

Common work-related musculoskeletal strains and injuries

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Abstract

Muscles, tendons, joints and nerves are susceptible to injury when stressed or traumatised repetitively, or over an extended period of time. Regardless of the nature of the work, a large proportion of the working population's time is spent engaged in repetitive movements and maintaining postures for extended periods of time. The reported incidence of work-related back and neck pain, and carpal tunnel syndrome, is between 15-60%,¹⁻³ indicating that a high proportion of the working population is at risk of developing one or more work-related musculoskeletal disorders. The parts of the body that are most commonly affected are the lower back, neck and shoulder girdle, and upper limbs. Based on current literature, we shall discuss conditions affecting these areas in order to gain a better understanding of the conditions, as well as their prevention.

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Introduction

Work-related musculoskeletal disorders (WMSDs) affect the muscles, tendons, joints and nerves when they are stressed, or traumatised on a repetitive basis over an extended period of time.⁴ As can be seen from the following data, WMSDs represent a common and ever-increasing problem. Back problems affect millions of people worldwide, i.e. 70-80% of people during their lifetimes.² International statistics indicate an increasing incidence.⁵ Neck pain occurs in between 15-44% of the general community, but is reported as affecting between 50-60% of office workers.¹ Carpal tunnel syndrome (CTS) is one of the most common and disabling WMSDs,⁶ affecting up to 25% of active workers.³

The first published literature regarding diseases of workers was by Bernardino Ramazzini in 1700. His work is extensively cited in a recent article by Franco,⁷ who states that Ramazzini recognised that workers are susceptible to certain illnesses, and also noted that poor posture, repetitive movements and muscular loads contributed to certain disorders. Ramazzini established the potential of psychological stress as a factor in these conditions, and recommended the moderation of activities to avoid risks.⁷

Risk factors associated with the development of WMSDs include static work postures (trunk and neck twisting, stooping and deep sideways trunk bending), whole-body vibration, shock, physical work demands such as walking, pulling and lifting, climatic conditions, and psychosocial

factors.^{2,8,9} Obesity and decreased physical activity have also been associated with the development of WMSDs.^{10,11}

WMSDs can affect virtually all parts of the body, but the back, neck and shoulders and upper limbs account for more than 50% of cases.¹² Gender studies of musculoskeletal injuries in the workplace show that women desk workers are at higher risk than men, while male assembly workers are at higher risk than their female counterparts.¹³

Low back pain

Non-specific low back pain (LBP) is one of the most common and expensive disorders affecting people in industrialised countries. It is estimated to affect 15-44% of the general population in one year.¹⁴⁻¹⁹ More than 10% of those suffering from LBP experience symptoms that persist for longer than one year.¹⁴

In 2004, of the 1.2 million non-fatal occupational injuries and illnesses in the USA resulting in loss of time from work, 22% were related to LBP.²⁰ The indirect cost of occupational back injuries in the USA in 1996 was \$18.5 billion, with an average cost per injury of \$5 000. Less than five per cent of back claims which resulted in disability of longer than one year, accounted for 65% of the costs.²⁰ Thirty thousand South Africans suffer from neck or back pain annually, with 10% of them becoming chronic sufferers.^{2,21}

Occupational LBP may occur as a result of traumatic injury, repetitive use, or other factors. Traumatic injury of the

lower back is diagnosed and treated uniformly, whether its cause is occupational or not. Therefore, this article will concentrate on non-traumatic causes of occupational LBP. Ninety per cent of all people purporting to suffer from LBP have non-specific LBP.²² It may occur as a single episode, be recurrent, or develop into a severe chronic burden.^{22,23}

Factors that contribute to the development of LBP include a combination of individual, biomechanical and psychosocial factors.^{19,20,23-25} High body mass index (BMI), a low level of exercise, and weak back strength, are examples of individual factors that can contribute to the development of back pain.^{11,25} Biomechanical factors include non-neutral static posture, frequent bending and twisting, as well as whole-body vibration.^{19,23-25} Psychosocial factors, such as low social support in the workplace and low job satisfaction, have not only been associated with causing LBP, but have also been shown to be the most powerful predictor of progression to chronicity.^{19,23,25,26}

