Objective: The purpose of this study was to determine the effect of a comprehensive workplace wellness program on the prevalence and severity of musculoskeletal disorders in a Canadian government department. Methods: The Healthy LifeWorks program was developed, implemented, and evaluated over a 4-year period. A total of 233 employees completed the Nordic Musculoskeletal Questionnaire before and after the program to determine the prevalence and severity of musculoskeletal disorders. Results: There was an approximately 10% decrease in the 12-month prevalence of musculoskeletal disorders, ranging from 4% for hip/thigh problems to 12% for lower and upper back problems. The proportion of people reporting that a musculoskeletal disorder interfered with their normal work during the past 12 months decreased from 83% to 46%. Conclusions: Comprehensive wellness, including educational sessions on posture, ergonomics, and joint health, results in improved musculoskeletal health.

Musculoskeletal disorders (MSDs) are among the main causes of activity limitation in workers and account for many long-term disability costs. Analysis of the costs associated with specific diagnostic categories showed that total costs were highest for cardiovascular disease ($18.5 billion), musculoskeletal diseases ($16.4 billion), and cancer ($14.2 billion). Population surveys have shown that up to 50% of people report musculoskeletal pain at one or more locations within the past month. The incidence of MSDs seems to be rising in Canada, the United States, and Europe because of age and lifestyle factors. The current burden of MSDs is considerable, with European and US estimates that MSDs account for nearly 50% of all absences from work lasting 3 days or longer and for 60% of permanent work incapacity. Because most MSDs are non-life threatening, the effects on people’s quality of life and the economic cost are often overlooked.

Musculoskeletal disorders include disorders and injuries involving muscles, tendons, ligaments, bones, and joints. When MSDs are considered to be caused by, or related to, work, they are called work-related musculoskeletal disorders. This category includes repetitive strain injuries, “sprains and strains,” and cumulative trauma disorders, and injuries affecting muscles and tendons that are thought to be the consequence of overuse, rather than an acute injury. These overuse injuries have become widespread in the workplace and account for 20% to 25% of all MSDs. Low back pain is the most common MSD, after neck/shoulder pain. It is estimated that up to 80% of people report at least one lifetime episode of low back pain, although approximately 20% of people surveyed currently experience low back pain.

Risk factors for the development of MSDs are multifactorial and include prolonged loading (as in repetitive strain injuries), excessive mechanical loading (as in back pain), vibration, cold, awkward working postures, decreased personal strength, increased age, previous injury, obesity, and an overall decline in fitness. Looking ahead, the intensification of work, an aging population, and rising rates of obesity are all risk factors for MSDs in the working age population for at least the next 20 years.

Musculoskeletal disorders are the most common cause of physical disability. They have an enormous socioeconomic cost, the greatest burden coming from back pain, osteoarthritis, and rheumatoid arthritis. The majority of the costs are indirectly related to social care, pensions, long-term disability, and workers’ compensation. Musculoskeletal disorders account for the vast majority of long-term disability costs in Canada (Health Canada) but most likely also account for most cases of short-term disability (less than 2 weeks) and casual absenteeism. Musculoskeletal disorders comprise the majority of time-loss claims in health care workplaces.

Sprains and strains account for more than 50% of time-loss work injuries, but many work-related MSDs go unreported. According to data from a 1997 study of newspaper office workers, only 29% of workers who experienced work-related pain in the neck or upper extremities said they had consulted a health practitioner. Nearly two thirds (63%) of workers who reported some degree of pain in the neck or upper limbs in the previous year said they had not mentioned these symptoms to their employers. Many people felt their symptoms were so mild or fleeting that they did not feel they were worth mentioning to their employers. Thus, employers often underestimate the existence and effect of MSDs in the workplace.

The purpose of this study was to determine the effect of a comprehensive workplace wellness program, which included education and interventions aimed specifically at MSDs, on the prevalence and severity of MSDs in the Department of Justice (DOJ) of the Nova Scotia Public Service, Canada.

