Office and Laboratory Ergonomics

WSU - TFREC
Safety Training
What is “Ergonomics”? 

• Ergonomics is the scientific study of human work 
• Ergonomic principals adapt work to a specific person by designing tasks & tools or equipment to fit the individual to prevent injuries to the musculoskeletal system 

  OR 

• Fitting the task to the person
What are the benefits of ergonomics?

• Reduction of work-related injuries
• Increased worker productivity
• Increased work quality
• Reduced absenteeism
• Increased morale
Where can Ergonomics be Applied?

- Office
- Shops
- Laboratory
- Agriculture
- Construction
- Manual Material Handling

Anywhere!
Risks of Ignoring Ergonomics

• **MusculoSkeletal Disorders (MSDs)**
  • MSDs are soft-tissue injuries to muscles, tendons, ligaments, cartilage, blood vessels and nerves that usually develop gradually
  • Can be serious, if not taken care of early
  • Also know as:
    • Cumulative Trauma Disorders (CTDs)
    • Repetitive Strain Injuries (RSIs)
    • Overuse injuries
Common MSDs

MSDs affect parts of the body when demands on them go beyond what they can handle. Typically they occur in the moving parts of the body like the neck, back, shoulder, elbow, wrist and knee.

- Low Back Injury
- Carpal Tunnel Syndrome
- Tendonitis
- Tenosynovitis
- Epicondylitis
- De Quervain’s Syndrome
MSD Signs and Symptoms

- Discomfort
- Aching
- Pain
- Swelling
- Loss of range of motion
- Stiffness or tight muscles
- Hands or feet feel like they are falling “asleep”
- Fatigue
- Numbness
- Tingling
- Burning sensations
- Shooting/stabbing pains
- Weakness or clumsiness in the hands; dropping things
When are MSD Symptoms a Concern?

• Having one or more symptoms does not necessarily mean a person has an MSD

• However, a task should be evaluated when:
  • The person associates symptoms with specific movements/ postures and/ or tasks
  • The symptoms are chronic
  • They appear to worsen throughout the work day & week, with some relief in the evenings and on the weekends
Get Treatment Early!

• MSDs are preventable and reversible if they are identified early
• Early modifications to work conditions help prevent permanent injury
• Ignoring symptoms can lead to injuries requiring more intensive treatment, including surgery

• Early treatment is more successful
• Untreated symptoms and injuries might result in permanent disability
Are You at Risk for MSDs?

Do you:

…perform frequent repetitive motions?
…bend at the waist or twist when lifting objects?
…lift push or pull objects throughout the day?
…sometimes use the wrong tool for the job?
…grasp tools with your fingers?
…forget to take breaks while working?
…feel like you are under stress?
…have to stretch to reach your work?
…forget to adjust your work area to fit your task?

The more you answered “yes”, the greater your risk.
Risk Factors for MSDs

The causes of MSDs are considered *multifactorial*

Exposure to the following risk factors or combination of risk factors might lead to an MSD

- Awkward and Static Postures
- High Hand Force
- Highly Repetitive Motions
- Mechanical/Contact Stress
- Computer Vision Syndrome/Lighting
- Vibration
- Cold Temperature
Awkward and Static Postures

- Reaching up and over the keyboard to use the mouse
- Using the keyboard/mouse with unsupported arms
- Leaning forward to read papers on the desk
- Typing with bent/deviated wrists
- Turning the head to one-side to view monitor
- Cradling the phone
High Hand Force

Office tasks can require only moderate amounts of force, but applied with very small muscle groups.

- Tightly gripping the mouse or telephone
- “Pounding” on the keys
- Grasping thick file folders
- Lifting heavy manuals with one hand
- Stapling, stamping, or 3-hole punching
Highly Repetitive Motions

Repeatedly performing same or similar motions without recovery time can lead to discomfort or trauma.

- Using the keyboard
- Using the mouse
- 10-keying
- Filing
Mechanical/Contact Stress

Caused by hard/sharp surfaces pressing into soft tissues

• Resting wrists on desk edge
• Leaning elbows on hard armrests or work surfaces
• Sitting in a chair that places pressure on the back of the thighs
Computer Vision Syndrome

Collection of symptoms associated with viewing a monitor for prolong periods:

- Burning, itchy, watery or dry eyes
- Headaches
- Eyestrain/blurred vision
- Neck & back aches

20/20/20 Rule

- Every 20 minutes
- Focus 20 feet away
- For 20 seconds

Prevention: 20/20/20 rule, workstation design, a clean monitor, frequent blinking, prescription eyewear
Computer Workstation Design

- Good design minimizes awkward and static postures
- Sit in a neutral posture
- Frequently change postures
- Locate equipment and materials based on use

![Bad Posture](image1)

![Good Posture](image2)
Computer Workstation Design

Ten factors to consider when designing/ modifying a computer workstation:

1. Chair adjustability
2. Desk height and keyboard/ mouse tray
3. Input devices
4. Monitor type, location & height
5. Location of work materials
Computer Workstation Design

Ten factors to consider when designing/ modifying a computer workstation:

6. Multi- user vs. single user workstations
7. Tasks – multi- tasking vs. single task
8. Right- or left- handedness
9. Ambient and natural lighting
10. The interaction of the above factors

Good Design = Desired Behavior
Computer Workstation Design - Chair

Chair should be equipped with the following adjustable features:

