

Occupational Hazards in Laboratories

Dr. Musaed Alzeid Alnaser
Occupational Therapy Department

Introduction

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

Introduction

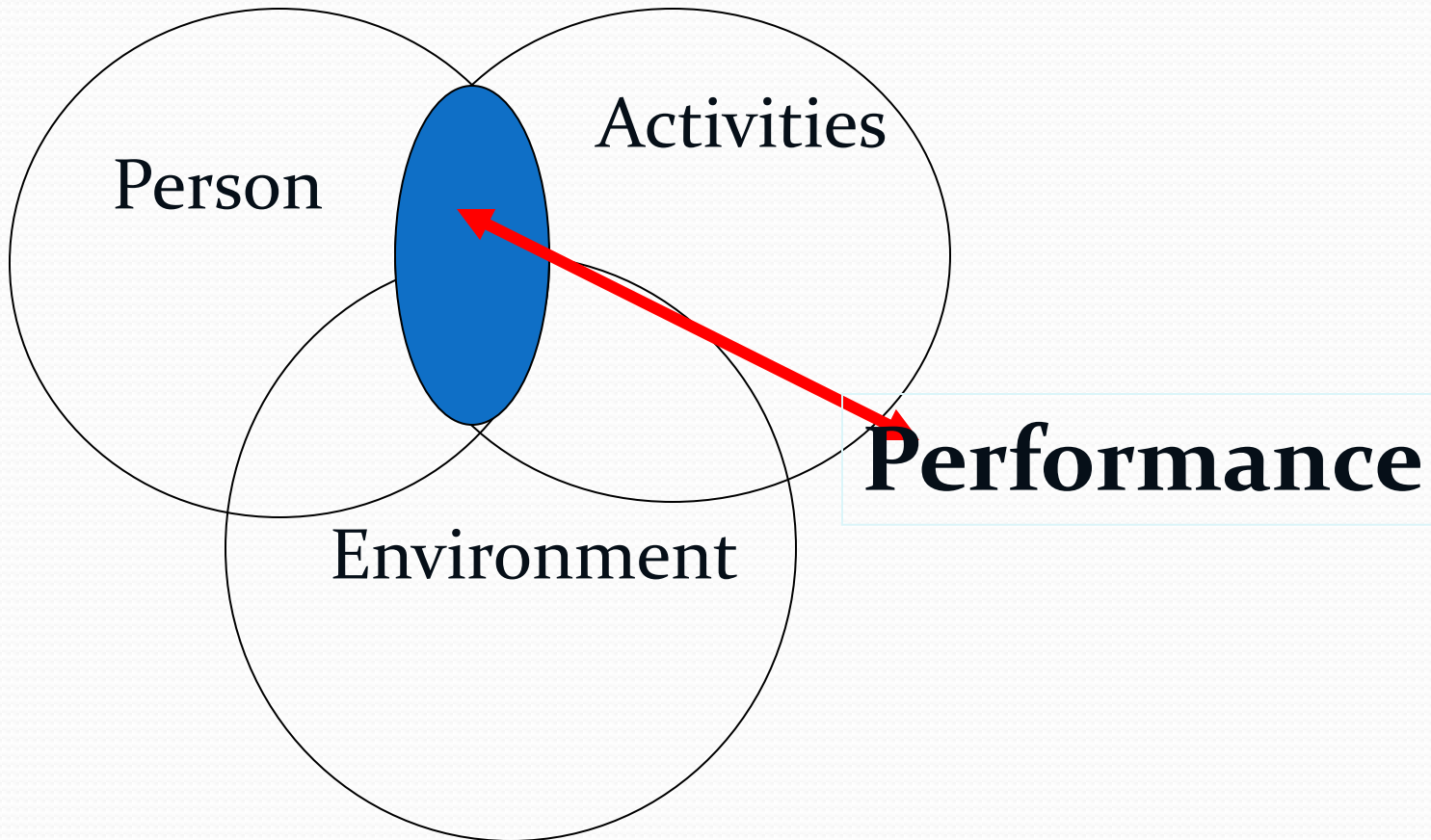
- Is creating a healthy environment enough to improve performance?
 - Environment
 - Person
 - activities