Methods

The Healthy LifeWorks (HLW) program, a voluntary comprehensive wellness intervention, was developed, implemented, and evaluated over a 4-year period in the DOJ, within the Nova Scotia Public Service of the Government of Nova Scotia, Canada. A total of 402 DOJ employees participated in a baseline and follow-up (4 years) health risk appraisal (HRA) in 12 sites throughout the province of Nova Scotia; 233 employees also completed a musculoskeletal pain questionnaire and constitute the study sample. Main reasons for nonattendance, or attrition, included retirement, change to other jobs within the Nova Scotia Public Service or to other...
sites within the DOJ, and work-related difficulties limiting participation in the program. Approximately 10% of DOJ employees who remained in the study chose not to participate in the final HRA despite repeated notifications.

Determining the Presence and Severity of Musculoskeletal Pain—the Nordic Musculoskeletal Questionnaire

The presence, location, and severity of musculoskeletal symptoms were assessed before and after the program using the Nordic Musculoskeletal Questionnaire (NMQ)22–25 (see the Appendix). The NMQ contains questions related to the presence of musculoskeletal pain, aided by a body map illustrating body regions. The following nine body regions are included: neck, shoulder, upper back, elbow, wrist, lower back, hip/thigh, knee, and ankle/feet. The NMQ has been used with various populations and shown to be a reliable and valid tool for the assessment of the prevalence of MSDs.25–30 There is an agreement between the questionnaire results and the physical examination, at least for the neck–shoulder region.30 The NMQ assesses three aspects of musculoskeletal pain: (1) 12-month prevalence, by asking, “Have you at any time during the past 12 months had trouble (ache, pain, and discomfort) in (nine body regions)?”; (2) interference with work, by asking those with musculoskeletal pain, “Have you at any time during the last 12 months been prevented from doing work (at home or away from home) because of the trouble?”; and (3) current disorders, by asking those with musculoskeletal pain, “Have you at any trouble at any time during the last 7 days?” The NMQ was distributed to workers in 12 geographic locations throughout Nova Scotia, and 233 responses were collected before and after the implementation of the comprehensive wellness intervention.

Interventions

The comprehensive workplace wellness intervention consisted of programs and policies to support employees in making lifestyle changes to improve their health including HRAs, workshops, group presentations, health fairs, competitions, incentives programs, various educational materials as well as one-on-one counseling via telephone, and computer-based support across lifestyle risk factors. Topics covered a wide range of health issues identified by the HRA including nutrition and weight management with a focus on establishing and monitoring healthy eating habits; smoking cessation by telephone and on-site group sessions; physical activity with a focus on how to exercise safely and effectively to increase endurance, strength, and flexibility; ergonomics and musculoskeletal injury prevention with emphasis on train-the-trainer sessions for sustainability; home and work physical activity programs, education about posture, sitting techniques to prevent injuries, and the importance of maintaining a healthy weight and improving fitness levels including strength and flexibility.

In addition to interventions aimed at general health risk factors, several interventions focused on MSDs in particular. The latter included the following:

- Workshop presentations aimed at educating workers about common MSDs, principles of prevention and treatment, advice on activity, and common beliefs and misconceptions about MSDs. Presentations were delivered twice at each of the 12 locations and focused on educating workers about how to reduce the severity of MSDs, the role of exercise in preventing/ameliorating MSDs, and the role of the individual in reducing MSDs (eg, work style and stress management). Emphasis was also placed on changing people’s beliefs about the relationships among physical activity, exercise, work, and low back and neck pain.
- Written handouts explaining workstation setup principles (for office workers).
- Workplace assessment and modification, and changes in equipment setup and behavior (eg, relocating telephones, changes in footwear, different mouse, chair adjustment, posture, and reducing repetitive movements).
- Individual consultations with workers to discuss personal MSDs and make recommendations about appropriate treatment such as physiotherapy, massage therapy, physician assessment, pedorthic intervention, and dietitian referral (no treatment or follow-up was provided).
- Strength training programs (part of the physical activity package).
- Workshops (6 hours, train-the-trainer) where occupational health committee members were trained to identify risk factors for MSDs, taught exercises to prevent common MSDs, and advised on the best treatment principles for MSDs to prevent them from becoming chronic.

Data Analyses

All data were analyzed using Statistical Analysis Software (Version 8.2) (SAS, Inc, Cary, NC). Employees in the study were assigned a coded ID name (for confidentiality purposes), which appeared on all data collection forms. The pre- and post-questionnaire data for each study participant were entered into Statistical Analysis Software Full Screen Product data entry screen using the coded ID name as the identifier. A Cochran–Mantel–Haenszel chi-squared test was used to compare the frequency and percentages of MSDs in each body region. The level of significance was set at $P \leq 0.05$.

