What are the productivity losses caused by musculoskeletal disorders (MSDs)?

A review of the current literature

Wellnomics® White Paper

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Introduction

Whilst the etiology and the risk factors for musculoskeletal discomfort and disorders in computer users has been well studied over the last two decades and the risk factors that lead to the occurrence of symptoms are reasonably well understood[1,2,3,4,5,6], the impact of discomfort or disorders on productivity has not been well studied. The main reason for the dearth of information in this specific area is that information regarding productivity is difficult to collect. Many intervention studies include a measure of productivity when comparing 'before' and 'after' states[7] but this does not provide information regarding *changes in* productivity from those workers experiencing discomfort.

The effect that discomfort or disorders has on productivity is likely to be of great interest to organisations from a business efficiency perspective. If an employee has a disorder or discomfort that is reducing their productivity then it is logical to assume that if the discomfort was improved in some way then their productivity would also improve. In addition, the risk factors that lead to decreased performance may not be the same as those that lead to the development of discomfort so better understanding of these factors could provide suggestions for interventions that decrease the impact of these disorders with improved cost-benefit outcomes for organisations.

A literature search was performed to identify peer reviewed journal articles that reported on some aspect of productivity with respect to musculoskeletal discomfort or disorders. Some studies have explored the area using sickness absence (SA) as a measure of productivity while some have used self-report instruments and employer data.

Studies using sickness absence

Ariëns et al (2002)[8] considered how physical and psychosocial factors of work influenced the amount of sickness absence taken by workers in mixed occupations due to neck pain. Physical load was measured through video analysis of neck position (flexion and rotation) and sitting time. The Job Content Questionnaire (JCQ) was used to gauge work-related psychosocial factors of quantitative job demands, skill discretion, decision authority, supervisor support and co-worker support. These variables were then compared against sickness absence that was attributed to neck pain from company records. The authors found that working with a forward bent neck (more than 20 degrees for more than 40 % of work time or more than 45 degrees for more than 5 % of work time) or rotated neck (more than 45 degrees for more than 25 % of work time) was related to sickness absence due to neck pain. They found that although prolonged sitting (more than 95 % of work time) was a risk factor for neck pain prolonged sitting at work was not related to sickness absence. This means that though neck pain is reported from prolonged sitting this does not cause workers to be absent from work. The analysis of the JCQ indicated that low decision authority and medium skill discretion are related to sickness absence. The authors conclude

> *'The results of our study therefore imply that both adequate workstation design to optimize neck position and organizational changes to increase decision latitude and decrease demands will contribute to the prevention of sickness absence due to neck pain'. p 229*

IJzelenburg and colleagues (2004)[9] questioned a group of laundry and dry cleaning workers about their work conditions, musculoskeletal complaints and sickness absence. The JCQ was used to evaluate psychosocial work conditions and the Standardized Nordic Questionnaire used to assess musculoskeletal problems and absence from work due to these problems. They found that females reported being absent twice as often as males due to upper extremity problems and immigrants were absent more than those born in the study country. For low back pain, females had less sickness absence than males and immigrants were absent more due to low back pain than those born in the study country. There was decreased risk for upper extremity pain and associated sickness absence for those who were active in sports and a greater risk for those with low job satisfaction though this did not impact on sickness absence. These results concur that both physical and psychosocial factors influence discomfort, disorders and sickness absence.

It has been argued that sickness absence is not an accurate expression of productivity, particularly amongst computer users, since many people experience discomfort and still attend work. This limits the usefulness of sickness absence data to estimate the true cost of discomfort and disorders to an organisation. Do the symptoms that employees experience affect their performance when they remain present at work? Some authors have examined this potential productivity loss using self-report measures and employer information.

Studies using self-report measures

Many computer users perform a wide variety of tasks which makes individual productivity difficult to measure. Hagberg et al[x] further explain

> *'Job relevant productivity cannot be accurately expressed by simple metrics such as keystrokes per minute, duration of telephone calls, or duration of computer use, since output is based on innovation, syntheses, and reflection.'*

Another way to assess productivity is to have the employee rate and report their productivity. Hagberg et al (2002) assessed if self-reports of reduced productivity at work occurred in computer users due to musculoskeletal symptoms and the associations between this and workplace and individual factors. The data was gained through written questionnaires. The questions regarding productivity were qualitatively validated with interviews and found to be satisfactory. The results showed that 87 % of women and 76 % of men reported musculoskeletal symptoms. Of these 9.2 % and 11.2 % reported reduced productivity due to the symptoms, respectively. For 6.1 % of women and 8.3 % of men this reduced productivity *did not* involve sickness absence. The average self-reported reduction in productivity was 15 % for women and 13 % for men. Increased persistence of symptoms was a strong risk factor for reduced productivity. Other risk factors for reduced productivity due to symptoms were tasks of information searching, accounting work, and layout/graphic design. If three or more risk factors[xi] were present at the same time the chance of having reduced productivity was significantly high[xii].

