Work, inequality and musculoskeletal health

Prepared by the University of Surrey for the Health and Safety Executive

CONTRACT RESEARCH REPORT
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A review of the relationship between aspects of work, inequality and musculoskeletal health was undertaken. As there are no existing models regarding musculoskeletal disorders and inequality, the socio-economic model of health and inequalities (Dahlgren and Whitehead, 1991) was used to structure this review.

The following workplace factors and their associations with musculoskeletal ill health were reviewed:

Social support: Studies investigating the association between social support and musculoskeletal symptoms indicate that poor social support is a risk factor for developing or reporting problems. It is also considered to be an important factor in coping with musculoskeletal disorders.

Access to health information/education at work: Access to information that promotes healthy working practices either at work or in the community may have a role in the prevention/reduction of musculoskeletal ill health problems. The majority of studies have considered the effectiveness and design of training and/or information programmes. Modern approaches to ergonomic interventions have shown the importance and value of a participatory approach that involves facilitation, access to information and appropriate participation. The evidence suggests that the role of health information and education within such an intervention strategy is important.
Job insecurity, temporary contract work and piecework: Along with greater labour market flexibility and deregulation of employment contracts has come greater job insecurity. While all sections of the workforce have been affected by these trends, less skilled manual workers at the lower end of the labour market have been affected the most, in terms of greater exposure to low paid, temporary and insecure employment (Acheson, 1998). Studies looking at these job conditions show an association with musculoskeletal ill health. The association between gender and these job conditions may also be important as the majority of the studies have been conducted on female low status workers.

Low status work: For this review, ‘low status’ work has been taken to mean unskilled, paced, or repetitive work; jobs where no training is required; where there is a low requirement to make decisions; low pay; or low control over the job. All studies reviewed indicated that the risk for the development of musculoskeletal disorders increases in jobs of lower status.

Income: Studies investigating income, often linked to occupational class and low status jobs, and musculoskeletal health show that lower income levels appear to be associated with a greater occurrence of musculoskeletal disorders.

Some individual factors and their associations with musculoskeletal ill health were also reviewed:

Education level: The limited literature on education level and musculoskeletal disorders has generally shown that a lower level of education is associated with a greater risk of the development of problems. The studies have generally not controlled for other well-established risk factors, such as physical workload.

Age: Whilst older age appears to be a risk factor for musculoskeletal ill health, it is often highly correlated with years spent in work and a number of indicators of musculoskeletal disorders and disability. A greater emphasis on specific relationships may help focus preventive programmes.

Gender: Investigations of the association of gender with musculoskeletal symptoms have often found that women are more likely to develop or report a problem than men. Some studies have acknowledged differences in job conditions, experience at work and home, and willingness to report as possible reasons for these differences. More research is required on whether musculoskeletal risk varies between men and women in jobs with the same occupational exposure.

Ethnicity: Musculoskeletal health differences have been found between people from different ethnic backgrounds. In some studies, minority and immigrant workers had a higher prevalence of musculoskeletal ill health; in others, majority groups had more musculoskeletal problems. In making these comparisons the studies have generally failed to control for other risk factors.
Gaps in knowledge are evident and basic terms and definitions missing. This, along with the complex interrelationship and lack of independence of the variables, has meant that attributing causal relationships is not possible. In view of the strength of many of the associations with both general health and musculoskeletal health, areas of future research have been advanced and prioritised.

The predominant focus has been on physical and psychological factors relating to the worker at the workplace. Whilst some studies have broadened the scope to also consider psychosocial factors (e.g. temporary or insecure work, social support at work) there remains a paucity of knowledge for socio-economic factors such as poor housing, access to health care services and unemployment.

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INTRODUCTION

AIM OF THE STUDY

The aim of this study was to review the contemporary literature on the relationship between inequality, work and musculoskeletal health.

BACKGROUND

The recently published Independent Inquiry into Inequalities in Health Report (Acheson, 1998) made reference to the association between lack of control, poor skill use, low job variety and the increased risk of musculoskeletal disorders and sickness absence. The report recommends that employers take further measures to improve health at work through good management and organisational practises.

Acheson (1998) recommends that all policies having a direct effect on health should be evaluated in terms of their impact on health inequalities and should favour the less well off to try to reduce these inequalities. This review will focus on how such inequalities might impact on the musculoskeletal health of the workforce.

There are, to our knowledge, no established models regarding inequality and musculoskeletal disorders. The review will consider the potential contributory influences of a range of workplace variables including: low status jobs, poor job security, low pay, piece work payment, poor social support and lack of access to health information. It will also consider a number of individual factors (e.g. age) that may mean workers are more likely to be exposed to these workplace variables. These factors may group together as risk factors for the development of musculoskeletal problems.

The review will not consider physical workplace risk factors directly. These have been adequately covered in a number of recent reviews including NIOSH (1997), Buckle and Devereux (1999) and NAS (2001).

A review involving the psychological, socio-economic, occupational health, medical and ergonomic literature was conducted. The literature review included information on musculoskeletal disorders obtained from the following sources:

- Scientific peer reviewed journals
- Conference proceedings
- Abstracts
- Recent textbooks
- Internally reviewed government/regulatory body reports
CD ROM and online commercial and regulatory agency databases
Biographies of recent and relevant articles
Non-English literature articles considered relevant and translated into English
Publisher on-line table of contents services for the latest research articles
Reports not yet submitted or papers in press to scientific peer reviewed journals obtained from individual researchers.

Databases scanned (from 1985 to the present) included Medline, Psychlit, Ergonomics Abstracts, CISDOC, HSELINE, MHIDAS, NIOSHTIC, RILOSH and BIDS and OSH-CD.

The extent of literature available on each factor considered in this study is highly variable. Where there are many studies reported in the literature it has not been possible, within the resources available, to provide a full and systematic appraisal. Thus reviews and examples of studies have been used to illustrate a number of the factors.

MUSCULOSKELETAL DISORDERS

Musculoskeletal disorders (MSDs) may affect the upper limbs (neck, shoulders, arms, hands, wrists and fingers), back and lower limbs (knees, hips, feet) and can result in debilitating pain, discomfort or numbness. MSDs arise in many forms and the symptoms are frequently non-specific. Some disorders classified as MSDs exhibit well defined signs and symptoms (e.g. carpal tunnel syndrome, tenosynovitis, tennis elbow), others are less well defined such as myalgic conditions involving pain and discomfort, numbness and tingling sensations throughout the neck, shoulders, upper limbs, lower back and lower limbs.

Musculoskeletal disorders are multi-factorial in aetiology and previous studies show it is necessary to take physical (heavy, static or monotonous work, extreme or constrained postures, repetitive movements, unsuitable workplaces and equipment, forces, exposure to vibration), psychosocial (work organisation, interpersonal relationships, short cycle tasks, poor work control, piece rate payment system, poor management, unsatisfactory training, lack of breaks) and personal (gender, age, seniority, exercise habits, life style, psychological characteristics and capacities) aspects into account as risk factors (Hales and Bernard, 1996; Bongers et al., 1993; Hagberg 1988, 1992). Musculoskeletal symptoms may result from non-occupational (e.g. hobbies, sports activities) as well as occupational factors.

The science of ergonomics focuses on the interaction between physical, psychological and individual factors at the workplace. Ergonomics also acknowledges the influence of non-work factors. This enables the understanding of the complex determinants of health symptoms associated with work (Mergler, 1987).
Currently, there are no models of the relationship between musculoskeletal disorders and inequality. In the same way that the Armstrong et al (1993) model of possible causation of musculoskeletal disorders guided research into the development of the disorders, a similar model for inequality and musculoskeletal factors might now be required.

**SOCIO-ECONOMIC MODEL OF HEALTH AND INEQUALITY**

In the absence of a model specific to musculoskeletal disorders and inequality, the Dahlgren and Whitehead (1991) socio-economic model of health and its inequalities has been used to structure this review. The *Independent Inquiry into Inequalities in Health Report* (Acheson, 1998) also used this model (Figure1).

![Socio-economic model of health and its inequalities](image_url)

*Figure 1*
Socio-economic model of health and its inequalities (Dahlgren & Whitehead, 1991)

The figure shows the main determinants of health as layers of influence. At the centre of the model, individuals are endowed with age, sex and constitutional factors that influence health potential. These factors are fixed. Surrounding the individuals are layers of influence that can be modified. The innermost layer represents the personal behaviour and way of life adopted (e.g. smoking habits and physical activity) with the potential to promote or damage health. Individuals interact with friends, relatives and the community and are affected by the social and community influences represented in the next layer. Mutual support within a community can sustain the health of its members in otherwise unfavourable conditions. The wider influences on a person’s ability to maintain health include their living and working conditions, food supplies and access to essential goods.
and services. Overall there are the economic, cultural and environmental conditions prevalent in society as a whole, represented in the outermost layer.

The model emphasises interactions between these different layers. For example, individual lifestyles are embedded in social and community networks and in living and working conditions, which in turn are related to the wider cultural and socio-economic environment.

Whilst all these areas are recognised as being of potential importance in defining and understanding the relationship between inequality and health in general, this review has found that there is often a paucity of evidence with respect to each area and musculoskeletal health.

Thus the factors considered here, whilst closely related to the model, do not enable an holistic picture to be drawn of inequality and musculoskeletal health. This absence of evidence should not be taken to mean "evidence of absence" but rather that further research may be required in some areas, particularly those known to be of importance for general health.

PROPOSED MAP OF POTENTIAL VARIABLES

A map of potential variables to be considered in the relationship between inequality and musculoskeletal disorders is put forward for future discussion (Figure 2). This map attempts to:

- include all the factors that could lead to inequality in musculoskeletal health;
- take a broader view of the influences on health and not just focus on workplace determinants;
- acknowledge the role of socio-economic, cultural and environmental, workplace, lifestyle, education, and physical and psychological loads by grouping factors under these headings;
- show that one factor does not necessarily lead to musculoskeletal problems but rather that there is likely to be an interaction between factors that could lead to musculoskeletal health inequalities.

Whilst all these variables are potentially important for musculoskeletal health, the focus for this work system oriented review has been on work factors, individual and education variables. The review does not consider physical workplace risk factors directly as these have been adequately covered in a number of recent reviews including NIOSH (1997), Buckle and Devereux (1999) and NAS (2001).
Figure 2:
Proposed map of potential variables in the relationship between inequality and musculoskeletal disorders (Woods and Buckle, 2001)
REPORT FORMAT

This review has focussed on the following factors and their association with inequalities in musculoskeletal ill heath:

Section 1: Workplace factors
- Social support
- Access to health information
- Job insecurity, temporary and piece work
- Low status work
- Income

Section 2: Individual factors
- Education level
- Age
- Gender
- Ethnicity

Both sections are introduced by an outline of some of the main issues and concerns in the consideration of workplace and individual factors. Each factor has been reviewed separately, in order to examine its relationship to general ill health, followed by a consideration of its association with musculoskeletal ill health. An overview, highlighting areas for further research is provided.
LITERATURE REVIEW

Section 1 – Workplace factors

Introduction

In this section five workplace factors are reviewed with regard to their potential association with general and musculoskeletal ill health. Social support and access to health information are concerned with communication, relationships and organisational culture. Job insecurity, temporary and piecework, low status work and low income are conditions faced by the individual at the workplace.

In contrast to individual factors that are fixed, these workplace factors can be modified. Changes can be made to work schedules and to the provision of better access to information at work; in addition more support and better communication can be provided for the worker, to improve job conditions and to reduce their potential ill health implications for the worker.

None of these factors stand alone in their potential contribution to the development of musculoskeletal disorders. The interactive role of work demands, occupational stressors and ergonomic risk factors in musculoskeletal disorders remains unclear. There are many gaps in the literature and more prospective studies are required to determine and quantify causal relationships.
Social support

**Summary**
- Social support received at work from colleagues, supervisors or management has received some attention in the literature in relation to both general ill health and the occurrence of musculoskeletal problems. The studies have varied in their definition of social support at work. Lack of social support received away from the workplace may also be important but has received little attention as a risk factor for ill health.
- The findings from the majority of studies looking at mental and physical health indicate that a lack of social support from co-workers, supervisors or managers is a risk factor for ill health.
- The majority of studies investigating the association between social support and musculoskeletal symptoms show that poor social support is a risk factor for developing or reporting problems.
- A number of studies have recognised social support as an important strategy in coping with musculoskeletal disorders.

**Social support and general ill health**

According to Fox and Benzeval (1995) social circumstances are increasingly regarded as important causes of ill health but little research attention has been given to the role of social factors. They acknowledge that there is increasing evidence that factors such as social support, integration, isolation and social networks and roles are associated with health.

The variable 'poor social support' has been considered in a number of studies as a possible risk factor for the development of general ill health problems. As mentioned above, definitions of social support vary.

Three studies found the association between social support and health to be weak or non-specific (Dooley *et al.*, 1987; Aston and Lavery, 1993; Sheffield *et al.*, 1994). The findings from ten studies looking at different health outcomes (i.e. mental and physical health, stress, job burnout) indicate that a lack of social support from either co-workers, supervisors or managers appears to be a risk factor for ill health.

*Mental and physical health*

In a number of longitudinal studies, workers with high levels of social support at work showed less symptoms of anxiety (Morrison and Roberts, 1987) and less health problems (Stansfeld *et al.*, 1997; Marmot *et al.*, 1991). Blaxter (1997) using data on social relationships from the Health and Lifestyles survey found that both physical and psychological ill health were associated with low levels of social integration and support. Lundberg (1991) also found that weak social networks were important for mental ill health. More specifically a poor relationship with a supervisor was associated with health problems (Walters *et al.*, 1996).
Stress and job burnout

Warr (1994) and Vachon (1995) found that low social support along with other job characteristics were associated with stress and burnout. Burnout/emotional exhaustion were associated with low supervisor support among nurses (Robinson et al., 1991) and low social support provided by friends and family among air traffic controllers (Dell'Erba et al., 1994).

Social support was also recognised as a protective factor against ill health in five studies. Walters et al. (1996) found that enjoying a confiding relationship at work appeared to reduce health problems. Similarly, Stansfeld et al. (1997) found that high work social support predicted less health problems and was protective against spells of psychiatric absence. Social support at work was protective against mortality (Hibbard and Pope, 1992) and was an important predictor of those who remained in work for women (Lund and Borg, 1999). In a prospective study, Niemcryk et al. (1987) found co-worker amicability was significantly protective against illness and injury among air traffic controllers.

Social support and musculoskeletal ill health

The variable 'poor social support' has been considered as a possible risk factor in the development of musculoskeletal health problems. However as with the general health literature, it is important to recognise that the studies vary significantly in their definitions of social support (e.g. amicability with co-workers, good relationship with supervisor, good social support at work) and it is impossible to know if these various definitions of social support have the same meaning or importance for musculoskeletal ill health.

