

Occupational Health Clinics for Ontario Workers Inc.

Centres de santé des travailleurs (ses) de l'Ontario Inc.

Ergonomics & Manual Material Handling

Presented by:

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OHCOW

- Introduction to Ergonomics
- Ergonomic Hazards
- Musculoskeletal Disorders (MSD)
- Manual Material Handling (MMH)
- Controls
- Questions

OHCOW



- Health & Safety Association funded under the prevention section of the MOL
- Unique because OHCOW is a "free" service
- Assist with vulnerable workers, high hazards, small companies, non-profit organizations
- Referrals from: health care professionals, JHSC, advocates and workers

Our Services

Multidisciplinary Team

Physicians Nurses **Occupational Hygienists Ergonomists Administration**





S.

GROUP EVALUATIONS



9

<u>a</u>

EDUCATION



RESEARCH

Teamwork Throughout Ontario

Clinics:

- Ottawa
- •Thunder Bay
- Sudbury
- Toronto
- Hamilton
- •Sarnia
- Windsor



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Ergonomics

Matching job design, equipment, and workstations to workers

Encompassing the fields of:

- Biomechanics
- Engineering
- Biology
- Psychology



"Working smarter *not* harder"



Why Ergonomics?



2018 Highlights Injury Claims Allowed lost-time ----7.7 claims Workplaces - III average days lost within one month Nature post-injury date 48% Sprains and strains 2.17 businesses lost-time injury rate covered Event **High-impact claims** 17% Fall on same level 22% of all allowed lost-time claims claims Part of body 25% 16% Multiple registered body parts of all lost-time benefit payments

Why Ergonomics?



Why Ergonomics?



Reactive vs. Proactive











Force

External forces

- Applied to the body by outside objects
- E.g. weight of an object being held



Internal forces

- Generated by muscles in response to task demands
- E.g. force required of the shoulder/neck to support the arms



Force

Effort exerted to do work

- If force exerted is too much, can lead to injury
- Example: Gripping
 - Slippery objects
 - Pinch grips
 - Awkward shapes
 - Glove use



Repetition

Repetition

 Using the same muscles, tendons, and other soft tissues repeatedly with little chance of rest or recovery can lead to injury





Examples of Repetitive Tasks: Shoveling snow, push cutting grass



Posture

- Neutral posture
 - Position which minimizes stresses on the body
 - Safest & most efficient position to work



	BACK	FRONT	
Shoulder, h knee and a joints vertic aligned with	ip, nkle cally	Head erect and straight chin level	
gravity line Pelvis in n alignment	eutral to	Efficiently bearing weight in a body of perfect balance as	
support th S-curve of spine and to move th	e the ready ie body	nature intended it to be	
		Weight evenly distributed from front-to-back in feet	

Awkward Posture

Awkward postures can increase risk of injury

- Muscles operate less efficiently, and more force must be expended due to the task.
- Overhead reaching, bending down, twisting





Static Postures



- Occur when a posture is held for a long period
- Reduced blood flow to muscles
- Can lead to early onset of fatigue



Effects of Static Postures



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Contact Stress

- Stress on tissues of the body that come in to contact with hard or sharp objects
- Direct pressure on underlying tendons and nerves resulting in decreased blood flow
 - Examples: Kneeling on hard surface
 - Using body parts to strike a hard surface
 - Tool handle ridges









Source: Kodak's Ergonomic Design for People at Work, 2004

Vibration

Whole Body Vibration

- Typically tractors, heavy equip., vehicles, etc.
- Different frequencies affect different areas
- Increased risk of vertebral disc herniation and degeneration for example

Segmental Vibration (Hand & Arm)

- Hand tools, controls, machinery
- Lead to vascular disorders (i.e. white finger) and carpal tunnel







Vibration



3 Sources of Vibration from Heavy Equipment

- 1. Low-frequency caused by the tires and terrain
- 2. High-frequency from the engine and transmission
- 3. Shock from running into potholes or obstacles

Chart 1: Vibration Magnitude of Equipment



For eight hours of continuous work, the magnitude of vibration should not exceed 0.5 m/s².

