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5 Innovations in Musculoskeletal Disorder (MSD) Prevention

New and emerging technologies are transforming how organizations assess and prevent musculoskeletal disorders

1 Exoskeletons

Wearable device that augments, enables, assists or enhances physical activity.

2 Cobots

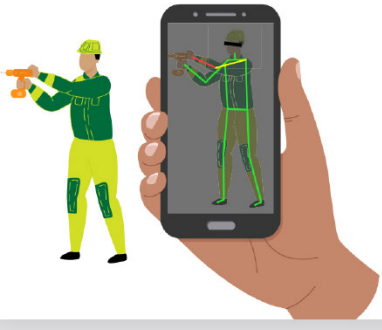
Collaborative robots work safely alongside a human counterpart to complete work, particularly repetitive or forceful tasks to prevent and reduce MSDs.

3 Wearable Sensors

Devices worn on the body to give real-time feedback on a user's movements, posture and vital signs.

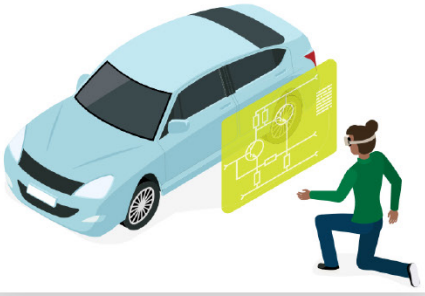
4 Computer Vision

Technologies that use video input and artificial intelligence to assess MSD risks.



5 Extended Reality (XR)

Computer-generated imagery used in augmented or virtual space to help workers identify ergonomic risks and practice difficult tasks in a controlled environment.



Exoskeletons

Wearable devices that augment, enable, assist or enhance physical activity.

Supports Posture

Reduces Discomfort

Minimizes Fatigue

Enhances Performance

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DID YOU KNOW?

Exoskeletons can be active or passive.

Active Exoskeletons

- Rigid
- Powered or motorized
- Enhances and augments worker strength

Passive Exoskeletons

- Rigid or soft
- Use levers, springs or counterbalance forces
- Redistributes force from back and shoulders

BE AWARE

Exoskeletons are not a one-stop solution. They are not appropriate for all work tasks and should be used in combination with other ergonomic strategies to prevent MSDs.

PRO TIP

Account for the varied needs of your workforce. You may need to purchase a variety of devices that meet the ergonomic needs of your diverse workforce. Ask vendors how their equipment accounts for unique worker needs.

Some factors to consider:

- Shape and size
- Fit
- Comfort
- Type of task
- Ease of use
- User experience
- Balance
- Ability to put on and take off
- Impact on range of motion

Cobots

Collaborative robots work safely alongside a human counterpart to complete work, particularly repetitive or forceful tasks, to prevent and reduce MSDs.

4 LEVELS OF COLLABORATION

Coexistence Humans and robots work independently in the same space	**Sequential Collaboration** Humans and robots work on a task in turns
Cooperation Humans and robots work together on a task	**Responsive Collaboration** Robot responds to the movement of the worker

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DID YOU KNOW?

Common Safety Features

- Multiple redundant micro-controllers stop motion if one or more controller fails
- Motion sensors halt movement if a worker is too close
- Speed and range of motion are limited
- Lightweight materials and rounded joints reduce force in the event of a collision

BE AWARE

Cobots do not replace workers. Collaborative robots perform high-force, repetitive or monotonous tasks, reducing risk of injury and freeing workers to perform tasks that people are uniquely equipped to complete.

PRO TIP

Perception matters. When introducing cobots, consider workers' perspectives.

Trust
Do workers feel safe around the cobot?

Acceptance
Do workers believe the cobot will enhance (rather than replace) their job performance?

Usability
Is the cobot easy for workers to use to accomplish their duties?

Wearable Sensors

Devices worn on the body to give real-time feedback on a user's movements, posture and vital signs.

Detects early risk factors for MSDs

Signals workers to correct awkward postures

Alerts workers to physical risk in the environment

Monitors signs of fatigue or overexertion

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DID YOU KNOW?

Sensors can be comfortably and discreetly worn in a number of ways.

Hats | Sunglasses | Earbuds | Watches/ Bracelets | Clothing

Chest Straps | Belts | Anklets | Shoes | Smart Phones

BE AWARE

Privacy and transparency are essential.