Of the many studies reviewed, only Vasseljen et al. (1995) reported that poor social support was not a predictor or associated with musculoskeletal symptoms and Skovron et al. (1987) found that recent lower back pain was significantly associated with satisfaction with co-workers relations among nurses.

Bongers et al. (1993) reviewed the epidemiological evidence and reported that lack of social support (from colleagues) was positively associated with musculoskeletal disorders. In addition, the findings from fourteen studies reported below investigated a wide range of workforces and job tasks (e.g. wood mill workers, tank terminal workers, journalists) and indicated that a lack of social support from either co-workers or supervisors was a risk factor for developing musculoskeletal ill health.

This was evident for studies looking specifically at back pain (Thorbjörnsson et al., 2000; Hughes et al., 1997; Skov et al., 1996) and studies examining upper limb pain (Polanyi et al., 1997; Linton and Kamwendo, 1989).

A number of studies that investigated the association of psychosocial characteristics of various jobs and lower back, neck and upper limb symptoms (Ahlberg-Hulten et al., 1995; Faucett and Rempel, 1994; Linton, 1990)
identified low social support from co-workers and/or supervisors as a factor that was associated with or increased the risk for symptoms.

Studies focussing on general musculoskeletal discomfort also recognised the importance of social support in the development of these problems (Baker et al., 1999/2000; Toomingas et al., 1997; Burdorf et al., 1997). Leino and Hanninen (1995) found that poor satisfaction with social relations at work was an antecedent to an increase in musculoskeletal morbidity. Results also showed a change in clinical findings in the low back as well as in the morbidity of the neck, shoulder, upper and lower limbs, was predicted by the quality of social interaction at work.

Good social support was highlighted as a potential protective factor against musculoskeletal ill health (Fjellman-Wiklund and Sundelin, 1998; Punnett, 1994; Faucett and Rempel, 1994). Similarly, Krause et al (1997) found that the ability to communicate with fellow workers and social support received from supervisors reduced the risk of disability retirement. For those already with problems, good social support was considered important in coping with musculoskeletal symptoms (Torp et al, 1999; Kemmlert et al, 1993) and with motivation for change in patients with prolonged musculoskeletal disorders (Grahn et al, 1999).

The majority of studies indicated that a lack of social support whether from co-workers, supervisors or managers is a risk factor for general and musculoskeletal ill health. When people have musculoskeletal problems at work or are returning to work after problems, social support has been identified as important in their coping strategy. Clearer definitions are required for social support in future research.
## Table 1: Summary of research studies on social support and musculoskeletal ill health

<table>
<thead>
<tr>
<th>Social support</th>
<th>Focus</th>
<th>Study type</th>
<th>Problem e.g. back</th>
<th>Onset</th>
<th>Incidence of disorders</th>
<th>Association with MSD / disability</th>
<th>Coping and recovery disability, retirement etc</th>
<th>Reporting method</th>
<th>Control for variables</th>
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</thead>
<tbody>
<tr>
<td>Skovron et al., 1987</td>
<td>Low back pain and work organisation among nurses</td>
<td>Prospective epidemiological</td>
<td>Low back (LBP)</td>
<td>Recent low back pain (in last 6 months)</td>
<td>Associations with low back pain: younger age, satisfaction with work colleagues, being a registered nurse. 43% low back pain sometime in past; 28% reported episodes of more than 3 days; 20% reported at least 1 episode in last 6 months</td>
<td>Yes but with good social support</td>
<td></td>
<td>Self report questionnaire</td>
<td>controlled job category, a small positive association between satisfaction with co-workers and previous LBP remained</td>
</tr>
<tr>
<td>Linton and Kamwendo, 1989</td>
<td>Risk factors in psychosocial environment for neck and shoulder pain in secretaries</td>
<td>Cross-sectional</td>
<td>Neck and shoulder pain</td>
<td>Last year</td>
<td>A poor psychological environment related to frequency of neck and shoulder pain. RR for frequent neck pain was 2.85 (1.28-6.32) and shoulder pain 3.32 (1.53-7.2). Work content and social support at work related to pain but no clear relationships identified for job demands</td>
<td></td>
<td></td>
<td></td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Linton, 1990</td>
<td>Risk factors (lifestyle, ergonomics, psychosocial work place factors) for MSD in Sweden</td>
<td>Cross sectional study of 22, 180 employees</td>
<td>Neck and low back</td>
<td>Last year</td>
<td>31% neck pain and 18% consulting doctor; 39% back pain and 16% consultation. Age was a factor for prevalence of neck and back pain. Not eating regularly and smoking increased risk for ill health. Lifting, monotonous tasks, vibration, uncomfortable postures were the most important ergonomic factors. A poor psychological environment (work content and social support in particular) increased risk (OR 1.6-3) except for the oldest category; the youngest group had highest odds ratios. Poor psychological environment/exposure to one ergonomic factor - highest risk (OR 2.4-3.6)</td>
<td></td>
<td></td>
<td>Prevention programmes should be broad based and include psychosocial as well as ergonomic measures</td>
<td>Questionnaire completed as a result of routine examinations at occupational health services</td>
</tr>
<tr>
<td>Bongers et al., 1993</td>
<td>Psychosocial factors at work and MSD</td>
<td>Qualitative review of the epidemiological literature</td>
<td>General MSD but particularly back, neck and shoulders</td>
<td></td>
<td>Reviewed studies do not present conclusive evidence due to high correlations between psychosocial factors and physical load and to difficulties in measuring independent and dependent variables. The data suggested that low job control and lack of social support from colleagues were positively associated with musculoskeletal disease. Perceived stress may be intermediary in this process. Concluded that monotonous work, high perceived workload and time pressure were related to musculoskeletal symptoms.</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
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<tr>
<td>Social support (cont.)</td>
<td>Focus</td>
<td>Study type</td>
<td>Problem e.g. back</td>
<td>Onset</td>
<td>Incidence of disorders</td>
<td>Association with MSD / disability</td>
<td>Coping and recovery disability, retirement etc</td>
<td>Reporting method</td>
<td>Control for variables</td>
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<td>Kemmlert et al., 1993</td>
<td>Current status of health, well being and functional capacity of those with occupational over exertion injuries in a previous study</td>
<td>Three-year follow-up</td>
<td>General MSD</td>
<td>Current</td>
<td>Higher prevalence of physical and psychological symptoms than normal population. More than 50% reported difficulties in activities of daily living. Almost one third of the sample had changed occupations and had more varied tasks. Those with reduced workloads did not report less MSD.</td>
<td></td>
<td></td>
<td></td>
<td>Access to social support was positively related with health and psychological well-being.</td>
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<td>Faucett and Rempel, 1994</td>
<td>VDU work, MSD, posture and psychosocial factors in a newspaper editorial department</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>59% pain in last week</td>
<td>More hours per day on VDU and less decision making were significant risk factors for potential MSDs. Workstation factors (e.g. keyboard height) significantly related to more pain in shoulders, neck and upper back. Lower levels of social support associated with severe hand and arm numbness.</td>
<td></td>
<td>Yes</td>
<td>Symptoms severity modified by psychological workload, decision making, employee relationship with supervisor.</td>
<td>Questionnaire</td>
</tr>
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<td>Punnett, 1994</td>
<td>Risk factors for injury in a sawmill industry</td>
<td>Case control cross-sectional study</td>
<td>General MSD injury</td>
<td></td>
<td>Cases were more likely than controls to be employed in machine paced jobs, exposed to dangerous work methods and materials, experience louder noise levels and faster work pace, have higher lifting demands and more frequent postural stress, experience lower decision latitude and lower social support at work. Being male, being one year or less in the job, inability to take a break when tired were also significantly associated with injury occurrence.</td>
<td>Yes</td>
<td>Decision latitude and social support had small protective effects.</td>
<td>Cases identified by compensation commission. Interviews</td>
<td></td>
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<tr>
<td>Vasseljen et al., 1995</td>
<td>Individual, psychological and psychosocial risk factors for MSD in manual (n=15 pairs) and office work (n=24 pairs) settings</td>
<td>Case control cross-sectional study</td>
<td>Neck and shoulder</td>
<td>Perceived general tension was most strongly associated with pain in both work groups. Otherwise results in the two groups were very different. Social support, job pressure and job contentment were not shown to be significant predictors of pain in either work group.</td>
<td></td>
<td>No</td>
<td></td>
<td>Questionnaires and interviews</td>
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</table>
| Social support  
(continuation) | Focus | Study type | Problem e.g. back | Onset | Incidence of disorders | Association with MSD / disability | Coping and recovery disability, retirement etc | Reporting method | Control for variables |
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<tr>
<td>Ahlberg-Hulten et al., 1995</td>
<td>Perception of social support, job strain and musculoskeletal pain in female health care personnel</td>
<td>Cross-sectional study – results based on two studies</td>
<td>Low back, neck and shoulders</td>
<td>In last month</td>
<td>None of the non-work factors (age, number of children or habitual status) had a significant effect on MSD. Psychological demands, authority over decisions, skill utilisation and support at work had a statistically significant effect on lower back symptoms while neck and shoulder symptoms were associated with social support at work. Multivariate logistic regression showed different associations: higher the strain, the more symptoms in the back. Neck and shoulder pain more associated with low social support at work/relational and emotional factors.</td>
<td>Yes</td>
<td></td>
<td>Questionnaire</td>
<td></td>
</tr>
<tr>
<td>Leino and Hanninen, 1995</td>
<td>Association between work control, social relationships, mental strain, physical workload and musculoskeletal morbidity</td>
<td>10 year follow-up prospective study of metal workers (n= 902 blue and white collar workers)</td>
<td>Neck, shoulders, upper limbs, lower back and lower limbs</td>
<td>Pain in different parts of the musculoskeletal system was associated with psychosocial factors at work, suggesting a general MSD responsivity to mental stress. The associations were independent of physical workload. Prospectively, social relations and work content scores predicted change in several morbidity scores. Changes in clinical findings were predicted by quality of social interaction at work.</td>
<td>Yes</td>
<td></td>
<td>Questionnaire, interviews and clinical exam</td>
<td>Controlled for age, gender, social class and physical workload</td>
<td></td>
</tr>
<tr>
<td>Skov et al., 1996</td>
<td>Psychosocial and physical risk factors for MSD</td>
<td>Cross-sectional study of 1306 sales workers</td>
<td>Neck, shoulder and lower back</td>
<td>Both psychosocial and physical factors were associated with MSD. High job demands were related to neck and shoulder symptoms and a tendency to become overworked. Lack of social support from colleagues was related to back pain.</td>
<td>Yes</td>
<td></td>
<td>Self report questionnaire</td>
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<tr>
<td>Krause et al., 1997</td>
<td>Predictors of disability retirement – role of physical and organisational work conditions, perceptions of job strain, job dissatisfaction and social support</td>
<td>Prospective population based study of 1038 Finnish men in a heart risk study</td>
<td>General MSD and disability retirement</td>
<td>Only those disabled and retired at time of follow-up but not at beginning were included</td>
<td>Various job characteristics predicted disability retirement: heavy work, work in uncomfortable positions, working in isolation, long work hours, noise at work, physical job strain, musculoskeletal strain, repetitive or continuous muscle strain, mental job strain and job dissatisfaction. The strong association between workplace factors and the incidence of disability retirement link the problem of disability retirement to poor work conditions. 15% new cases of disability retirement in follow-up study.</td>
<td>The ability to communicate with fellow workers and social support from supervisors tended to reduce the risk of disability retirement</td>
<td>4 year follow-up examination and questionnaire</td>
<td>The relationships persisted after control for socioeconomic factors, prevalent diseases and health behaviour</td>
<td></td>
</tr>
<tr>
<td>Toomingas et al., 1997</td>
<td>Associations between psychosocial factors and MSD</td>
<td>Cross-sectional study of 358 people</td>
<td>General MSD</td>
<td>Current</td>
<td>Low social support at work, high psychological demands and job strain were associated with MSD symptoms and signs. Decision latitude at work showed few associations with musculoskeletal disorders.</td>
<td>Yes</td>
<td></td>
<td>Self report questionnaire, medical examinations</td>
<td>Controlled for age, gender, and physical load</td>
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<td>Social support (cont.)</td>
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<tr>
<td>Polanyi et al., 1997</td>
<td>Prevalence and associations of upper limb problems</td>
<td>Cross-sectional survey of 1306 newspaper personnel in Canada</td>
<td>Upper limb</td>
<td>20% reported moderate or worse ULDs monthly or lasting more than a week in last year.</td>
<td>Those facing frequent deadlines, high psychological demands (fast work pace, conflicting demands), had low skill discretion and social support, spent more time keyboarding, or had computer screen in non-optimal positions were likely to report moderate to severe symptoms. Women reported significantly higher levels of symptoms than men.</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>Hughes et al., 1997</td>
<td>Prevalence of MSD and their association with physical and psychosocial characteristics of jobs</td>
<td>Cross-sectional study in an aluminium smelter</td>
<td>Upper limb and back</td>
<td>Years of forearm twisting were found to be a significant predictor for upper limb disorders. Low decision latitude was a significant predictor for shoulder pain. High job satisfaction (OR=5.9, 95% CI=1.4-25) and low social support (OR = 5.3, 95% CI=1.3-22) were associated with low back pain.</td>
<td>Yes</td>
<td></td>
<td></td>
<td>Structured interview, physical exam and questionnaire</td>
<td></td>
</tr>
<tr>
<td>Burdorf et al., 1997</td>
<td>Physical load as a risk factor for MSD among tank terminal workers – development of an assessment strategy</td>
<td>Cross-sectional study of operators, n=77, office workers n=52, and misc n=15</td>
<td>General MSD</td>
<td>Pain that had persisted for at least a few hours in the last 12 months</td>
<td>High prevalence of MSD in all 3 groups although operators were at higher risk of pain in the neck, shoulder, elbow, wrist and knee when compared to office workers. After adjustment for age and other confounders the observed work time with trunk rotation and flexion was associated with back pain. Lack of social support at work and heavy physical labour in previous jobs increased the frequency of musculoskeletal complaints.</td>
<td>Yes</td>
<td></td>
<td></td>
<td>Standardised interview, direct observation, self completed diaries</td>
</tr>
<tr>
<td>Fjellman Wiklund and Sundelin, 1998</td>
<td>MSD among music teachers</td>
<td>Eight-year prospective study</td>
<td>Neck, lower back and upper limbs</td>
<td>Music teachers often experience discomfort in the neck, shoulders and low back of long duration, increasing over the years. Psychosocial environment characterised by high psychological demands and low authority over decisions but compensated for by good social support. The work required skill and creativity but was also monotonous.</td>
<td>Good social support compensated for poor psychosocial environment</td>
<td>Questionnaire and measurements of arm elevation</td>
<td></td>
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<tr>
<td>Social support (cont.)</td>
<td>Focus</td>
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<tr>
<td>Grahn et al., 1999</td>
<td>Motivation for change in patients with prolonged MSD</td>
<td>Qualitative follow-up case studies</td>
<td>MSD disability</td>
<td>Prolonged over 2 year study</td>
<td>Utilisation of professional networks (i.e. healthcare, regional social insurance office), emotional support (i.e. nuclear family, close relatives), use of personal coping resources (i.e. positive beliefs, problem-solving) and social support at work (i.e. employers, colleagues) were considered important for motivation to change.</td>
<td>Social support important for motivation to change</td>
<td>Interview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Torp et al., 1999</td>
<td>Psychosocial work environment and coping with MSD</td>
<td>Cross-sectional of 103 of motor mechanics</td>
<td>General MSD</td>
<td>Last year</td>
<td>Positive, significant relationships were identified between how mechanics coped with MSD and psychosocial factors: work demands, social support, control, manager's involvement in health and safety work, and whether the garages had regular meetings between management and workers.</td>
<td>Social support important for coping</td>
<td>Questionnaire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baker et al., 1999/2000</td>
<td>Background factors, work practises and psychosocial variables and musculoskeletal discomfort</td>
<td>Cross-sectional study of 155 customer service representatives</td>
<td>Last 12 months and last 7 days</td>
<td>Back and upper limb and neck</td>
<td>93% reported musculoskeletal discomfort in some body part. The amount of social support, job variety and skill utilisation in the job were the psychosocial variables most often associated with musculoskeletal discomfort (apart from the neck).</td>
<td>Yes</td>
<td>Self report questionnaires</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thorbjörnsson et al., 2000</td>
<td>Physical and psychosocial occupational factors related to low back pain</td>
<td>Longitudinal</td>
<td>Low back</td>
<td>24 year follow-up</td>
<td>Factors at work were risk indicators for low back pain for both genders: low influence over work conditions, heavy physical workload, sedentary work, smoking among women and poor social relations at work, heavy physical workload, sedentary work, high perceived load outside work and combination of poor social relations and overtime among men, in combination with other factors.</td>
<td>Yes</td>
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</table>
Access to health information/education at work