RESULTS

Overall Prevalence of MSDs

The 12-month prevalence of musculoskeletal pain before and after the HLW program is shown in Table 1. Nearly 90% (89%; 207 of 233) of respondents reported musculoskeletal pain in at least one body region during the past 12 months at initial assessment, which was reduced to nearly 80% (79%; 184 of 233) after the HLW program. The low back (58% pre-HL W vs 46% post-HL W) and the neck (57% pre-HL W vs 48% post-HL W) were the most common body regions affected, both before and after intervention, and the elbow the least common location (19% pre-HL W vs 13% post-HL W). The 12-month prevalence of musculoskeletal pain was significantly reduced ($P < 0.05$) in all body regions except the hip/thigh region after the HLW program. The decreases varied among body regions, ranging from a low value of 6% for the elbow region (19% pre-HL W vs 13% post-HL W) to a high value of 12% for the lower back (58% pre-HL W vs 46% post-HL W) and wrist/hand regions (36% pre-HL W vs 24% post-HL W).

Trouble During the Past 7 Days

The numbers and percentages of respondents reporting musculoskeletal pain within the past 7 days are shown in Table 1. The numbers of people reporting an MSD within the past 7 days decreased in all body regions postintervention, but the changes were significant only for upper back and lower back body regions.

Prevention of Normal Work

The numbers and percentages of respondents reporting musculoskeletal pain interfered with their work during the past 12 months are shown in Table 1. Presumably, a more severe MSD will be more likely to interfere with normal work. The numbers of people reporting that an MSD interfered with their normal work decreased in all body regions, but the changes were significant only for the shoulder and hip/thigh body regions.

Number of Body Regions With Musculoskeletal Pain

The percentages of respondents with pain in zero through nine body regions are shown in Fig. 1. A decrease in the number of body...
regions with pain means that some areas of pain have disappeared. There are decreases in the number of subjects reporting four to nine body regions with pain (92 pre-HLW vs 51 post-HLW), although the numbers of respondents with three or fewer locations of pain increased (141 pre-HLW vs 182 post-HLW). This represents a general shift downward in the number of musculoskeletal problems reported by each participant. The largest change was observed in the “zero” category, where 23 additional respondents had no musculoskeletal pain after the HLW program. Prior to the HLW program, only 11% subjects reported no musculoskeletal pain, which increased to 20% after the HLW program.

DISCUSSION

The results of this study are consistent with previous reports that the low back region is the most common location for work-related MSDs.18 The 12-month prevalence of low back pain of 58% was within the range of 22% to 65% reported in a systematic review, higher than the 1-year prevalence of 39% reported in a later systematic review,17 but similar to previous estimates of 60% in Africa,41 40% to 47% in Sweden and Norway,32 and 67.6% in Australia,33 as well as a reported 6-month prevalence of 48.9% in Saskatchewan, Canada.34 The 7-day prevalence of 23% in this study is consistent with the estimated point prevalence of 20% for low back pain.

We observed higher rates of neck pain in our initial survey results (57%) than the 12-month prevalence of 15% to 45% reported by others,35–37 although similar rates of 60% have been reported in a group of medical secretaries.28 A large survey of a British population found 12-month and 7-day prevalence of neck pain of 34% and 20%, respectively, although we observed 57% of subjects reporting a history of neck pain within the past 12 months and 26% within the past 7 days.28 This may reflect differences in the population because many of the workers we surveyed worked in office conditions, where neck pain is more common. The proportion of subjects reporting that neck pain interfered with their work was similar to previous reports (13% in this study vs 11% in another study28). Neck pain decreased 9% after the HLW program, and a similar decrease was observed in upper back pain (12%) and shoulder pain (10%), which often accompany neck pain. More than 51% of respondents initially reported pain in the shoulder region (one or both), slightly higher than the 1-year prevalence rates of 46.7% reported in the literature,39 which declined significantly to 41% postintervention. We observed a significant decline in the 12-month prevalence of musculoskeletal pain in all body regions except the hip/thigh region. We also saw a one-point reduction in the number of pain locations reported by subjects; that is, each subject, on average, had one fewer pain location after the HLW program. The decrease in 12-month prevalence, 7-day prevalence, and number of pain locations suggests an overall improvement in musculoskeletal health after the HLW program; indeed, an additional 23 people reported no musculoskeletal pain in the past 12 months (26 pre-HLW vs 49 post-HLW).