- Height
- Arm rests
- Back rest/lumbar support
- Seat pan depth and tilt

Ideally the chair is fitted to the user and then the workstation is adjusted to seated user.
Computer Workstation Design - Desk

Desk and keyboard/mouse tray height:

• Dependent on the height of the seated user
• Should keep the body in neutral postures
• Tray should be adjustable to accommodate changing postures and different users
• Tray location dependent on tasks and handedness
Computer Workstation Design - Desk

• Tasks and user handedness affect design:
  • Configuration – standard, “L” or “U” shaped
  • Required desk top writing/work space
  • Single task vs. multi-tasking
  • Document holders vs. desk slants
  • Telephone use
  • Other equipment (i.e., 10-key)
Computer Workstation Design - Input

Wrists and arms should be in neutral positions
Computer Workstation Design - Monitor

Computer monitor should be:

• As far away from user as possible and still comfortable to see
• Directly in front of user
• Top tilted away from user
• Top of screen level with eyes (Lower for bifocal wearers)

Other considerations: CRT vs. LCD; lighting and glare
Office Lighting

- Overhead lights (low glare lenses or louvers)
- Indirect lighting
- Task light
- Direct light
- Screen
- Document Holder
- Window
- Vertical blinds
Office Lighting

Computer workstation lighting considerations:

• Frequency and duration of computer use
• Computer and non-computer tasks
• Sources of glare
• Full-spectrum lighting
• Lighting levels
  (35-50 foot candles)
Task Variability

Task variability offers several advantages:

- Opportunity to change postures
- Users will be more alert and productive
- Different tasks use different muscle groups
- Provides recovery time and pauses for stretches
- Tasks with highly repetitive motions and high hand forces can be spread out during the day
Laptops and Tablet Computers

- Laptop and tablet computers pose unique ergonomic considerations when used like a desktop computer
- Laptops violate a number of basic ergonomic principles
- Use an external mouse and keyboard (and possibly a monitor)
Common Laboratory Activities

- Pipetting
- Microscopy
- Fume Hoods/Biological Safety Cabinets
- Micro-Manipulation & Fine Motor Skills
- Standing Work
- Lifting

Good design = Desired postures & motions
Risk Factors: Pipetting

• Repetitive motions – hands, forearm and thumb
• Pinch grips – handling tips and vials
• Bending and twisting of the wrist
• Neck bent forward or to the side and/or jutted chin
• “Winged” elbows
• Excessive force of the thumb
Preventative Measures: Pipetting

- Electronic or latch-mode pipette instead of manual plunger
- Use thin-walled tips that are easy to eject
- Limit periods of continuous pipetting to 20 minutes (2 minute micro-breaks)
- Adjust height/position of sample holders, containers and waste receptacles to ensure neutral postures
- Ensure proper back and thigh support by using adjustable stools or chairs with foot/arm rests
Risk Factors: Microscopy

• Awkward and static posture of the neck and back
• Lack of leg/knee clearance under work table
• Eye strain and fatigue
• Wrist and arm contact stress
• Pinch grip when making adjustments
• “Winged” elbows
Preventative Measures: Microscopy

- Extended eye tube and/or variable height adapter
- Adjust eyepiece’s height to allow head and neck neutral posture
- Position microscope close to the user
- Avoid arm and wrist contact pressure (pad sharp & hard edges)
- Ensure feet are flat on the floor or use a foot rest
- Reduce repetition motion and prolonged awkward postures by taking micro-breaks
Risk Factors: Fume Hoods

- Repetitive motions of the hands and wrists
- Constrained knee and leg space in fume hoods and older biological safety cabinets (BSCs)
- Awkward and static postures of the neck, torso, legs, arms and wrists
- Contact stress on the forearms, wrists and knees and/or legs
- Working with “winged” elbows
- Eye strain
Preventative Measures: Fume Hoods

- Position materials as close as possible to avoid extended reaching (at least 6” back for fume hood)
- Avoid contact stress – apply foam padding
- Reduce eyestrain and awkward postures by keeping viewing window of hood/BSC and line of sight unobstructed
- Make sure hood/BSC lighting is working properly
- Use a ergo-task chair or stool with foot rest
- Take micro-breaks
Risk Factors: Fine Motor

• Repetitive motion
• Force
• Awkward postures
• Contact stress

Forcep Ergo-Grip
Preventative Measures: Fine Motor

- Use plastic vials with fewer threads to reduce twisting motions during capping and uncapping lids
- Use small pieces of foam where fingers and forceps articulate
- Practice using forceps between first and second digits
- Tilt storage bins towards workers
- Take micro-breaks
Risk Factors: Standing

Associated Risk Factors:
- Static Postures
- Awkward Postures – neck, head and arms

Associated Health Concerns:
- Sore feet
- Swelling of the legs
- Fatigue
- Low back pain
- Neck pain
Preventative Measures: Standing

• Proper shoes
• Change in posture
• Walking
• Footrests
• Sit-stand stools
• Anti-fatigue mats
Your Role

- Let your supervisor know if you are experiencing symptoms
- Evaluate your workstation and tasks
- Consider different equipment
- Change the way you perform tasks
- Take micro-breaks & increase task variability
- Assess home computer workstation and tasks
- Keep fit – exercise (aerobic, flexibility and strength)
- Consult with your physician and eye care professional
- Listen to your body!
Don’t be a Slouch!