Source: ISO 2631; The European Vibration Directive.

Extreme Temperatures

- Cold
 - Muscles and Tendons become less flexible
 - Blood circulation is reduced in arms and hands
- Hot/ Humid
 - Imposes strain on the body and increases dehydration



Psychosocial

• Work-related stressors that negatively affect the workers mental and physical health:



Understanding the Hazards



Musculoskeletal Disorders (MSD)

- An umbrella term for several injuries/ disorders of the muscles, tendons, nerves, etc.
 - Muscles, tendons and tendon sheaths
 - Nerves
 - Bursa
 - Blood vessels
 - Joints / spinal discs, and
 - Ligaments.



- MSD are usually associated with physical demands of work activities including:
 - Lifting or pushing <u>heavy loads</u>
 - Reaching or bending in <u>awkward postures</u>
 - Holding the <u>same position</u> for a long time
 - <u>Repetitive</u> movements with <u>little rest or recovery</u>

MSD

<u>Musculoskeletal Disorders</u>: Painful disorders of the muscles, tendons, and nerves that develop over time from tasks that repeatedly cause stress and injury to tissues (ссонз, 2016)

3 Stages of an MSD:

	1st	2nd	3rd
Symptoms	pain, aching, fatigue	pain, aching, fatigue, may affect sleep	constant pain, aching and fatigue; sleep disturbance
Duration	weeks or months	months	months to years
Occurrence	at work	at work and at home	constant, even at rest
Job performance	not affected	decreased	unable to perform light duties
Visible signs	absent	may be present	often present
Effectiveness of treatment	conditions may be reversible if treated early	increasingly difficult and slower recovery	greater risk of permanent damage

Commonly Injured Areas



• Tendons

- Flexible bands of fibrous tissue that connects muscles to bones. They are meant to glide smoothly as muscles contract.
- Lower Back
 - Low back injuries are very common. Vertebral disc disorders are affected greatly by heavy forces and awkward postures.
- Wrist
 - The wrist is put under a lot of pressure when performing MMH activities.

Bones – add structural stability

Muscles – create movement by contracting and relaxing

Tendons – connect the muscle to the bone (to create movement)

Ligaments – connect bone to bone (stability)

Nerves – carry messages to and from the brain

Intervertebral Discs – provide shock absorption, flexibility

Low Back Pain Statistics

- In a 6 month period, 5 in 10 Canadians suffered low back pain
- Up to 85% of working people can expect to experience low back pain in their lifetime
- The estimated costs of low back pain in Canada is between 6 and 12 billion dollars annually
- Low back is the most common injury in Ontario
- Accounts for 16% of lost time claims





Lower Back Injuries

- The spine is divided into 4 parts
- They all support the body and protect the spinal cord
- Lumbar (lower back) vertebrae are larger as they are designed to bare weight





Lower Back Injury Causes

- In between are intervertebral disc or "shock absorbers"
- When factors such as large forces or awkward postures act on the Intervertebral discs, injuries can occur
- This can have an instant or gradual onset



The Wrist



- The wrist can move in many directions, however, a neutral wrist posture is the strongest and safest
- Many different types of tasks can flex, extend, or deviate the wrist increasing its probability of injury



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The Wrist

Carpel Tunnel Syndrome:

- Compression of the median nerve underneath the ligaments
- Symptoms include numbness, tingling and reduced grip strength

Risk Factors:

 Excessive force, awkward postures, repetition, and prolonged gripping





Tendonitis

- Smooth gliding of tendon is impaired leading to inflammation of the tendon.
- Using the muscle becomes irritating and painful
- Commonly found in tendons with poor blood supply
- Cause: Too much strain as a result of heavy loads, repetition and static or awkward postures





