

## Repetitive Motions

### Risk Trends

Work-related musculoskeletal disorders (MSDs) are often due to physical risk factors such as [forceful exertions](#), awkward postures and repetition. In the current spotlight, we focus on repetitive motions involved in tasks performed by workers. Injuries from repetitive motions involving microtasks (small, individual movements that can be completed quickly and are often part of a larger, more complex task) ranked as the tenth most costly cause of workplace injuries, resulting in \$1.54 billion in direct costs to U.S. private businesses (Liberty Mutual Workplace Safety Index, 2024). Additionally, according to the National Safety Council [2023–2024 MSD Solutions Index Community report](#), over half (54%) of participating MSD Pledge organizations cite computer and/or noncomputer related repetitive activities as one of their top three greatest risk factors for MSDs.

Repetitive motions refer to performing the same or similar motions or actions repeatedly over a long period and are a significant contributor to the development of MSDs. When work involves repetitive movement of one or more muscle groups and there is impact on the muscles, joints, tendons, ligaments and/or nerves, there is a higher risk of fatigue and MSDs, especially if there is not enough recovery time between movements. MSDs can also develop when repetitive motion is combined with other risk factors, such as sustained awkward postures, force or environmental factors.

### Types and Examples of Repetitive Motions

Any motion a worker performs frequently has the potential to develop into a repetitive motion injury. Specifically, the level of force involved is important to consider when assessing MSD risk from repetitive motions, as studies have indicated increased risk when high-force tasks are performed repetitively compared to low-force tasks (Gallagher & Heberger, 2013). For example, prolonged typing and mouse clicking are considered repetitive motions and have MSD risks associated with them, but the level of force is relatively low compared to tasks such as tightening bolts in an assembly line or using vibrating tools like a jackhammer. Basically, to fully understand how repetition impacts MSD risk and to develop effective solutions, it is necessary to understand the forces involved and how they interact with the repetitive nature of a task. Common tasks that, if done repeatedly with high enough force, might lead to an MSD include:

- Screwing or tightening bolts or fasteners using a hand tool, such as a screwdriver, wrench or other instrument, for example, during assembly line work
- Prolonged typing or using a computer at a poorly designed workstation with minimal breaks
- Prolonged exposure to using vibration tools such as jackhammers, sanders, drills and chain saws
- Picking, sorting, placing, bagging or moving objects during packaging of goods
- Climbing or stepping up and down and tasks that involve frequent kneeling, squatting, climbing and bending
- Prolonged or repetitive reaching
- Cutting and handling chilled products during meat processing in cold environments

Forceful repetitive motion injuries impact the muscles, tendons or nerves, and commonly impact workers' hands and fingers, wrists, elbows, arms, shoulders and knees, and can develop into a variety of injury types:

- Carpal tunnel syndrome
- Tendinitis
- Tennis elbow and golfer's elbow
- Trigger finger
- Bursitis, including upper (e.g., shoulder and elbow) and lower extremities (e.g., prepatellar bursitis)
- Hand-arm vibration syndrome or vibration white finger

## Industries Commonly Impacted by Repetitive Motions

Some industries may be more susceptible to repetitive motion injuries due to the type of work performed (e.g., high force) and working environments. While the U.S. Bureau of Labor Statistics (BLS) does not report specifically on repetitive-motion-caused MSDs by industry, over 98% of nonfatal injuries involving days away from work, job transfer or restriction that resulted from repetitive motions involving microtasks were classified as MSDs (BLS, 2021–2022). Therefore, the information below is a good representation of industries more commonly afflicted with MSDs due at least in part to repetitive motions.

**Annualized incidence rates for nonfatal occupational injuries and illnesses involving days away from work, restricted activity or job transfer (DART) that resulted from repetitive motions involving microtasks per 10,000 full-time workers by private industry, 2021–2022**



## Potential Solutions

### Elimination

Remove the hazards that cause repetitive motions entirely:

- Automate processes that require repetitive handling of the load, through mechanization (e.g., robotic arms or conveyor systems)
- Redesign job tasks to eliminate unnecessary repetitive movements or the use of vibrating tools
- Replace or redesign the vibration-causing machinery so that it no longer produces harmful vibrations

### Substitution

Replace highly repetitive tasks with safer alternatives:

- Implement ergonomic equipment, when and where possible to avoid repetitive exposure to risk
- Use power tools instead of manual tools. However, in special cases, switching from power tools to manual hand tools may reduce vibration exposure.
- Use low-vibration power tools or pneumatic tools to reduce the exposure to vibration

### Engineering

Modify the work environment to reduce exposure to repetitive motions:

- Reduce the required forces for a forceful repetitive task, even if the number of repetitions remains the same
- Install adjustable workstations to accommodate different worker heights
- Design work to avoid repetitive forearm rotation, as this can lead to many repetitive motion injuries of the hand, wrist, arm and elbow
- Provide power tools and ergonomically designed equipment. Modify tools to include anti-vibration handles or grips to reduce the transmission of vibration to the hands
- Install vibration dampening systems or isolators on the equipment to isolate the vibration from the operator
- Implement mechanical assists for lifting, lowering, pushing or pulling, carrying, and/or reaching tasks
- Design workflow to ensure workers can control the timing and speed of work

### Administrative

Change work procedures and practices to minimize risk:

- Provide regular breaks from sustained or repetitive tasks to rest and encourage stretching exercises
- Establish guidelines for maximum exposure times to vibrating machinery and ensure that workers take frequent breaks to rest their hands and reduce fatigue
- Train workers on early symptoms, proper ergonomic techniques and body mechanics
- Establish best work practices that promote neutral postures and reduce awkward positions
- Ensure medical management protocols are in place to catch early signs or symptoms of MSDs that might result from repetitive motions
- Implement job rotation schedules to allow for workers to vary tasks and/or switch between jobs to lessen exposure to repetitive motions
- Implement job enlargement, which provides workers with additional job tasks to further diversify their job responsibilities and lessen their exposure to repetitive motions
- Ensure workers know how to use machinery and tools properly to minimize repetitive motion and/or vibration exposure

### Personal Protective Equipment (PPE)

While least effective, PPE can still play a role in preventing MSDs:

- Provide wrist supports, anti-vibration gloves that meet ISO 10819:2013 standards or other ergonomic supports when and where necessary

- Provide elbow pads, kneeling pads, knee pads, shoe inserts or wearable anti-fatigue matting to help address contact stress
- Ensure proper fitting and use of PPE through training and supervision

## Key Takeaways

To mitigate MSDs due to repetitive motions, organizations should design work appropriately and align with ergonomic guidelines. Along with risk assessments to better understand the prevalence of repetitive motion risk, employers are encouraged to use this information and assess the presence of repetitive motion risk factors in their workplaces by consulting with their workers. Then workplaces can take a participatory approach to better understand and eliminate risks.

Employers are also encouraged to provide time for workers to take breaks, rotate jobs when tasks require exertion or provide workers with other responsibilities to lessen their repetitive motion workload. While repetitive motions are important to mitigate, MSDs are multifactorial in nature. Only controlling for repetitive motions helps reduce MSD risks partly, but it's not likely to eliminate risks entirely. Employers are encouraged to take a holistic approach to MSD prevention and consider other possible risk factors (e.g., forceful exertions, awkward postures and nonphysical risks) and how they interact with each other (e.g., tasks that are forceful and repetitive) in their prevention efforts.

## References

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