National Safety Council

Risk Spotlight

MSD Solutions Lab
an nsc program

Awkward or Sustained Postures

What Are Awkward or Sustained Postures?

Work-related musculoskeletal disorders (MSDs) are often due to physical risk factors such as forceful exertions, repetitive motions, or awkward or sustained postures. It is important to consider how these and other risk factors, including non-physical risk factors, interact with and compound each other when assessing MSD risk, as work-related MSDs are complex. The current risk spotlight focuses on awkward postures, or tasks that require the body to be in a non-neutral position such as bending, twisting, or reaching.

Neutral posture refers to a body position with minimal stress on muscles and joints. The joint position is stable in neutral postures, allowing larger muscle groups to generate the greatest force with the least amount of fatigue and joint stress. As joints move out of neutral posture, smaller stabilizing muscles are used for movement instead of larger muscles. These muscles fatigue more quickly, which can compromise joint stability and increase the risk of fatigue and injury. As awkward postures take the joint further toward the edge of a person's range of motion, the risk of muscular weakness rises. Additionally, sustained postures (also known as static postures) or staying in the same position for too long, even in a neutral posture, can reduce blood flow and lead to muscle fatigue.

These kinds of movements or postures involving awkward or non-neutral positions can lead to an MSD by causing strain on workers' joints and surrounding soft tissues (e.g., muscles, tendons, nerves) and are most impactful in combination with repetition or forceful exertions. For example, leaning over to grab a box on the floor places the body in an awkward posture, but the risk of developing an MSD increases if the box is heavy and the task is performed repeatedly throughout a worker's shift.

Types and Examples of Awkward Postures

Any position that deviates from a neutral posture can be considered an awkward posture (see Figure 1). Some examples of tasks that can involve awkward postures and lead to MSDs are:

Task	Example
Bending forward (e.g., stooping)	Leaning over to grab a box stored on the floor
Reaching above shoulder level (e.g., overhead work)	Completing drilling overhead
Reaching behind the body (e.g., twisting)	Grabbing an item behind you on a conveyor belt
Rotating the arms	Using a screwdriver
Bending the wrists	Reaching into a bin to grab a small item
Using a pinch grip	Using a small surgical instrument with two fingers
Crawling	Moving through a small, confined space
Kneeling	Working on an object placed low to the ground

Risk Trends

The Bureau of Labor Statistics (BLS) does not specify awkward postures as an event or exposure leading to injury or illness; however, the category "other exertions or bodily reactions" refers to a single or prolonged instance of free bodily motion that imposes stress or strain on some part of the body. The category also assumes an unnatural position for a prolonged period of time and encompasses injuries from movements such as bending, reaching, twisting, climbing, crawling, kneeling, sitting, standing, walking, and running (BLS, 2012). The Liberty Mutual Workplace Safety Index subsequently uses this category to quantify injuries from awkward postures.

According to the BLS, MSDs inflicted by "other exertions or bodily reactions" (awkward postures) were the cause of 183,180 cases involving days away from work, job transfer, or restriction (DART) in 2021–22 and were the second highest reason for DART cases for MSDs, behind forceful or over-exertions. In simpler terms, these numbers suggest that more than 183,000 workers had to take time off, switch jobs, or change how they worked because of injuries caused by awkward body positions. These types of injuries were the second most common reason for serious musculoskeletal problems on the job, just behind injuries from manual handling due to lifting or pushing. These statistics highlight how poor posture at work, not just heavy lifting or pushing or pulling, can lead to serious injuries and time away from work. Additionally, awkward postures ranked as the fifth most costly cause of injury according to the past five years of data, costing U.S. businesses $3.68 billion in 2021 alone (Liberty Mutual Safety Index, 2024).

It should be noted that awkward postures are not limited to the "other exertions or bodily reactions" category and that the cost and incidence of awkward postures injuries may be higher. For example, events or exposures categorized by BLS as "overexertion involving outside sources" (e.g., using a wrench in an unnatural posture or lifting an object) can involve awkward postures, but injuries resulting from that exposure would not generally be classified as an awkward posture–related injury.

According to the National Safety Council 2023–24 MSD Solutions Index Community report, 50% of participating MSD Pledge organizations cite awkward postures/excessive bending or twists as one of their top three greatest risk factors for MSDs.

