

Commentary

An Integrated Approach to Preventing and Treating Work-Related Musculoskeletal Disorders

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Introduction

Musculoskeletal disorders (MSDs) involve injuries of the muscles, ligaments, spinal discs, nerves, tendons and joints that often cause back, neck, shoulder, wrist, knee and foot pain.

They are also often referred to as ‘repetitive strain injuries’, ‘cumulative trauma disorders’, or ‘overuse injuries’ [1]. MSDs account for approximately 40-60% of workplace disorders.

Low back pain is the most common MSD, accounting for 35-50% of all MSDs [1-3]. Neck and upper limb injuries are the next most common, accounting for 15-45% of MSDs, while lower limb disorders account for about 10% of MSDs [4,5]. Statistics vary among countries and regions, but these patterns appear to be consistent. Overall, MSDs account for about 40% of all work-related ill-health [2].

The WHO recognises that musculoskeletal health disorders contribute greatly to disability across the life-course in all regions of the world. In particular, WHO recognises that musculoskeletal disorders significantly impact functional ability. In this context, WHO is responding through the Integrated Care for Older People (ICOPE) approach, which identifies the need to improve musculoskeletal function through a range of interventions, with multimodal exercise as a key component [4]. Worker average age is increasing in most countries, so these recommendations can be applied to the workforce. Musculoskeletal disorders and injuries, however, are not *just* conditions of older age – they are relevant across the life-course. Between one in three and one in five people live with a painful and disabling musculoskeletal disorder.

The prevalence and cost of MSDs has led to considerable research examining risk factors for these disorders and intervention to prevent or treat them. Most research to date has focussed on what we call ‘job risk factors’. These factors involve the design and organization of the workplace, and include physical risk factors, as well as factors

involving work design, like overtime or shift length. There are three primary work-related risk factors:

- **High task repetition.** Many work tasks and cycles are repetitive in nature, and are frequently controlled by hourly or daily production targets and work processes. High task repetition, when combined with other risk factors such as high force and/or awkward postures, can contribute to the formation of MSDs. A job is considered highly repetitive if the cycle time is 30 seconds or less.
- **Forceful exertions.** Many work tasks require high force loads on the human body. Muscle effort increases in response to high force requirements, increasing associated fatigue which can lead to MSD.
- **Repetitive or sustained awkward postures.** Awkward postures place excessive force on joints and overload the muscles and tendons around the effected joint. Joints of the body are most efficient when they operate closest to the mid-range motion of the joint. Risk of MSD is increased when joints are worked outside of this mid-range repetitively or for sustained periods of time without adequate recovery time.

The National Institute for Occupational Health and Safety (NIOSH) in the U.S. has developed a Total Worker Health® program that provides a conceptual model that can be used to design a MSD prevention program [1]. The model involves the following steps:

1. Eliminate workplace conditions that contribute negatively to worker well-being. This can involve physical risk factors as well as factors related to supervision, work organization, etc.
2. Replace unsafe or unhealthy working conditions or practices with policies and practices that improve the culture of safety and health in the workplace

3. Redesign the work environment, if needed, and provide flexibility in work schedules
4. Educate workers about safety and health in the workplace
5. Encourage and facilitate personal change for improvements in health

Most MSD prevention programs to date have focussed on educating workers about disorders such as low back pain, the job risk factors for these MSDs, and information about how to reduce these job risk factors. Unfortunately, this approach has not been successful and, indeed, may lead to an increase in identified MSDs and to workers blaming work for any musculoskeletal pain they experience.

Rather than encouraging workers to view musculoskeletal pain as being solely caused by work, it may be more helpful to view MSDs as involving a 'mis-match' between the worker and his/her environment – which include all daily activities, including work. MSDs occur when the demands of the environment exceed the capabilities of the person. MSDs can thus develop over the course of time as a result of exposure to two categories of risk factors, *job risks* and *life risks* [5,6]. Job risks include ergonomics and other work-related issues such as physical surroundings and the equipment or tools necessary to perform a job. Life risks include the individual characteristics and lifestyle of the worker. Successful prevention and reduction of work-related MSDs involves addressing both categories of risk factors.

The overall process for addressing job risk factors is well-described in the NIOSH Total Worker Health model above, but life risk factors do not appear to be given equal weight with job risk factors. We have developed a MSD Prevention Model based on the premise that both life risks and job risks, i.e. worker and workplace, must be addressed to successfully prevent MSDs.

