October 27, 2023 12:45 PM - 1:30 PM

## Preventing Musculoskeletal Injuries Through Effective Risk Controls

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# MUSCULOSKELETAL INJURY PREVENTION

- 1.Why a different approach is needed
- 2. Ergonomics Approach is needed
- 3. Build a Foundation for MSI Prevention
- 4. Manage the Risk of Musculoskeletal Injury
- 5.Control Risk Factors for Musculoskeletal Injury
- 6.Resources and Tools for MSI Prevention





## Preventing Musculoskeletal Injuries

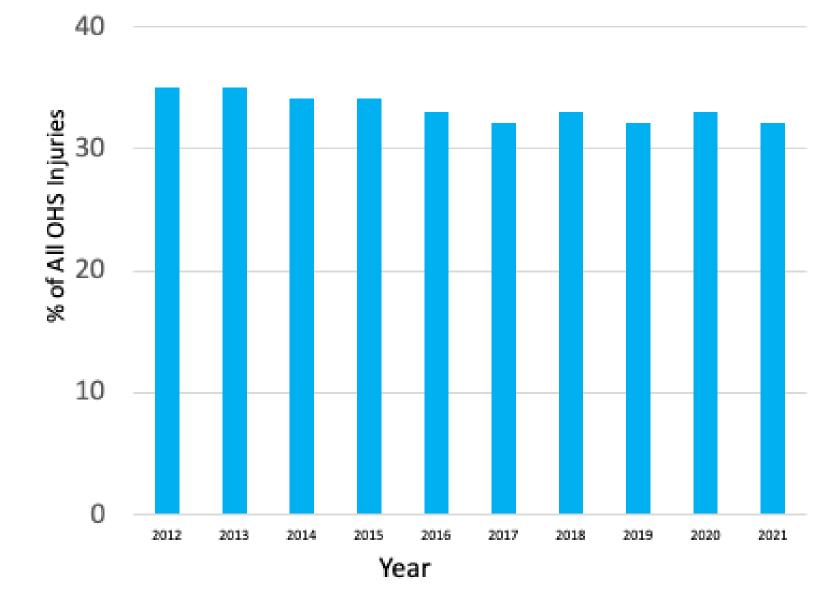
1. Why a different approach is needed



# Musculoskeletal Injury (MSI) Definition & Incidence

An injury or disorder of the musculoskeletal system, which includes muscles, tendons, blood vessels, ligaments, nerves, joints, spinal discs, and related soft tissue

CANADA LABOUR CODE, PART II



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### WorkSafeBC MSI Claims

# **MSI Risk Control is JENGA in Reverse**



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## Preventing Musculoskeletal Injuries

2. Ergonomics approach is needed



# **Ergonomics** *Defined*

- Ergon -> work (Greek)
- Nomos -> laws
- The science of work
- Fitting the workplace, facility, equipment, task, and processes to the physical and cognitive capabilities and limitations of humans



### **Organizational Factors**

HF/E

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Cognitive Factors

### Physical Factors

# Ergonomics

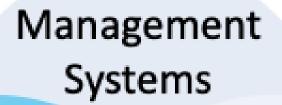
## DEFINITION

The scientific discipline concerned with the understanding of interactions among humans and other elements of a system.

INTERNATIONAL ERGONOMICS ASSOCIATION (IEA), 2000

## **ERGONOMISTS**

APPLY THEORY, PRINCIPLES, DATA, AND METHODS TO DESIGN IN ORDER TO OPTIMIZE HUMAN WELL-BEING AND OVERALL SYSTEM PERFORMANCE.



Equipment & Facilities



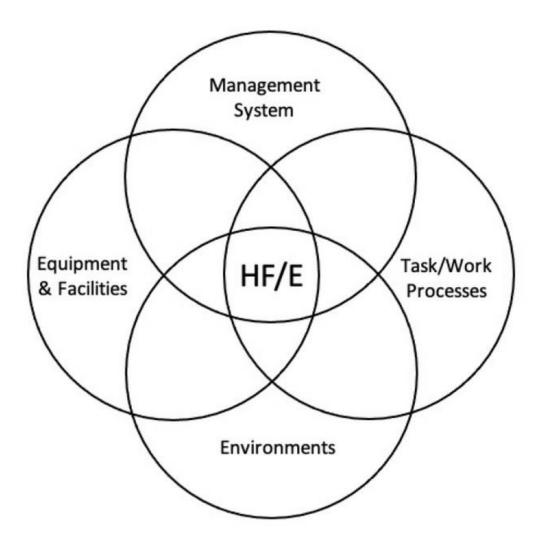
Task/ Work Processes

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## Environments

Human Factors/ Ergonomics (HF/E)

## Worker(s) are at the centre of the total work system



### **NEED TO CONSIDER:**

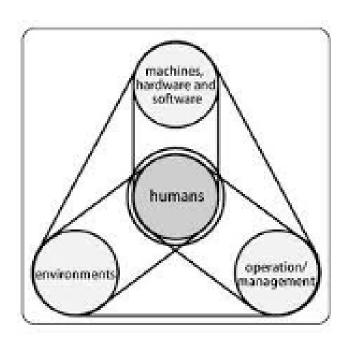
The scientific discipline concerned with the understanding of interactions among humans and other elements of a system.

