INTRODUCTION

Current theories of work related cumulative musculoskeletal disorders of the upper extremities indicate that causation is multifactorial (Armstrong et al., 1993; Kuorinka et al., 1995; Smith and Carayon, 1996). Prominently mentioned among the causes are biomechanical exposures which are believed to lead to “micro” trauma to tissues that accumulates over time to produce more serious injury. Also believed to have a role are psychosocial factors that lead to job stress (Smith and Carayon, 1996). There is some debate about the explicit role that these psychosocial factors play. Do they exacerbate the strain due to biomechanical exposures, are they co-causal factors, are they a necessary condition for biomechanical exposures to produce problems, or can they produce problems on their own? This paper explores some of the ways that psychosocial factors may affect the risk of upper extremity cumulative trauma disorders (CTD’s). For a more detailed discussion see Smith and Carayon (1996) and Moon and Sauter (1996).

TRADITIONAL CTD CAUSATION FACTORS

Traditional risk factors in cumulative trauma disorders (CTD’s) of the hand, wrist, arm, shoulder and neck have been tied to the biomechanical aspects of the workplace which lead to tissue strain with repeated exposure, and other factors (Kuorinka et al., 1995). There are eight risk factors
that influence the probability of the occurrence of an upper extremity CTD. These are the frequency of motions of the upper extremities (repetition rate and duration of exposure); the posture of the joint, arm, hand, wrist, elbow, shoulder and neck; the force necessary to do a task, or the load that creates forces in the musculature and tissues; vibration; environmental conditions; work organization characteristics; psychosocial conditions; and personal risk factors such as gender. The first four consideration cause direct strain on the joints, muscles, tendons, ligaments, nerves and soft tissue. They have been referred to as biomechanical factors.

It has been postulated that repetitive actions or sets of motions cause “wear and tear” on the joints, rubbing and abrading of the tendons and ligaments, and increased muscular fatigue (Armstrong et al., 1993; Putz-Anderson, 1988; Silverstein et al., 1987; Kuorinka et al., 1995). While there currently is insufficient research evidence to establish the number of movements or the length of exposure that will produce a specific injury or health problem, it is believed that in most situations the higher the number of movements, the greater the potential risk of a CTD problem.

The longer an individual is exposed to a physical stressor, the greater the risk of cumulative trauma (Putz-Anderson, 1988). Duration of exposure can be subdivided into daily actions; extended periods of similar action for weeks, months, and years; and career exposures to action. Continuous daily exposure without breaks for rest can produce local muscle fatigue, general systemic fatigue and possibly micro-damage of muscles, tendons and ligaments. It is suspected that if this exposure is prolonged, over weeks and months, it can lead to a tissue strain; and over a longer duration, it can lead to tissue damage. The extent of career exposure for specific tissues generally defines the potential risk for cumulative trauma. It is believed that the longer the months and years of exposure, the greater the stress accumulation and the higher the risk of permanent injury.

As the upper extremities deviate from the natural or a neutral posture, the risk of a CTO increases (Putz-Anderson, 1988). However, the extent of joint or appendage deviation that produces a health problem has not been specifically quantified through research or experience.

Force can be the result of the effort necessary to complete a task, such as assembling components, twisting wires, picking up washers or lifting a box. Or, force can be influenced by the loading aspects of the materials and tools that are being used such as the weight, weight distribution, size and dimensions of the products or tools. Force can also be influenced by the personal style of the user in carrying out the task. For instance, there can be great variability in the amount of force with which different employees hold a tool or grip the product, or place merchandise onto a conveyor. High force jobs that also have high repetition have been shown to be at a greater risk for certain types of CID’s (Silverstein et al., 1987).

Environmental factors such as hot and cold temperatures can make the soft tissues and nerves more susceptible to injury and fatigue (Putz-Anderson, 1988). Some facilities are cold and this can increase the risk of muscle strain and distorts neuro-sensory processes. Hot environments can lead to increased muscle fatigue. Other environmental factors such as vibration can increase upper extremity CID risk.

Personal factors also increase susceptibility to CID. These include, but are not limited to, personal physical conditioning, diseases (such as arthritis, diabetes and gout), prior musculoskeletal injuries, small wrist tunnels, gender, and use of certain hormone treatments such as estrogen. Additionally, some people are more prone to these types of injuries due to their personality and their behavior in carrying out their job.

Workplace ergonomic conditions such as the nature of the work activities, workstation design, and equipment design can contribute to CID problems by affecting the biomechanical factors.