Ergonomic Design Considerations from Head to Toe

ErgoPlus

ErgoPlus Industrial

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A workplace ergonomics process systematically identifies and minimizes ergonomic risk factors.

Following are ergonomic design considerations for different parts of the body, from head to toe. Each body part has its potential musculoskeletal disorders and ergonomic design principles for prevention.

Ergonomic Design for the Head / Neck

The nerves of the body enter the head through the neck. With such sensitive wiring passing through such a mobile structure, potential for problems is high.

Potential Musculoskeletal Disorders

- thoracic outlet syndrome
- tension neck syndrome
- cervical disc disease

Ergonomic Design Principles

A. Allow for tallest workers

B. Avoid forced forward head posture

C. Natural posture is to look down slightly

D. Avoid narrow viewing angles and visual obstructions

Ergonomic Design for the Shoulders

Shoulder MSDs are associated with postures that place heavy loads on its muscles and tendons. Since the arm provides a very long lever, holding even small loads in the hand with the arm held away from the body will quickly result in shoulder fatigue and discomfort, and place substantial stress on the tendons in the shoulder.

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Potential Musculoskeletal Disorders

- rotator cuff tendonitis
- bicepital tenosynovitis
- frozen shoulder syndrome

Ergonomic Design Principles

A. Place items and parts between shoulders and waist height

B. Avoid reaches above shoulder and reduce any excessive reaching

C. Avoid greater than 45o shoulder flexion and abduction

Ergonomic Design for the Elbows

The elbow is actually two different joints. It raises and lowers the arm (flexion and extension) and also acts as the pivot point for forearm rotation (pronation and supination). There are numerous vulnerable soft tissues (tendons, nerves, blood vessels) that pass though the elbow to reach the forearm and hand.

Potential Musculoskeletal Disorders

- lateral and medial epicondylitis
- radial tunnel syndrome
- cubital tunnel syndrome

Ergonomic Design Principles

A. Normal work (medium weights) work surface designed to just below elbow height

B. Precision work (light weights) raise surface above elbow height and provide upper extremity weight bearing support when possible

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C. Heavy work surface 6-8” below elbow height

Ergonomic Design for the Wrists / Hands

The wrist is an incredibly mobile joint that contains numerous tendons, nerves, and blood vessels, which service the hand and are vulnerable to MSD.

Potential Musculoskeletal Disorders

- tendonitis
- carpal tunnel syndrome
- ganglion cysts
- trigger finger
- DeQuervain’s

Ergonomic Design Principles

A. Maintain neutral posture

B. Avoid repeated or sustained flexion and ulnar deviation

C. Avoid repeated or sustained pinching and allow for small hands when designing gripping tasks and selecting hand tools

D. Allow plenty of access space for large hands

Ergonomic Design for the Lower Back

The back is a flexible curved column composed of a series of bones (vertebrae) separated by shock absorbing discs. The structure is held together by a large number of muscles and ligaments. Acting together, they give the spine the ability to bend and twist. The spine protects the spinal cord and acts as a distribution center for the nerves.

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Potential Musculoskeletal Disorders

- degenerative disc disease
- fatigue strains (muscle or tendon) and sprains (ligaments)

Ergonomic Design Principles

A. Avoid repeated lifting that requires excessive forward bending

B. Avoid sustained forward bending

Ergonomic Design for the Legs

Very little research exists on the relationship between work activities and lower extremity MSDs. However, there are some MSDs associated with the legs, and ergonomic design principles that we should keep in mind.

Potential Musculoskeletal Disorders

- plantar fasciitis
- tarsal tunnel syndrome
- Tailor's Bunion

Ergonomic Design Principles

A. Avoid foot actuation if possible

B. Avoid repeated walking up and down steps

C. Avoid mechanical stress on the legs

D. Allow for long legs

E. Provide adjustments or footrests for shorter legs for prolonged sitting

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