need them)
- Comfortable seat pan
- Easy to transport
Which has the better seating?
Monitor Height

- Sit with good sitting upright posture
- Look straight ahead of you so your eyesight is parallel with the floor
- Your sight should be at tool bar level
If you wear bifocals

• Adjust the chair so you are in a good upright posture.
• Adjust the monitor height so you can focus on the screen without tilting your head back.
• Adjust the keyboard and mouse accordingly.
On the phone a lot?

- Avoid holding the phone between your shoulder and head
- Use a head set while on the computer and the phone
Keyboard and Mouse
Work in “Neutral” as much as possible.

Note: the wrist and forearm are straight.
Reduce Glare
Clean the Screen!
How to solve a glare problem

- Computer screen should be parallel to overhead lights
- Computer screen should be perpendicular to outside light
- Try task lighting
- Try a glare screen
Standing Workstations
Traditional Office
### Office Ergonomics in the 21st Century

<table>
<thead>
<tr>
<th>Type of Worker</th>
<th>Tools Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchored</td>
<td>Desktop PC</td>
</tr>
<tr>
<td>Campus Mobil</td>
<td>Lap top</td>
</tr>
<tr>
<td>Travel Mobil</td>
<td>I-Pad</td>
</tr>
<tr>
<td>Distributed Worker</td>
<td>Thumbdrive</td>
</tr>
<tr>
<td></td>
<td>Broadband</td>
</tr>
</tbody>
</table>
Knowledge Workers
(it all adds up)

- Commuting
- Sitting at work
- Watching TV
- Video Games
- Armchair Sports

\[ \text{Total Time} = 7.7 \text{ hours} \]
Tele Commuting
Too Much Sitting

• Loss of contractile stimulation of postural muscles.
• Suppression of lipoprotein lipase (LPL) activity
• Decrease in triglyceride uptake
• Decrease in high density lipoprotein (HDL) production
• Reduced glucose uptake
• Musculoskeletal disorders

Science Daily, July 2010
Sitting Induces Muscular Inactivity

Static Loading On The Body

- Obesity
- Hypertension
- Diabetes
  - High blood glucose
- High Cholesterol
  - Low HDL (good cholesterol)
  - High LDL (bad cholesterol)
  - High Triglycerides
- Depression
- Neck Pain
- Low Back Pain
- Carpal Tunnel Syndrome

Sitting Disease

Sedentary time is defined as muscular inactivity rather than lack of exercise
The Active Office

• Walking Meetings
  – Lanyard to identify meeting in progress
  – Carpet tape to mark walking paths

• Active Conference Rooms
  – No chairs
  – Steppers

• Take The Stairs Campaign

• Stretch Breaks

• Stand up Desks

• Walking Workstations
The Active Office
Workplace of the Future Mayo Clinic
WELLNESS CULTURE

• Do warm up or stretching exercises prior to start of shift or during breaks
• Walking meetings
• Active conference rooms
• Encourage frequent mini-breaks
• Have healthy food available
• Tobacco policy
• Take the stairs campaign
• Flex time
• Fun health contests
• Accessibility
Ergonomic Culture

- Employees
  - Training
  - Health and Wellness
  - BOS

- Production Process
  - Engineering
  - Administrative Controls
  - Scheduling
  - JSA

- Product
  - Engineering
  - Packaging Design
  - Cost/Case
  - Customer Desires
Ecological Health & Safety Model

- Individual Level
- Healthy Behavior
- Physical Environment Level
- Social and Cultural Level
How can this be improved?
Workstation Problem
“Can’t figure out why my neck hurts?”
How can this be improved?
Ergonomics Discussions

• Where does ergonomics belong in your organization?

• What is the role so wellness with ergonomics?

• How would you set up an ergonomics program?
What We Have Covered

• Importance of Health / Wellness and Ergonomics
  – Risk factors
  – Prevention
    • Education
    • Analysis
  – Follow up
• Areas of most concern
  – Hand
  – Back
• The Office
• Where does ergonomics belong??