Introduction

- The formula

Performance = Person + Activities + Environment

Introduction



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

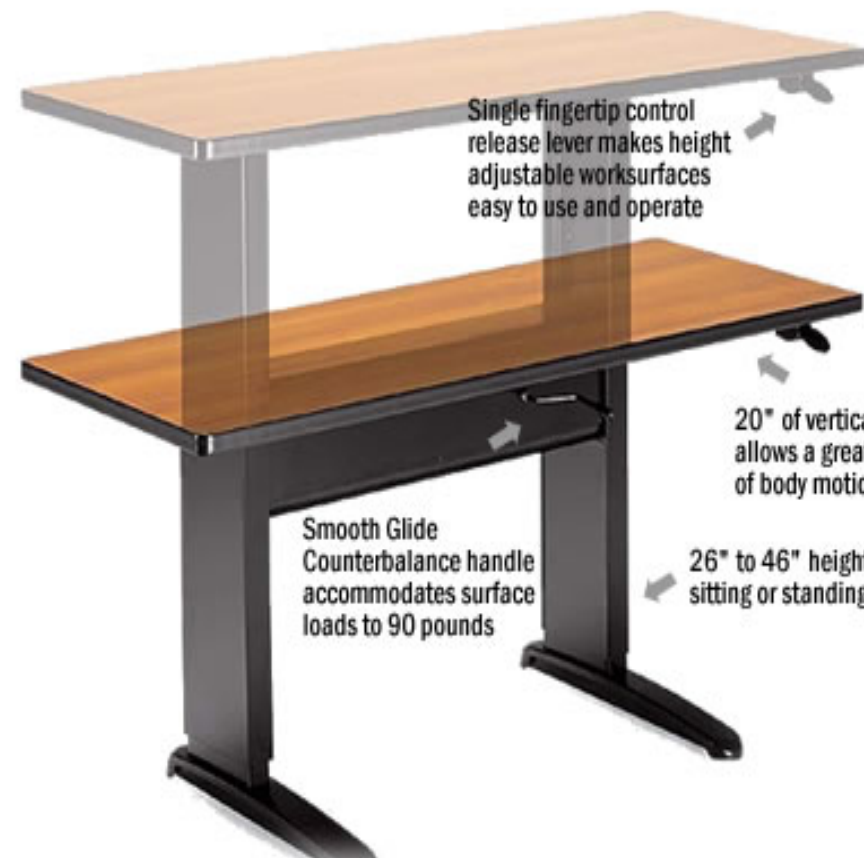
Equipment

- 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

20" of vertical adjustment allows a greater working range of body motion

Smooth Glide Counterbalance handle accommodates surface loads to 90 pounds

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



StrideTop eng.ty01.cn

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Laboratory Environment

Lights

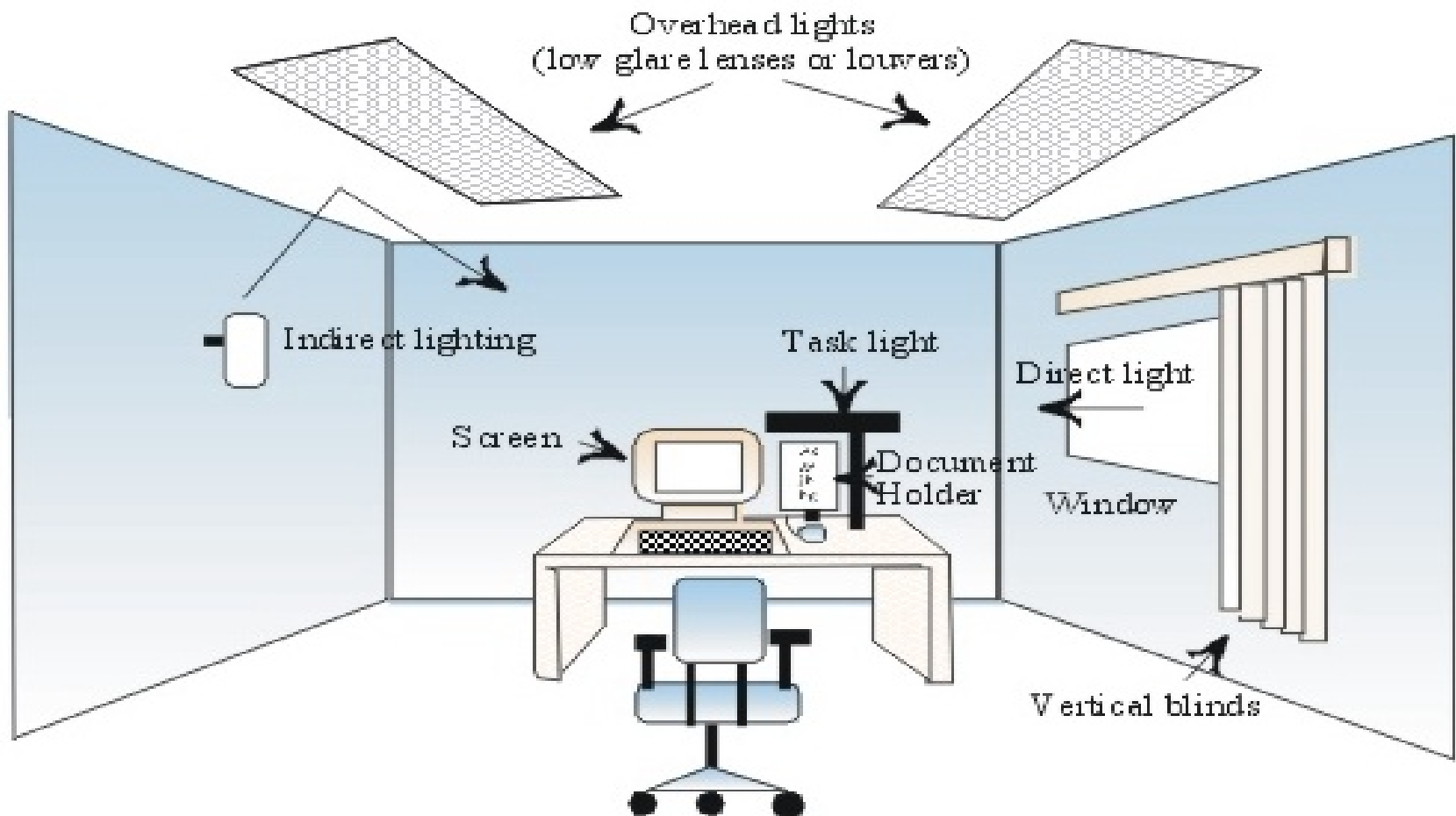
- Present of back or front light
- Present of dim lights
- Leading to
 - Unclear vision
 - Eye irritation
 - Eye redness
 - Eye fatigue

