Welcome to the Ergonomics Awareness module. The purpose of the module is to explain the importance of ergonomics and the risks that can result when ergonomics principles are not applied to work activities.

Upon completion of this module you will be able to:

- Define the term ergonomics
- Identify workplace physical risk factors
- Identify contributing risk factors
- Understand the difference between physical and contributing risk factors
- Define work related Musculoskeletal Disorder (WMSDs)
- Identify WMSD signs and symptoms
- Identify work activities with potential ergonomics risk
Ergonomics Defined

Ergonomics is the study of how to fit the workplace to the worker. While the use of the term ergonomics has become more common recently, Ergonomics is not a new science. The term was actually coined in 1857 by a Polish scholar.

The key points to remember are that ergonomics should:

- Fit the workplace to the worker
- Not fit the worker to the workplace
**Incorrect:** The individual accommodates themselves to their surroundings in order to perform their work

A worker should not have to adjust themselves to accommodate their workplace setup. If a worker must adjust to fit their workplace they become at risk to sustain a work related musculoskeletal disorder or WMSD.

The image above is an example of a worker that must adapt to her workplace. Prolonged periods in this posture could cause neck, eye, shoulder, back, or hand strain.
Correct: The workspace has been modified to fit the worker.

To reduce the risk of WMSDs, the workplace should be designed to fit the worker, as seen in the image. The individual no longer has to extend their neck back to view the monitor because the monitor, chair, and keyboard have been repositioned. This is an example of a workplace that is fit to the worker.

By adjusting the monitor to improve the sightline and neck posture, and adjusting the chair to maximize neutral position, this workplace better fits the worker.
Importance of ergonomics

The application of ergonomics can:

- Improve health and safety through the reduction of ergonomics risk factors and resulting work-related injuries and disorders
- Support mission readiness
- Improve comfort, morale, productivity and job satisfaction
- Reduce workers compensation costs and employee turnover
One Work-related Musculoskeletal Disorder Injury Affects Many People

Injuries affect not only the worker, but the people they interact with as well.
Injuries- Musculoskeletal Disorder (MSD)

MSDs are a category of injuries and disorders that deal with the musculoskeletal system. These disorders are not usually caused by acute trauma but instead occur slowly over time due to wear and tear on the nervous system and soft tissues, such as:

- Muscles
- Tendons
- Ligaments
- Cartilage
- Nerves

MSDs are preventable but everyone is at risk.
Work-related Musculoskeletal Disorders (WMSDs)

WMSDs are MSDs that are caused or aggravated by work methods and/or environments. WMSDs do not generally result from a single event or accident, but rather are disorders that have developed gradually from chronic workplace and occupational conditions causing repeated trauma.

Common WMSDs include:
- Tendonitis
- Epicondylitis
- Bursitis
- Trigger Finger
- Carpal Tunnel Syndrome
- Herniated Spinal Disc
WMSDs Aliases

WMSDs go by other names, including:

- Repetitive Strain or Stress Injury (RSI)
- Repetitive Motion Injury (RMI)
- Cumulative Trauma Disorder (CTD)
- Overuse Syndrome
- Activity Related Pain Syndrome

Some people who have been diagnosed with a disorder such as carpal tunnel syndrome may not know that it is a part of the category of injuries known as WMSDs.
Risk Factors

There are two types of risk factors for developing WMSDs:

**Physical** - the characteristics of the job that place the worker at risk of developing a WMSD, but which usually can be modified.

**Contributing** - the characteristics of the person or job that contribute to, but not cause, WMSDs and which usually cannot be changed. Contributing risk factors are frequently difficult to control.
Physical Risk Factors

Physical work place risk factors can cause WMSDs to develop. The risk factors must occur in combination to present a risk of WMSDs and they typically magnify each other as a result. There are six common physical risk factors related to WMSDs:

- Compression or Contact Stress
- Position or posture
  - Non-Neutral
  - Static
- Vibration
  - Whole body
  - Hand-arm
- Force
- Repetition
- Duration
Compression or Contact Stress

Compression occurs when an object presses on soft tissue. This concentration of force on small areas reduce blood flow and nerve transition and can damage the soft tissue.

Compression occurs from:

- Leaning or pressing against hard edges, sharp surfaces, or corners
- Supporting excessive weight
- Gripping tools
Neutral Posture vs. Non-neutral Posture

Posture or position dictates how hard the body works and how much effort the muscles must exert.

