National Safety Council

Risk Spotlight

MSD Solutions Lab
an nsc program

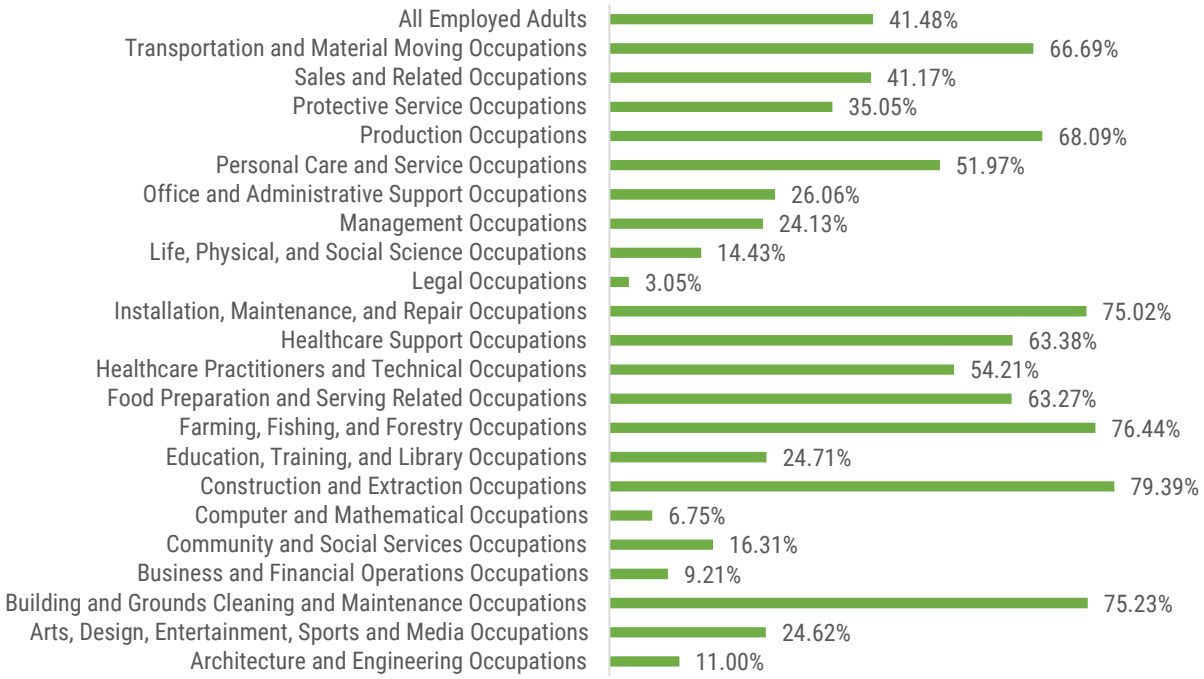
Forceful Exertion

Risk Trends

Work-related physical risk factors such as forceful exertions, awkward postures, and repetition often contribute to musculoskeletal disorders (MSDs). In the current spotlight, we focus on the force exerted by the worker during job tasks. Forceful exertion describes the amount of effort exerted by the muscles to complete a task. Forceful exertion involves outside forces at work, such as lifting, lowering, carrying, pushing, pulling, or gripping and is a main risk factor for MSDs. As such, overexertion, which includes injuries related to lifting, pushing, pulling, holding, carrying, or throwing an object, involve forceful exertion.

Forceful exertion is ranked as the most significant contributor to workplace injuries for the last six years according to the Liberty Mutual Workplace Safety Index (2024). They estimate that workplace injuries due to overexertion cost U.S. businesses close to $12.5 billion annually through direct medical costs and lost-wage payments. Similarly, as per the 2022-2023 MSD Solutions Index Community report from the National Safety Council, over half (64%) of participating MSD Pledge organizations cite forceful exertion as one of their top three greatest risk factors for MSDs, with lifting and carrying being cited as the most common risk.