### **NEED TO ENSURE:**

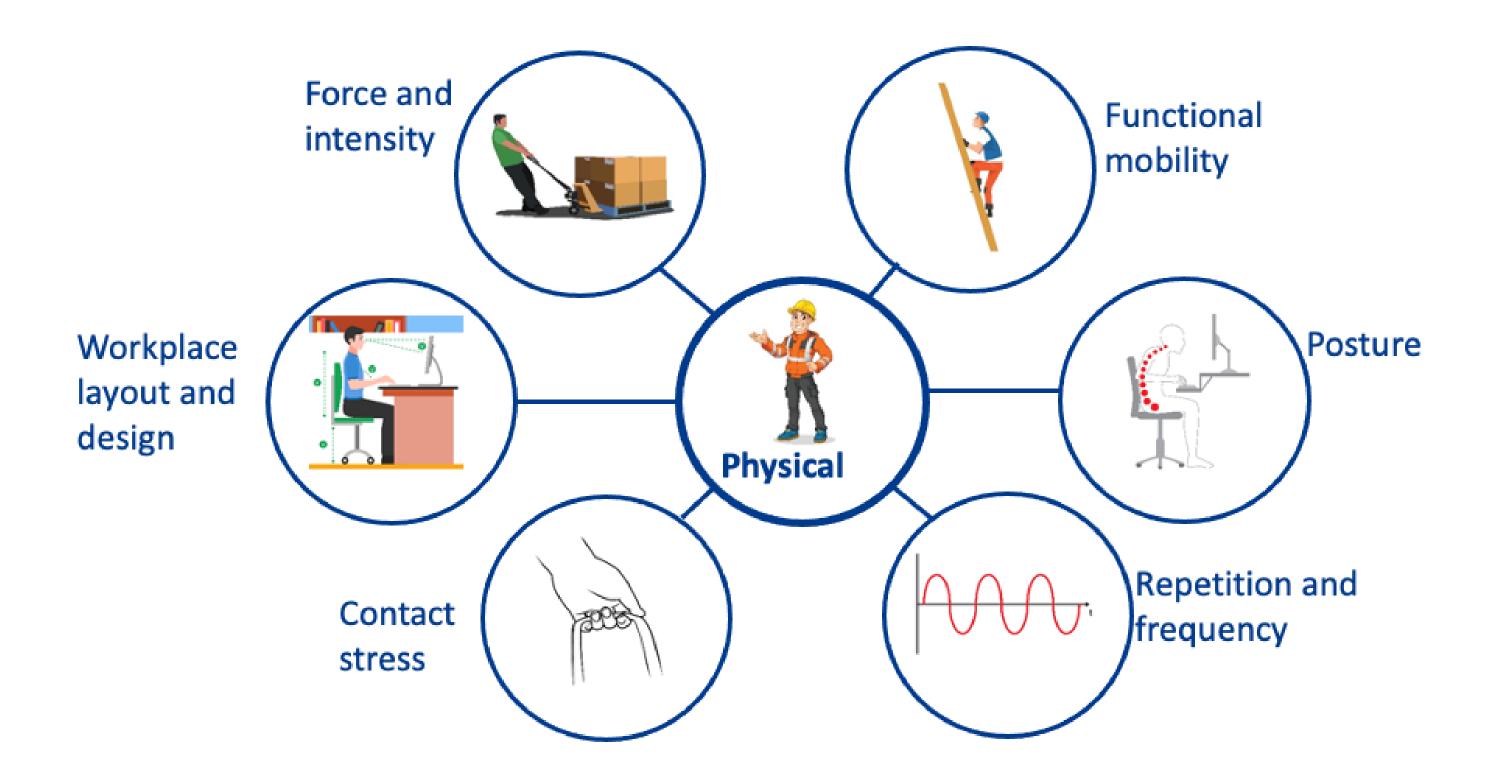
APPLY THEORY, PRINCIPLES, DATA, AND METHODS TO DESIGN IN ORDER TO OPTIMIZE HUMAN WELL-BEING AND OVERALL SYSTEM PERFORMANCE.

## A change in one component affects other components in the total work system

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# **MSI Risk Factors – Physical Demands**



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## Preventing Musculoskeletal Injuries

3. Build a Foundation for MSI Prevention





# Preventing **Musculoskeletal** Injuries

A firm foundation for MSI Prevention has:





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### EMPLOYEE PARTICIPATION



## MANAGEMENT COMMITMENT TO MSI PREVENTION

- Understanding the concerns and opportunities as work changes
- Engaging employees and staff from all levels of the company
- Taking a visible and active role in decisions and development of plans
- Opening lines of communication include updates
- Learning and improving and remaining open to ideas.
- Providing time and resources to support and maintain efforts to manage MSIs in a timely manner

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## MANAGEMENT ENGAGEMENT IN MSI PREVENTION

- Inviting workers to participate
- Involving workers in all aspects of the work and safety process
- Acting on ideas based on feedback to minimize MSI
- Evaluating solutions involving workers to assess effectiveness
- Communicating throughout the entire process in a transparent, open, two-way style



## rk and safety process nimize MSI assess effectiveness cess in a transparent,



# Employee **Engagement in MSI** Prevention

- Operators, maintenance workers, and procurement staff are also involved in safety
- Employees are asked for their input on safety
- Operators report unsafe conditions or near misses
- Active and structured involvement of staff in workshops, risk assessments, design projects
- Cooperation over safety a joint effort between all in the company



## PREVENTING **MUSCULOSKELETAL INJURIES**

- Are workers actively involved in the process?
- Is there an appropriate and effective system for employees and their supervisors to raise health and safety concerns?
- Workers are a key source of information about the demands of the job, the potential MSI hazards, and have suggestions on fixing it





## Preventing Musculoskeletal Injuries

4. Manage the Risk of Musculoskeletal Injury



# Compliance with Ergonomics (MSI) REGULATION



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Educate employees about risks and the signs and symptoms of injury.

Identify jobs, tasks and work locations that pose a higher risk of injury.

Assess how much risk each identified hazard poses and communicate that to employees.

Work with employees to develop controls that can eliminate or reduce risk factors.

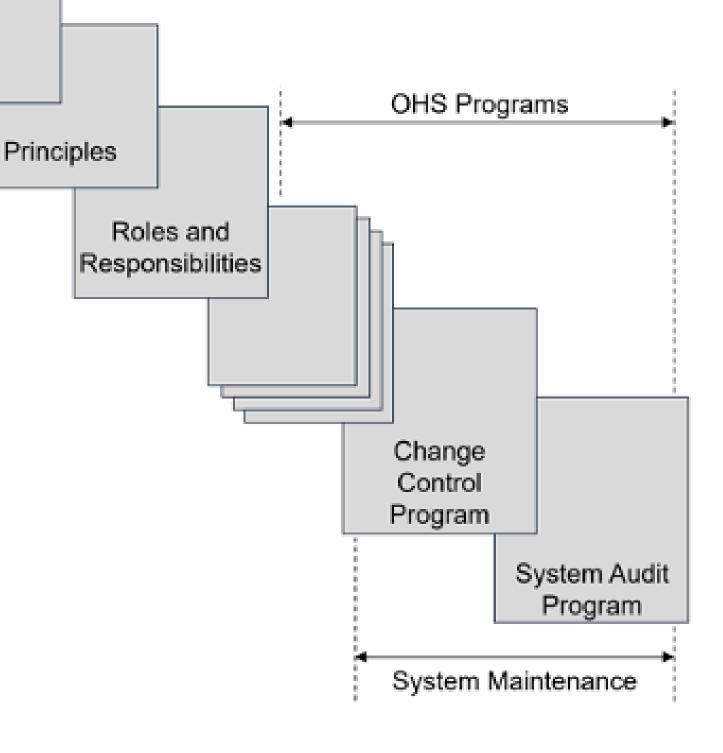
Ensure employees can safely use control measures when new procedures and equipment are implemented.

Provide ongoing evaluation of new control measures to assess their effectiveness.