**Neutral posture** maximizes strength, speed, endurance, and comfort while decreasing the risk of WMSDs. Neutral posture is important because it promotes blood flow, nerve conduction, strength and control.

**Non-neutral posture** stretches the physical limits and can cause muscle fatigue or micro trauma to tendons or ligaments, and compress or stretch soft tissues such as nerves.
Working Neutral Posture Demonstration

This video demonstrates the difference between neutral and non-neutral posture.
Working Neutral sitting Posture

You can recognize neutral posture at a computer workstation by looking for these key landmarks.

- Hands, wrists and forearms are straight, in line and roughly parallel with the floor.
- Head is level or bent slightly forward, forward facing and balanced, generally the head is in line with the torso.
- Shoulders are relaxed and upper arms hang normally at the side of the body.
- Elbows are in close to the body and are bent between 90 and 120 degrees.
- Feet are fully supported by the floor or footrest.
- Back is fully supported with appropriate lumbar support when sitting vertically or leaning back slightly.
- Thighs and hips are supported by a well padded seat and are generally parallel to the floor.
- Knees are about the same height as the hips with the feet slightly forward.
Posture Correction

Here are the posture corrections this medical technician needs to adjust or risk a WMSD.

- Ears are not over the shoulders.
- Shoulders are not over the hips.
- Hips are not over the knees.
- Hand is at an awkward angle and the arms are not at a 90 degree angle.
Static Posture

Holding a posture for extended periods of time is known as static posture.

Static postures prevent the flow of blood which brings nutrients to the muscles and carries away waste products. Holding a muscle in contraction causes waste products to build up and can lead to fatigue and discomfort.
Vibration

Vibration is another type of risk factor. A simple definition of vibration is rapid movement back and forth; however, vibration involves the exposure to movement against the body from all directions.

Vibration occurs in two forms:

- Whole body
- Hand-arm
Whole Body Vibration

Whole body vibration is caused by standing or sitting on a vibrating surface. The vibration works its way through the body and results in muscle fatigue and contraction.

High or prolonged exposure to whole body vibration can effect the skeletal muscles and digestive system and cause lower back disorders.
Hand-Arm Vibration

Hand-arm vibration is usually caused when a worker holds a vibrating hand tool for long periods of time. This action causes reduced blood flow to the fingers and can lead to blanching of the fingers or Raynaed’s syndrome. Cold weather is a contributing factor to vibration-related WMSDs.

Some of the WMSDs associated with hand-arm vibration are.
- Raynaed’s Syndrome
- Vibration induced white finger
- Carpal Tunnel Syndrome
Force

Force is the use of power or exertion to move, direct or operate equipment. The less force required to operate equipment, the less traumatic it is to the body. Excessive force exertion may cause the muscles to meet or exceed their maximum capability resulting in muscle fatigue or injury. Repeated muscle trauma can result in damage or injury.
High Force Examples

High force risk factor can occur while lifting, carrying, pushing, pinching and gripping. Posture and position are important in considering high force risks.

It is important to understand that strength varies by person and as individuals, we vary by tolerance and ability.

The power zone for lifting with the greatest strength and lowest risk of injury is close to the body between thigh and shoulder height. It is important to note lifting even a 20 pound weight, one hundred times a day in a non-neutral posture may pose a high force risk.
Repetition

The physical risk factor repetition is defined as performing the same motion or group of motions excessively, for example:

- Repeating the same motion every few seconds.
- Keeping a cycle of motions involving the same body parts/muscle groups.
- Using a tool or device in a steady manner.

Repetition or use of the same body parts continuously throughout the workday can be damaging to the body. It is important to note that if you change the job but still use the same muscle group you are not doing anything different. Repetition is often seen in tasks such as assembly, typing, operating machinery, or loading and unloading a vehicle.
Duration

How long a task is performed or how frequently the same muscle groups are used in a day contributes to the risk factor known as duration. Duration is defined as the time period that a task is performed. Continuous or repeated exposure to one or more of the other risk factors does not allow muscles time to recover and magnifies other risk factors.

The key point to remember is that the longer the duration, the greater the exposure and the greater the risk.

Taking breaks, reducing the amount of time spent on similar tasks, and alternating between jobs that use different actions can help reduce duration exposure.
Physical Risk Factors Review

Physical factors have to occur in combination to pose a risk.

Physical risk factors include:
- Compression
- Non-neutral, awkward or static posture
- Vibration
- High Forces
- Repetition
- Duration

By applying ergonomics principles to tasks, jobs and the work environment, physical risk factors can usually be modified or reduced.
Contributing Risk Factors

In addition to the six physical risk factors, there are three important contributing risk factors.