Deviation from upright posture generates increased force on the lumbar spine, with the disc fibre layers being most heavily loaded.²⁴ Any work situation requiring repetitive flexion and/or twisting for long periods, or sustained bending, is therefore at risk of causing LBP in workers. In heavy equipment vehicle operators, LBP has been associated with steady-state whole-body vibration, as well as mechanical shocks induced by tough rides and high accelerations.⁸

According to the Euro Back Unit Project, short-term LBP is back pain that affects the individual for less than 30 days in a year.²³ Methods used to treat acute LBP include medical, physiotherapeutic and/or chiropractic care. The latter is as effective as medical or physiotherapeutic methods.¹² In the small percentage of cases that progress to chronic LBP, other intervention strategies are needed to prevent long and costly periods of morbidity.^{12,14,23} It is also essential to predict which cases of LBP are likely to become chronic, to treat these patients effectively from the outset, and in so doing, prevent chronic LBP from developing.

X-rays and other forms of imaging such as magnetic resonance imaging (MRI) scans are poor predictors of long-term disability in most cases of back pain. Imaging is effective in making diagnoses such as fractures, metastatic cancers and disc and spinal cord pathology, which are associated with poor outcomes, but only account for approximately five per cent of incident cases.²⁰

Self-reported factors that are of value in determining the outcome of back pain include radiation of pain and high level of functional disability.²⁰ According to Baldwin et al back pain intensity is not generally accepted as a reliable predictor of long-term outcome.²⁰ However, Gheldof et al

reported that severe pain and radiation of pain to the feet and ankles were associated with progression to chronic pain.²³ More important than severity of pain is workers' ability to function following the pain, and their capacity to adapt to it.²⁰

General health status and psychosocial stress are other validated predictors of work disability. Interventions aimed at reducing the chronic stooped posture of sewage workers pushing large amounts of waste matter through pipes have been ineffective, indicating that the cause of their LBP is not purely posture related, but multifactorial. Biomechanical factors are significantly confounded by psychosocial factors.²⁴

Effective intervention strategies for the treatment and prevention of LBP include exercise therapy, behavioural therapy and back school programmes.¹⁴ Multidisciplinary biopsychosocial rehabilitation programmes are advocated in most clinical guidelines for the treatment of subacute and chronic LBP.^{15,23} Workplace interventions incorporating principles of workplace ergonomics, have been shown to be effective on return-to-work outcomes, whereas exercise programmes alone were not effective, or were even counterproductive.^{15,16}

This is thought to be due to the two effects that these programmes cause. Firstly, they reduce physical and mental stress, and secondly, the involved mediation process between worker, supervisor and an ergonomist changes the perceptions of both the worker and the supervisor, with regard to the worker's capabilities and the workplace environment. Therefore, a possible reason for failure of LBP medical treatments is the failed social transaction required to achieve modified work, rather than the medical condition of the worker.¹⁵

Participatory workplace ergonomics involve an ergonomist and occupational physician co-ordinating return to work by identifying injured workers and workplace barriers to achieving this, and then meeting with the worker at the workplace to resolve these barriers.¹⁶ An example of a workplace intervention is a standing aid. The device provides a rest anterior to the lower leg, allowing the worker to kneel on it, thereby decreasing the need to bend forwards. It was tested on kitchen staff working at a nursing home, and was found to be effective in preventing low back pain in taller kitchen workers.²⁷ Other common examples include adjusting the height and lumbar support of chairs, and changing the position of computer screens.

Treatment of occupational LBP needs to be a multidisciplinary approach that addresses the physical elements of the pain, as well as the ergonomic and psychosocial causes, in order to prevent recurrence and the development of chronic LBP.

Neck and shoulder pain

Depending on the outcome measure that is used, various studies have estimated that neck and shoulder pain affect between 6-76% of the working population annually. Women are more frequently affected than men.^{18,28} The associated cost of treating neck and upper limb conditions is rapidly approaching that of LBP.²⁹ Recent increases in the incidence of these disorders are attributable to better disease recognition, increased use of computers, and improvements in the manufacturing process, resulting in faster speeds and shorter work cycles.³⁰ Unfortunately, the increased use of computers has not been accompanied by appropriate changes in the machine and people interface.