Figure 1. Examples of awkward postures in comparison to neutral posture

Adapted from Source: National Institute for Occupational Safety and Health https://www.cdc.gov/niosh/media/pdfs/2011-191_demonsttaion-of-ergonomic-principles.pdf

Industries Commonly Impacted by Awkward Postures

While all industries can face risks from awkward postures, those involving frequent reaching, bending, overhead work, or confined spaces tend to have higher exposure. Data from sources like BLS show that some industries have higher incident rates linked to awkward postures. Meanwhile, the Liberty Mutual Safety Index

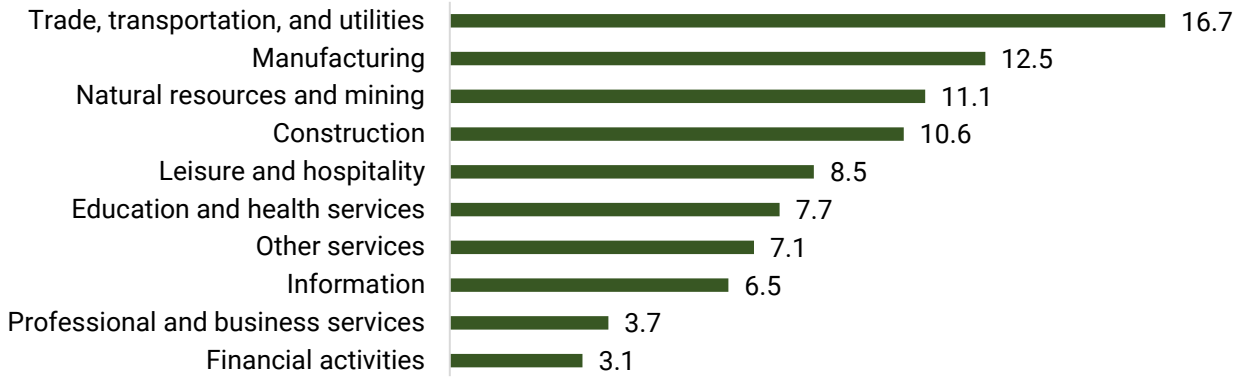
highlights industries where awkward posture–related injuries are among the top five causes of loss. These differences suggest that even if awkward postures significantly contribute to losses in an industry, it doesn't necessarily mean that industry experiences a higher overall rate of such injuries.

According to the 2024 Liberty Mutual Safety Index, the following industries experience awkward posture–related injuries as one of their top five causes of losses:

- Leisure and hospitality
- Transportation and warehousing
- Healthcare and social assistance
- Retail
- Construction

Additionally, the graph below illustrates which industries are more commonly afflicted with MSDs due to awkward postures. While the BLS does not report specifically on MSDs caused by awkward postures by industry, over 95% of DART cases resulting from the category most commonly used to refer to awkward postures, "other exertions or bodily reactions," are classified as MSDs. Therefore, this is a good representation of industries that are impacted by MSDs due to awkward postures. For reference, the overall DART incidence rate across industries is 9.2 cases per 10,000 full-time employees, indicating that the trade, transportation, and utilities; manufacturing; resource and mining; and construction industries have a higher risk of injury from awkward postures.

Figure 2. Annualized incidence rates for nonfatal occupational injuries and illnesses involving days away from work, restricted activity or job transfer (DART) that resulted from "other exertions or bodily reactions" (awkward postures) per 10,000 full-time workers by private industry, 2021–22



Data Source: U.S. Bureau of Labor Statistics Employer-Reported Workplace Injuries and Illnesses, 2021–22

Potential Solutions

Risk assessments are key before deployment of solutions to ensure that the solutions implemented match the workplace risks. A lack of proper risk assessments can result in poor data quality, leading to misinformed decisions on the effectiveness of controls in mitigating injury risk, thus wasting resources and not reducing risk. To this effect, emerging technologies (e.g., smart wearables, computer vision, AI analytics) offer a promising path for gathering richer, continuous, and more representative exposure data. Whether exploring emerging technologies for risk assessment or using more traditional methods, it is important that risk assessments include representative samples and minimize assessor bias. Safety professionals can strengthen the accuracy and impact of assessments by partnering with experts in occupational health and ergonomists who are well versed in proper risk assessment procedures and tools.

Solutions to prevent and eliminate awkward posture–related risks are provided in alignment with the hierarchy of controls. While automation and other suggestions for eliminating awkward posture–related risks are included, many other practical controls for awkward postures are also included. It is important to consider solutions that best fit the risk, work environment, resources, and workforce.

Elimination
Remove the hazards that cause awkward postures entirely:

- Redesign the task or work area to avoid overhead work, twisting, and awkward or prolonged reaching. Place frequently used tools/materials within arm's reach.
- Incorporate automation or material handling devices to perform repetitive or heavy lifting tasks, eliminating the need for manual handling and helping workers maintain safer, more neutral postures throughout the workday.
- Remove the need for lifting, holding, and positioning heavy or awkward objects with raised arms by redesigning or automating the work process.
- Utilize technologies to do work that would typically require a person to work in an awkward posture (e.g., robotics to grab items in hard-to-reach places).
    - Install automated systems for tasks that require prolonged sitting/standing and repetitive movements, e.g., sorting, assembling, or packing tasks.