To estimate the economic impact for the employer the authors calculated that for a man or a woman in the study group the mean loss of productivity per month was 16.8 hours. Since reduced productivity *without* sick-leave was reported by 8.3 % of the men, this could be translated into 1.4 h lost per month per employee. The corresponding figure for women would be 1.0 h lost per month per employee. If salary and associated costs for employees are $4,800 per month then

> *'… loss due to reduced productivity without sick leave can be estimated to be $42 (1.4 h/160 h) x $4800) per month per employee for male computer users. In a medium-sized company with 50 employees this will mean an additional cost of $25,200 per year. This cost is "hidden" since it is not accounted for in the company's economic balancing procedures.' p 160*

Van den Heuvel et al (2007)[xiii] investigated self-reported productivity loss amongst computer users with regular or prolonged neck/shoulder symptoms and hand/arm symptoms (n=654) in the preceding three months. They used questions to determine productivity changes due to neck/shoulder and hand/arm symptoms based on the questions used in the study discussed above. They also gathered information regarding pain intensity, physical activity in leisure time, working hours, mouse position, psychosocial load and over-commitment. Productivity loss was reported by a total of 8.6 % across the symptom areas but only 2.6 % reported productivity loss that *was due* to sickness absence. This means that only about one third of workers who report productivity loss due to musculoskeletal symptoms actually take sick leave. Pain intensity, high effort and low job satisfaction was identified as being associated with productivity loss. The authors conclude

> *'The results of this study show that employers should be aware that the consequences of neck/shoulder and hand/arm symptoms are more extensive that the visible sickness absence due to these symptoms'.*

Lerner et al (2003)[xiv] considered the effect of on-the-job 'work limitations' due to physical or mental health problems on employees' productivity. The authors suggested

> *'If work limitations are related to productivity loss, then they also contain important information about the economic burden of illness and can serve as a valuable economic indicator' p 650*

'Work limitations' were self-reported using the Work Limitations Questionnaire (WLQ), a validated instrument designed to assess the degree to which health problems interfere with performing work activities. It includes four scales of job demands: time or scheduling demands, output demands, physical work demands and mental-interpersonal demands. Productivity was measured using data collected by the employer regarding number of calls answered and rates of merchandise units processed in an organisation which included call centres and distribution centres. They found that work productivity was significantly associated with limitations in time or scheduling demands, physical job demands and output demands. The authors calculated that for every 10 % increase in on-the-job limitations, total employee work productivity declined 4 to 5 %. They go on to suggest

> *'Quantifying how work limitations influence work productivity and, thus, the costs of illness will be useful for planning and evaluation disease or disability management program, testing the outcomes of medical interventions, and crafting health policy.' p 657*

Summary

Though there are few studies which have examined the effects of musculoskeletal discomfort and disorders on productivity, those that have suggest:

1. Sickness absence is not the only source of lost productivity resulting from discomfort and disorders.
2. Experiencing discomfort and disorders while still present at work results in a loss of productivity for some workers (reported as 6 % to 9 % of workers).
3. Both physical and psychosocial factors influence productivity loss due to symptoms.
4. Estimates of productivity loss can be used to calculate the 'hidden' costs of musculoskeletal discomfort and disorders.

Implications

- It is important that organisations consider the degree and cost of productivity loss due to musculoskeletal discomfort and disorders if they are to improve efficiency.
- By targeting the factors which are associated with the loss of productivity due to musculoskeletal symptoms an organisation can expect to improve productivity and to see a better return on investment for interventions aimed at decreasing the impact of musculoskeletal discomfort and disorders.

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[7] This is discussed further in the Wellnomics White Paper 'Interventions to decrease musculoskeletal discomfort or disorders: Do they also improve productivity?', *Under development*

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[xi] The risk factors were layout/graphic design task, information searching task, non-optimal computer mouse position, accounting work, divorced/separated, computer problems, work demands, data/text input task and persistent symptoms

[xii] Prevalence ratios between 3.01 and 4.50 with 95th confidence intervals varying between 2.04 and 7.61

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