Occupational Hazards in Laboratories

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Introduction

- What is the goal behind creating a healthy environment?
  - To prevent injuries
  - To reduce absenteeism
  - To improve performance and increase production
Introduction

- Is creating a healthy environment enough to improve performance?

- Environment
- Person
- activities
Introduction

- The formula

\[ \text{Performance} = \text{Person} + \text{Activities} + \text{Environment} \]
Introduction

Person

Activities

Environment

Performance
Introduction

- Main Concept
  - Change or modify or adapt the environment, activities, and person’s intrinsic factors to fit the person’s physical factors rather than the person physically tries to meet the demands of the environment, activities, and person intrinsically.

  - Because each person has limited physical abilities.
Laboratory Environment

- Components
  - Equipment
    - Chairs, tables
  - Light
  - Temperature
Laboratory Environment

Equipment

- Chairs
  - Without back support
  - Missing or un-adjustable armrest
  - Un-adjustable height
  - Leading to
    - Low back pain, neck and shoulder pain, burning sensation in back of thighs, numbness in feet
Laboratory Environment

- Solution
- Use ergonomic chairs
- Must include
  - Back support
  - Adjustable armrest
  - Adjustable height
  - Casters
Laboratory Environment
Laboratory Environment

Equipment

- Tables
  - Standard height for all users
  - Causing
    - Back pain
    - Neck pain
    - Numbness of the hands
Laboratory Environment

Solution

- Adjustable tables
- Must have clearance for feet and chair
Single fingertip control release lever makes height adjustable worksurfaces easy to use and operate.

Smooth Glide Counterbalance handle accommodates surface loads to 90 pounds.

20” of vertical adjustment allows a greater working range of body motion.

26” to 46” height range for sitting or standing.

Worksurface can easily be adjusted to the appropriate height for different users and tasks.

Safety lock prevents sudden surface movement if the load is significantly unbalanced.
Laboratory Environment

Lights
- Present of back or front light
- Present of dim lights
- Leading to
  - Unclear vision
  - Eye irritation
  - Eye redness
  - Eye fatigue
Laboratory Environment

Solution for Light

- Ceiling light

- Direct light on project

- Side lighting when outside natural light used
Laboratory Environment
Laboratory Environment

Temperature

- Low or high temperature
  - Diminish executive function, attention, decision making, and problem solving

- Alter mood

- Leading to making errors
Laboratory Environment

Optimal Temperature

- **Summer**
  - 19 – 22 C

- **Winter**
  - 21 – 23 C

- Must include ventilation
Person

Factors

• Physical

• Cognitive

• psychosocial
Person

Physical Factor

- Bones
- Muscles
- Nerves
(Spinalis)
(Longissimus)
(Ilio-costalis)
PERIPHERAL NERVOUS SYSTEM

- Brain
- Cerebellum
- Cranial nerves
- Cervical nerves
- Spinal cord
- Radial nerve
- Median nerve
- Ulnar nerve
- Thoracic nerves
- Lumbar nerves
- Sacral nerves
- Sciatic nerve
- Tibial nerve
- Peroneal nerve
Person

- Sitting and standing
  - Constant loading on lumbar region even with upright posture
  - Increase muscular activities with the slightest extension or flexion
  - Prolonged sitting or standing causes cumulative loading
  - Greater loading while sitting than standing
Person

- Example of working day
  - 5 hours, 4 samples in an hour, 10-15 minutes each sample
  - 200 minutes of neck and back flexion and low back loading

- Neck muscles generate force equal to 100 N at a given moment to maintain the head in this position
  - Imaging for to 200 minutes!!!!!!!
Person

- Example of working day
  - If there is a 25 years old male worker weighting 75kg
    - Then there is over 200kg of constant loading on low back during repetitive motion of the back
Person

- Sitting and standing laboratory activities
  - Causes
    - Low back pain
    - Neck pain
    - Shoulder pain
    - Numbness in hands
    - Numbness in feet
Person

Solution

- Taking frequent rest breaks
  - Take short break and close your eyes after each examined sample
  - Take 5 minutes away from work station every 45 minutes

- Combine sitting and standing activities

- Marinating natural posture of the entire body
Person

Solution

- Use ergonomic chairs
  - Must sit against the back rest

- Use adjustable tables

- Redesign of the microscope
  - Increasing the length of the eyepiece to allow natural posture of neck and back
Person

Solutions

- Placing tools and supplies within arm reach to minimize flexion and accidents

- Sit close to work area

- Spread microscope work throughout the working hours and try to share work with others if possible
Person

Cognitive Factor

- Includes attention, decision making, memory, problem solving

- A link between physical pain and cognitive function
  - Increase physical pain, reduces cognitive function, leading to error, reducing performance
  - Reduced cognitive function due to extrinsic factors leads to injuries and in turn reducing performance
Solution

- Creating a healthy environment
- Changes to life style
  - Reduce work pressure
    - 3 samples instead of 4 sample in an hour
  - Exercise
  - Healthy nutrition
  - Manage weight when overweight
  - Stop smoking
Person

- Psychosocial Factor
  - These are the intrinsic (psychological) and extrinsic (social) factors
    - Including fear, anger, gob satisfaction, work and home pressure and problems, uncooperative coworkers or boss
    - Could be due to work injury

- Likely to reduce cognitive function and in turn causes errors, accidents and injuries which reduce performance
Person

Solution

• Creating a healthy environment is one way but not enough

• Adaptation is the solution for psychosocial factors
  • Sensibly deal and master the challenges of the environment
  • Ongoing process
    • Sometime comes natural and other times requires the person effort
Adaptation Model

Person

Challenge

Performance

Reaction

Result

Evaluation

Positive

Negative

Person’s Environment
Activities

- Activities related to laboratory use
  - Microscope
    - Vision and use of knobs
  - Lifting and carrying of tools
  - Use of small tools

- Most activities require repetitive use of the hands
  - May cause fingers and wrist pain
  - May cause carpal tunnel syndrome
Activities

Solution

• Minimize repetitive motion of the wrist

• Minimize twisting and turning of hands

• Use of tubing and padding to reduce pressure and force
Activities

Solution

- Use tools and equipment that are right size for the hand if available

- Use thin, flexible gloves that fit properly
Thank you for Listening

Comments and questions