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# Occupational Health and Safety Systems

- A guide to action, expressing important principles, values or beliefs, that should be followed by individuals in the organization in order to attain stated goals and to provide consistency of decisions.
- Concepts which frame the organization's philosophy and approach to addressing OHS



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OHS

Policy

# Preventing Musculoskeletal Injuries

**EMPLOYEE PARTICIPATION IN MSI PREVENTION:** 

- Provides insights about the demands of the job and potential MSI hazards
- Suggest ideas and methods to implement interventions that will reduce MSI risk

# There is continuous improvement and a total quality approach



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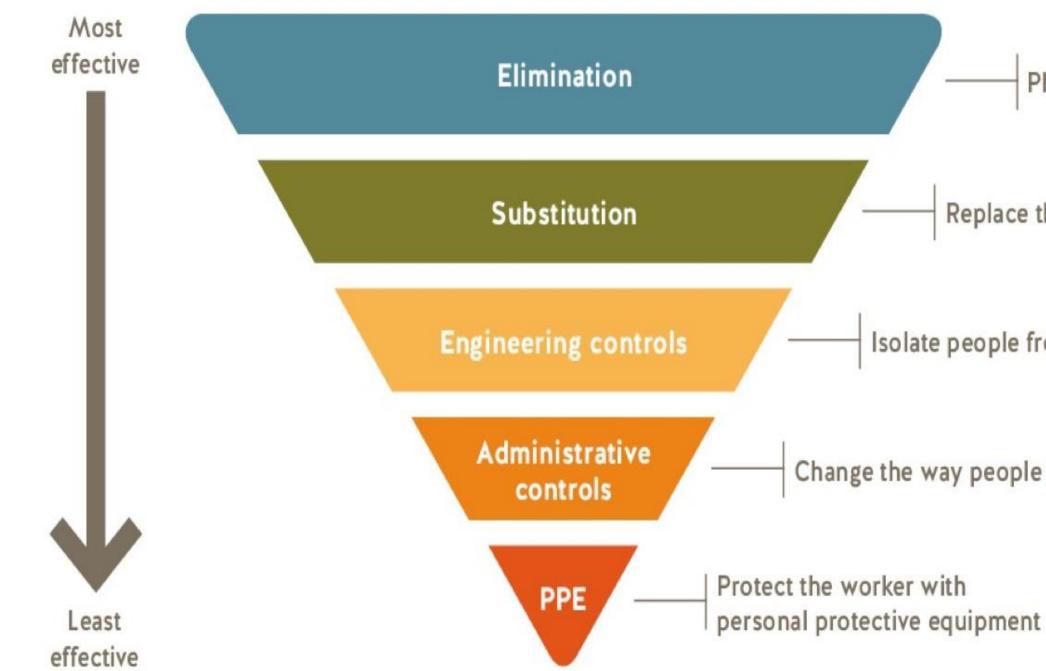
## Preventing Musculoskeletal Inju

5. Control Risk Factors for Musculoskeletal Injun



## **Hierarchy for Controlling MSI Risks** Most effective Elimination Physically remove the hazard Replace the hazard

and shallow



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Isolate people from the hazard

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Change the way people work



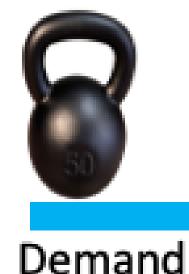


# **Ergonomics Principles for Controlling MSIs**

- Fit the work task to human capabilities and goals
- Minimize concurrent, long duration and/ or high magnitude physical exposures (force, repetition, awkward/ static posture, mechanical compression, vibration)
  - a) Reduce static loads and physically stressful posturesb) Minimize peak force requirements and the percentage of time spent in forceful exertion
  - c) Minimize the duration of exposure to whole-body vibration and hand-arm vibration (WBV & HAV)
  - d) Ensure that work/rest recovery cycles within a work shift minimize fatigue

## **EVIDENCE THAT CONTROL IS EFFECTIVE**

- Increased capacity or reduced demand
- Increased time in neutral postures
- Reduced injury rates
- Increased productivity, performance, quality









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## Capacity



## **ADMINISTRATIVE CONTROLS Job Rotation**

- Distributes MSI risk factors more evenly across a group of people
- Requires accurate risk assessments and planning to implement the optimal rotation sequence to avoid loading the same musculotendinous groups in adjacent jobs

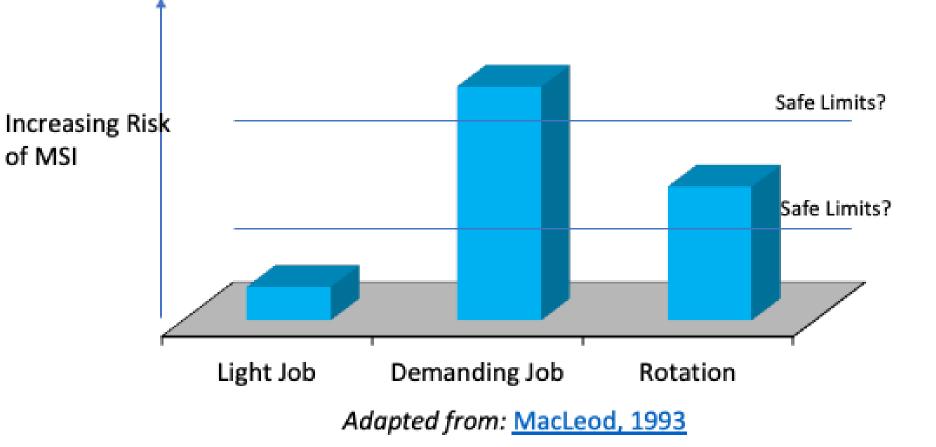






## ADMINISTRATIVE CONTROLS Job Rotation (Low)

- Job rotation alone does not change MSI risk factors in the facility
- The risk for some individuals can be reduced, while the risk for others can be increased
- No net change in risk factors present.

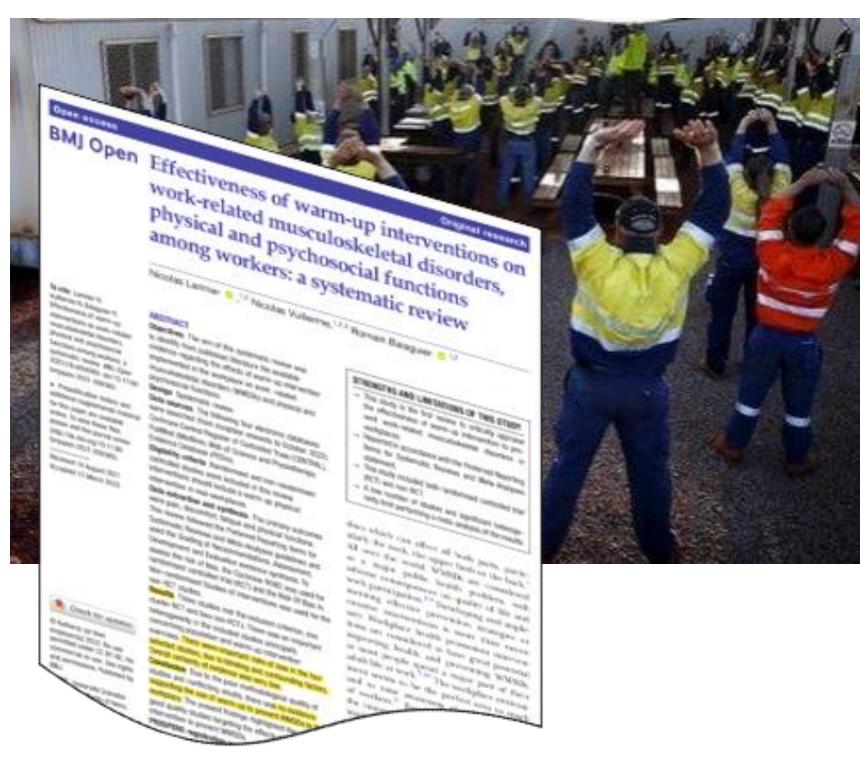


## **Job Rotation and Safe Limits**

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**ADMINISTRATIVE CONTROLS Pre-Shift Stretching (Low)** 

