More Than Ergonomics: Warm-Up and Stretching Key to Injury Prevention

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In recent years, the field of ergonomics has expanded rapidly. Companies and individuals have realized the fiscal and human benefits of ergonomics and have begun using these principles at home and at work. The easiest and most common method for preventing musculoskeletal disorders (MSDs) is to use engineering and administrative controls to change the workplace and improve the interface between the work and the worker. This singular approach falls short, however, because risk factors associated with the workplace are not the only cause of MSDs. Effective MSD prevention, management, and cost containment require much more than ergonomics.

In identifying injury-prevention strategies, one must first look at the root causes of MSD. Unfortunately, no single cause of MSD can be cited. The terms repetitive strain injury, cumulative trauma disorder, and ergonomic injury are confusing and not medically accurate. These terms imply a particular cause (repetition, cumulative trauma, or ergonomics), without any epidemiological or diagnostic evidence to establish such a correlation. Although some in the medical and ergonomics industries purport convincing evidence that musculoskeletal problems are caused by exposure to repetitive motion and cumulative trauma at work, other experts disagree. As Dr. Morton Kasdan (1996) states, “Even those of us in the medical profession who treat these patients do not know enough about the causes to explain why one worker is healthy and another worker, doing an identical job under identical conditions, has MSD symptoms” (p. 12).

Vender, Kasdan, and Truppa (1995) conducted a review of over 2,000 articles identified as potentially relevant studies concerning the work-relatedness of MSDs. They concluded,

Most articles purporting to demonstrate a relationship between work and the development of upper extremity conditions focused on occupational risk factors with very little mention given to non-occupational risk factors. We found no studies that tested the reliability or validity of causal models most currently used. Many of the studies simply looked at the relationship between symptoms and work activities. (p. 539)

If only work is evaluated as a cause for MSDs, only work can be found as a cause. If MSDs were solely caused by occupational factors, wouldn’t it follow that ergonomic improvements would always help? Many engineers and ergonomics experts believe that designing ergonomic risks out of systems will reduce the MSD problem for good. Unfortunately, this is not always the case. In a 1992 evaluation of U.S. West Communications, the National Institute for Occupational Safety and Health found workstations that were of “high ergonomic quality,” but the incidence of MSDs continued to rise during the period studied. In another example at U.S. West, company facilities and jobs were virtually the same, yet one facility experienced MSD problems while the others did not (U.S. West Communications, 1992).

It must be realized that humans are at the core of effective MSD prevention and management. Many studies have shown a correlation of MSD with other variables such as anatomy, physiology, medical conditions, personal response to fatigue and discomfort,
psychosocial problems, psychological factors, and hobbies or leisure activities (Nathan, Keniston, Meyers, & Meadows, 1992a, 1992b; Rempel, 1992). Because human performance is the variable that is being targeted for improvement, warm-up and counteractive stretching exercises are a vital component to an effective MSD management and prevention process.

To understand how specific stretching and strengthening exercises are important in MSD primary prevention, one must first understand all risk factors for causation of upper extremity MSD. Those who limit their explanation of MSD to repetitive motion in the lower arm often overlook the issue of sustained work posture at the neck and shoulder.

Many experts in the field point to sustained forward head and arm posture as a primary cause of MSD (Bullock, 1991; Herbert, 1992a; Jenkins, 1982; Mackinnion & Novak, 1994). They suggest that sustained abnormal postures and positions of the head, neck, and arms are assumed during many repetitive work activities. The head and neck are held forward, and the arms are also held in a forward position while performing work tasks (see Figure 1). Maintaining these postures will have several major effects on the soft tissues of the upper extremities:

- Sustained forward head and neck posture is very demanding and requires burning huge amounts of calories. Static muscle contraction reduces circulation to the muscle, decreasing oxygen and creating metabolic-waste accumulation in the soft tissues, leading to muscle tightening, fatigue, and discomfort.
- Sustained neck-muscle contraction or proximal tightening can compress blood vessels and nerves passing through the neck on the way to the working arm. This can cause nerve irritation and reduce circulation needed for recovery and repair of the soft tissues of the distal arm.
- Sustained abnormal (forward head, neck, and shoulders) postures will result in some muscles being statically overused while others are underused and subsequently weakened. Weakness of one set of muscles will then result in a compensatory overuse of another set, and a cycle of muscle imbalance will be the result.

Reducing physical stress related to sustained abnormal posture at the neck and shoulder region, as well as overuse and resulting tightness of distal soft tissues, is a very valuable strategy in eliminating upper extremity MSD. Muscle imbalance and tightness that frequently develop at the neck, shoulders, elbows, wrists, and hand can be successfully managed or prevented with specific stretching and strengthening exercises (Allers, 1989; Hansford et al., 1968; Herbert, 1992b; Jackson, 1990; Sawyer, 1987; see Figure 2). Muscles that are shortened and tight should be

Figure 1  Sustained forward head, neck, and arm posture can lead to musculoskeletal disorders.

Figure 2  Stretching and strengthening exercises help manage or prevent muscle imbalance and tightness that can develop as a result of sustained abnormal postures.