Diagnoses of neck and shoulder pain include tension neck syndrome, cervical syndrome, cervicobrachial fibromyalgia and rotator cuff syndrome.³¹ Workers are predisposed to these conditions when sustaining awkward, constrained or static postures, such as cervical and thoracic spine flexion, shoulder elevation and abduction, as well when performing forceful or repetitive precision tasks.^{30,31} Rotator cuff syndromes in the workplace include impingement, tendinosis, and rupture of the tendons. They are associated with high static or repetitive loads, particularly in combination with abduction, rotation and flexion.²⁹

The role of psychosocial factors in neck and shoulder complaints is unclear, although a number of studies have demonstrated a correlation between poor job satisfaction, perceived stress, poor relations with colleagues, a low level of support from co-workers, and neck pain.^{28,32-34}

The posture associated with computer work, described as “forward head posture”, is a combination of extension of the upper cervical spine and flexion of the lower cervical spine. This posture is believed to be associated with an increased risk of neck and shoulder pain. Arvidsson et al cited several studies which investigated neck posture and trapezius muscle activity among office and manual workers, and found conflicting results with respect to neck pain syndromes.^{1,35} Interventions such as adjusting seat height and curved seat pan chairs have been effective in preventing neck and shoulder pain in seated manual workers.³¹

Other ergonomic interventions may also be of value in preventing neck pain and upper limb conditions.^{18,30} In designing tools and workplaces, attention to human factors can prevent many injuries. However, these ergonomic changes usually occur in response to injuries, rather than as a measure to prevent them.³⁰

Upper extremity conditions

One-third to half of all disability claims are related to hand, wrist or upper extremity cumulative trauma.^{30,36} In the USA

in 1999, the cost of upper extremity cumulative trauma disorders was between \$15-20 billion. Of these disorders, 78% was ascribed to CTS, making it one of the most significant and costly health care problems to affect the working population.^{30,37} While current, and South African data on the costs related to CTS are not available, other recent studies indicate that the incidence of CTS is remaining static, while the incidence of WMSDs is decreasing. It has also been reported that CTS disability time is significantly longer than that of other WMSDs.³⁸⁻⁴⁰ Since nearly 80% of workplace-related upper limb complaints are attributable to CTS, the authors of this article have decided to focus their discussion entirely on it. Other common WMSDs that affect the upper limbs are listed in Table 1.

Table 1: Common work-related musculoskeletal disorders that affect the upper limbs⁴¹

Disorder	Symptoms	Causes
Carpal tunnel syndrome	Numbness of middle fingers, especially at night	Repetitive wrist flexion
Myofascial pain of the neck	Heaviness and aching in the shoulders, upper back and neck	Overhead work and work with extended arms Computer posture Stress reaction
Shoulder bursitis	Shoulder pain and stiffness	Repetitive shoulder movements
Rotator cuff tendinosis	Shoulder pain and stiffness	Repetitive shoulder movements with twisting and overhead activities
Lateral epicondylitis	Lateral elbow pain, especially with extended wrist	Lateral elbow pain, especially with extended wrist
Trigger finger	Locking of fingers in flexion	Repetitive hand grip

CTS occurs in 2.1% of males and 3.0% of females,⁴² and has been reported as presenting in 1-10% of the general population.³⁸ It is primarily associated with workers who use their hands,^{3,30,42} and 34-79% of CTS patients attribute the condition to their work.⁴²

In women, it occurs more frequently in office, than manual, workers (19% vs. 24%), while in men, 50% of cases occur in manual workers.³⁷ Keogh et al reported that 27% of cases were worked in the manufacturing sector, while 25% were engaged in “keyboarding”.³⁰ One in ten CTS sufferers remains permanently disabled as a result of the condition, while 12% of workers receive workman’s compensation 30 months after diagnosis.^{39,42} It is believed that factors other than CTS itself may be responsible for the long recovery periods. Suggested influences include economic incentives, amount of sick leave available, and physical and psychosocial demands in the workplace.^{39,42} Patients requiring surgery often require up to seven weeks of sick leave to recover fully, but surgical intervention is associated

with better recovery of earning potential.^{39,42} The delay in time between diagnosis and surgical treatment is also cited as a reason for prolonged recovery periods.³⁹

In medical literature, CTS definitions vary greatly. The presence of symptoms in the median nerve distribution is neither sensitive, nor specific, for a CTS diagnosis. Similarly, electrodiagnostic techniques are only modestly sensitive and specific, and show poor correlation with clinical signs.⁴³ The non-specific nature of CTS signs and symptoms often makes electrophysiological testing a more reliable diagnostic indicator than clinical signs alone, and the combination of the two is more specific and sensitive than either in isolation.^{42,43}