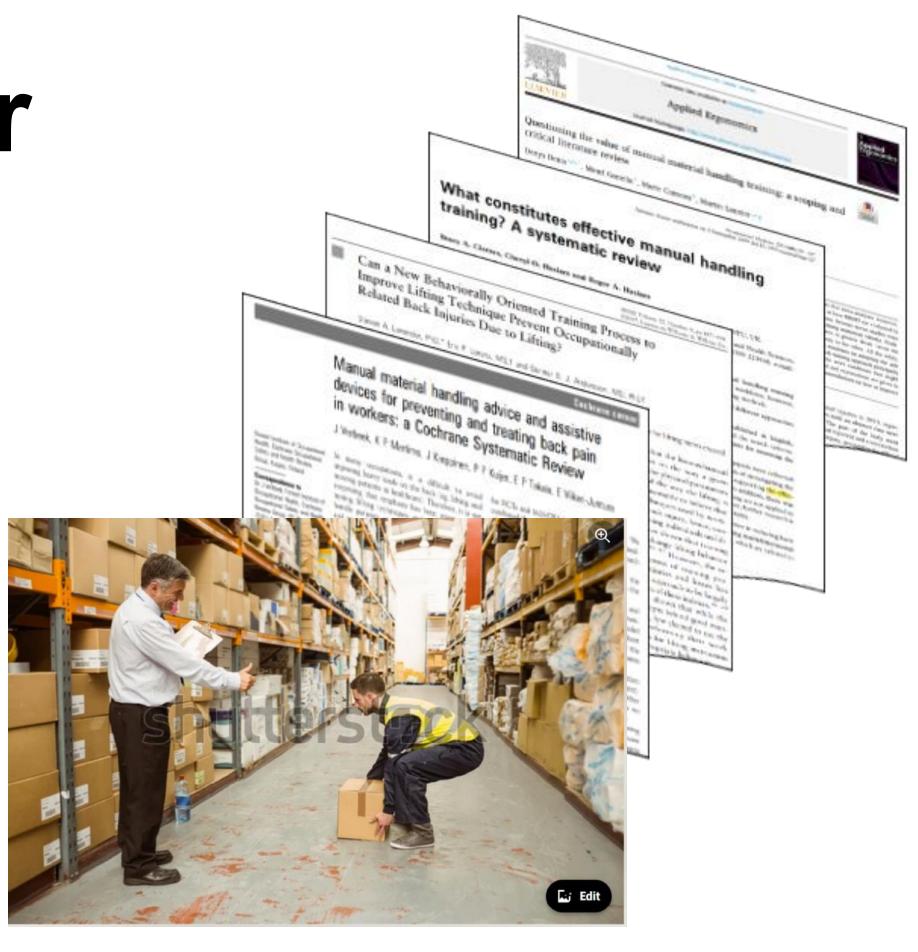
- Pre-shift stretching is commonly requested by manufacturing employers
- Weak evidence in the literature to support pre-shift stretching in industrial environments



**MAKE IT SAFE** WORK SAFE BC

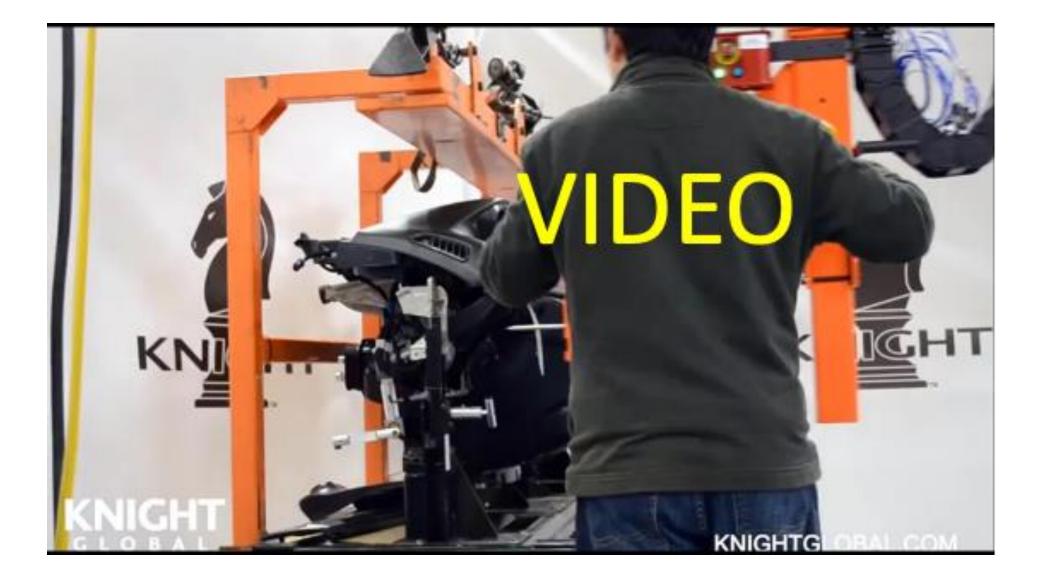
## ADMINISTRATIVE CONTROLS Training and Advice (Low)

- Training workers to lift correctly does not change how people lift at work
- Does not prevent injury

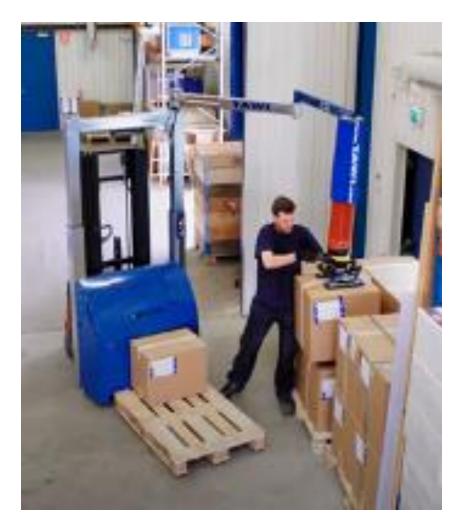


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# **Effectiveness for** *Controlling MSIs* ENGINEERING CONTROLS - LIFT AIDS