**Summary**
- The importance of access to information that promotes healthy working practices either at work or in the community may have a role in musculoskeletal ill health in terms of development, reporting or coping with a problem. However there are very few studies in this area.
- Modern approaches to ergonomic interventions have shown the importance and value of a participatory approach (Haines and Wilson, 1998). Such an approach involves facilitation, access to information and appropriate worker participation.
- The evidence suggests that the role of health information and education within such an intervention strategy is important. Informed interventions need further research.

**Access to health information and general ill health**

No studies were found that investigated the effect of poor access to health information at work on ill health.

**Access to health information and musculoskeletal ill health**

A report from the Occupational Health Services Working Group (OHSWG, 2000) of the Occupational Health Advisory Committee (OHAC) investigated how to improve access to occupational health support, particularly for people at work in small and medium enterprises. This reflects concern that lack of access to occupational health support contributes to health inequalities within the adult population. The main conclusions reached by OHSWG are:

- prevention of ill health at work and amelioration of the effects of health on work (e.g. through rehabilitation) are essentially management issues and whilst professional occupational health support may be required, this is not inevitably the case in all circumstances. The key will be to ensure that employers and managers have access to a point of enquiry that can either suggest solutions or signpost employers and managers to the appropriate level of advice;
strategies to remove occupational health inequalities and improve access to occupational health support will not succeed unless further action is taken to improve employer and worker awareness of when such support is needed;

- delivery mechanisms for occupational health support should give priority to the prevention of health risks at work and the issues that arise from the effects of health on work (e.g. non-work related illness compounded by work and rehabilitation);

- there is no one solution that will meet the occupational health support needs of everyone; flexibility is the key to delivery mechanisms;

- there is a wide range of mechanisms, many involving partnerships, that should be pursued to raise awareness of occupational health issues, and encourage and facilitate the delivery and use of occupational health support.

The term occupational health conveys different meanings to different people. For some, it means simply the prevention and treatment of illness that is directly related to work, in which health education has no place. Others will emphasise fitness for work issues separately from health and safety. Health inequalities stem from a complex interaction between low income, employment status (or lack of it), socio-economic class, education, standard of housing and other environmental factors (OHSWG, 2000). Neither prevention of work-related ill health nor workplace advice on healthy living can deliver all the solutions to health inequalities amongst the adult population. Even where there is occupational health support, people may not know how to make use of it.

Five studies reviewed have considered the importance of ergonomics training programmes and the approach undertaken in providing ergonomics information (King et al., 1997; Marcotte, 1991; Silverstein et al., 1991; Dyer and Morris, 1990; Shahnavaz, 1987). Modern approaches to ergonomic interventions have shown the importance and value of a participatory approach (Haines and Wilson, 1998). Such an approach involves facilitation, access to information and appropriate participation. The evidence suggests that the role of health information and education within such an intervention strategy is important.

Two training programmes reported success in reducing the occurrence of musculoskeletal problems (Chavalinitikul et al., 1995; Marcotte, 1991) and harmful postures and ergonomic errors in nursing (Engels et al., 1997), and therefore had potential to reduce the occurrence of injury and pain. However one health care programme designed to decrease the incidence of disability as a result of musculoskeletal injury was unsuccessful (Verbeek et al., 1993). This was explained by a lack of motivation among management and a separation of policy on worker health from overall company policy.

Type of worker beliefs and attitudes about back pain may influence the development of chronic back disorders and work loss (Symonds et al., 1995). An intervention study conducted to establish the effectiveness of educational material about low back pain on various psychosocial parameters and
absenteeism (Symonds et al., ibid). A significant reduction in sickness absence and a positive shift in beliefs concerning the locus of pain control and the inevitable consequences of low back trouble was found. The importance of access to appropriate educational resources and materials would therefore seem evident, especially where confronting lay beliefs and attitudes.

The success of providing information that promotes healthy working practises either at work or in the community in terms of reducing musculoskeletal ill health is an under researched area. However, there is support from the studies reviewed that provision of ergonomics and health and safety information is important. More investigation of the ways in which health information (other than occupational health provision) is provided and managed and how successful this is in preventing ill health is required.
<table>
<thead>
<tr>
<th>Access to health info</th>
<th>Focus</th>
<th>Study type</th>
<th>Problem e.g. back</th>
<th>Onset</th>
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<th>Coping and recovery disability, retirement etc</th>
<th>Reporting method</th>
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</thead>
<tbody>
<tr>
<td>Shahnavaz, 1987</td>
<td>Workplace injuries in developing countries (DCs)</td>
<td>Discussion document</td>
<td>General MSD and injuries</td>
<td>____</td>
<td>Poor working conditions and ineffective injury prevention programmes lead to high sickness and accident rate in DCs. Salary and social benefits are low; this results in malnutrition and low work capacity and greater vulnerability to disease and accidents.</td>
<td>_____</td>
<td>Need to take account of users and environment and provide workforce with better understanding of technology transfer problems.</td>
<td>Observation</td>
</tr>
<tr>
<td>Dyer and Morris, 1990</td>
<td>Human aspects of library automation</td>
<td>Review of research</td>
<td>General ergonomics</td>
<td>____</td>
<td>Importance of management of change, planning and implementation in informing/training employees in alternatives work conditions (e.g. workstation design, variation in job procedures, software interface usability) to try and reduce ergonomic problems.</td>
<td>_____</td>
<td>_____</td>
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</tr>
<tr>
<td>Silverstein et al., 1991</td>
<td>Evaluation of a factory ergonomics training</td>
<td>Training intervention</td>
<td>General MSD</td>
<td>____</td>
<td>Trial of ‘train the trainer’ programmes to provide ergonomic trainers. Ergonomic knowledge increased as a result of the course. Trainee course satisfaction, ergonomics knowledge and performance did not differ from those trained by university instructors.</td>
<td>_____</td>
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<tr>
<td>Marcotte, 1991</td>
<td>Implementing ergonomics training using in-house personnel</td>
<td>Training intervention</td>
<td>General MSD</td>
<td>____</td>
<td>Different levels of training given to 2 groups (basic ergonomics to identify potential causes/prevention of injury and more detailed ergonomics methodology). Decrease in injuries, increase in production, improvement in work attitudes for those trained by both groups.</td>
<td>Yes</td>
<td>Improved after training</td>
<td>_____</td>
</tr>
<tr>
<td>Verbeek et al., 1993</td>
<td>Evaluation of occupational health care programme - incidence of MSD disability</td>
<td>Training intervention among refuse collectors</td>
<td>MSD disability</td>
<td>____</td>
<td>Only 3 of the 10 preventive measures were reached. Explained by lack of motivation among management and separation of policy on worker health from overall company policy.</td>
<td>No</td>
<td>_____</td>
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</tr>
<tr>
<td>Chavalintikul et al., 1995</td>
<td>Effect of ergonomics training on postures, back pain, back strength in workers lifting heavy objects</td>
<td>Training intervention</td>
<td>Back</td>
<td>Current</td>
<td>Back pain experienced by up to 40% before training and by 25% after. Decrease in back strength in control group. Lifting methods should be compatible with actual working environment.</td>
<td>Yes</td>
<td>Improved after training</td>
<td>Interview, observation and back strength testing</td>
</tr>
<tr>
<td>Access to health info (cont.)</td>
<td>Focus</td>
<td>Study type</td>
<td>Problem e.g. back</td>
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<td>Symonds et al., 1995</td>
<td>Effects of an educational pamphlet on altering avoidance behaviour and reducing absenteeism from low back trouble</td>
<td>One year prospective study at 3 factories - intervention</td>
<td>Low back pain</td>
<td>Absence data over 4 years</td>
<td>Significant reduction in number of spells with extended absence and number of days of absence. A positive shift in beliefs was seen for locus of pain control and inevitable consequences of low back trouble.</td>
<td>Yes</td>
<td>Improved after training</td>
<td>Questionnaire and absence data from company records (collected for 4 years before intervention and 1 year after)</td>
</tr>
<tr>
<td>King et al., 1997</td>
<td>Impact of 3 ergonomics training methods in manufacturing industry</td>
<td>Training intervention</td>
<td></td>
<td></td>
<td>Lectures supplemented by ergonomic job redesign and participatory training were effective in altering worker safety behaviours. This training had a significant effect on ergonomics knowledge, job satisfaction, recognition and reporting of hazards.</td>
<td>Yes</td>
<td>Improved after training</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Engels et al., 1997</td>
<td>Development of ergonomics program to prevent MSD</td>
<td>Training intervention among nurses</td>
<td>General MSD</td>
<td></td>
<td>The ‘train the trainer’ concept was used in the ergonomics education program. A survey of harmful postures and ergonomic errors revealed that nursing performance improved substantially following the intervention.</td>
<td>Yes</td>
<td>Improved after training</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Haines and Wilson, 1998</td>
<td>Framework for participatory ergonomics interventions</td>
<td>Literature review development of definitions and framework</td>
<td></td>
<td></td>
<td>A participatory approach involves facilitation, access to health information/education and appropriate participation.</td>
<td>Yes</td>
<td>Improved after training</td>
<td>Questionnaire</td>
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</table>
Job insecurity, temporary contract work, piecework

Summary
- Along with greater labour market flexibility and deregulation of employment contracts has come greater job insecurity. While all sections of the workforce have been affected by these trends, less skilled manual workers at the lower end of the labour market have been affected the most, in terms of greater exposure to low paid, temporary and insecure employment (Acheson, 1998).
- Studies on job insecurity have been grouped together in this section with studies on temporary contract and piece work.
- The studies looking at these job conditions indicate that they are a risk factor for ill health.
- The findings from the small number of studies on job insecurity, temporary and piece work indicate an association of these job conditions with an increase in musculoskeletal ill health.

Job insecurity, temporary contract work, piece work and general ill health

The variable ‘job insecurity’ has been considered in a number of studies as a possible risk factor for the development of general health problems. While one study indicated that job security was not related to psychiatric distress in fulltime, male and female dual earner couples (Barnett and Brennan, 1995), ten studies found job insecurity was a risk factor for or associated with ill health.

Job insecurity was a risk factor for or associated with ill health in a number of studies (Ferrie et al., 1995; Triolo, 1989; Dooley et al., 1987); similarly Smith (1997) identified fear of job loss as an important psychosocial aspect of working with computers and physical and mental health.

Extended periods of job insecurity decreased job satisfaction and increased physical symptoms in automotive workers (Heaney et al., 1994). This study indicated that job insecurity acted as chronic stressor with effects becoming more potent as the time of exposure increased.

Thomas (1997), studying management strategies for stress in mental health nursing, identified increased workloads, understaffing, job insecurity and organisational change as major stressors. Bussing (1986) and Murphy (1991) indicated more distress and diminished job satisfaction occurred as a result of job insecurity and Warr (1994) found job insecurity was associated with stress and burnout. In a review of research on the psychological consequences of job insecurity De Witte (1999) found that job insecurity reduced psychological well-being and job satisfaction and increased psychosomatic complaints and physical strains.
The findings from studies looking at mental health and piece work (Nadeau et al., 1990), unpaid work (Arber and Lahelma, 1993) and part-time work (Arber and Lahelma, 1993; Ross and Bird, 1994) have found that these job conditions were associated with ill health among female workers. Temporary workers suffered more from severe occupational injuries than permanent staff Francois (1991).

**Job insecurity, temporary contract work, piece work and musculoskeletal ill health**

The findings from six studies looking at insecure, temporary and piece work working conditions show an association between job conditions and musculoskeletal disorders.

One study on job insecurity identified an increase in pain symptoms with less job security among female computer users (Marcus and Gerr, 1996). A further study (Camerino et al., 1999) found a significant relationship between past history of episodes of acute low-back pain and job insecurity.

Part-time work along with other occupational exposures (e.g. standing continuously) increased the risk for musculoskeletal ill health among female warehouse workers (Kondo et al, 1989).

Piecework was associated with musculoskeletal disorders (Moure-Eraso et al, 1997) and the duration of the piecework was associated with the severity of disability (Vezina et al., 1989; Vinet et al, 1989).