Vibration Disorders

Raynaud's Phenomenon

- Disorder of blood circulation in the fingers and toes; aggravated by exposure to cold
- Sometimes called "white finger"
- Symptoms include cold finger or toes, tingling and slight loss of feeling, whitening, numbness, colour changes in the skin from white to blue to red
- Hazards in the workplace: vibrating power tools, extreme cold





Manual Material Handling (MMH)

- MMH includes manually lifting, carrying, lowering, pushing or pulling objects
- Many injuries that occur because of MMH are musculoskeletal (gradual over time or a one time over exertion)
- MMH is the most common cause of back pain
- 3 out 4 Canadians who's job entails MMH suffer from back pain
- Every years several thousand Canadians are permanently disabled due to back injuries

OHSA

Keep equipment in good condition

Under clause 25(1)(b), employers must make sure the equipment, materials and protective devices they provide are maintained in good condition. Equipment that is in disrepair can increase the physical demands of workers.

Provide information, instruction and supervision

Under clause 25(2)(a), employers must provide workers with information, instruction and supervision to protect their health and safety.

Take every precaution reasonable in the circumstances

Under clause 25(2)(h), employers must take every precaution reasonable in the circumstances for the protection of a worker, including MSD hazards while manually handling objects

Communicate hazards

Under clause 25(2)(d), employers must make sure that the worker or a person in authority over a worker are acquainted with the hazards in their work. This incudes MSD hazards when manually handling objects



Modifications to work, equipment to reduce the exposure

Alter the way work is done, timing, policies, work practices and SOPs (i.e. training, equipment maintenance)

Equipment worn to reduce exposure (i.e. knee pads, gloves)

Engineering Controls

- Eliminate the risk factors in specific work tasks
 - Using mechanical devices to hold and lift heavy material/equipment
 - Minimize the amount of reaching or overhead work (i.e. relocation of materials based on use)
 - Replace carrying tasks with use of carts/dollies

Administrative Controls

- Restrict the weight individuals can lift or carry at one time (i.e. no more than 50 lbs)
- Dependent on distance carried and nature of the load
- Equipment available to assist with lifting
- Employees should be trained on the ergonomic hazards associated with specific material and equipment uses at the job sites
- Setup site correctly from the start
- Require employees to use a mechanical lift or hoist to get closer to their work

PPE Controls

- Dampening gloves
- Hearing protection
- Knee pads
- Hydraulic dampers & shock absorber on seats









Ergonomics and Lifting



- Lifting and carrying items pose a risk to your back's health if they are done wrong
- Safe lifting principles will help keep you healthy, and your back comfortable.

Principles of Lifting:

- **B** ack Straight
- A void Twisting
- **C** lose to Body
- K eep Smooth



Back Straight



- Discs can handle larger loads when the back is straight
- Neutral spine position bend at knees and hips.



Back Straight - Neutral Spine

- Aligns torso
- Maintains spine's natural curves
- Keeps torso moving smoothly

Avoid Twisting

- Discs are weaker when <u>lifting</u> and <u>twisting</u>
- Avoid twisting by pivoting

Close to the Body

Keep Smooth

- Avoid "Jerking" motions increases the load on the discs
- Avoid sudden release of force
- Communication is key when lifting with a partner

Lifting is Affected by...

Prevention Through Intervention

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Object Weight

Heavier Loads

- Increased difficulty
- Increased probability of poor technique
- Increased probability of jerking
- Increased probability of injury

Help yourself

- Test weight
- Utilize lifting aid
- Get help partner

Object Size - Horizontal Location

Remember Biomechanics?

