# Common Sense Ergonomics

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Much has been written and discussed about OSHA's proposed ergonomic standard. Issues that have been hotly debated range from the "trigger" clause to cost estimates of implementation for individual companies. Despite the uncertain future of the proposed standard in its present form, many companies have moved forward in embracing the science of ergonomics as an essential element of their safety and health programs. The General Duty Clause states that "each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm." Aside from the recognized provisions of the General Duty Clause, there is a moral and ethical responsibility to correct a hazard when a known and feasible abatement exists. The cost of inaction is exponentially greater.

Bureau of Labor statistics capture the magnitude of musculoskeletal disorders in the workplace. The OSHA 200 logs of 250,000 private sector employers in 1994 revealed over 700,000 cases involving days away from work as a result of repetitive motion. Of those cases, over 360,000 were due to over exertion in lifting (65% involved the back). Over 90,000 were due to over exertion in pushing or pulling objects (52% back). Another 68,000 plus were due to overexertion in holding, carrying or turning objects. (58% back). Over 92,000 injuries or illnesses were due to repetitive motion including repetitive use of tools, repetitive placing, grasping or moving of objects other than tools, and key entry.

In looking at evidence for a casual relationship between physical work factors (repetition, force, posture, and vibration) and musculoskeletal disorders, much epidemiological research has been conducted. This research reveals strong evidence of a relationship between musculoskeletal disorders and certain work factors when there are high levels of exposure, particularly when combined with exposure to other physical work factors. For example, performing repetitive lifting of heavy objects in an awkward posture. The risk of each exposure is dependent upon factors such as frequency, duration, and intensity of exposure. In one study (Silverstein, 1985), jobs with high force and high repetitiveness had a predicted risk for tendonitis thirty-two times greater than that of jobs with low frequency and low repetitiveness. It then follows that reducing or eliminating high levels of exposure to any of the identified work factors that are elements of a job task, would reduce the risk for musculoskeletal disorder.

Repetition is measured by counting the number of cycles performed over the course of a shift. A cycle is defined in terms of the time required to complete a specific job task or operation. Repetition can contribute to fatigue and make a worker more susceptible to accidents and overexertion injuries. It is important to insure the worker has adequate recovery time from the physical demands of their work cycles. Ergonomic intervention strategies for repetition include: altering the work standard, changing the work layout for motion economy, work rotation, job enlargement, use of mechanical aids, and automation.

Posture plays a large role in injury because we often ask the body to sustain awkward postures. A sustained posture, even ergonomically corrected, will place an

increasing static load on a muscle group in order to fight gravity. Static loading can be more fatiguing to muscle than dynamic loading. Some postures place the joints in extreme positions, which may stretch ligaments and alter joint biomechanics. Some postures to avoid include: extreme wrist flexion or extension, ulnar or radial deviation, working with arms overhead, sustained neck flexion or extension, and forward bending from the waist. Some postural abatement measures include building flexibility or adjustability into the workstation, fitting the tool to the employee, and education relative to proper body mechanics/joint protection principles.

A number of factors impact the degree of force required to perform a task. The weight of the object held, carried or lifted and the friction forces between the hands and handles (coupling). If the grip surface is slippery, more force will be required to maintain a grip on the object. Also, if leverage or mechanical advantage is poor, force requirements will be greater. Ergonomic intervention strategies for force abatements include: reducing the weight of the object handled, increase friction at coupling, provide mechanical assist devices, quality control and maintenance of equipment (i.e. bearings in wheels).

Vibration can be local (such as from a hand tool) or whole body (truck drivers, jackhammers). It can contribute to circulatory, skeletal, and neurologic impairment. In combination with cold, awkward postures, or excessive force, it can be a significant contributor to injury. Abatement intervention may include cushioning handles with shock absorbing material, dampening vibration at the source, worker rotation, job enlargement, and anti-vibration gloves.

The use of good ergonomic abatement measures does not have to be an expensive undertaking. When the true cost of a lost-time claim is calculated, it's particularly enlightening how little the cost of intervention is relative to that of replacement workers, overtime, re-work, lost productivity, and workers' compensation costs. Not to mention the fact that a company with a 4% profit margin and medical/workers' compensation costs of just $20,000 will need to sell $500,000 in additional product to offset the losses associated with that injury. Many corrections can be made using existing equipment or supplies onsite and can be as simple as the following:

1. Using tool or reach extenders to reduce the need to stretch or twist in long reaches.

2. Using a scissors lift, levelator, platform, or 2-3 extra pallets to raise items about 20 inches above the floor in frequent handling tasks to reduce forward trunk bending.

3. Providing chair inserts or inflatable cushions for additional lumbar support at a seated workplace if the chair is not ergonomically sound.

4. Using small platforms on a too low work surface to raise the work height enough to reduce bending for the taller worker.

5. Using sections of roller conveyor, ball bearings mounted on the work surface, or slides to permit heavy items to be moved across the work surface without having to be lifted.

6. Providing hand carts or hoists to support the weight of objects that are difficult to handle due to their weight or configuration.

7. Using an adjustable footrest, or block of wood, Styrofoam, or a telephone book as a footrest for standing or sitting workplaces to give postural relief.

There are many more low-cost interventions that safety teams can brainstorm. A good ergonomic program should consider engineering controls (i.e. equipment, design/layout), work practice or behavioral controls (i.e. training/education relative to safe work practices such as proper body mechanics and joint protection principles), personal protective equipment (gloves, headgear, respirators, etc.), and administrative controls (i.e. job enlargement, job rotation, breaks). It is imperative to include front-line workers in the process. This ensures that those most closely associated with the tasks in question have input and, therefore, ownership of the recommended abatements for their area. Some of the most creative, low-cost interventions will come from employees that know the specific problems and all of the processes that need to be considered in arriving at a solution.

It is readily apparent that the scope of the problem of musculoskeletal disorders in the workplace and the resulting costs to individual workers and employers is enormous. With a comprehensive common-sense ergonomic approach, significant progress can be made in decreasing risk factors in the work environment. Creating a corporate culture focused on maintaining the health and safety of each individual worker should be the goal of every organization.