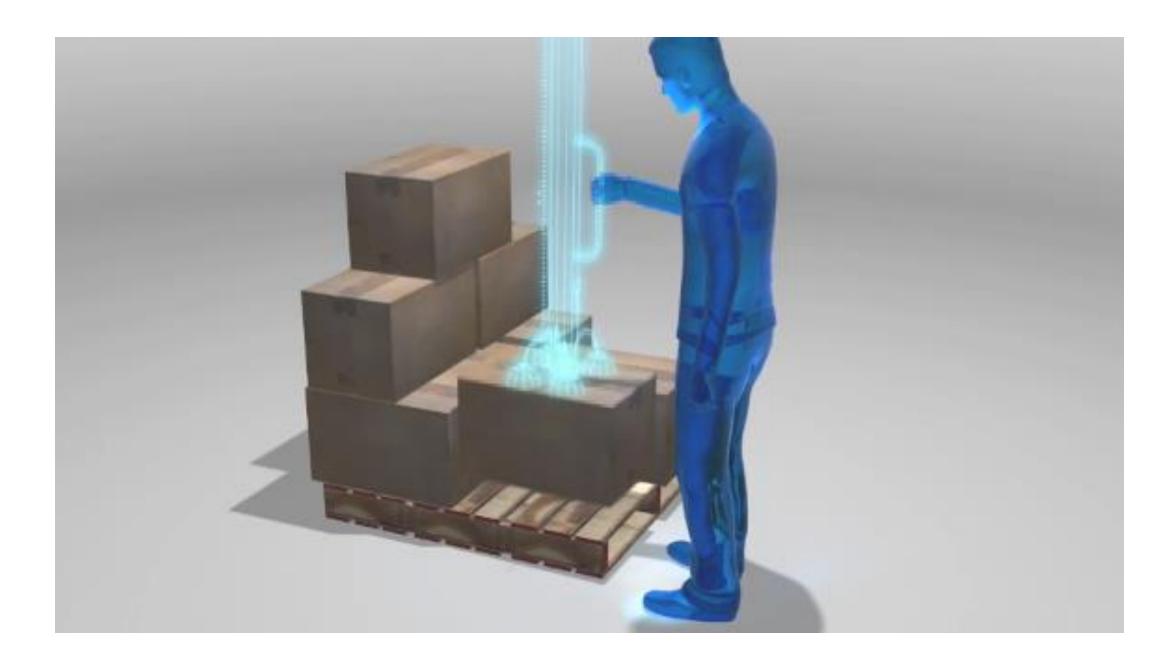








# **Effectiveness for** *Controlling MS/s* ENGINEERING CONTROLS – LIFT TABLES

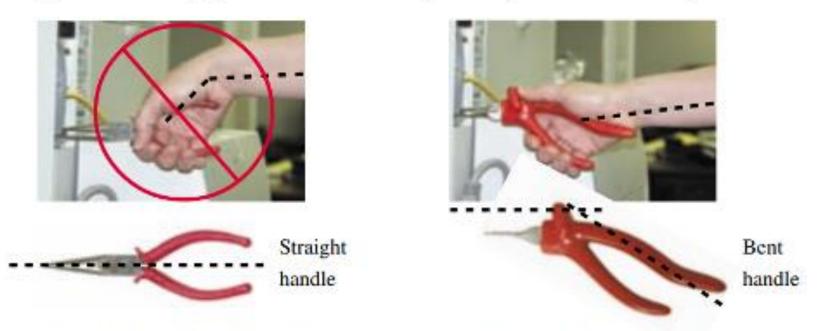




# **Effectiveness for** Controlling MSIs **ENGINEERING CONTROLS Tool Design**

- "Bend the tool, not the wrist"
- Tool selection in terms of handle shape is dependent on orientation of work

Tools with bent handles are better than those with straight handles when the force is applied horizontally (in the same direction as your straight forearm and wrist).



applied vertically.

Bod

У



Straight handle

Tools with straight handles are better than those with bent handles when the force is

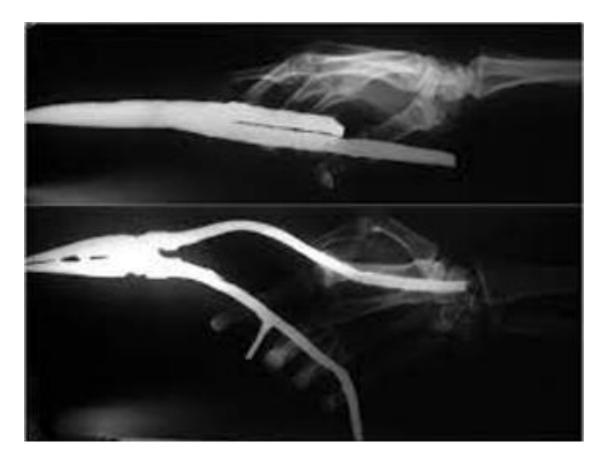


Bent handle



# Effectiveness for Controlling MSIs **ENGINEERING CONTROLSTool Design**

"Bend the tool, not the wrist"



HAGUE AND KHAN, 2010

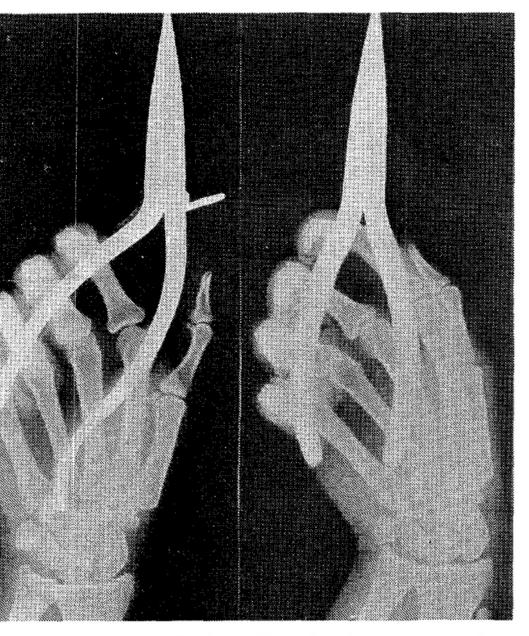


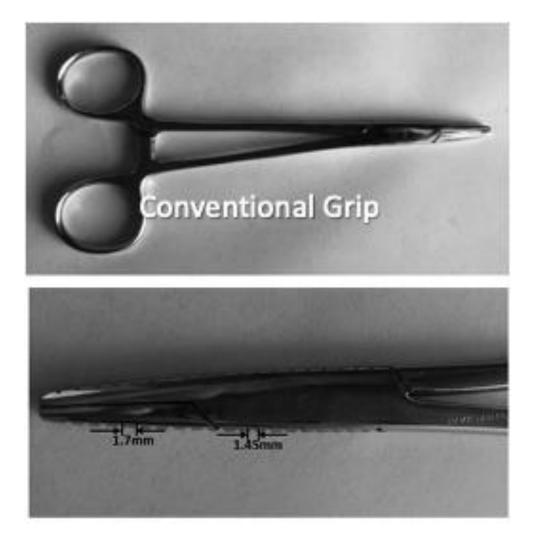
Figure 1<sup>4</sup> — A poorly designed handtool may cause ulnar deviation of the wrist as indicated in the top view. The offset handle (bottom view) allows more normal alignment of the wrist reducing the lateral deviation forces acting at the carpal tunnel.