Prevalence of Frequent Lifting, Pushing, Pulling, or Bending Among Workers by Occupation



Data Source: National Center for Health Statistics, National Health Interview Survey, 2015.

The National Center for Health Statistics, part of the Centers for Disease Control and Prevention, conducts the National Health Interview Survey, which estimates the prevalence of frequent lifting, pushing, pulling, or bending among workers by occupation type. As exemplified, nearly half (41.48%) of employed adults are exposed to forceful exertions at work.

Types and Examples of Forceful Exertions

For an exertion to be forceful, the force magnitude is typically greater than the maximum capability of the specific body part involved. Although many forceful exertion risks are at the expense of manual material handling, common forceful exertion risks that could result in MSDs are:

Type of Exertion	Example
Lifting	Lifting a heavy bag as a baggage handler
Lowering	Placing a product on the ground when unloading a truck
Pushing	Pushing a trolley of packages on the shop floor
Pulling	Pulling a cart of equipment
Carrying	Carrying materials between workstations
Manipulating	Shifting boxes to move them or make them fit in a crammed space
Gripping/grasping	Gripping and squeezing pliers to cut wires
Throwing	Tossing a box into a large storage bin

Industries Commonly Impacted by Forceful Exertions

While all industries could experience force-related risks, certain industries that commonly require more physical labor such as manual material handling or reaching may pose an increased level of exposure to such risks. According to the 2024 Liberty Mutual Safety Index, the following industries experience overexertion injuries as the most common or second most common cause of losses:

- Manufacturing
- Retail
- Transportation and warehousing
- Wholesale
- Construction
- Professional and business services
- Healthcare and social assistance
- Leisure and hospitality

Potential Solutions

Employers are encouraged to create tailored MSD solutions best suited for their workers to mitigate and eliminate overexertion including forceful exertions. Where possible, employers are encouraged to eliminate injury risks. Below are potential solutions to prevent forceful exertion risks across industries categorized by the Hierarchy of Controls.

Elimination

- Eliminate material handling by engineering out the hazard.

Substitution

- Reduce the weight of loads or enact and adhere to safe weights of objects for handling.

Engineering Controls

- Use adjustable material handling devices, such as lift assists, pushcarts, hand trucks, wheelbarrows, forklifts, levers, hoists, inclined planes, or rollers to move loads as needed.
- Utilize tool balancers when working with heavy tools.
- Design containers to reduce the effort needed to lift and hold, such as adding handles or handholds.
- Raise and/or tilt working surfaces to reduce horizontal and vertical reach.

Administrative Controls

- Plan the workflow ahead to avoid unnecessary manual handling.
- Minimize the distance materials need to be moved.
- Ensure loads are properly balanced and stable prior to moving.
- Avoid lifting objects off the floor, over shoulder height, and overhead.
- Avoid jerking by using smooth motions and avoiding twisting during lifts.
- Engage in pushing and pulling instead of carrying, lifting, and lowering, as able.
- Position materials to be lifted close to the body between mid-thigh and mid-chest.
- Establish a secure grip on the object to be moved.
- Provide frequent breaks to allow muscles to rest.
- Ask for help from another worker when the load is too heavy and equipment to assist is unavailable.
- Supplement hazard controls with instruction and coaching for workers.
- Create a policy and procedure for manual handling guidelines.

Personal Protective Equipment (PPE)

- Utilize the right exosuits or exoskeletons for the right task.

Key Takeaways

Employers are encouraged to use this information and assess the presence of forceful exertion risk factors in their workplaces by consulting with their workers. Then workplaces can take a participatory approach to better understand and eliminate risks. For example, mitigating MSDs due to forceful exertion revolves around using equipment to assist with manual material handling as per ergonomic guidelines and well-rounded training. Risk assessments should be conducted to better understand the prevalence of forceful exertion risk in the workplace. Employers are also encouraged to provide time for workers to take breaks.

While forceful exertion is important to mitigate, MSDs are multifactorial in nature. Only controlling for forceful exertions 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., repetition, awkward postures, and non-physical) in their prevention efforts.

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