The findings of the studies that have investigated job insecurity, temporary, part time and piece work show that these job conditions have an effect on musculoskeletal ill health. The interaction of gender with these job conditions may also be important in the development of musculoskeletal ill health as the majority of the studies have been conducted on female workers. Job insecurity is under researched. Current economic trends suggest that further research to establish the problems of insecure job conditions is required.
<table>
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<th>Job insecurity</th>
<th>Focus</th>
<th>Study type</th>
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<tbody>
<tr>
<td>Vezina et al., 1989</td>
<td>Premature ageing among piecework female garment workers</td>
<td>Longitudinal data analysis and cross-sectional follow-up of 800 females</td>
<td>General MSD</td>
<td>12 months prior to interview</td>
<td>Twice as many cases of severe disability among those paid on hourly basis. Duration of employment in piecework associated with severe disability</td>
<td>Yes</td>
<td>Yearly data from public agency data for 30 year period and interviews</td>
<td>Age, task type and smoking</td>
<td></td>
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<tr>
<td>Vinet et al., 1989</td>
<td>Duration of employment among female garment workers</td>
<td>Longitudinal data analysis</td>
<td>General MSD</td>
<td>Duration of piecework associated with prevalence of severe MSD disability, independent of smoking, age, education, task type length of employment.</td>
<td>Yes</td>
<td>Analysis of public agency data</td>
<td></td>
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<tr>
<td>Kondo et al., 1989</td>
<td>Workload and MSD among female warehouse workers</td>
<td>Cross-sectional study of 1268 part-time workers</td>
<td>Back and upper limbs</td>
<td>Pain at end of day and those that sought help</td>
<td>High degree of muscular strain in shoulders and back; fatigue in neck and upper limbs at end of day. Part-time work, continuous standing and frequent repetitive postures increased risk for MSD.</td>
<td>Yes</td>
<td>Questionnaire survey</td>
<td></td>
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<tr>
<td>Marcus and Gerr, 1996</td>
<td>MSD, computer use and psychosocial stress among female office workers</td>
<td>Cross-sectional</td>
<td>Neck and shoulder</td>
<td>Two weeks</td>
<td>Significantly increased odds ratios for symptoms for subjects who had ever used a computer, had less job security and had more stressful work</td>
<td>Yes</td>
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<tr>
<td>Moure-Eraso et al., 1997</td>
<td>Sweatshop working conditions in Mexico</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Workers (61% female) reported MSD related to working conditions. Prevalence of symptoms correlated with increased duration of exposure to ergonomic risk factors.</td>
<td>Yes</td>
<td>2 questionnaire surveys of workers and community leaders</td>
<td></td>
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<tr>
<td>Camerino et al., 1999</td>
<td>Psychosocial factors and manual handling risks for nurses in a hospital</td>
<td>Cross-sectional</td>
<td>Back</td>
<td>Past history and last 12 months</td>
<td>Past history of episodes of acute low back pain associated with limited decision making and job insecurity; episodes of acute low back pain in the last year associated with low discretion at work</td>
<td>Yes</td>
<td>Observation and questionnaire</td>
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Low status work

Summary
- Employment plays a fundamental role in our society. People are often defined, and define themselves, through what they do for a living. Sociological studies emphasise that not only is employment a primary source of status but is also significant in providing purpose, income, social support, structure to life and a means of participating in society (Acheson, 1998).
- The Black report (1980) found that the poorer health experience of lower occupational groups applied at all stages of life. Surveys that ask about self-perceived pressure of work have found that people in higher socio-economic groups report pressure more frequently. However, evidence of health related harm is associated more with specific psychosocial factors such as imbalance between psychological demands and control and lack of control at work. Exposure to high demand and low control is more common among lower socio-economic groups (Acheson, 1998).
- The 1995 Labour Force Survey figures show that blue collar workers experience more injuries at work and work-related ill health than white collar workers. Manual workers, along with nurses are more likely to have left their jobs through work-related ill health than non-manual workers.
- For this review, ‘low status’ work has been taken to mean unskilled, paced, or repetitive work; jobs where no training is required; where there is a low requirement to make decisions; low pay; or low control over the job.
- A sample of studies looking at low status jobs shows an association with ill health.
- All studies reviewed have indicated that jobs of lower status are a risk for the development of musculoskeletal disorders.

Low status work and general ill health

The variable ‘low status work’ has been considered in a number of studies as a possible risk factor for the development of general health problems.

Studies have shown an association between physical ill health and conducting lower status jobs in an organisation (Marmot et al., 1991), conducting dull, monotonous work under pressure with low control over the job (Marmot et al., 1997; Pickett and Lees, 1991) and occupational class and employment status (Arber and Lahelma, 1993). On the other hand, a combination of high control and high demand was found to be protective against heart disease in blue collar workers (Steenland et al, 1997) and ill health in health service employees (Rees and Cooper, 1992).

A sample of studies has shown an association between mental ill health (including stress and emotional exhaustion) and low decision latitude in nurses (Robinson et al., 1991) and hospice staff (Vachon, 1995) and in the perception of poor treatment by emergency staff and low appreciation of their job skills (Neale, 1991). Further studies confirmed the findings that the effect
of doing dull, monotonous work, working under pressure and conflicting demands were associated with psychiatric distress in fulltime, male and female dual earner couples (Barnett and Brennan, 1995) and among blue-collar workers (Lundberg, 1999).

**Low status work and musculoskeletal ill health**

The variable ‘low status work’ has been considered in many studies as a possible risk factor for the development of musculoskeletal health problems.

In a review of the epidemiology literature, Bongers *et al* (1993) concluded that low job control, monotonous work, high perceived work load and time pressure are related to musculoskeletal symptoms.

Higher risk and greater incidence of musculoskeletal disorders was associated with conducting paced, repetitive work with poor postures (Putz-Anderson, 1988; Kondo *et al*., 1989; Krapac *et al*., 1992) and blue-collar work (Leino *et al*., 1988; Andersson *et al*., 1993; Arndt *et al*., 1996)

Ahlberg-Hulton *et al* (1995) found that authority over decisions and skill utilisation had a significant and positive effect on lower back symptoms among female health carers. A higher prevalence of musculoskeletal problems was also evident in workers (e.g. data entry operators, warehouse workers) in jobs with low decision making and skill use (Thorbjörnsson *et al*., 2000; Baker *et al*., 1999/2000; Woods *et al*., 1999; Hughes *et al*., 1997; Polyani *et al*., 1997; Leino *et al*., 1988; Chau *et al*., 1995; Faucett and Rempel, 1994; Seitsamo *et al*., 1994; Chiang *et al*., 1993; Hodgson *et al*., 1993; Gun, 1990; Krapac *et al*., 1985). In contrast, Toomingas *et al* (1997) found that decision latitude at work showed few associations with musculoskeletal disorders.

Three studies showed more frequent absence due to musculoskeletal problems among low skill or lower grade employees (Feeney *et al*., 1998; Stürmer *et al*., 1997; Krapac *et al*., 1985). The frequency of radiating pain was found to decrease in proportion with the degree of work qualification (Krapac *et al*., ibid).

The majority of studies reviewed indicated that jobs of lower status are a risk factor for the development of musculoskeletal disorders. Standardised terms and definitions are required. These require validation and application in future epidemiological studies of musculoskeletal disorders.
<table>
<thead>
<tr>
<th>Low status</th>
<th>Focus</th>
<th>Study type</th>
<th>Problem e.g. back</th>
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<th>Incidence of disorders</th>
<th>Association with MSD / disability</th>
<th>Coping and recovery disability, retirement etc</th>
<th>Reporting method</th>
<th>Control for variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krapac et al., 1985</td>
<td>Spine pain among various skilled railway workers</td>
<td>Cross-sectional</td>
<td>Back</td>
<td>Absence more frequent among unskilled and semiskilled workers and among young. Frequency of radiating pain decreased in proportion with degree of work qualification.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Putz-Anderson, 1988</td>
<td>Automation impact on MSD in assembly line work</td>
<td>General MSD</td>
<td>Risk associated with repetitive, machine pace work, awkward postures and excessive hand force.</td>
<td>Yes</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Leino et al., 1988</td>
<td>Occupational class, physical workload and MSD in engineering</td>
<td>Longitudinal</td>
<td>General MSD</td>
<td>MSD more frequent among male and female blue collar workers than in respective white-collar groups and increase in morbidity over time higher in blue collar. Physical strain and physical load negatively associated with incidence of long-term MSD in blue collar female.</td>
<td>Yes</td>
<td></td>
<td>Interview/observation, clinical exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kondo et al., 1989</td>
<td>Workload and MSD among female warehouse workers</td>
<td>Cross-sectional study of 1268 workers</td>
<td>Back and upper limbs</td>
<td>High degree of muscular strain in shoulders and back; fatigue in neck and upper limbs at end of day. Part-time work, continuous standing and frequent repetitive postures increased risk for MSD.</td>
<td>Yes</td>
<td></td>
<td>Questionnaire survey</td>
<td></td>
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<tr>
<td>Gun, 1990</td>
<td>Incidence and distribution of RSI in Australia</td>
<td>Analysis of data form various surveys</td>
<td>Upper limb</td>
<td>High prevalence of RSI in blue collar workers. Higher prevalence among women in all occupational and industrial categories. Groups most at risk are female workers performing unskilled unfulfilling tasks.</td>
<td>Yes</td>
<td>Interventions of benefit to keyboard operators have not improved the situation for female blue collar workers</td>
<td></td>
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<tr>
<td>Krapac et al., 1992</td>
<td>Cervicobrachial syndrome and work disability</td>
<td>Case control cross-sectional study of 114 people</td>
<td>Upper back</td>
<td>Cervicobrachial syndrome was highly prevalent among unskilled workers (32%) and among those conducting work requiring force postures and repetitive movements.</td>
<td>Yes</td>
<td></td>
<td>Clinical examination Standardised questionnaires</td>
<td></td>
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</tr>
<tr>
<td>Chiang et al., 1993</td>
<td>Prevalence of ULD and associated ergonomic risk factors among fish processing workers</td>
<td>Cross-sectional study of 207 workers in 8 factories</td>
<td>Upper limb</td>
<td>Shoulder girdle pain, epicondylitis and CTS most common disorders. Untrained and unskilled workers suffered more MSD.</td>
<td>Yes</td>
<td></td>
<td>Interview, job analysis and medical check-up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low status (cont.)</td>
<td>Focus</td>
<td>Study type</td>
<td>Problem e.g. back</td>
<td>Onset</td>
<td>Incidence of disorders</td>
<td>Association with MSD / disability</td>
<td>Coping and recovery disability, retirement etc</td>
<td>Reporting method</td>
<td>Control for variables</td>
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<tr>
<td>Hodgson et al., 1993</td>
<td>Perception of work and health</td>
<td>Cross-sectional study</td>
<td>General MSD</td>
<td>Last 12 months</td>
<td>Self-reports of musculoskeletal conditions far exceeded any other disease category. The occupations reporting the highest overall rates of work-related illness were coal mining, construction, metal and electrical processing, transport and materials moving and unskilled labourers.</td>
<td>Yes</td>
<td>Questionnaire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andersson et al., 1993</td>
<td>Geographical area, age, gender, social class and chronic pain</td>
<td>Cross-sectional epidemiological study</td>
<td>Neck, back, upper and lower limbs</td>
<td>Chronic pain greater than 3 months (55%) and 49% lasting 6 months</td>
<td>Prevalence of pain increased with age up to 50-59 then decreased. High prevalence of chronic pain in general even among young. Women more multiple pain locations and higher prevalence in certain areas. Prevalence higher in blue collar workers.</td>
<td>Yes</td>
<td>13% with reduced functional capacity (mainly blue collar)</td>
<td>Self report questionnaire mail survey</td>
<td></td>
</tr>
<tr>
<td>Bongers et al., 1993</td>
<td>Psychosocial factors at work and MSD</td>
<td>Qualitative review of the epidemiological literature</td>
<td>General MSD but particularly back, neck and shoulders</td>
<td>Reviewed studies do not present conclusive evidence due to high correlations between psychosocial factors and physical load and to difficulties in measuring independent and dependent variables. The data suggested that low job control and lack of social support from colleagues were positively associated with musculoskeletal disease. Perceived stress may be intermediary in this process. Concluded that monotonous work, high perceived workload and time pressure were related to musculoskeletal symptoms.</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Faucett and Rempel, 1994</td>
<td>VDU work, MSD, posture and psychosocial factors in a newspaper editorial department</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>59% pain in last week</td>
<td>More hours per day on VDU and less decision making were significant risk factors for potential MSDs. Workstation factors (e.g. keyboard height) significantly related to more pain in shoulders, neck and upper back. Lower levels of social support associated with severe hand and arm numbness.</td>
<td>Yes</td>
<td>Symptoms severity modified by psychological workload, decision making, employee relationship with supervisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seitsamo et al., 1994</td>
<td>Incidence and predictors of sciatica in older workers</td>
<td>4 year follow-up of 4863 workers</td>
<td>Back</td>
<td>4 year cumulative incidence</td>
<td>4 year cumulative incidence was 8.7%; highest incidence (11.2%) occurring among unskilled workers and the lowest (6.2%) among professionals/executives. Different predictors were identified for gender.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study type</td>
<td>Problem e.g. back</td>
<td>Onset</td>
<td>Incidence of disorders</td>
<td>Association with MSD/ability</td>
<td>Coping and recovery disability, retirement etc</td>
<td>Reporting method</td>
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<tr>
<td>Cross-sectional study – results based on two studies</td>
<td>Low back, neck and shoulders</td>
<td>In last month</td>
<td>None of the non-work factors (age, number of children or habitual status) had a significant effect on MSD. Psychological demands, authority over decisions, skill utilisation and support at work had a statistically significant effect on lower back symptoms while neck and shoulder symptoms were associated with social support at work. Multivariate logistic regression showed different associations: higher the strain, the more symptoms in the back. Neck and shoulder were more associated with low social support at work/relational and emotional factors.</td>
<td>Yes</td>
<td></td>
<td>Questionnaire</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cross-sectional study</td>
<td>Hand</td>
<td>Current injuries</td>
<td>Excess work injuries among unskilled workers and younger workers. High frequency of injured had both work and domestic demanding activities.</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Longitudinal</td>
<td>General MSD</td>
<td></td>
<td>Compared with white collar workers, a higher prevalence of hearing deficiencies, signs of obstructive lung diseases, increased body mass index and musculoskeletal abnormalities were evident. Compared with white collar workers, the construction workers showed a 3.5 to 8.4 increased rate of disability (P&lt;0.05) for all occupational groups.</td>
<td>Yes</td>
<td></td>
<td>Health examination</td>
<td></td>
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<tr>
<td>Cross-sectional population survey</td>
<td>Back</td>
<td>Long-term definition?</td>
<td>Prevalence of long-term back pain was 7.8%. This increased with age, those with less formal education, smokers, overweight, blue collar workers and those with lower income.</td>
<td>Yes</td>
<td></td>
<td>Questionnaire survey</td>
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<tr>
<td>Cross-sectional</td>
<td>Low back</td>
<td>Last 12 months</td>
<td>Prevalence of low back pain highest in painters (57%), intermediate in concrete builders and bricklayers (41%), and lowest in carpenters and unskilled workers (38%).</td>
<td>Yes</td>
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<tr>
<td>Cross-sectional study in an aluminium smelter</td>
<td>Upper limb and back</td>
<td></td>
<td>Years of forearm twisting were found to be a significant predictor for upper limb disorders. Low decision latitude was a significant predictor for shoulder pain. High job satisfaction (OR=5.9, 95% CI=1.4-25) and low social support (OR = 5.3, 95% CI=1.3-22) were associated with low back pain.</td>
<td>Yes</td>
<td></td>
<td>Structured interview, physical exam and questionnaire</td>
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<tr>
<td>Cross-sectional study of 358 people</td>
<td>General MSD</td>
<td>Current</td>
<td>Low social support at work, high psychological demands and job strain were associated with MSD symptoms and signs. Decision latitude at work showed few associations with musculoskeletal disorders.</td>
<td>No</td>
<td></td>
<td>Self report questionnaire, medical examinations</td>
<td>Controlled for age, gender, physical load</td>
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<tr>
<td>Study type</td>
<td>Incidence of disorders</td>
<td>Association with MSD / disability</td>
<td>Coping and recovery disability, retirement etc</td>
<td>Reporting method</td>
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<tr>
<td>Polanyi et al., 1997</td>
<td>Prevalence and associations of upper limb problems among newspaper personnel</td>
<td>Cross-sectional survey</td>
<td>Upper limb (ULDs)</td>
<td>20% reported moderate or worse ULDs monthly or lasting more than a week in last year.</td>
<td>Those facing frequent deadlines, high psychological demands (fast work pace, conflicting demands) had low skill discretion and social support, spent more time keyboarding, or had computer screen in non-optimal position were likely to report moderate to severe symptoms. Women reported significantly higher levels of symptoms than men.</td>
<td>Yes</td>
<td>Questionnaires, physical exam, GP records, company records of sickness absence</td>
<td></td>
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<tr>
<td>Feeney et al., 1998</td>
<td>Socio-economic and sex differentials in reasons for sickness absence</td>
<td>Longitudinal analysis of 5620 civil servants in Whitehall II study</td>
<td>General MSD</td>
<td>Short (&lt;7 days) and long (&gt;7 days) absence</td>
<td>Headache and migraine, musculoskeletal disorders, injury and neurosis accounted for 20%-30% of absences. The lower the employment grade the higher the rate of absence for both short and long spells. In general women had higher rates of absence than men.</td>
<td>Yes</td>
<td>Questionnaires, physical exam, GP records, company records of sickness absence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woods et al, 1999</td>
<td>Musculoskeletal health among cleaners</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Last 7 days and last 12 months</td>
<td>Higher than expected prevalence of musculoskeletal pain and discomfort (74% in last year, 53% in last week) was found among cleaners. The proportion of cleaners seeking medical advice was 52%. 23% reported taking time off work in last year.</td>
<td>Yes</td>
<td>Questionnaire, workplace assessments, laboratory trials, focus groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baker et al., 1999/2000</td>
<td>Background factors, work practises and psychosocial variables and musculoskeletal discomfort</td>
<td>Cross-sectional study of 155 customer service representatives</td>
<td>General MSD</td>
<td>Back and upper limb and neck 93%</td>
<td>93% reported musculoskeletal discomfort in some body part. The amount of social support, job variety and skill utilisation in the job were the psychosocial variables most often associated with musculoskeletal discomfort (apart from the neck).</td>
<td>Yes</td>
<td>Self report questionnaires</td>
<td></td>
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</tr>
<tr>
<td>Thorbjörnsson et al., 2000</td>
<td>Physical and psychosocial occupational factors related to low back pain</td>
<td>Longitudinal</td>
<td>Back</td>
<td>24 year follow-up</td>
<td>Factors at work were risk indicators for low back pain for both genders: low influence over work conditions, heavy physical workload, sedentary work, smoking among women and poor social relations at work, heavy physical workload, sedentary work, high perceived load outside work and combination of poor social relations and overtime among men, in combination with other factors.</td>
<td>Yes</td>
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</tbody>
</table>
Income