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

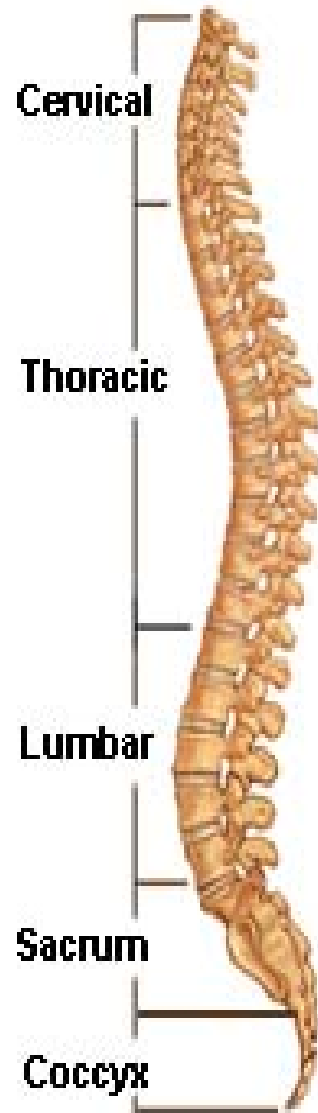
- Physical
- Cognitive
- psychosocial

Person

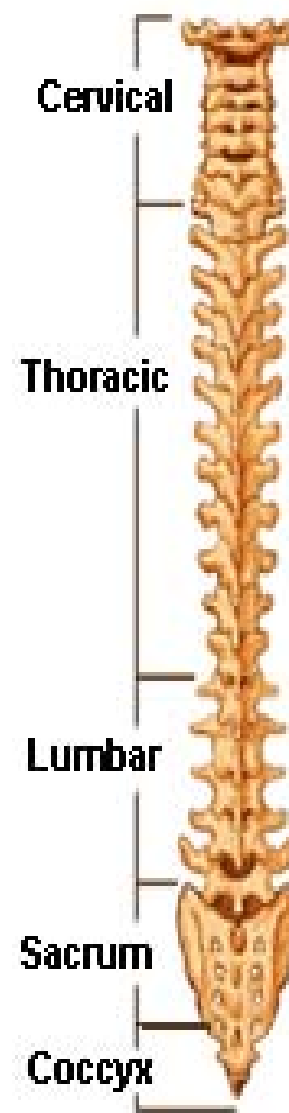
Physical Factor

- Bones
- Muscles
- Nerves

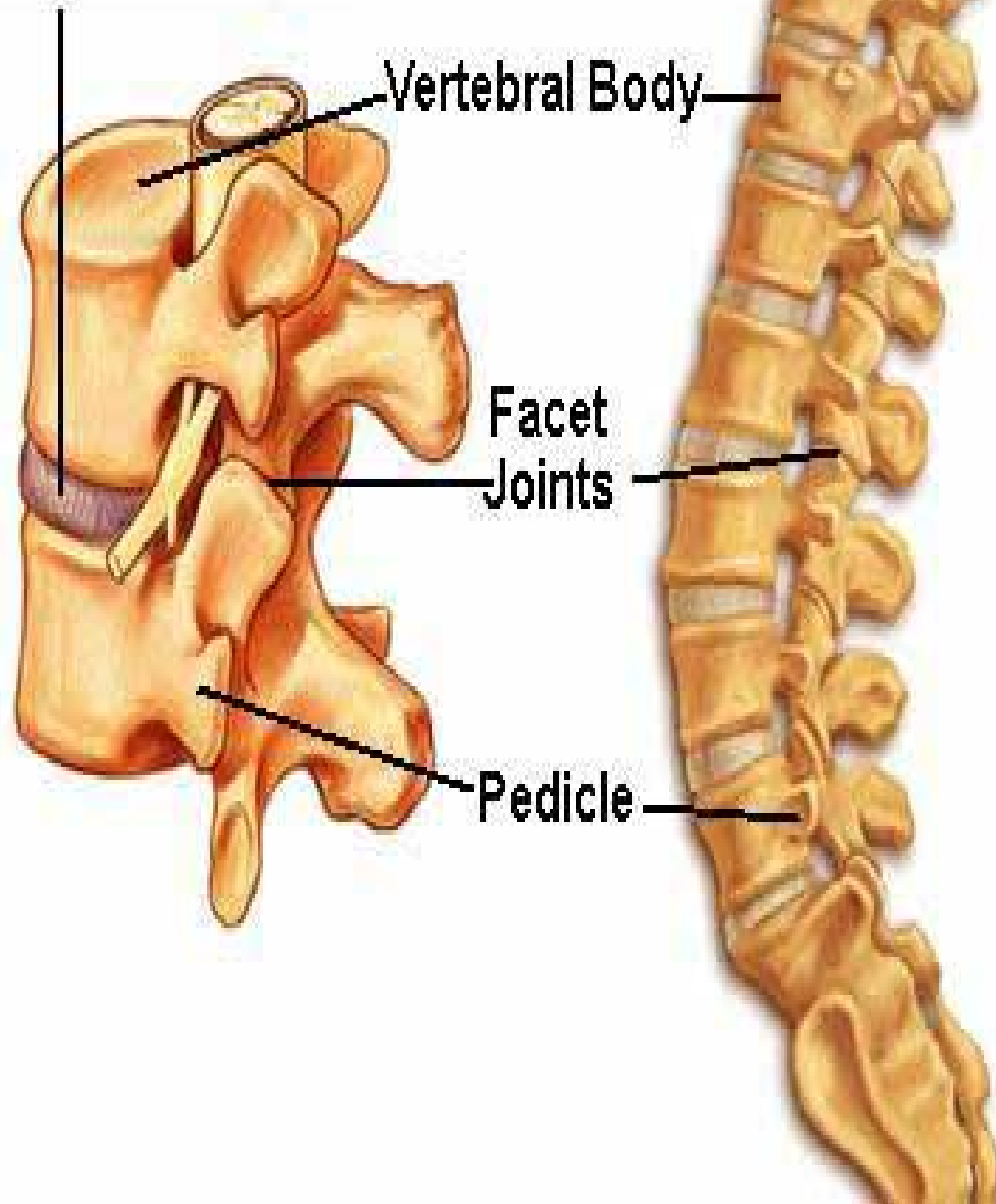
Lateral (Side) Spinal Column

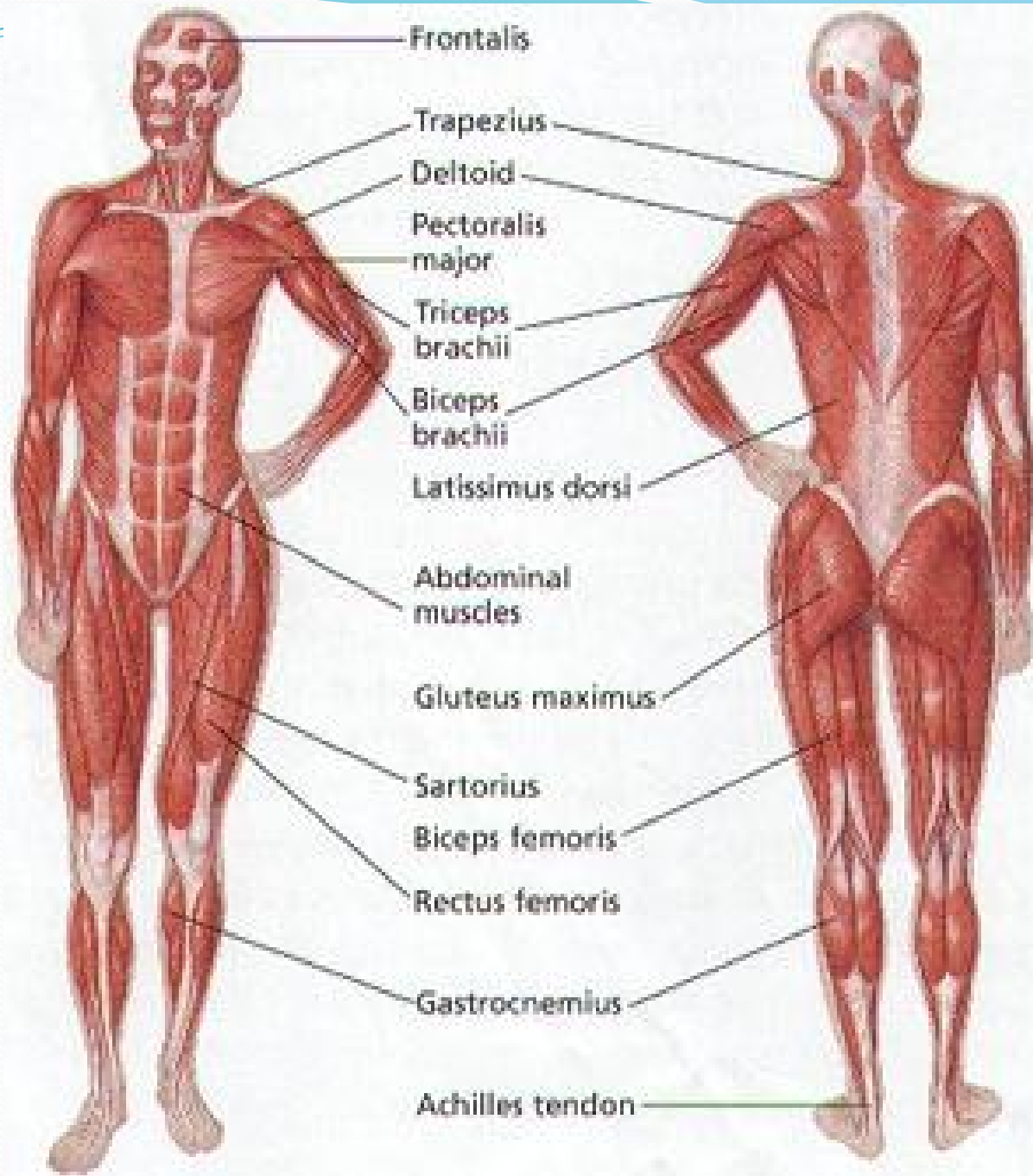