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TICHAUER AND GAGE, 1977

# **Effectiveness for** *Controlling MSIs* ENGINEERING CONTROLS Suturing Tool Design

- "Bend the tool, not the wrist"
- "New grip design of needle holder reduced time to suture, led to better wrist posture, less difficulty, and less discomfort compared with traditional grip"

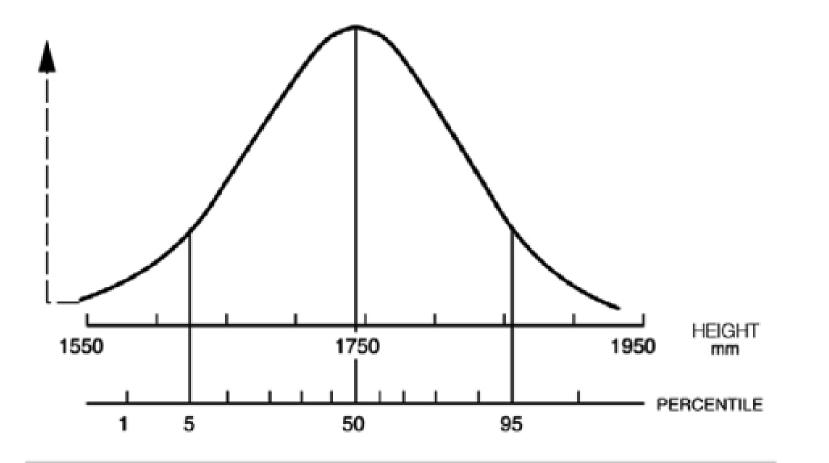




Abdelall et al., 2021

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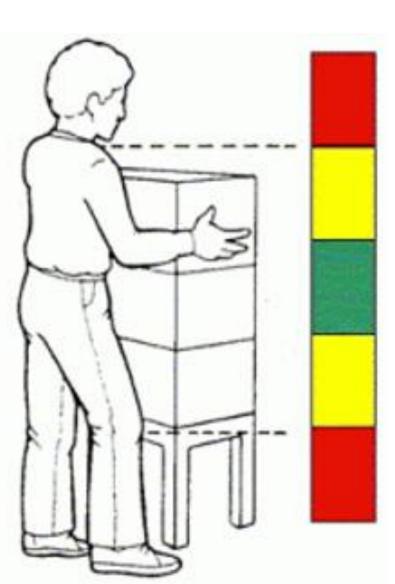
## ANTHROPOMETRY AND DESIGN OPTIMAL LIFTING HEIGHT



49 in. (5<sup>th</sup> percentile female shoulder height)

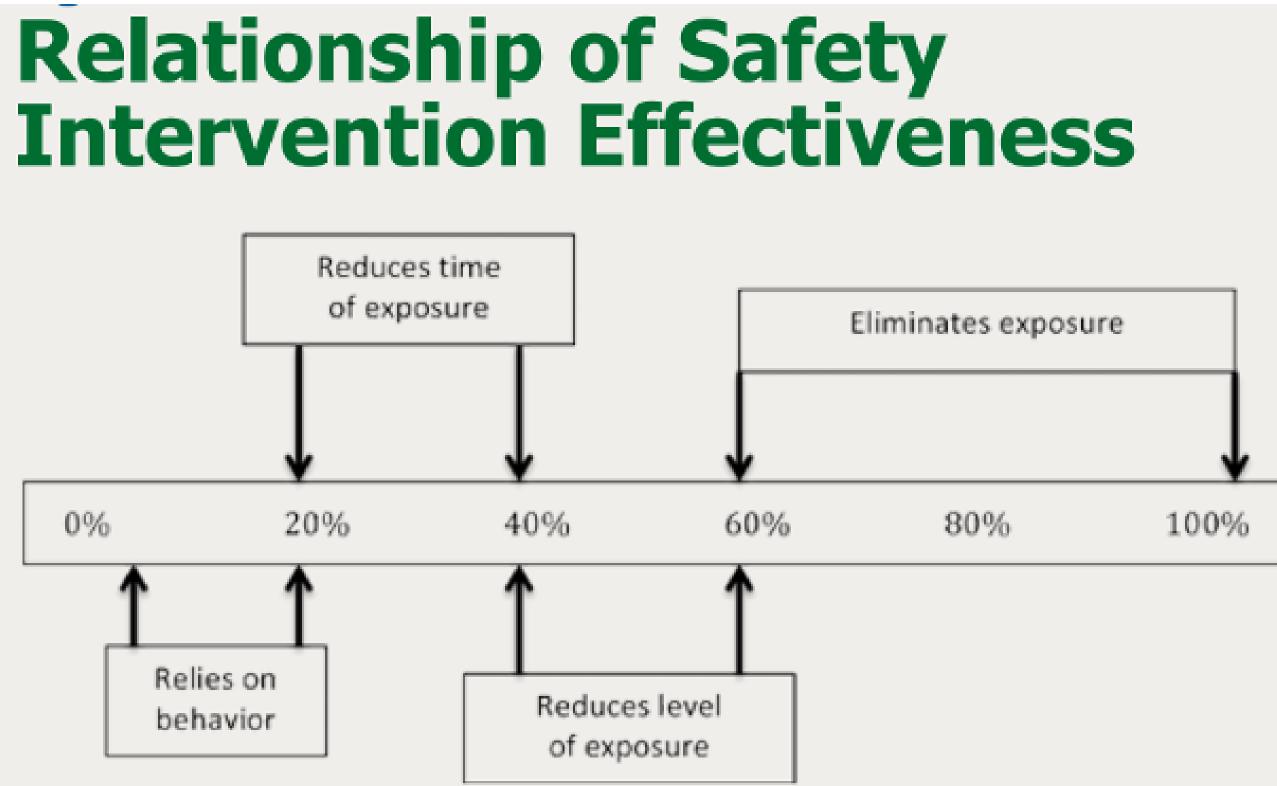
24 in. (95<sup>th</sup> percentile male knee height)

The curve obtained through approximation has a normal Gaussian distribution (the curve is symmetrical in comparison to the central value) and has a similar trend for all of the measurements of the human body found within sufficiently broad population groups. The data reported here refers to the adult population in the UK.



ERGOWEB, MACLEOD, 2013

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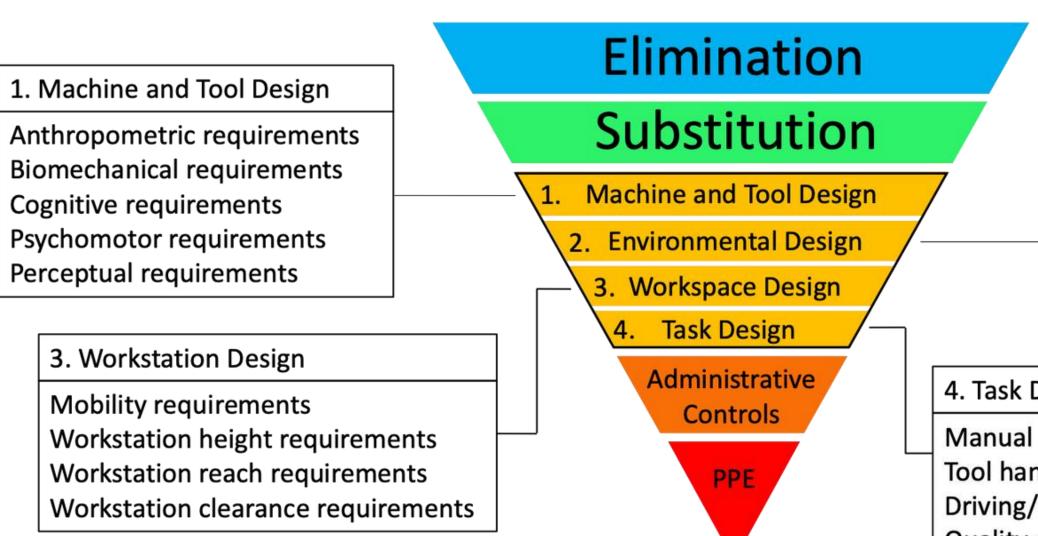