Summary
- Income has a strong influence on health. It influences where people live, the type of house they live in, access to leisure, education, clothing and fuel (Lyon 1998).
- Research on income and general ill health, often linked to occupational class and low status jobs, indicates that income contributes to health problems.
- The majority of studies indicate that lower income levels are associated with an increase in musculoskeletal problems.

Income and general ill health

Many research studies have been conducted on income and health in the sociological literature. Four study examples have identified a link between low pay and perceived ill health among women (Ross and Bird, 1994), the negative effect of low pay on absenteeism (Brooke and Price, 1989), greater disability and lower family income in a follow-up study on an ageing cohort (Hubert et al, 1993) and a significant correlation between percentage of total household income and mortality in USA (Kaplan et al, 1996). Income inequality in this study was also significantly associated with other factors including work disability and sedentary activity.

Ross and Bird (ibid) raised an interesting argument that gender differences in labour and lifestyles explained differences in perceived health. Gender inequality in paid and unpaid work and subjective experiences of inequality disadvantage women. Women were less likely to be employed, more likely to be part-time, have low incomes and do more unpaid domestic labour than men. The study found all these factors, apart from domestic labour, were associated with ill health. Similar arguments concerning exposure to different psychological and job conditions are put forward by a number of researchers (Messing, 2000; Punnett and Herbert, 2000) in Section 2 to explore gender differences in musculoskeletal health.
Income and musculoskeletal ill health

Five studies included the factor ‘low income’ or ‘perceived low income’ in investigations on musculoskeletal ill health.

Three studies focussed on back pain. An early study (Leigh and Sheetz, 1989) did not find an association between prevalence of back pain and income. Two more recent studies of working populations identified associations between low income and prevalence of chronic back trouble (Liira et al., 1996) and perceived inadequacy of income and low back pain (Papageorgiou et al, 1997). The later study also found that perceived inadequacy of income along with social class were strongly associated with consulting with a new episode of low back pain during the last year.

Two further studies looked at musculoskeletal disability (Badley and Ibañez, 1994) and musculoskeletal disorders among older (aged 51-61 years) workers (Yelin, 1997) found that musculoskeletal ill health was independently associated with reported lower income.

Four out of the five reviewed studies found an association between lower income level and musculoskeletal ill health. However, there are only a limited number of studies in the literature that explored the associations between income and musculoskeletal ill health. The relationship between low income and workplace risk factors requires further elucidation.
Table 5: Summary of research studies on income and musculoskeletal ill health

<table>
<thead>
<tr>
<th>Income Source</th>
<th>Focus</th>
<th>Study type</th>
<th>Problem e.g. back</th>
<th>Onset</th>
<th>Incidence of disorders</th>
<th>Association with MSD or disability</th>
<th>Coping and recovery disability, retirement etc</th>
<th>Reporting methods</th>
<th>Control for variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leigh and Sheetz, 1989</td>
<td>Prevalence of back pain in USA</td>
<td>Cross-sectional</td>
<td>Back</td>
<td>Last year</td>
<td>20% back trouble in previous year. Back pain prevalence was significantly associated with occupation group, low education level, smoking, and job conditions but not sex, race, tallness, obesity, age, marital status and income.</td>
<td>No</td>
<td>Self report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Badley and Ibañez, 1994</td>
<td>Socio-economic risk factors and musculoskeletal disability in Canada</td>
<td>Cross-sectional</td>
<td>General MSD disability</td>
<td>Disability</td>
<td>Risk factors (apart from gender) associated with musculoskeletal disability similar to those for other cases of disability. Independently associated with increasing age, not being married, less years of schooling, lower income and unemployment.</td>
<td>Yes</td>
<td>Questionnaire survey</td>
<td></td>
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</tr>
<tr>
<td>Liira et al., 1996</td>
<td>Work exposures e.g. vibration, postures) and long term back problems in Canada</td>
<td>Cross-sectional population survey</td>
<td>Low back</td>
<td>Long-term</td>
<td>Prevalence of long-term back pain was 7.8%. This increased with age, those with less formal education, smokers, overweight, blue collar workers and those with lower income. Only a slight difference in prevalence between men and women. Higher prevalence in two oldest age groups</td>
<td>Yes</td>
<td>Questionnaire survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Papageorgiou et al., 1997</td>
<td>Work related psychosocial factors, social status and occurrence of new episodes of low back pain and consultation behaviour</td>
<td>Initial cross-sectional study and a prospective study over 1 year</td>
<td>Low back</td>
<td>Pain lasting more than 24 hrs in last 4 weeks; New episodes in 12 months</td>
<td>Initial survey indicated a modest but significant association between low back pain in last 4 weeks and perceived inadequacy of income (rr 1.3), dissatisfaction with work (rr 1.1) and social class (rr 1.2). Both perceived inadequacy of income (rr3.6) and lower social class (rr4.8) were strongly associated with consulting with a new episode of low back pain during the year.</td>
<td>Yes</td>
<td>Gender differences in reporting behaviour – women in lower social class more likely to report; perceived low income more strongly associated with men reporting.</td>
<td>Questionnaire</td>
<td>Risks adjusted for age; adjustment for social class did not alter relationship between income and consultation</td>
</tr>
<tr>
<td>Yelin, 1997</td>
<td>Earnings, income and assets of persons aged 51-61 with and without musculoskeletal conditions</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Current</td>
<td>Fifty-nine percent of persons 51-61 years of age reported one or more MSD conditions. Persons with musculoskeletal conditions and co-morbidity reported 18% lower family earnings, 15% lower family income and 35% fewer assets than the average among all persons of these ages. Persons with musculoskeletal conditions and no co-morbidity have earnings, income and assets closer to the average.</td>
<td>Yes</td>
<td>Data from a national, community based probability sample of persons</td>
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</table>
Section 2 – Individual factors

Introduction

In this section the studies of the association between individual factors (i.e. age, gender and ethnicity) or ‘fixed constitutional factors’ (Dahlgren and Whitehead, 1991) will be reviewed. The profile of the workforce has changed in the last decade in most industrialised countries. The workforce is growing older, there are many more women in the workplace and the workforce is comprised of many different ethnic groups. These personal and individual factors are unchangeable and might be confounded by occupational demands and should be accommodated in the workplace to ensure worker health and safety (Punnett and Herbert 2000; Riihimaki, 1995). Level of education is also reviewed in this section as it is a characteristic that people bring to the workplace.

As will become apparent in the review, these individual factors appear to have an influence on the experience of musculoskeletal problems at work; however this is likely to be a result of their interaction with other factors in the workplace e.g. occupational type, job insecurity, work organisation culture, (factors reviewed in Section 1). Due to these individual factors (e.g. being an older worker or being female) certain groups of workers may be exposed to factors in the workplace that will lead to inequality in musculoskeletal health.

It is important to bear in mind that individual factors are often confounders in the studies that have been reviewed. For example, age is often assumed to be related to musculoskeletal disorders in epidemiological studies but the variable age is also highly correlated with years spent in work. Women are commonly in monotonous and repetitive jobs and this might help to explain the high prevalence of musculoskeletal problems in upper limbs among women. In addition some studies indicate that women are not at an increased risk for disorders but are more likely to report musculoskeletal problems than men or have more demanding activities at home which increase total workload over the day and reduce the opportunity of physical recovery after a working day. Thus there is frequently a confounding effect when individual variables are considered. Better study designs and analyses attempt to control for this.

Changes to work systems (e.g. changing physical working heights, providing alternative equipment designs, reorganising working schedules, changing working methods) can accommodate individual factors and so reduce the occurrence of musculoskeletal disorders. However care is needed when change is introduced as alterations in the work and work environment can also cause problems to the health and well being of workers. An ergonomic approach (e.g. consultation with users, work systems where problems are monitored and good reporting systems are available) should be adopted at the workplace to ensure that individuals do not experience problems at work that may result in a risk for musculoskeletal disability.
Education level

Summary
- In 1997, 16 per cent of men and 21 per cent of women of working age had no qualifications. There were also large differences between ethnic groups (ONS, 1998).
- Although the extent to which education has an independent effect on health status and the mechanisms by which it does so are not fully understood, it does appear to have an important influence on health.
- This influence may be seen as both potentiating (i.e. providing the trigger for healthier lifestyles and behaviour) and protective (providing access to employment opportunities and other chances that can protect individuals from disadvantage later in life) Acheson (1998).
- The limited numbers of studies on education level and musculoskeletal disorders have shown an association between low education and an increased likelihood of musculoskeletal problems.

Education level and general ill health

Cohort studies show that those with low levels of educational achievement have poor adult health (Montgomery and Schoon, 1997; Bynner and Parsons, 1997). Level of education may act as a marker for other influences such as socioeconomic status, occupational level or lifestyle (Marmot et al., 1997). Education may have a direct influence on health related behaviour: children who do well in education tend to report healthier behaviour in adult life in relation to diet, smoking and exercise (Wadsworth, 1997).

Education level and musculoskeletal ill health

Five studies included the factor ‘education level’ in investigations on musculoskeletal ill health.

Three studies on prevalence of back pain found an association with low education level (Liira et al., 1996; Tang et al., 1995; Leigh and Sheetz, 1989). Liira et al (ibid) also found that low income and unemployment were associated with a high prevalence for chronic back trouble; these factors may also be related to lower levels of education.

Badley and Ibañez (1994) found musculoskeletal disability was independently associated with less years of schooling. Like the Liira et al (ibid) study, earning a lower income and not being employed were also associated with musculoskeletal ill health.