Contributing risk factors can contribute to, but do not cause, WMSDs. For example, temperature and humidity affect the worker performing repetitive work. When it is too hot and too humid, workers fatigue more quickly and become more susceptible to injury. Contributing risk factors are generally harder to control than physical risk factors.

Contributing risk factors include:

- Temperature
- Inadequate recovery
- Personal risk factors
Temperature

Temperature is a known contributing risk factor. Working in extreme environments places a greater aerobic demand on the worker which means they fatigue faster.

Cold

Cold temperatures impair blood flow in the extremities reducing sensation, muscle strength and dexterity. Cold makes gripping harder, therefore more muscle force must be applied increasing the likelihood of injury. Cold temperatures can increase the risk of injury from vibration exposure.

Heat

Prolonged work in hot environments can result in fatigue and a variety of heat related illnesses. Wearing PPE may increase the risk of suffering heat related illnesses.
Inadequate Recovery

Inadequate muscle recovery is a contributing risk factor as working without rest can cause fatigue and contribute to injury. Working the same muscles without rest may result in injury.

Muscles need blood flow to supply nutrients and oxygen, and to carry away the waste products of muscle metabolism. Without sufficient muscle recovery, lactic acid can build up in the muscle. Working the same muscles without rest may result in injury.

Stretching, using alternative muscle groups, and taking short breaks can aid in recovery and help prevent fatigue.
Personal Risk Factors

Personal Factors also contribute to WMSDs, which is one of the reasons why it cannot be predicted who will suffer a WMSD, because factors other than those in the workplace contribute to risk.

Personal risk factors do not cause WMSDs but are contributing risk factors. Some examples include:

- Age
- Gender
- Hobbies
- Previous injuries
- Physical Condition
- Medical Conditions
- Pregnancy
- Medications
- Smoking
- Fatigue
- Weight management
- Stress management
- Blood Pressure
- Nutrition
Early detection is the key to preventing WMSDs, therefore, seek medical attention if you are experiencing any of the signs or symptoms listed here.

Signs and symptoms include:

- Painful aching joints or muscles
- Pain, tingling or numbness
- Fingers or toes turning white
- Shooting or stabbing pains
- Swelling or inflammation
- Stiffness or difficulty moving
- Burning sensation
- Pain during the night
- Loss of strength and mobility
Risk Factor Activity

Lifting 10 to 30 pounds many times a day may result in a WMSD.

This picture shows the following risk factors:

- Non-neutral posture
- Force
- Frequency

The worker in this picture is in a non-neutral posture of the upper extremities and back. Force is applied to the back and upper extremities from the force of lifting the boxes, repetition from the frequent loading and unloading of boxes, and compression to the hands from holding the boxes, which may result in a WMSD.
Risk Factor Activity

Examine this Image.
Four sailors are lifting a 500 lb. hovercraft air conditioning unit.

Which Factors are shown in this image?

Each worker in this image is in a non-neutral posture of the upper and lower extremities. Force is applied to the back and upper extremities from the force of lifting and compression to the hands from holding the air conditioning unit. These factors may result in a WMSD.
Summary

The key points to remember about ergonomics are:

- Ergonomics is defined as fitting the work to the worker
- Physical risk factors that can cause WMSDs are force, posture, duration, repetition, vibration and compression
- Contributing risk factors, such as temperature and personal factors can contribute to, but can not cause WMSDs
- Physical risk factors can be eliminated or reduced in the workplace, whereas contributing risk factors typically cannot be changed
- Work related Musculoskeletal Disorders (WMSDs) are MSDs that are caused by or aggravated by work practices, and/or environments
- WMSD signs and symptoms include pain, tingling or numbness
If you think you may have pain or discomfort that may be work related:

- Tell your supervisor
- Contact your Command/Unit/Directorate Ergonomics Team Representative
- Contact the Command Ergonomics Coordinator: Patti Klinger @ 466-2555, Safety & Standardization Office
Web-based assistance:

- Naval Facilities Engineering Command: ergonomics tools, resources, guides, training and awareness material.
  www.navfac.navy.mil/safety

- Naval Safety Center: success stories of ergonomic interventions throughout the Navy.
  www.safetycenter.navy.mil

- DoD Ergonomics Working Group: ergonomics tools, resources, guides, reports, best practices, and Ergonews
  www.ergoworkinggroup.org/
Congratulations!

You have completed your annual Barber Ergonomics Training

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