Dynamic Chiropractic

CHRONIC / ACUTE CONDITIONS

Preventing Workplace Neuromusculoskeletal Disorders

HUMAN BIOMECHANICS, LIFTING AND LOAD

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I thought I'd take a break from my standard interview format and discuss human biomechanics as they relate to workplace ergonomics and occupational health. Here are some suggestions, based on time-honored, fundamental principles of human biomechanics, that can be of notable assistance in reducing/preventing workplace neuromusculoskeletal disorders. Feel free to clip this article for use in patient care or in your work with corporate clients.

Fundamentals of Proper Lifting

With workers in the standing posture, all objects to be transferred in the workplace should be positioned between knuckle height and shoulder height, not to exceed fingertip reach. Also avoid twisting while bending. Most injuries to the lower spine occur during the act of flexion (forward bending from the waist) in conjunction with simultaneous rotation or twisting.

When objects to be transferred are located off to one side, avoid planting your feet in a stationary position while rotating your trunk during the process of lifting/sliding/gliding the object. Align your head, face and trunk with your feet to face the object or load you are transferring squarely before you go to lift or transfer it, thus avoiding the need to rotate. Another simple way of instructing workers is by using the phrase, "As you move your nose, move your toes," and then demonstrating what you are telling them.

Use a "wide-stance" posture when lifting. In addition to keeping your spine straight and your knees bent, you should spread your feet at least 6 inches wider than your shoulders when preparing to lift. This posture provides substantially more leverage from the lower limbs with notably less strain on the lower spinal tissues. It is also the lifting posture that workers will "buy into" so compliance is more readily accomplished.

Keep the load close to your body. Stress on the lower spine increases exponentially as a load is carried forward of your body's mid-line and base of support (your feet). To dramatically teach and demonstrate this phenomenon, have the worker hold an object such as a loaded briefcase or a bowling ball out away from their body at full arm's length, with the elbow and wrist locked.

An optimal lifting situation is having a conditioned person performing a prepared lift with an accurately anticipated load that does not exceed their physical capacity. The most dangerous situation is having a deconditioned worker lifting an excessive load while unprepared.

Never flex from the waist while carrying or transferring a lifted object. Obtain a secure grip and then assume the fully erect posture before moving your body and the object to be transferred through space. Encourage workers to use provided handles on parcels, boxes, crates or other objects to be transferred through space. Encourage manufacturers and suppliers to provide cut-out handles in cardboard boxes and other parcels to facilitate ease of lifting and transferring of parcels and packaged materials.

Worker and Workload Characteristics

When the performance of overhead lifting tasks is required, male workers are statistically stronger and have more endurance than female workers. When workers are assigned to lifting tasks that require more than one person, ascertain that they are of essentially equal height and have equal reach capacity. Avoid assigning male and female paired workers, as their anthropometric factors (trunk and limb measurements) are usually not the same. When possible, make an effort to match workers with equal lifting strength capacity as well. Not respecting these rules will place both or all of the workers at risk to injury.

Shape, size and contents of the load to be transferred must be considered when providing lifting training. Liquids and other unstable contents can shift while being transferred and therefore must be maintained in as level a position as possible.

Load Considerations

From a structural engineering perspective, the most efficient loading system (including the human spine and skeletal frame) is one without vectors or load moments. When the spine or any portion thereof shifts away from the midline, such as when flexing forward from the waist, or is held in this posture, it creates what is known in the world of biomechanical engineering as a "load moment," in this case at the lumbosacral junction. A load moment is also referred to as a "bending moment," the site of "maximal stress within a loading system" and a "buckling point."

Whenever possible, work toward eliminating the need for human "load moments" in the design and layout of workstations. Load moments can also occur at the hand, wrist, elbow, shoulder, and knee, as well as within the spine, so each of these positions must be carefully considered when assessing the stress loads to workers involved in various physical tasks. Bending, reaching, grasping, twisting and various physical activities requiring torque deserve careful attention in your effort to eliminate or minimize the presence of load moments in task design.

Ergonomic Assessments

The five most important considerations when performing ergonomic assessments are posture, repetition, force, vibration and temperature extremes. Carefully monitor for the presence of physical obstacles or barriers that prevent workers from attaining optimal posture while at their workstation. Such barriers force workers to flex from their waist and engage in excessive reaching. Complete elimination of the barrier is optimal; when impractical or impossible, make every effort to reduce or minimize the barrier.

Power with motors, not with muscles. Do everything you can to mechanize heavy or repetitive physical tasks. Forklifts, hydraulic hoists, overhead suspension devices, and scissor-jack devices are examples.

Shock-absorbing mats should be used for workers involved in prolonged standing postures, particularly on non-resilient surfaces such as concrete floors. Appropriately fitting and properly chosen gloves should be used for protection from heat, cold, chemical hazards, infectious agents, environmental exposure and vibration. Design and materials should consider fine, medium and coarse motor activity.

Hand tools should be designed to fit the individual worker. Hand tools that vibrate, such as drills, saws, polishing tools, jack-hammers, air hammers and ratchets, cause vasoconstriction and predispose to tissue damage and breakdown, resulting in cumulative microtrauma disorders. Vasoconstriction also results from the vibration experienced from vehicular operation, such as in

truck, bus and tractor driving, and occurs from exposure to cold, and the use of nicotine.

Proper Support During Lifting

Workers who stand on concrete or other non-resilient surfaces for prolonged periods should be carefully assessed for the existence of pronation of the subtalar joint/ankle mechanism and fitted with carefully chosen flexible orthotics when indicated. Shoe fit is also critically important in the prevention of lower limb and lower spinal disorders. The most common error is choosing shoes that are too wide and too short. The longitudinal arch (instep) measurement, rather than toe length, is the critical component of measuring for proper shoe fit.

Lower spinal and abdominal support devices, often with suspender attachments, are commonly worn in the workplace when heavy physical lifting tasks are required. No strong evidence suggests decreased injury from use of such devices; however, no harm has been reported (such as muscle atrophy) and if used with proper instruction, they have been found to be of some benefit. They should only be used during active exertion and released when not exerting.

Proper fit is often a challenge. Men find use of such supports to be more comfortable than women do as fitting the contours of the human female pelvis and lower spine is more challenging as most such devices are generic in design, with only small, medium and large options available.

Don't Forget to Stretch

Simple stretching programs have been shown to effectively reduce the potential for neuromusculoskeletal injury. A basic rule to consider is to have the worker actively *s-t-r-e-t-c-h* the exact muscles they are most commonly contracting during their specific work activity. Honor the axiom: "Long muscles are strong muscles, short muscles are vulnerable."

Use of the full-body Straighten Up America exercise and stretching system is proving to be highly beneficial in preventing workplace neuromusculoskeletal injuries and disorders. The program was developed by Ron Kirk, DC, of Life University, and is available to the chiropractic profession without charge. For more information, visit www.chirotoolbox.straightenupamerica.org.

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