In a study investigating factors that influence return to work, Straaton et al (1995) found that higher education level was an important predictor of those who returned to work after a musculoskeletal problem.
The limited numbers of studies available have found associations between low education levels and musculoskeletal ill health. There is also some evidence to show that a higher education level may be important in the recovery and rehabilitation from a musculoskeletal problem. More research is required on the extent to which low education level might impact on musculoskeletal disorders. If this association is further confirmed through more research, techniques to compensate for a lack of education in (and away from) the workplace should be identified to ensure inequalities do not exist.
<table>
<thead>
<tr>
<th>Education level</th>
<th>Focus</th>
<th>Study type</th>
<th>Problem e.g. back</th>
<th>Onset</th>
<th>Incidence of disorders</th>
<th>Association with MSD / disability</th>
<th>Coping and recovery disability, retirement etc</th>
<th>Reporting methods</th>
<th>Control for variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leigh and Sheetz, 1989</td>
<td>Prevalence of back pain among fulltime workers in USA</td>
<td>Cross-sectional</td>
<td>Back</td>
<td>Last year</td>
<td>20% back trouble in previous year: Back pain prevalence was significantly associated with occupation group, low education level, smoking, and job conditions but not sex, race, tallness, obesity, age, marital status and income.</td>
<td>Yes</td>
<td>Self report</td>
<td></td>
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<tr>
<td>Badley and Ibañez, 1994</td>
<td>Socio-economic risk factors and musculoskeletal disability</td>
<td>Cross-sectional</td>
<td>General MSD disability</td>
<td>Disability</td>
<td>Risk factors (apart from gender) associated with musculoskeletal disability similar to those for other cases of disability. Independently associated with increasing age, not being married, less years of schooling, lower income and unemployment.</td>
<td>Yes</td>
<td>Questionnaire survey</td>
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<td></td>
</tr>
<tr>
<td>Tang et al., 1995</td>
<td>Relationship between workload and MSD in China</td>
<td>Cross-sectional epidemiological</td>
<td>Low back</td>
<td>Current</td>
<td>51% low-back disorders and correlated with older age, standing, previous back injury, lower education level, sport activity, work intensity, working posture, satisfaction with tools, work conditions and house work. Heavy workload and non-neutral posture were the main factors.</td>
<td>Yes</td>
<td>Questionnaire and clinical exam</td>
<td></td>
<td></td>
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<tr>
<td>Straaton et al., 1995</td>
<td>Musculoskeletal disability and return to work in USA – demographic and socio-economic characteristics</td>
<td>Database analysis – segmentation modelling and logistic regression</td>
<td>General MSD disability</td>
<td></td>
<td>71% of those with arthritis or MSD accepted for rehabilitation between 1987-91 returned to work</td>
<td>Not receiving disability benefit and higher education levels were best predictors of return to work. Also being female, White, younger, and those with non-back disorders were also more likely to be rehabilitated.</td>
<td>Database of cases from rehabilitation service over a 4 year period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liira et al., 1996</td>
<td>Work exposures and long term back problems</td>
<td>Cross-sectional population survey</td>
<td>Low back</td>
<td>Long-term</td>
<td>Prevalence of long-term back pain was 7.8%. This increased with age, those with less formal education, smokers, overweight, blue collar workers and those with lower income. Only a slight difference in prevalence between men and women. Higher prevalence in two oldest age groups</td>
<td>Yes</td>
<td>Questionnaire survey</td>
<td></td>
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</tbody>
</table>
Age

### Summary
- The average age of the working population is increasing and in conjunction with this there is a rapid and simultaneous change in work conditions and job structures (Lindstrom, 1988). In the coming decades, demographic, economic and social changes will result in an increased proportion of elderly persons in the workforce in most industrialised countries (de Zwart et al., 1995). By the year 2010, about 20% of the population of the EU and other developed counties will be aged over 60 years (Rabbitt, 1997). The Health and Safety Executive (HSE) suggest that special attention should be paid to creating a good fit between work demands and individual resources and to integrate individuals currently considered over retirement age into the productive working population (Haigh and Haslegrave, 1992).
- Some studies show that young age groups may be at particular risk for musculoskeletal problems (e.g. in heavy physical work situations such as nursing or construction). Research indicates that schoolchildren have a high prevalence of back pain (Murphy and Buckle, 2001; Burton et al., 1996). Thus new entrants to the workforce may already have a history of musculoskeletal disorders. Prior history is considered to be a good predictor of future episodes for low back pain (Troup et al., 1987).
- The results of the studies looking at the relationship between age and ill health are varied. Although there are a number of limitations (e.g. age is often highly correlated with years spent in work), older age appears to be a risk factor for the development of musculoskeletal disorders. However, younger age groups appear to be at particular risk in some occupations.

### Age and general ill health

The variable ‘age’ has been considered in many studies as a possible risk factor for the development of general health problems. The results of a number of example studies reviewed are mixed. The findings from four studies looking at health indicate that older age is a risk factor for or associated with ill health in police (Burke, 1989), burnout among air traffic controllers (Dell’Erba et al., 1994), poor work ability of active employees (Illmarinen et al., 1997) and longer spells of absence from work (Sharp and Watt, 1995).

In contrast, one study found that absence due to ill health was more common among younger and also unskilled workers (Krapac et al., 1985). A further study indicated that there was no association between age and physical ill health among data entry workers (Ong and Phoon, 1987).
Age and musculoskeletal ill health

The Age Diversity in Employment - Code of Practice (DfEE, 1999) covers good practice in six aspects of the employment cycle. Each factor has been considered with respect to specific aspects of interest:

- Recruitment on the basis of skills and abilities needed to do the job
- Selection on merit by focusing on application form information about skills and abilities and on interview performance
- Promotion on the ability, or demonstrated potential, to do the job
- Encourage all employees to take advantage of relevant training opportunities
- Redundancy decisions based on objective, job related criteria to ensure the skills needed to help the business are retained
- Ensure that retirement schemes are fairly applied, taking individual and business needs into account

Many of the aspects highlighted identify skills and abilities. It is unclear how abilities might be interpreted in light of the relationship between age and musculoskeletal function. The relative importance of age with respect to musculoskeletal disorders needs to be clearly spelled out if discrimination is not to occur.

The findings from a number of studies on musculoskeletal health indicate that older age is a risk factor for or associated with the prevalence of musculoskeletal problems among nurses (Lert et al., 1989), railway workers (Brulin et al., 1985) and workers in various occupations (Leclerc et al., 1999; Huuhtanen et al, 1997; Badley and Ibañez, 1994). Studies on back pain (Liira et al, 1996; Tang et al, 1995) and neck pain (Leclerc et al., 1999) showed that prevalence of long-term back pain increased with age. In contrast, Ahlberg-Hulten et al (1995) found that none of the non-work factors (age, number of children or habitual status) had a significant effect on MSD in female health care personnel.

In a review of the literature on physical workload and the ageing worker, de Zwart et al (1995) recognised that a progressive decline in physical work capacity, characterised by diminished aerobic capacity and muscular capacity has consistently been reported in studies. However, inter-individual differences appear to be considerable. The question of whether there are systematic differences in physical work demands between younger and older workers within occupations has been answered vaguely. Conflicting results bring into discussion the role of the actual working method as one of the determinants of the physical workload. An age-related imbalance between physical workload and physical work capacity was suggested to result in a chronic overload, increasing the risk of long-term health effects such as musculoskeletal complaints and disorders. For many ageing workers in physically demanding occupations, extreme physical workloads, increasing the risk of disease or disablement, are still reported.
For several complaints a flattening (i.e. no further increase with after 60 years) or decrease in prevalence was observed in older groups in a number of studies (Bart et al, 1997; Andersson et al, 1993).

Three studies found that musculoskeletal ill health, injury and sickness absence were more common among younger workers (Chau et al., 1995; Krapac et al, 1985; Ong et al., 1991). Similarly, Skovron et al (1987) found that recent lower back pain was significantly associated with younger age in nurses in the USA. The important point was made that these results may reflect the early withdrawal of back pain sufferers from nursing or the transfer into a job category perceived to be less physically demanding, resulting in a higher prevalence of low back pain in younger respondents.

Increasing age shows a general increase in risk with respect to many musculoskeletal disorders. However, the relationship varies with the type of outcome measured (e.g. reporting of symptoms, sickness absence, disability). The implications of increased prevalence of these disorders arising from the changing demographics of the workforce (notably the ageing of the workforce) requires further clarification. This is of particular importance with respect to the new targets being set by the Health and Safety Commission.
<table>
<thead>
<tr>
<th>Age</th>
<th>Focus</th>
<th>Study type</th>
<th>Problem e.g. back</th>
<th>Onset</th>
<th>Incidence of disorders</th>
<th>Association with MSD/disability</th>
<th>Coping and recovery disability, retirement etc</th>
<th>Reporting method</th>
<th>Control for variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brulin et al., 1985</td>
<td>Prevalence of MSD in railway workers in Scandinavia</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>In last 7 days</td>
<td>Sites of MSD varied between countries. Disorders increased with age, employment duration. Nationality, age and employment duration important factors in explaining MSD.</td>
<td>Older</td>
<td>Prevalence of occupational incapacity varied among body regions and nationality</td>
<td>Self report questionnaire</td>
<td>Controlled job category, small positive association between satisfaction with co-workers and previous BP remained</td>
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<tr>
<td>Krapac et al., 1985</td>
<td>Spinal pain among various skilled railway workers</td>
<td>Cross-sectional</td>
<td>Back</td>
<td>Absence more frequent among unskilled and semiskilled workers and among young. Frequency of radiating pain decreased in proportion with degree of work qualification.</td>
<td>Young</td>
<td></td>
<td></td>
<td>Controlled job category, small positive association between satisfaction with co-workers and previous BP remained</td>
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<tr>
<td>Skovron et al., 1987</td>
<td>Low back pain and work organisation among nurses</td>
<td>Prospective epidemiological</td>
<td>Low back BP (BP) in last 6 months</td>
<td>Associations with occurrence of back pain: younger age, satisfaction with work colleagues, being a registered nurse</td>
<td>Young</td>
<td>Move to less physically demanding job, early departure from workforce</td>
<td>Self report questionnaire</td>
<td>Controlled job category, small positive association between satisfaction with co-workers and previous BP remained</td>
<td></td>
</tr>
<tr>
<td>Lert et al., 1989</td>
<td>Health of nurses in public hospitals</td>
<td>Longitudinal over 5.5 years</td>
<td>General MSD</td>
<td>Health problems mainly relate to age. Oldest (over 40) group worse for MSD and other health problems. Perception of working conditions stable with slight improvement. Perceived stress related to mental and psychological load had not decreased.</td>
<td>Older</td>
<td>Less turnover. Young nurses more likely to leave profession</td>
<td>Interview</td>
<td></td>
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<tr>
<td>Ong et al., 1991</td>
<td>Musculoskeletal disorders in VDU operators, clerical workers and teachers</td>
<td>Data entry workers higher prevalence than other groups, teachers had the lowest. No direct association with age but higher prevalence in working mothers aged 26-35 years. Malays and Indians reported higher prevalence of MSD than their Chinese counterparts. Job activities, duration of VDU work, social and psychological factors should be taken into account in the development of MSD.</td>
<td>Questionnaire</td>
<td></td>
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<td>Age (cont.)</td>
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<td>Problem e.g. back</td>
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<tr>
<td>Andersson et al., 1993</td>
<td>Geographical area, age, gender, social class and chronic pain</td>
<td>Cross-sectional epidemiological study</td>
<td>Neck, back, upper and lower limbs</td>
<td>Chronic pain greater than 3 months (55%) and 49% lasting 6 months</td>
<td>Prevalence of pain increased with age up to 50-59 then decreased. High prevalence of chronic pain in general even among young. Women more multiple pain locations and higher prevalence in certain areas. Prevalence higher in blue collar workers.</td>
<td>Older</td>
<td>13% with reduced functional capacity (mainly blue collar)</td>
<td>Self report questionnaire mail survey</td>
<td></td>
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<tr>
<td>Badley and Ibañez, 1994</td>
<td>Socio-economic risk factors and musculoskeletal disability</td>
<td>Cross-sectional</td>
<td>General MSD disability</td>
<td>Disability</td>
<td>Risk factors associated with musculoskeletal disability similar to those for other cases of disability. Independently associated with increasing age, not being married, less years of schooling, lower income and unemployment.</td>
<td>Older</td>
<td></td>
<td>Questionnaire survey</td>
<td></td>
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<tr>
<td>Ahlberg-Hulten et al., 1995</td>
<td>Perception of social support, job strain and musculoskeletal pain in female health care personnel</td>
<td>Cross-sectional study – results based on two studies</td>
<td>Low back, neck and shoulders</td>
<td>In last month</td>
<td>None of the non-work factors (age, number of children or habitual status) had a significant effect on MSD. Psychological demands, authority over decisions, skill utilisation and support at work had a statistically significant effect on lower back symptoms while neck and shoulder symptoms were associated with social support at work. Multivariate logistic regression showed different associations: higher the strain, the more symptoms in the back. Neck and shoulder pain more associated with low social support at work/relational and emotional factors.</td>
<td>No</td>
<td></td>
<td>Questionnaire</td>
<td></td>
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<tr>
<td>Tang et al., 1995</td>
<td>Relationship between workload and MSD</td>
<td>Cross-sectional epidemiological</td>
<td>Low back</td>
<td>Current</td>
<td>51% low-back disorders and correlated with older age, standing, previous back injury, lower education level, sport activity, work intensity, working posture, satisfaction with tools, work conditions and house work. Heavy workload and non-neutral posture were the main factors.</td>
<td>Older</td>
<td></td>
<td>Questionnaire and clinical exam</td>
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<tr>
<td>Chau et al., 1995</td>
<td>Implications of ULD on occupational activities</td>
<td>Cross-sectional study</td>
<td>Hand</td>
<td>Current injuries</td>
<td>Excess work injuries among unskilled workers and younger workers. High frequency of injured had both work and domestic demanding activities.</td>
<td>Young</td>
<td></td>
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<tr>
<td>De Zwart et al., 1995</td>
<td>Physical workload and ageing workers</td>
<td>Literature review</td>
<td>General MSD</td>
<td></td>
<td>Progressive decline in physical work capacity with age. Inter-individual differences considerable. Identified research areas that need more clarification.</td>
<td>Older</td>
<td></td>
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</tr>
<tr>
<td>Liira et al., 1996</td>
<td>Work exposures and long term back problems</td>
<td>Cross-sectional population survey</td>
<td>Low back</td>
<td>Long-term</td>
<td>Prevalence of long-term back pain was 7.8%. This increased with age, those with less formal education, smokers, overweight, blue collar workers and those with lower income.</td>
<td>Older</td>
<td></td>
<td>Questionnaire survey</td>
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<tr>
<td>Bart et al., 1997</td>
<td>MSD, age, gender and physical work</td>
<td>Cross-sectional</td>
<td>Back, neck, upper and lower extremities</td>
<td>Regular pain</td>
<td>MSD among workers in physically demanding jobs increase with age for both sexes. For several complaints, a flattening or decrease in prevalence was observed in older groups. Higher rate of women reporting for some complaints. High number of complaints among older females.</td>
<td>Older</td>
<td>Gender and age discussed in relation to reasons for increase in complaints: survivor population, additional work duties, more likely to report</td>
<td>Self report questionnaire as part of occupational health survey</td>
<td>Stratified sample</td>
</tr>
<tr>
<td>Huhtanen et al., 1997</td>
<td>Perceived changes in stress (including physical) symptoms and relationship to changes in work in older workers</td>
<td>Longitudinal over 11 years</td>
<td>Upper and lower limbs</td>
<td>Current</td>
<td>Stress symptoms marked increase with age, especially aches and pains in upper and lower limbs. More symptoms evident the more work had changed. Women had a greater increase in symptoms.</td>
<td>Older</td>
<td>Significant increase in avoidance reactions 6% women and 7% men could no longer manage full time work; proportion of subjects on disability pensions/died during follow-up was highest for those in physically demanding work in 1981</td>
<td>Self report questionnaire</td>
<td>Analysed by gender, work profile and age</td>
</tr>
<tr>
<td>Leclerc et al., 1999</td>
<td>Factors that predict incidence, recurrence and persistence of neck disorders among workers in different occupations</td>
<td>Longitudinal epidemiological study over 12 months</td>
<td>Neck</td>
<td>In last 6 months, more than 30 days, treatment, visit to health professional</td>
<td>Older age and being female were predictive factors for neck pain</td>
<td>Older</td>
<td>Self report questionnaire</td>
<td></td>
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</tr>
</tbody>
</table>
Gender

- The findings from studies in the general health literature are very mixed in relation to gender differences in health. Similar numbers of studies found that gender differences in health problems do or do not exist. Controlling for the interaction with other variables sometimes removes a gender difference (Sharp and Watt, 1995).
- The majority of studies that have investigated the association of gender with musculoskeletal symptoms indicate that women are more likely to develop a musculoskeletal problem than men. Some studies have acknowledged differences in job conditions, experience at work and home as possible reasons for gender differences.
- The reasons behind gender differences in health are not always explored and may be misleading. More research is required on whether musculoskeletal risk varies between men and women in jobs with the same occupational exposure (Punnett and Herbert, 2000).