Substitution
Replace tasks involving awkward postures with safer alternatives:

- Replace low or high shelving with shelving around waist level to keep workers from reaching or stooping to retrieve items. Move heavier objects to waist-level heights of the shelves for ease of handling.
- Use ergonomically designed tools, such as bent-handle versions, to replace those that force awkward wrist or shoulder positions.
- Use adjustable height workstation/benches or equipment instead of fixed-height setups to allow posture variation throughout the workday (e.g., sit-stand desks).
- Replace heavier tools or reduce load weights to minimize physical strain, making it easier for workers to maintain proper posture while performing tasks.

Engineering
Modify the work environment to isolate or reduce exposure to awkward or sustained postures:

- Use properly designed tools or equipment, such as:
    - Tools with extension handles that let the worker more comfortably complete overhead or ground-level tasks as opposed to stooping, bending, or reaching.
    - Bit extensions for drills and screw guns.
    - Handgrips on trolleys, machines, and other equipment that consider the shape and position of the hands and arms to accommodate workers of different heights.
    - Conveyors with limited width or conveyors with push or diverter bars to move products closer to workers and reduce reaching or twisting.
    - Positioning devices, like scissor lifts, articulating or swing-arm fixtures, raised platforms, turntables, ergonomic stands, lifters/tilters, elevating bins, or palletizers to raise and position loads so they can be lifted while close to the body with the back straight.
    - Workstations positioned to allow users to look straight ahead without tilting the head.
    - Tools that allow for the use of a power grip instead of a pinch grip.
- Recognize the diversity in workers' body sizes and shapes, and ensure that tools accommodate a wide range of users.

    - Ensure that tools can be used in either hand or provide specific tools for left-handed workers.
    - Consider differences in male and female hand size when purchasing hand tools.
    - Install adjustable workstations or lift tables to accommodate different heights and allow work to be done in more neutral postures.
    - Provide enough workspace so that workers can move more freely and be able to do their jobs without extensive reaching or bending. Free space around the knees, legs and feet can also help workers get closer to their work without bending and reaching.

Administrative
Change work procedures and practices through policies and procedures to minimize risk:

- Allow for frequent rest breaks or micro-breaks, especially from tasks that require a sustained or repetitive awkward posture (e.g., overhead work, manual use of a screwdriver).
    - Integrating micro-breaks into the workflow, instead of relying solely on scheduled breaks, can facilitate recovery opportunities, helping to minimize fatigue and reduce the risk of MSDs while maintaining productivity.
- Provide dynamic stretching breaks to minimize exposure to awkward or sustained postures.
- Consider job enlargement, an alternative to job rotation, which provides workers with a variety of job tasks that utilize different muscle groups to lessen exposure to awkward postures or static loading.
- Train workers on recognizing and correcting the risks associated with working in awkward postures (e.g., proper lifting techniques, adopting neutral posture while using a hand tool).
- Limit the amount of time spent working overhead.

Personal Protective Equipment (PPE)
While least effective, PPE can still play a role in preventing MSDs:

- As a supplemental solution to help correct posture and offset physical loads, investigate the potential use of exoskeletons or exosuits for reducing strain on the body during demanding tasks (e.g., upper extremity exoskeletons for overhead work).
- Provide anti-fatigue mats for standing-related work or kneepads for work that requires kneeling.

Key Takeaways

To mitigate MSDs due to awkward or sustained postures, organizations should design work appropriately to align with ergonomic guidelines. Sustained, non-neutral postures can weaken the muscles and lead to fatigue, so employers are encouraged to reduce strain by redesigning tasks to include rest breaks, ensuring that tools and equipment are properly designed, and modifying the work environment to eliminate the need for awkward and sustained postures. While awkward postures are important to mitigate, MSDs are multifactorial in nature. Controlling for awkward postures may 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, repetitive motions, and non-physical risks) and how they interact with each other (e.g., tasks that are completed in an awkward posture and repetitive) in their prevention efforts.

Proper risk assessments are essential in identifying awkward and sustained postures and guiding targeted solutions. Along with risk assessments to better understand if workers are conducting their job tasks in awkward postures, employers are encouraged to consult with their workers. Taking a participatory approach by involving workers in the design and modification process, such as gathering their feedback on tool redesigns, can significantly improve compliance and interventions' effectiveness. Additionally, combining

multiple approaches from the NIOSH hierarchy of controls—for example, engineering out the hazard or reducing the exposure, combined with worker training—often leads to the most successful outcomes. By systematically applying these strategies, organizations can reduce MSDs related to awkward postures.

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