Posterior (Back) Spinal Column



Intervertebral Disc





Frontalis

Trapezius

Deltoid

Pectoralis major

Triceps brachii

Biceps brachii

Latissimus dorsi

Abdominal muscles

Gluteus maximus

Sartorius

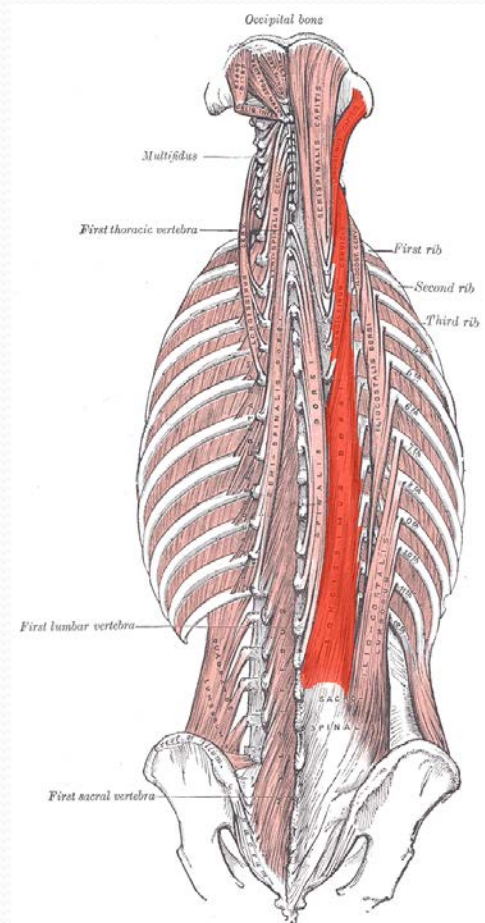
Biceps femoris

Rectus femoris

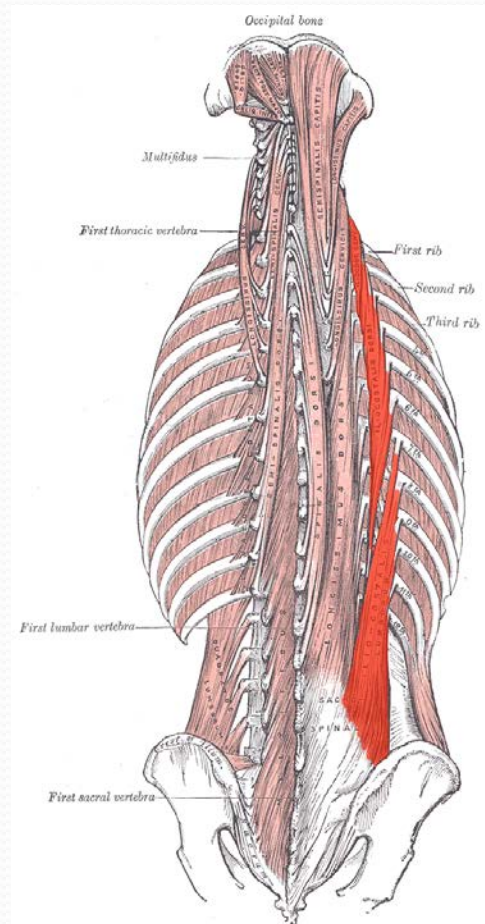