Increased horizontal distance from fulcrum (torso) to the load (object lifted)
= increased effort force required (torso muscle)

Dimensions of object may

- Increase difficulty
- Increase force required
- Decrease grip

Decrease horizontal distance

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Vertical Location

Increased Vertical Travel Distance

- Increased difficulty
- Increased reaching
- Increased probability of injury
- Decreased safety

Help yourself

- Avoid above shoulder height
- Store objects between knuckle and chest level
- Minimize vertical distance

Asymmetrical Loading

Unbalanced Loads

- Create awkward posture twist, lean
- Unbalanced force production
- Increased stress on muscles, discs
- Increased probability of injury

Help yourself

- Avoid single handed carry
- Balance load
- Utilize lifting aid
- Get help partner

Grip

- Poor coupling (grip) increases the risk of injury
- Tools Available
 - Can Claw
 - Gorilla Gripper
 - Lifting Straps

Lift Preparation

- Object close to the body
- Test weight
- Feet shoulder width apart
- Bend knees
- Back in neutral posture
- Head and neck neutral
- Tighten torso musculature

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The Lift

- Maintain normal breathing
- Lift with legs
- Maintain neutral torso posture

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Carrying Loads

- Minimize if possible
- Move feet -do not twist
- Use an Aid
 - Wheelbarrow
 - Dolly
 - Cart
- Dolly Use
 - Push not pull
 - Knees bent
 - Neutral posture

Pushing & Pulling

- Reduce force when pushing or pulling:
 - Improve handhold or grip
 - Reduce the size or weight of the load
 - Use 4-wheel trucks or dollies
 - Preventative Maintenance on all carts/dollies (lubrication, larger casters)
 - Floor maintenance (eliminate bumps, cracks)
 - Proper gripping shoes

Pushing & Pulling

Reduce the distance to push or pull:

- Relocation of material that is moved
- Improve production process to eliminate unnecessary material handling steps

Eliminate Pushing/Pulling:

- Conveyors (powered or non-powered)
- Powered trucks
- Lift tables
- Slides or chutes

Pushing & Pulling

Optimizing Pushing/Pulling Tasks:

- Eliminate 1 handed pushing/pulling tasks
- Provide variable handle heights to accommodate short/tall employees
- Ensures wrists are not fully pronated (palm down)when pulling
- Replace a pull with a push whenever possible
- Use ramps with a slope of less than 10%
- Keep the load within shoulder to mid thigh vertical range

Vertical handles are good for workers of various heights.

Tool Selection

- Select tools that allow the wrist to be straight and minimizes twisting
- Select tools that all operators can use a power grip
- Tools should weigh no more than 5 lbs if used above shoulder and away from the body; also should be evenly weighted
- Vibrating tools should have dampening built in
- Wear proper fitting gloves to reduce exposure to vibration
- Use lighter weight tools if possible (more comfortable and require less force)
- Longer triggers to allow 2-3 finger activation

Tool Selection

- Studies by NIOSH & CSA (IHSA) showed that using the power tool may reduce the workers risk of injury to the hands, wrists and low back
- Increase in productivity; because using the tying tool is twice as fast

Awkward Postures

Cabin Innovation for Heavy Equipment Operators

- Maintain static awkward neck postures
- Neck extension is required to look up at the end of the boom
- Solution: use a loader with a modified cabin that tilts which allows the operator to see the load while maintaining more neutral neck postures

Vibration

Controlling Whole Body Vibration

- Report any poorly maintained equipment to your supervisor.
- A good suspension system and correct tire pressure will help reduce vibration
- If your seat has hydraulic dampers and shock absorbers, adjust the seat to your weight and height
- Slow down when driving over potholes and rough terrain
- Get out of your vehicle for a few minutes every hour to stand, stretch and give your body a break from the vibration

Vibration

Controlling HAVS:

- Anti-vibration tools
- Anti-vibration gloves (PPE lowest form of control)
- Use a minimum strength hand grip
- Wear sufficient clothing, including gloves
- Avoid continuous exposure; take rest periods
- Do not use faulty tools
- Maintain tools

- Know the signs and symptoms of MSDs
- Apply the principles of safe lifting
- Perform PM on all equipment
- Be aware of your posture
- Ensure the proper tools are being used
- Educate yourself and others

Work Smarter <u>NOT</u> Harder