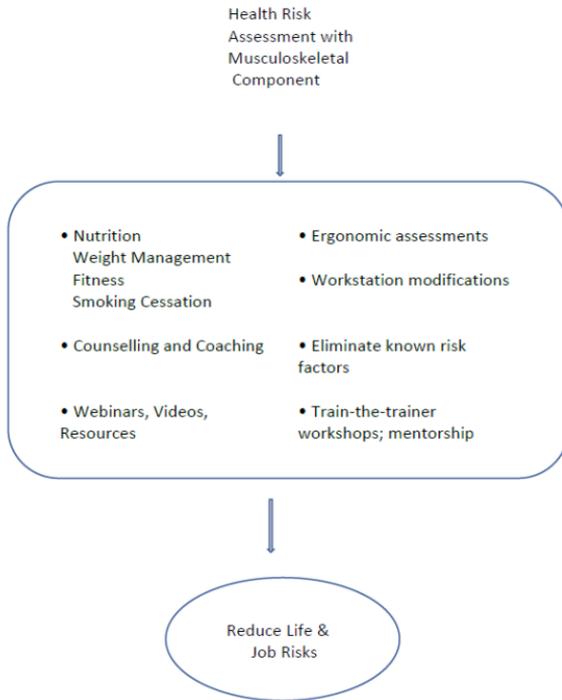


Figure 1: The Evexia MSD Prevention Model.

First, identify MSDs and health issues via health risk assessment. Next, implement education programs to change job risks and life risks. Finally, re-measure using the health risk assessment to see if health is improved and MSDs and illness costs are reduced.

It is important for workers to have a clear picture of their health status and be aware of their own life risk factors and how they can improve these. For the employer, knowing the most prevalent life risks will enable selection of the most appropriate interventions to reduce these risks. A comprehensive Health Risk Assessment (HRA) will provide both a personal, confidential report for the worker as well as an aggregate corporate report for the organization. The worker's personal wellness report (PWR), outlines what a worker is doing right or wrong, and provides recommendations for maintenance and im-

provement [11]. The corporate report provides an overall picture of the health status of the organization as a whole, including the most prevalent health issues and workers' interests in changing these.

Interventions aimed at improving overall health often are considered separate interventions from those aimed at reducing MSDs, as if these life risks are independent of each other. However, it is now recognized that several health issues are closely associated with MSDs, and that risk factors for common MSDs overlap with risk factors for other health disorders. This means that interventions aimed at improving overall health are likely to reduce MSDs as well. The presence of MSDs may also influence the onset or severity of other health issues, through reducing the ability to participate in health-improving behaviours. This suggests a reciprocal relationship between MSDs and overall health.

Modifiable life risk factors such as physical inactivity and obesity are importantly associated with osteoarthritis and other musculoskeletal pain conditions, including low back pain, neck pain, and upper limb pain [7-9]. Smoking is the main modifiable risk factor for inflammatory arthritis, and lifestyle risk factors for osteoporosis include smoking, poor nutrition and low physical activity [2,10]. It is also clear that the presence of a MSD limits participation in physical activity. Hip or knee arthritis, low back pain, and neck/shoulder pain often prevent or limit activities that benefit health.

Research supports a combined approach to addressing MSDs in the workplace. Sowah et al. (2018) conducted a systematic review of various interventions aimed at the prevention of LBP that can be conducted at the workplace [11]. This review showed that exercise alone or in combination with education was the only approach that could consistently be shown to be effective in the prevention of LBP. Isolated approaches such as lumbar supports and foot orthoses had no effect, nor did education alone.

Van Eerd et al. (2016) reviewed interventions aimed at preventing or reducing upper extremity MSDs, and found strong evidence

of a positive effect for workplace-based resistance exercise training in preventing upper extremity MSDs. Nilsen et al. (2011) described a exercise approach to reducing MSDs that can serve as a model for a successful intervention [12]. The exercise training program was performed during working hours, at or near the workplace. The program lasted one hour a week for 2 years, the first year was fully supervised, and, during the second year, monthly supervision of the weekly training session was provided. The authors showed that reductions in musculoskeletal pain occurred as a result of increased physical activity and strength training.

It is thus becoming increasingly clear, based on research results and our own experience delivering workplace health promotion (WHP) programs, that prevention of MSDs requires an integrated approach. Worker behaviour can be addressed through education, the value of micro-breaks, and the value of stretching and strengthening exercise. The best results will be obtained through a combined approach involving education, changes in physical activity, overall health, and reduction of known job and life risk factors. A comprehensive HRA should be used to identify and track job and life risks.

MSD prevention programs traditionally have relied upon increasing worker awareness about job risk factors and their role in causing MSDs. Such approaches are not effective. Education about job risk factors and MSDs is important, but will not succeed if used in isolation.

The inter-relationships between MSDs and other health conditions, and the evidence supporting interventions to reduce MSDs, show a number of areas of overlap among interventions that will improve employee health and those to reduce MSDs, especially rest, nutrition, and physical activity and strength. This suggests that the most cost-effective interventions will improve both overall health and reduce MSDs. These interventions also should include smoking cessation, healthy diet, weight loss, active exercise, and strengthening exercises. Successful programs will offer organizational leadership, health risk screening, individually tailored programs, and a support-

ive workplace culture. Our experience, and recent research, suggests that health-related interventions are likely to improve all facets of health, including MSDs.

We recommend that both MSD incidence and overall health status be assessed in the workplace [13]. We also emphasize that job risk factors and life risk factors should be addressed together in the workplace. When integration is achieved, program costs are reduced, worker health improves, and MSDs decrease.

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