Gastrocnemius

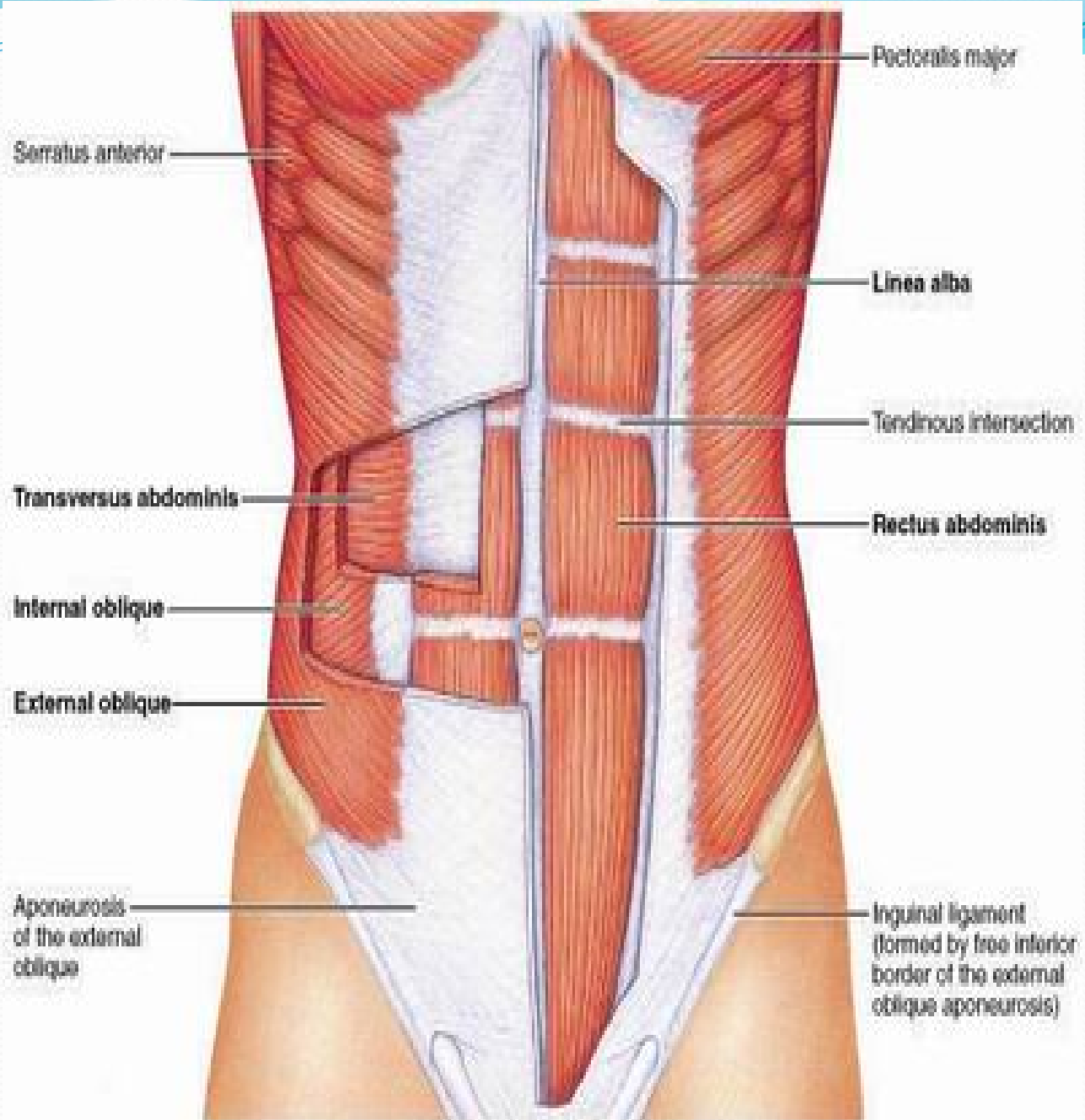
Achilles tendon

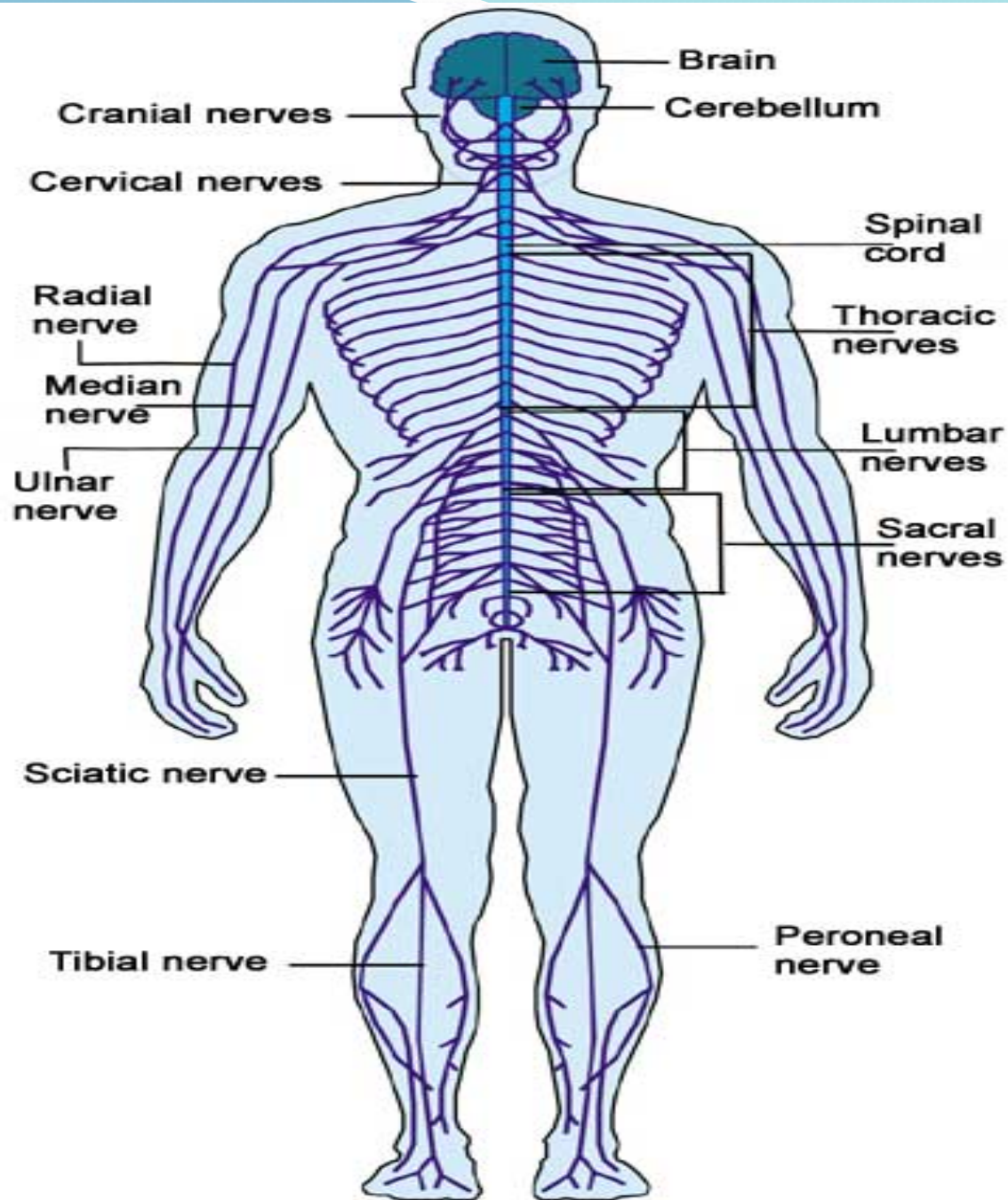
(Longissimus)



(Ilio-costalis)