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# **Hierarchy of Controls** with Engineering Controls



2. Environmental Design

Temperature controls Lighting controls Vibration controls Noise controls

### 4. Task Design

Manual handling tasks

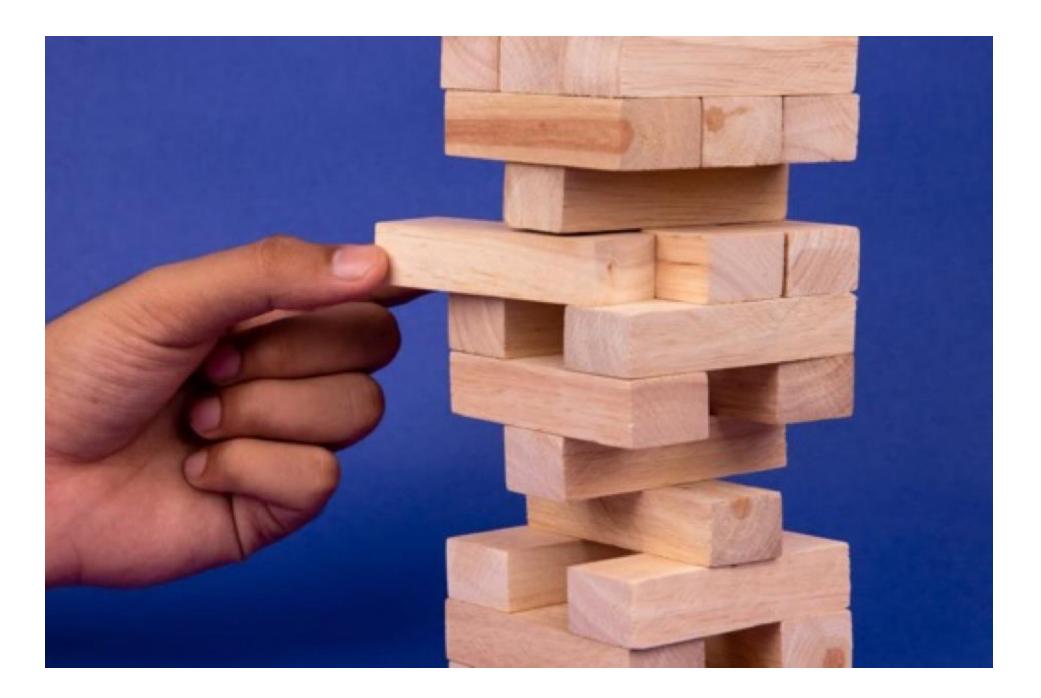
- Tool handling tasks
- Driving/ equipment operation tasks

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Quality control tasks

**DEROUIN**, 2013

## **Preventing Musculoskeletal Injuries** FILL THE GAPS FOR MSI RISK CONTROL



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## Preventing Musculoskeletal Injuries

6. Resources and Tools available for MSIP



# **WSBC Resources for Preventing MSIs**

### UNDERSTANDING THE RISKS OF MUSCULOSKELETAL INJURY (MSI)

An educational guide for workers on sprains, strains, and other MSIs



PREVENTING MUSCULOSKELETAL INJURY (MSI)

> A guide for employers and joint committees







**ERGONOMICS ENEWS** 

WWW.WORKSAFEBC.COM/ERGONOMICS

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## **WSBC Resources for Preventing MSIs MSI PREVENTION GUIDANCE INFORMATION SHEETS**

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### MSI prevention guidance Contact stress

Contact stress is a common but often unnoticed risk factor for mascal solution lighty (). This resumpts provides information to bein empioyers identify, assess, and control the rito workers of contact stress.

### Risk Mentification

Contact stress happens when some partial a we firstbasy dug, the treast above, while, "repeat to the or relevant against a load, sharp, or inflexible serviceor object repetitively or for an extended period. The surface or object could be a worksmalor, the How placking alook or a bucket handle.

Pressure from the surface or object can effect blood flow, name function, and the more mark and varge of metto viol tendors and muscles. It can also cause inflammation, buised mercles, English, numbers, reduced grip sinergify. suffices, loss of circulation, and adding.

Contact stress can slow down workers and lead to other injuries, as sed allowing combined with other ACI risk feations such as repetition, avenued promary, or indensive foreig. Consider stress cars pepar in nearly any type of Job.

### Risk assessment

The greater the pressure mental on the body, the groups the disk of WSL When assauling the life, talk to workers who may be exposed to a risk of ANSI. Ask them if they experience any pressure. reader on their skip or any distal period.

"he severity of risk depends on three factor." magnitude, frequency, and darst on of equal The greater the cotal time that there is come a single on a specific part of the book, the area. the risk of A431 Sealar red explosures generally. many a presidential line service independent. processing that total the same amount of time.

Consider the following when averying the risk of AGI from contact ensure

- Does contact stress have marks or depressions. on the skin?
- Are waiters exposed to contact stress for long periods (more than two hours spread out to works has P
- Ane workers apperiancing humbrass or singling sensetione?
- Ane workers exposed to contact stress along with pitter #RS lask: factors, such as frequent. or prolotged expenses to grip/force, awitward welst perstants, hand-arm obsticles, or equil?

Associating yes to one or more of these suppliers. indicates that the contact stress may lead to an MSL either on its own or slong with other risk. South Reports

MSI prevention guidance Pushing and pulling And the second water to be a second with the second water to be a second water to be

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## MSI prevention guidance Cold temperature

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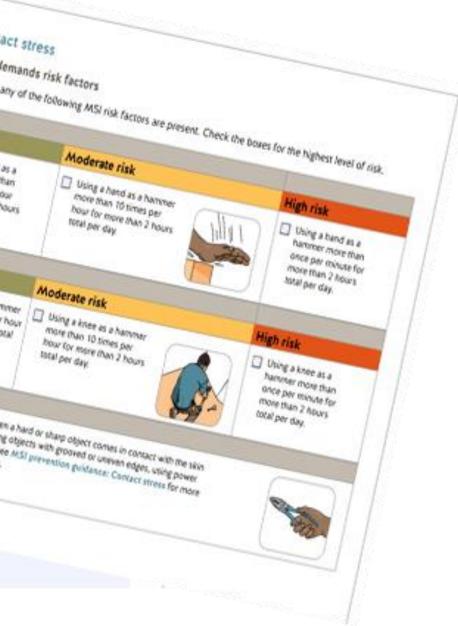
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## **WSBC Worksheet for MSI Risk** Assessment