- **Seek workers' input** on the selection and rollout of new devices
- **Keep workers informed** on how data are used to support their work
- **Be clear** that results are not used to penalize workers
- **Prioritize confidentiality** in collection, storage and display of data

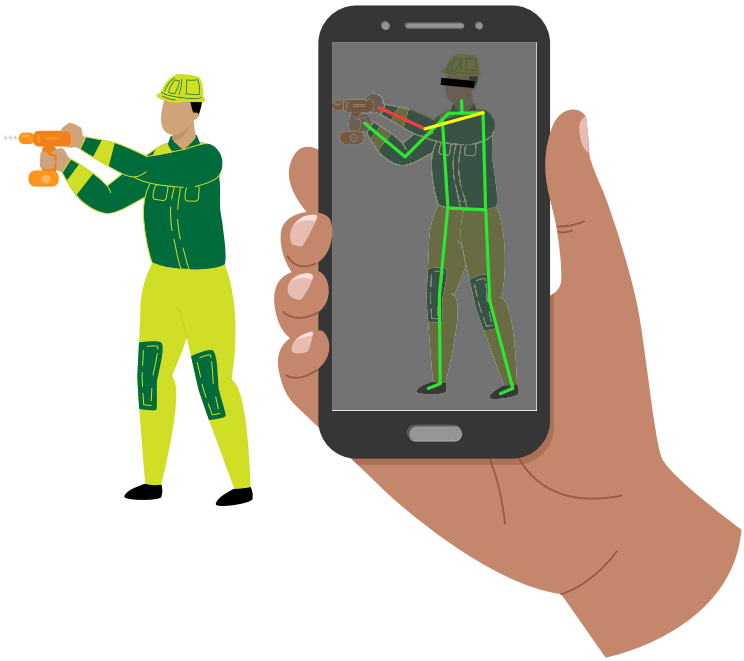
PRO TIP

Use the data from wearables to give workers a greater sense of autonomy.

- Look for devices that provide real-time communication
- Let workers see their own data so they can understand and learn

Computer Vision

Technologies that use video input and artificial intelligence to assess MSD risks.



BENEFITS OF COMPUTER VISION

Automatic
Immediate feedback from real-time video input

Accessible
Non-expert team members can conduct accurate assessments from their existing devices

Economical
Relatively low-cost technology

Efficient
Multiple movements and postures assessed at once

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DID YOU KNOW?

Computer vision is **less disruptive** and **less invasive** to the worker than wearable devices.

- **Quickly assess** multiple people without interrupting work.
- **Get better data** on MSD risks when people are moving naturally.

BE AWARE

Computer vision generates a large amount of data that requires **proper storage and security**.

Tips to secure your data:

- **Define** data collection and storage policies
- **Classify** who has access to the data and for what purpose
- **Invest** in data security software
- **Encrypt** data files and require user authentication
- **Mask** personal identifying information (10/20/1980 → ********)
- **Train** staff on best practices in data security

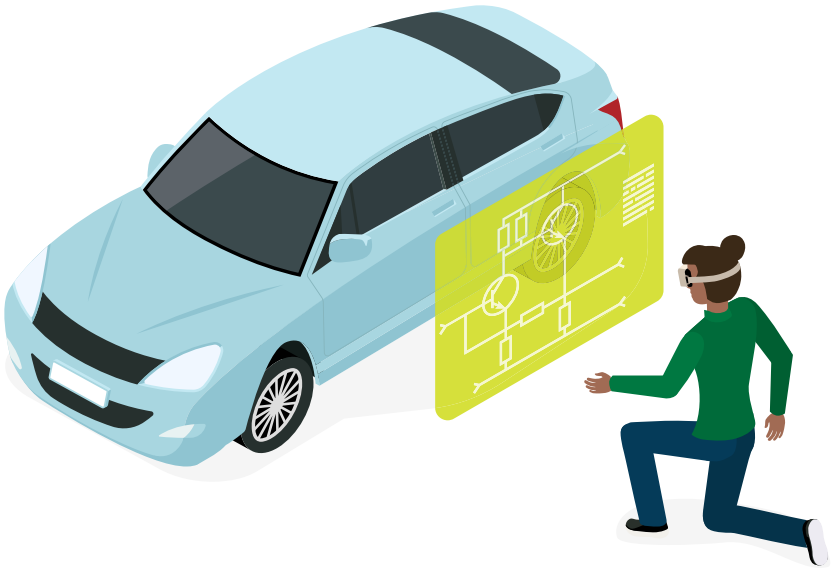
PRO TIP

Ethics are essential. Never collect data without workers' consent.

- **Inform workers** about the data you are collecting and how it will be used.
- **Use facial blurring** to protect worker privacy.

Extended Reality (XR)

Computer-generated imagery used in augmented or virtual space to help workers identify ergonomic risks and practice difficult tasks in a controlled environment.



Virtual Reality
An immersive digital experience

Augmented Reality
Digital information layered onto real-world elements

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DID YOU KNOW?

XR training is just as effective as traditional training.

- Safe, controlled environment to learn new tasks
- Real-time ergonomic feedback
- Repeatable, lifelike scenarios
- On demand access to instructions and user manuals
- Adaptable conditions to meet training needs
- More sustainable and cost effective

BE AWARE

Some workers may experience challenges if XR devices are worn too long, including:

- Strain to the eyes, neck or shoulders
- Visual and muscular fatigue
- Mental overload
- Motion sickness
- Disorientation
- Anxiety

PRO TIP

Select training devices that account for the accessibility needs of your workforce.

- Adjustable headsets
- Adaptable text size
- Controllable light, darkness and color
- Controller-free hand-tracking
- Non-visual sensory feedback
- Alternative training options