PERIPHERAL NERVOUS SYSTEM

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
- Maintaining 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 through out the working hours and try to share work with other 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

Person

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

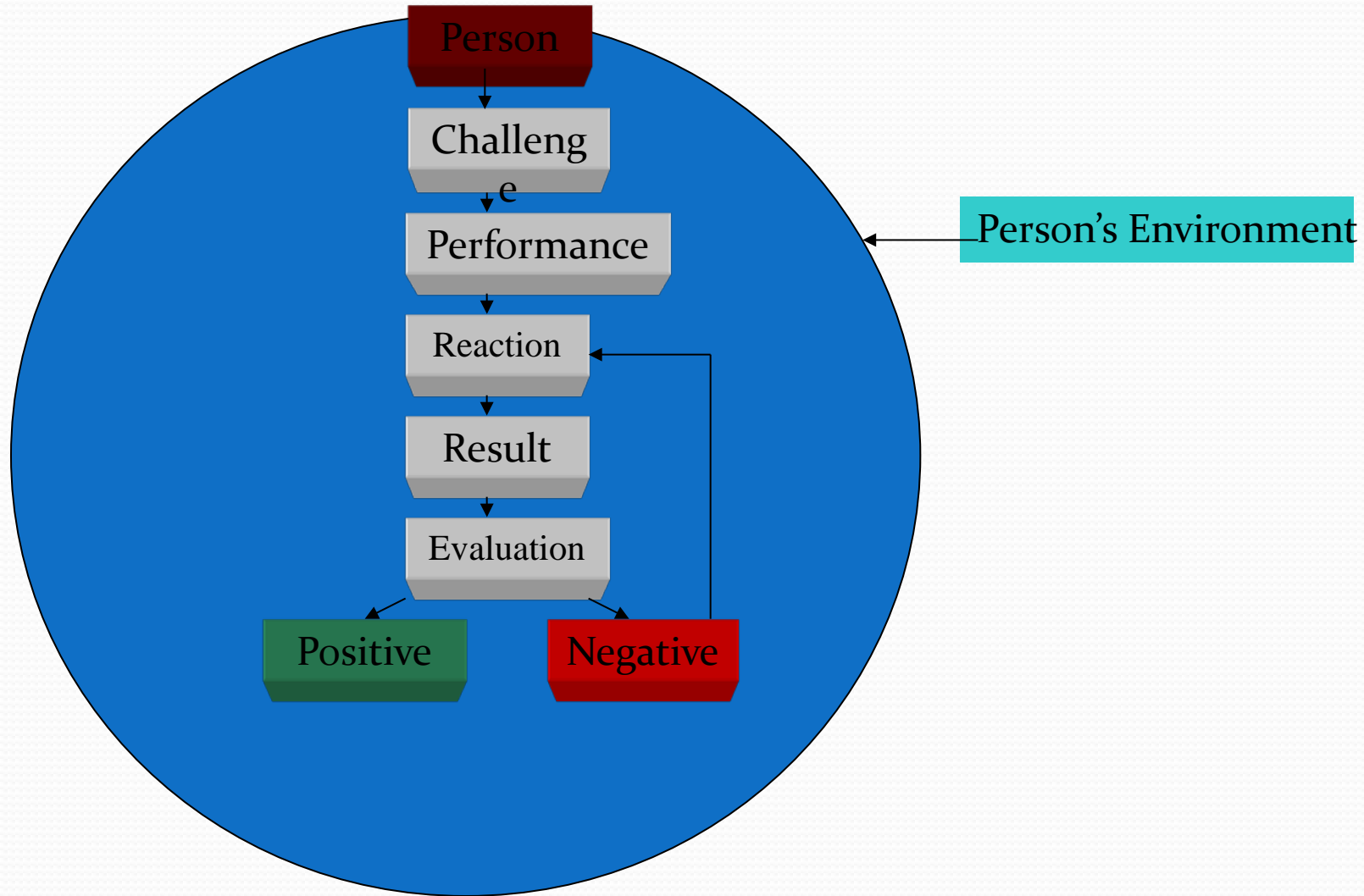
- Psychosocial Factor
 - These are the intrinsic (psychological) and extrinsic (social) factors
 - Including fear, anger, job satisfaction, work and home pressure and problems, uncooperative coworkers or boss
 - Could be due to work injury
 - Likely to reduce cognitive function and in turn causes errors, 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



Activities

- Activities related to laboratory use
 - Microscope
 - Vision and use of knops
 - Lifting and carrying od tools
 - Use of small tools
- Most activities require repetitive use of the hands
 - May cause fingers and wrist pain
 - May cause carpel tunnel syndrome



Transverse Carpal Ligament

Ulna

Median Nerve

Radius

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