The results of the pre-program NMQ were used to plan the educational sessions delivered; these focused on neck/shoulder/upper back and lower back problems because these areas accounted for the largest proportions of MSDs. Lower extremity problems were less prevalent and seemed to be more pronounced among correctional officers. This may be because these workers, mostly guards, are required to spend large amounts of time walking and standing, including considering stair climbing. We observed decreases in all reported lower extremity problems, but this was significant only for the foot and ankle (12-month prevalence) and hip/thigh regions.
(prevented normal work during the past 12 months). The smaller numbers of subjects reporting hip/thigh, foot/ankle, or knee pain may mean that a larger sample size may have been required to show changes in the prevalence of MSDs in these body regions. Alternatively, interventions more specifically tailored to the lower extremity and the corrections work environment may be required, such as footwear modifications, specific lower extremity exercises, or modifications in job performance (especially decreasing the amount of stair climbing).

Previous reports on workplace interventions to reduce MSDs have shown mixed results,49 and a recent systematic review suggests that such interventions aimed at MSDs may reduce absence from work but do not improve overall musculoskeletal health.50 Most workplace interventions, however, have focused solely on MSDs, revealing several needs in workplace wellness programs, including improving people’s attitudes and beliefs about back pain, 3.4 hr/wk of productivity is gained (or somewhere between 1.6 and 5.2 hr/wk, depending on the work population). The HLW program resulted in 27 fewer people experiencing low back pain during the previous 12 months (11 fewer in the past 7 days; 11 fewer reporting low back pain interfered with their work). Thus, somewhere between 37.4 hr/wk (3.4 hr/wk × 11 fewer people with low back pain in the past 7 days) and 91.8 hr/wk (3.4 hr/wk × 27 fewer people with low back in the past 12 months) of productive work can be estimated to have been gained by reducing low back pain alone as a result of the HLW program.

We observed a decline in these numbers for all nine body regions, with 86 fewer people (83% preintervention vs 46% postintervention), reporting that musculoskeletal pain had prevented normal work during the past 12 months. Cost savings through preventing loss of productivity could thus be estimated using numbers between a low value of 38 hours50 to a high value of 250 additional work hours per year.51 Work-related MSDs are associated with higher costs related to absenteeism, workers’ compensation claims, disability costs, and overall health care use.52 We did not relate absenteeism or health care costs directly to the prevalence or severity of MSDs among the subjects in this study, but we have previously shown that absenteeism and health care costs decrease as overall health improves.53 Because MSDs account for most cases of short-term disability, a decrease in the prevalence and severity of MSDs should result in lower absenteeism and health care costs.

Study Limitations

A number of issues particular to the workplaces involved affected the study results. Some recommendations were not possible in all settings. For example, office staff and lawyers may be able to take appropriate rest breaks, but this is not usually possible for court stenographers during long court sessions. Twelve geographic locations, ranging from courthouses to correctional facilities and including everyone from prison cooks to judges, meant that the needs of a very diverse group had to be addressed. Union requirements to make all interventions available to all workers, rather than just study participants, and to maintain anonymity among workers, made it impossible to compare study participants with the rest of the workforce, or to know whether study participants completed all the interventions. However, the use of such a diverse and challenging “real-life” work setting may mean that the results are likely to be more generalizable, and a similar multifaceted approach with a more homogeneous workforce may yield even better results.

CONCLUSIONS

This study reported the effects of a comprehensive workplace wellness program, including education and interventions aimed specifically at MSDs, on the prevalence and severity of MSDs in workers in the DOJ of the Nova Scotia Public Service, Canada. The 12-month and 7-day prevalence of MSDs was reduced in seven of nine body regions; the number of locations of musculoskeletal pain was reduced, and fewer people reported that musculoskeletal pain had affected their work during the past year. The results suggest that integrated workplace wellness approaches aimed at improving overall health, in addition to targeted interventions for MSDs, can decrease the prevalence and severity of MSDs in a diverse workforce.
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REFERENCES


**APPENDIX**

**Nordic Questionnaire**

From Dickinson et al.25

![Nordic Questionnaire Image](image-url)