Gender and general ill health

The variable ‘gender’ has been considered in a number of studies as a possible risk factor for the development of general health problems.

The findings from six health studies looking at lifestyles (Ross and Bird, 1994; Arber and Lahelma, 1993; Hall, 1990), shiftwork among steel plant workers (Oginska et al., 1993), job demands (Roxburgh, 1996) and sickness absence (Feeney et al., 1998) indicated that women had more health problems than men; however health was found to improve with age among women but not among men in one study (Oginska et al., 1993).

A number of these studies have indicated that there are often differences in the basic daily experience of men and women and that the sources of stress, and consequently ill health, in women’s lives are more diverse and diffuse than those experienced by men (Ross and Bird, 1994; Beerman and Nachreiner, 1992; Hall, 1990) e.g. different job types (piecework, part-time, low status), lifestyle, responsibilities at work and at home (Arber and Lahelma, 1993).

Five studies indicated no differences in health between men and women. These health studies focussed on shiftwork in police officers (Beerman and Nachreiner, 1992), sickness absence (Sharp and Watt, 1995), job conditions (Barnett and Brennan, 1995; Stansfeld et al., 1995) and managerial style (Gardiner and Tiggemann, 1999). Sharp and Watt (1995) indicated that gender differences in absence were removed by standardisation of age and occupational status.
Gender and musculoskeletal ill health

The variable ‘gender’ has been considered in many studies as a possible risk factor for the development of musculoskeletal health problems. The majority of studies looking at gender and musculoskeletal health have shown that women are more likely to develop a musculoskeletal problem than men.

The findings from many studies looking at prevalence and risk factors for back pain (Burgmaier et al., 1988; Harreby et al., 1986), prevalence of and risk factors for neck and upper limb pain (Leclerc et al., 1999; Feuerstein et al., 1997; Polanyi et al., 1997), prevalence of general musculoskeletal problems (Bart et al., 1997; Feuerstein et al., 1997; Augustson and Morken, 1996; Andersson et al., 1993; Messing et al., 1993; Gun, 1990), stress (Huuhtanen et al., 1997) and sickness absence (Brage et al., 1998; Feeney et al., 1998; Leijon et al., 1998) indicated that being female was a risk factor for musculoskeletal ill heath.

However, job type and conditions (e.g. repetitive, low status work) are important to consider when looking at the role of musculoskeletal health and gender. Mergler et al (1987) identified more musculoskeletal problems among women but found that when looking at men and women working in similar conditions, symptoms levels were close. Likewise, Nordander et al (1999) acknowledged that gender differences in physical and psychosocial exposure in work accounts for the gender differences in health identified.

Four studies have found that risk factors in the same job effect women and men differently (Feuerstein et al., 1997; Fredricksson et al., 1999; Virokannas et al., 1999; Thorbjörnsson et al., 2000). A further study indicated that one factor influencing return to work after a musculoskeletal disorder was being female (Straaton et al., 1995) and another indicated that being male was associated with injury occurrence in a sawmill (Punnett, 1994).

A recent review of the literature on gender and musculoskeletal disorders (Punnett and Herbert, 2000) identified many variations in results and gaps in the literature with respect to issues of reporting behaviour, different work exposures and non-work exposures. More research is required on whether musculoskeletal risk varies between men and women in jobs with the same occupational exposure, both physical and psychosocial. The authors concluded that the substantial body of research evidence identifying the risk associated with specific occupational workplace stressors should provide the focus for preventive strategies.

In general, the musculoskeletal literature shows that women are more likely to experience a musculoskeletal problem than men. However, some of these studies highlight differences without exploring further potential confounders. Some researchers have found that variation in, for example, job conditions (e.g. unskilled work, job type or responsibilities away from work), are important to consider when examining gender differences in musculoskeletal health.
Women in the workplace are often exposed to different musculoskeletal and psychological constraints, even when they share job titles with men. Job and task assignments may differ by sex, and gender-associated biological and social characteristics may interact with workplace constraints to modify the exposures or the effects of working conditions. Jobs preferentially assigned to women may have specific exposures that escape the attention of researchers (Messing, 2000). More research is required to investigate whether musculoskeletal ill health risk varies between women and men in jobs with the same occupational exposures and status.
<table>
<thead>
<tr>
<th>Gender</th>
<th>Focus</th>
<th>Study type</th>
<th>Problem e.g. back</th>
<th>Onset</th>
<th>Incidence of disorders</th>
<th>Association with MSD / disability</th>
<th>Coping and recovery disability, retirement etc</th>
<th>Reporting methods</th>
<th>Control for variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harreby et al., 1986</td>
<td>Risk factors for low back pain in 38 year olds</td>
<td>25 year prospective cohort study of 640 school children</td>
<td>Low back (LBP)</td>
<td>Lifetime, 1 year and point prevalence</td>
<td>Cumulative lifetime prevalence of LBP = 70%, 1 year prevalence = 63%, point prevalence 19%, independent of gender. Women reported higher incidences of LBP. Heavy manual work associated with LBP and smoking was more common among unemployed and sick subjects.</td>
<td>Female</td>
<td>Questionnaire</td>
<td></td>
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<tr>
<td>Mergler et al., 1987</td>
<td>Health and sex-specific working conditions in poultry slaughterhouses</td>
<td>Cross-sectional General MSD</td>
<td>MSD</td>
<td></td>
<td>More MSD among women related to ergonomic and organisation of job. Other health problems (e.g. auditory) were reported to a similar extent by men. Men and women's jobs differed. More women reported that the job involved standing still, repetitive movements, very rapid work rate and working with small instruments. Men reported more moving around, lifting heavy objects, working in alternative areas and use of large equipment. Symptom levels closer for men and women in similar working conditions.</td>
<td>Female</td>
<td>Self report questionnaire</td>
<td></td>
<td>controlled for age and seniority as men were on average younger and less senior than women</td>
</tr>
<tr>
<td>Burgmaier et al., 1988</td>
<td>Personal and occupational risk factors for backache in hospitals</td>
<td>Cross-sectional survey</td>
<td>Back</td>
<td></td>
<td>Confirmed previous research with respect to risk factors (age, sex, length of service, job content including heavy physical workload) and obesity and previous attacks of back pain.</td>
<td>Female</td>
<td>Consequences and prevention measures were discussed including importance of sport.</td>
<td>Self report questionnaire</td>
<td></td>
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<tr>
<td>Gun, 1990</td>
<td>Incidence and distribution of RSI in Australia</td>
<td>Analysis of data from various surveys</td>
<td>Upper limb</td>
<td></td>
<td>High prevalence in blue collar workers. Higher prevalence among women in all occupational and industrial categories. Groups most at risk are female workers performing unskilled, unfulfilling tasks.</td>
<td>Female</td>
<td></td>
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<td>Andersson et al., 1993</td>
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<tr>
<td>Messing et al., 1993</td>
<td>Health effects of the sexual division of labour (task of toilet cleaning done exclusively by women) among 36 train cleaners</td>
<td>Cross-sectional</td>
<td>General</td>
<td>In last 5 years (using occupational health records)</td>
<td>Rigid sexual division of labour. Number of physical constraints: awkward posture, manual handling and fast pace. Women suffered more MSD and were more frequently absent (x 3 times) from work than men.</td>
<td>Female</td>
<td>Inability to rotate jobs may be associated with specific health and safety risks for both sexes</td>
<td>Interviews, observation, analysis of occupational health and company absence records</td>
<td></td>
</tr>
<tr>
<td>Punnett, 1994</td>
<td>Risk factors for injury in a sawmill industry</td>
<td>Case control cross-sectional study</td>
<td>General MSD injury</td>
<td>Cases were more likely than controls to be employed in machine paced jobs, exposed to dangerous work methods and materials, experience louder noise levels and faster work pace, have higher lifting demands and more frequent postural stress, experience lower decision latitude and lower social support at work. Being male, being one year or less in the job, inability to take a break when tired were also significantly associated with injury occurrence.</td>
<td>Male</td>
<td>Decision latitude and social support had small protective effects.</td>
<td>Cases identified by a compensation commission. Interviews</td>
<td></td>
<td></td>
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<tr>
<td>Straaton et al., 1995</td>
<td>Musculoskeletal disability and return to work in USA – demographic and socio-economic characteristics</td>
<td>Database analysis – segmentation modelling and logistic regression</td>
<td>General MSD disability</td>
<td>Not receiving disability benefit and higher education levels were best predictors of return to work after disability. Being female, White, younger, and those with non-back disorders were also more likely to be rehabilitated. 71% of those with arthritis or MSD accepted for rehabilitation between 1987-91 returned to work.</td>
<td>Male</td>
<td>Being female more likely to go back to work after disability</td>
<td>Database of cases from rehabilitation service over 4 years</td>
<td></td>
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<tr>
<td>Augustson and Morken, 1996</td>
<td>MSD among dental health personnel</td>
<td>Cross-sectional</td>
<td>General</td>
<td>No difference in prevalence from general population. Females reported higher prevalence of MSD.</td>
<td>Female</td>
<td></td>
<td></td>
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<tr>
<td>Polanyi et al., 1997</td>
<td>Prevalence and associations of upper limb problems among newspaper personnel</td>
<td>Cross-sectional survey</td>
<td>Upper limb</td>
<td>20% reported moderate or worse ULDs monthly or lasting more than a week in last year.</td>
<td>Those facing frequent deadlines, high psychological demands (fast work pace, conflicting demands) had low skill discretion and social support, spent more time keyboarding, or had computer screen in non-optimal position were likely to report moderate to severe symptoms. Women reported significantly higher levels of symptoms than men.</td>
<td>Female</td>
<td></td>
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<tr>
<td>Gender (cont.)</td>
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<tr>
<td>Feuerstein et al., 1997</td>
<td>ULD in sign language interpreters</td>
<td>Cross-sectional</td>
<td>Upper limbs</td>
<td>74% neck pain and 70% hand/wrist pain. Female gender, number of years worked, pressure at work, fear of developing pain, tendency to work in pain to ensure work quality, and increased wrist deviations from neutral were associated with upper limb symptoms. Combination of work demands, work style and psychosocial stressors are associated with case status and exacerbation of pain, muscular tension functional limitations and work disability. Time off work was associated with tendency to work in pain to ensure work quality, fear of developing pain problems and lack of opportunity to use initiative</td>
<td>Female</td>
<td></td>
<td></td>
<td>Self report questionnaire</td>
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<tr>
<td>Bart et al., 1997</td>
<td>MSD, age, gender and physical work</td>
<td>Cross-sectional</td>
<td>Back, neck, upper and lower extremities</td>
<td>Regular pain</td>
<td>MSD among workers in physically demanding jobs increase with age for both sexes. For several complaints, a flattening or decrease in prevalence was observed in older groups. Higher rates of reporting by women for some complaints. High number of complaints among older females.</td>
<td>Female</td>
<td>Gender and age discussed in relation to reasons for increase in complaints e.g. survivor population, additional work duties, women more likely to report</td>
<td>Self report questionnaire, as part of occupational health survey</td>
<td>Stratified sample</td>
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<td>Gender (cont.)</td>
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<tr>
<td>Feuerstein et al., 1997</td>
<td>Prevalence of musculoskeletal-related disability, gender, and military occupational specialties in US Army personnel</td>
<td>Analysis of 41,750 disability cases</td>
<td>General</td>
<td>Any cases submitted over 4 years to the database - unfit for duty, temporarily or permanently retired</td>
<td>Back disorders represented most prevalent source of disability. Certain occupations specialties were associated with higher disability risk. Women experienced higher overall (r=1.3, 1.26-1.33) and musculoskeletal (r=1.22, 1.17-1.27) disability risk. Specific jobs were identified in which women experienced higher rates of MSD. Majority (94%) of physical disability sample were under 45 years with largest group in 25-34 years. White people experienced more MSD than Black (r=1.18, 1.16-1.21) personnel. Research indicates that MSD represent a prevalent source of outpatient visits, duty restrictions, lost work time, hospitalisation and disability.</td>
<td>Female</td>
<td>Women’s psychosocial experiences in the army may be different to men.</td>
<td>Disability agency database</td>
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<tr>
<td>Huhtanen et al., 1997</td>
<td>Perceived changes in stress symptoms (including physical) and relationship to changes in work in older workers</td>
<td>Longitudinal over 11 years</td>
<td>Upper and lower limbs</td>
<td>Current</td>
<td>Stress symptoms showed marked increase with age, especially aches and pains in upper and lower limbs. More symptoms apparent the more work had changed. Women had greater increase in symptoms.</td>
<td>Female</td>
<td>Significant increase in avoidance reactions 6% women and 7% men could no longer work full time; proportion of subjects on disability pensions/died during follow-up highest for those in physically demanding wok in 1981</td>
<td>Self report questionnaire</td>
<td>Analysed by gender, work profile and age</td>
</tr>
<tr>
<td>Feeney et al., 1998</td>
<td>Socio-economic and sex differentials in reasons for sickness absence</td>
<td>Longitudinal analysis of 5620 civil servants in Whitehall II study</td>
<td>General MSD</td>
<td>Short (&lt;7 days) and long (&gt;7 days) absence</td>
<td>Headache and migraine, musculoskeletal disorders, injury and neurosis accounted for 20%-30% of absences. The lower the employment grade the higher the rate of absence for both short and long spells. In general women had higher rates of absence than men.</td>
<td></td>
<td>Questionnaire, physical exam, GP records, company records of sickness absence</td>
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</table>