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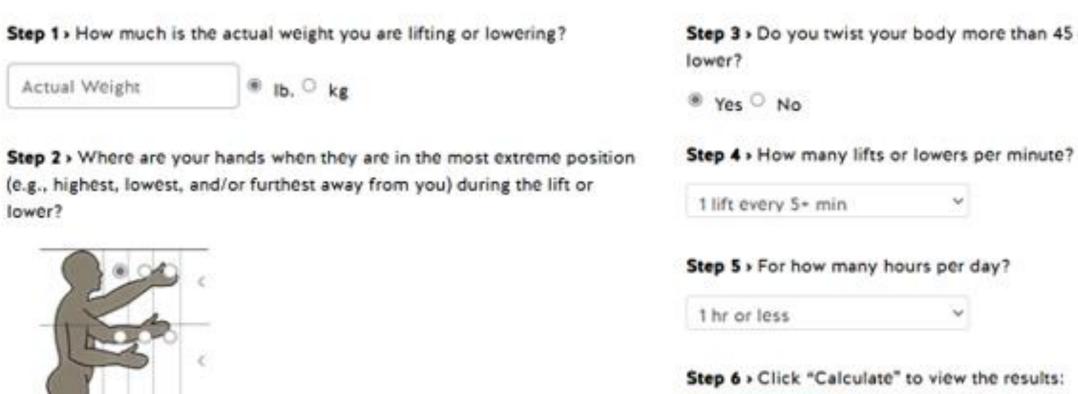


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## WSBC Tools for MSI Risk Assessment

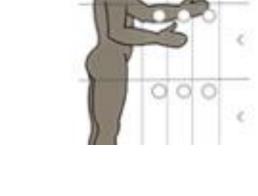


### Lift/Lower Calculator





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Step 3 > Do you twist your body more than 45 degrees during the lift or

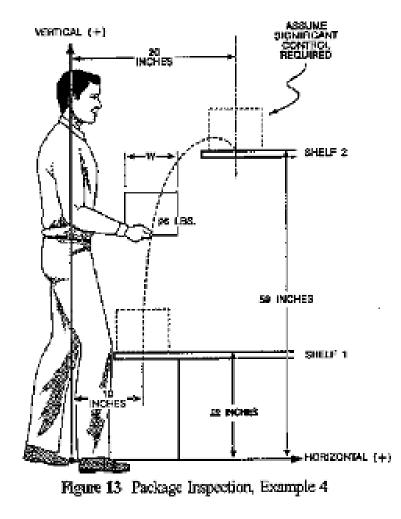
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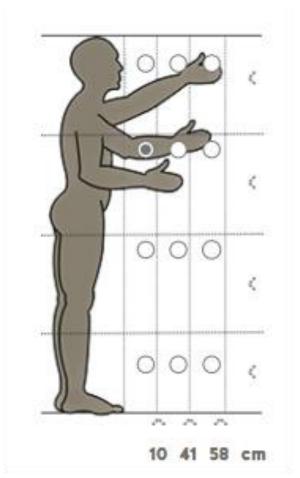




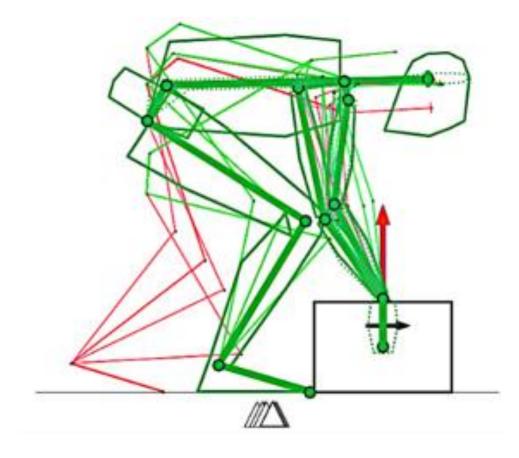
## **Effective for Controlling MSIs UNDERSTANDING DEMAND VS. CAPACITY MMH TOOLS**



NIOSH Lifting Equation, 1994



### WSBC Lift/Lower Calculator



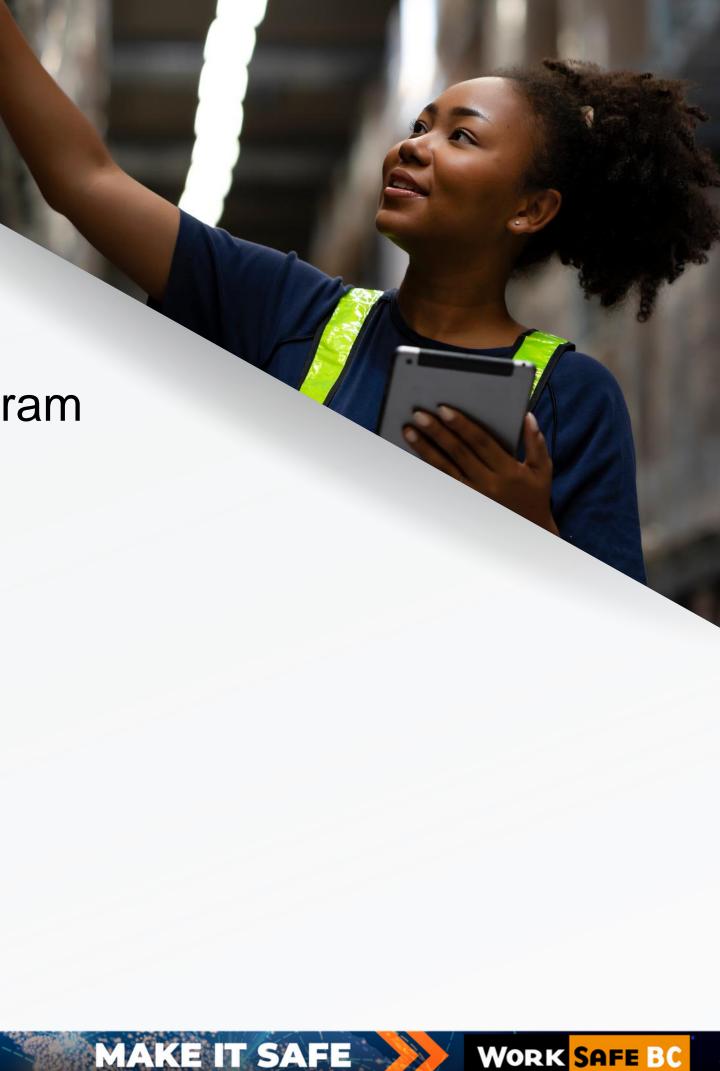
Work(s) Ergo

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# Musculoskeletal Injury Prevention

- Build a foundation for your MSI Prevention Program
- Assess and Manage MSI Risks
- Control the MSI risk factors
- Consult with workers throughout the process







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