Median mononeuropathy (MN) is defined as prolongation of the median sensory-evoked potential across the wrist, when compared to the ulna nerve.^{3,43} CTS is the clinical syndrome that occurs as a result of MN. Clinical symptoms include pain, parasthesia, weakness and altered temperature or dryness of the hand.⁴² It affects people performing intensive work with their hands. MN is reported to be present in up to 25% of active workers, but more than half of patients are asymptomatic.³

CTS has been regarded as a significant cause of hand and arm complaints since the 1960s. Studies that relied on clinical CTS symptoms in the 1980s postulated an association between occupational hand use and CTS. However, more recent studies that combine electrophysiological signs, as well as clinical findings, have demonstrated a less consistent association.⁴³ Years of work experience correlate negatively with the incidence of CTS, and increased physical activity does not increase the risk of its development.⁴³ The increased incidence of CTS has been demonstrated to be associated with increased BMI, increased wrist index ("square wrist") and medical conditions such as gout, thyroid disorders and diabetes mellitus.^{36,43} Diabetics have a higher risk of MN than non-diabetics, but with CTS, tend to be less symptomatic. This is thought to be due to mild peripheral neuropathy, that masks CTS symptoms.³

A higher degree of electrophysiological change in median nerve conduction is associated with a trend to report CTS symptoms more frequently. The trend is not as significant as would be expected. Asymptomatic workers with documented MN only have a 10% likelihood of developing CTS symptoms in two years. This is no different from the incidence in age-matched and sex-matched controls with normal nerve conduction.³

Psychosocial factors have not been found to be discriminatory as to who experiences CTS symptoms. In contrast to LBP, workers with a higher level of job satisfaction have been found to be more likely to report CTS symptoms.

It is believed that a worker who is more satisfied with his or her job, may feel that he or she is able to make such a report, without fear of jeopardising his or her job security. Higher work stress and lower job satisfaction are not associated with a higher level of reporting CTS.³ However, workers with a lower education level, lower income, low job control, low job social support and high psychological job demands are less likely to return to work six months after CTS surgical treatment.^{6,40}

Ergonomic risks pertaining to the development of CTS include a high level of repetitive hand movements, awkward wrist posture, higher forces at the hand and wrist, and the use of hand-held vibratory tools at work.^{3,42} Ergonomic interventions in symptomatic workers have resulted in the reduction of CTS surgical treatment.^{30,42} Following the identification of CTS, changes in the workplace environment include safety evaluations, engineering adaptations (change of equipment, tools or work set-up), change of employee duties, and change of work pace.³⁰

Up to 50% of CTS could be avoided if effective intervention programmes were implemented in the workplace.³⁷ These interventions should include management of all CTS development risks, including diabetes and high BMI. Since only a small percentage of workers develop CTS, it is recommended that, rather than change the workplace environment of all workers, implementation of essential changes is made for symptomatic workers. This is to decrease the incidence of surgery, as well as assist in recovery.

Conclusion

Repetitive movements, static and stressful postures, obesity, lack of physical activity and psychological stressors predispose workers to WMSDs. Many of these conditions occur at the interface between workers and machines, whether in manufacturing or the office. They can often be prevented or modulated by addressing the ergonomics of the workplace.

When treating any WMSD, the clinician should accurately diagnose the condition and treat it appropriately, but should also look for predisposing factors and address these with the worker and employer to facilitate a more rapid return to work. This will also prevent recurrence. The clinician must consult with an occupational therapist and the employer to address the risk factors for each individual. Ergonomic interventions can then be introduced to prevent recurrence. The interaction with the employee and employer should be used as an opportunity to educate both regarding the factors that contribute to WMSD, so that strategies may be implemented to prevent similar injuries in other employees.

In many instances, ergonomic interventions can be introduced as a preventative measure in the workplace prior to the occurrence of injury. Unfortunately, clinicians do not usually have the opportunity to educate workers about these injuries until they have already occurred. When seeing patients with any of the abovementioned conditions, clinicians should be vigilant as to whether or not the patient is presenting with early signs of a WMSD. If there is suspicion of an early WMSD, an occupational therapist should be consulted, and the opportunity used to discuss the circumstances with both the employer and employee.

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