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<table>
<thead>
<tr>
<th>Gender (cont.)</th>
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<tbody>
<tr>
<td>Brage et al., 1998</td>
<td>Gender differences in long-term sickness absence due to musculoskeletal health problems</td>
<td>Analysis of data from the National Sickness Benefit Register in Norway</td>
<td>General MSD</td>
<td>Sickness absence more than 14 days</td>
<td>Women had higher cumulative incidence of sickness absence and longer mean duration of episodes but episode frequency did not differ. Multivariate analysis indicated that the large gender differences in sickness absence might be overstated due to lack of adjustment for income and income-related factors.</td>
<td>Female</td>
<td>Long-term sickness absence was strongly associated with gender, age, income and diagnosis.</td>
<td>After adjustment in for age and gender reduced</td>
<td></td>
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<tr>
<td>Leijon et al., 1998</td>
<td>Gender trends in sickness absence with musculoskeletal symptoms</td>
<td>Prospective population based study</td>
<td>General MSD</td>
<td>All new sick leave spells greater than 7 days over a 2 year period</td>
<td>More women than men sick-listed with musculoskeletal diagnoses except with the diagnosis &quot;low back pain&quot;. Sick listing with musculoskeletal diagnoses increased for both women and men from 1985 to 1987, but the increase was consistently much higher for women, especially younger women.</td>
<td>Female</td>
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<tr>
<td>Leclerc et al., 1999</td>
<td>Factors that predict incidence, recurrence and persistence of neck disorders among workers in different occupations</td>
<td>Longitudinal epidemiological study over 12 months</td>
<td>Neck</td>
<td>In last 6 months, more than 30 days, treatment, visit to health care professional</td>
<td>Older age and being female were predictive factors of neck pain.</td>
<td>Female</td>
<td></td>
<td>Self report questionnaire</td>
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<tr>
<td>Nordander et al., 1999</td>
<td>Impact of work tasks, physical exposure and psychosocial factors on risk for MSD in men and women in fish processing work</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Last 12 months and last 7 days</td>
<td>Despite superficially similar work, clear sex differences in physical exposure and psychosocial work environment. Female workers had worse working conditions than men for repetitiveness, constrained neck postures and psychosocial work environment. High prevalence among women for neck, shoulders, elbow and hand.</td>
<td>Female</td>
<td>Women left the industry more often than men because of neck and upper limb problems</td>
<td>Questionnaire, physical examination, observation</td>
<td></td>
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<tr>
<td>Fredricksson et al., 1999</td>
<td>Association between risk factors for neck and upper limb disorders among blue collar workers</td>
<td>Longitudinal study</td>
<td>Neck and upper limb</td>
<td>24 year follow-up on; current condition</td>
<td>Risk factors differed between sexes. Among women, over-time work, high mental workload and unsatisfactory leisure time were associated with disorders in the neck-shoulder region. Among men, blue collar work and a simultaneous presence of high mental workload and additional domestic workload predicted disorders in the neck-shoulder region.</td>
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<tr>
<td>Virokannas et al., 1999</td>
<td>Associations between long-term MSD and work career in older workers (&gt;55 years)</td>
<td>Retrospective study</td>
<td>General MSD</td>
<td>Continuous sick leave for at least 1 month due to MSD was considered long term MSD</td>
<td>Long-term MSD reported by 62% of women and 57% of men. High prevalence associated with heavy physical work. In service work, majority were female; in industrial professions, the majority were male. Job mobility and declining work career (i.e. a decrease in work status) correlated with occurrence of long-term MSD in women; advanced work career connected with a low prevalence of long-term MSD. Job mobility was associated with prevalence of any type of long-term MSD among workers in heavy physical work.</td>
<td>Female</td>
<td>Type of work over a career can have an effect on the health of elderly workers</td>
<td>Postal self report questionnaire, interview and clinical exam</td>
<td></td>
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<tr>
<td>Thorbjornsson et al., 2000</td>
<td>Physical and psychosocial occupational factors related to low back pain</td>
<td>Longitudinal</td>
<td>Low back</td>
<td>24 year follow-up</td>
<td>Factors at work were risk indicators for low back pain for both genders: low influence over work conditions, heavy physical workload, sedentary work, smoking among women and poor social relations at work, heavy physical workload, sedentary work, high perceived load outside work and combination of poor social relations and overtime among men, in combination with other factors.</td>
<td>No</td>
<td></td>
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<tr>
<td>Messing, 2000</td>
<td>Occupational exposure differences in women and men</td>
<td>Literature review</td>
<td>General MSD</td>
<td>N/A</td>
<td>Women are often exposed to different musculoskeletal and psychological constraints, even when have same job titles as men. Job/tasks may differ by sex and gender associated biological and social characteristics may interact with workplace constraints to modify exposures. Jobs specifically assigned to women may have specific exposures.</td>
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<tr>
<td>Punnett and Herbert, 2000</td>
<td>Gender differences in MSD</td>
<td>Literature review</td>
<td>General MSD</td>
<td>N/A</td>
<td>Comparison of MSD endpoints have shown no gender difference, especially for low back pain. Different occupational and non-occupational exposures for women. Men and women experience qualitatively and quantitatively different work conditions due to workplace sex segregation. More research required on whether MSD risk varies between men and women in jobs with same physical and psychosocial exposure.</td>
<td>No</td>
<td>Reporting behaviours appear to be different to men and women</td>
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</table>
Ethnicity

Summary

- Ethnicity is difficult to define, but most definitions reflect self-identification with cultural traditions that provide both a meaningful social identity and boundaries between groups (Barot, 1996). In this summary of the research on health, ethnicity has various definitions and refers to cultural identity, place of origin as well as skin colour.
- A number of studies have considered the relationship between ethnicity and ill health. The studies indicate that differences exist in ill health conditions experienced by majority and minority groups giving some indication that health is not as good among minority groups. However Bhopal (1997) states that the similarities between minority and majority groups are greater than the differences.
- It is apparent from the studies that have investigated the association of ethnicity and musculoskeletal problems that the majority have indicated that musculoskeletal health differences exist between people from different ethnic backgrounds but the findings vary. A number of studies have concluded that the relationship between race, ethnic background and disease is mediated by several factors including genetic predisposition, socio-economic status and cultural patterns of belief and behaviour (Palinkas and Colcord, 1985).
- Abeysekera and Shahnavaz (1987) believe that ergonomics must take into account basic human factors differences such as size of people, organisations and cultural differences. Both Gurr et al (1998) and Bridger et al (1992) have stated that there needs to be a wider appreciation of the cultural specific nature of much ergonomic research. More research is required on whether musculoskeletal risk varies for ethnic groups living in the same country.

Ethnicity and general ill health

In the 1991 Census 5.5 per cent of the UK population identified themselves as belonging to one of the non-white minority ethnic groups. Almost half had been born in the United Kingdom (Owen, 1992). Recent estimates show that the Irish form the largest minority ethnic group, comprising 4.6 per cent of the population (Commission for Racial Equality, 1997).

Research studies have acknowledged that differences exist between minority and majority groups in the UK in relation to their geographical location (Owen, 1992, 1994), age and gender distribution (Owen, 1993), socioeconomic status (Office for National Statistics, 1998; Modood et al., 1997), income (Modood et al., 1997) and life style e.g. exercise and smoking habits (Health Education Authority, 1997).

The findings from a number of studies indicate that some ethnic groups are more likely to report their own health as poor (Nazroo, 1997), be less healthy (Crimmins et al., 1999), consult doctors more (Nazroo, 1997), display lower
maximal heart rates then majority groups (Farrell et al., 1988), show differences in pulmonary function (Chia et al., 1993) and be at greater risk from job stress (Brett et al., 1997) than the ethnic majority in the UK.

Difference in disease type among minority and majority groups has been acknowledged by a number of authors (McKeigue and Sevak, 1994; De Cock and Low, 1997; Nazroo, 1997; Wild and McKeigue, 1997; Owen, 1995). The diversity of experience of health between different ethnic groups may reflect different causes of poor health, differential susceptibility to these causes or differential access to factors which ameliorate cause or susceptibility e.g. preventive health care services (Acheson, 1998).

The most recent analysis of migrant mortality suggests that socioeconomic differences, as measured by social class, do not explain the different rates of mortality between groups born in different countries (Harding and Maxwell, 1997).

James (1994) reviewed studies looking at social identity, work stress and minority workers health. The review argued that social identity is a central issue to consider in studies of work stress in minorities. Social identity is proposed to exert a major influence both on behaviours directed toward minority workers by non-minority colleagues that can be stressors and on minority individuals own perceptions of stress and their ability to cope with it.

**Ethnicity and musculoskeletal ill health**

The variable ‘ethnicity’ has been considered in a number of studies as a possible risk factor for the development of musculoskeletal health problems. Some studies have concluded that the relationship between race, ethnic background and disease is mediated by several factors including genetic predisposition, socio-economic status and cultural patterns of belief and behaviour (Palinkas and Colcord, 1985; Meers, 1987).

Although one study found there was less injury at work among immigrant workers (Meers, 1987), four studies found greater levels of musculoskeletal disorders (MSD) among immigrant workers/those who had received their education in a different country (Ekberg et al, 1994, 1995; Ong et al, 1991; Kvarnstrom and Hallden, 1983). In the Ekberg et al (1995) study it is interesting to note that as well as being an immigrant worker, other determinants for early symptoms were being female and conducting jobs involving repetitive movements and jobs demanding precision; these findings may say something about the type of low status work immigrants are likely to be involved in.

Musculoskeletal problems have been found to be more prevalent among White workers than among a number of ethnic minority groups in three studies (Gorsche et al., 1998; Feuerstein et al, 1997; Burchfiel et al., 1992). In contrast, one study indicated that Black males displayed a significantly higher risk for MSD than Caucasian males in the US Navy (Palinkas and Colcord,
A further study (Gorsche et al., 1999) showed no relation between ethnicity and prevalence or incidence of carpal tunnel syndrome.

A number of studies have identified variations in musculoskeletal health among workers living in different countries (Brulin et al., 1988; Shahnaz et al., 1991; Waluyo et al., 1996; Shimaoka et al., 1998; Ong et al. (1991).

The findings of studies in the general health literature indicate that differences exist in ill health conditions experienced by minority and majority ethnic groups and that there is some indication that health is not as good among minority groups. The majority of studies that have investigated the association of ethnicity and musculoskeletal problems have indicated variations in musculoskeletal health among people from different ethnic backgrounds but findings vary. In some studies, minority and immigrant workers had a higher prevalence of musculoskeletal ill health; in other studies majority ethnic groups had more musculoskeletal problems. Clearer definitions of ethnicity for epidemiological studies are needed; various studies reviewed used different definitions and future research studies need to control more closely for individual factors including ethnicity.
<table>
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<tr>
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<th>Control for variables</th>
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<tbody>
<tr>
<td>Kvarnstrom and Hallden, 1983</td>
<td>Risk factors for occupational cervicobrachial disorder (OCD) in Sweden</td>
<td>Comparative case control</td>
<td>Back</td>
<td>A large proportion of cases were immigrants/received education in a different country. Significant differences between perception of workload and work environment and a slightly significant difference for negative relations with supervisors were apparent in the cases.</td>
<td>Black males displayed significantly higher risk for MSD than Caucasian males.</td>
<td>Minority</td>
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<tr>
<td>Palinkas and Colcord, 1985</td>
<td>Health risks and disease incidence in the US Navy.</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Black males displayed significantly higher risk for MSD than Caucasian males.</td>
<td>Black males displayed significantly higher risk for MSD than Caucasian males.</td>
<td>Minority</td>
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<tr>
<td>Meers, 1987</td>
<td>Discrepancy in incidence of injuries in immigrant (Inuit and White) populations</td>
<td>Discussion paper</td>
<td>Back</td>
<td>Less injury in immigrant (Inuit) workers than among other workers (predominantly transient white southern Canadians) doing the same job. Considered a result of a combination of factors relating to cultural influence, genetics and physical environment.</td>
<td>Less injury in immigrant (Inuit) workers than among other workers (predominantly transient white southern Canadians) doing the same job. Considered a result of a combination of factors relating to cultural influence, genetics and physical environment.</td>
<td>Majority</td>
<td>Clinical examination of workers with fewer injuries</td>
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<tr>
<td>Brulin et al., 1988</td>
<td>Prevalence of MSD in railway workers in Scandinavia</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Sites of MSD varied between countries. Disorders increased with age, employment duration. Nationality, age and employment duration important factors in explaining MSD.</td>
<td>Sites of MSD varied between countries. Disorders increased with age, employment duration. Nationality, age and employment duration important factors in explaining MSD.</td>
<td>Majority</td>
<td>Prevalence of occupational incapacity varied among body regions and nationality</td>
<td>Questionnaire</td>
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<tr>
<td>Ong et al., 1991</td>
<td>Musculoskeletal disorders in VDU operators, clerical workers and teachers</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Data entry workers higher prevalence than other groups, teachers had the lowest. No direct association with age but higher prevalence in working mothers aged 26-35 years. Malays and Indians reported higher prevalence of MSD than their Chinese counterparts. Job activities, duration of VDU work, social and psychological factors should be taken into account in the development of MSD.</td>
<td>Data entry workers higher prevalence than other groups, teachers had the lowest. No direct association with age but higher prevalence in working mothers aged 26-35 years. Malays and Indians reported higher prevalence of MSD than their Chinese counterparts. Job activities, duration of VDU work, social and psychological factors should be taken into account in the development of MSD.</td>
<td>Questionnaire</td>
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<tr>
<td>Shahnavaz et al., 1991</td>
<td>MSD, work and worker related factors occupational stress in China and Thailand</td>
<td>Case studies</td>
<td>General MSD</td>
<td>Onset Incidence of disorders with MSD / disability</td>
<td>Findings support development of programmes for improving working conditions and preventing stresses.</td>
<td>Questionnaire survey</td>
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<tr>
<td>Burchfiel et al., 1992</td>
<td>Prevalence of back pain and joint problems in a manufacturing company</td>
<td>Longitudinal study of 5903 workers</td>
<td>General MSD</td>
<td>Poor working conditions and lack of injury prevention programmes lead to MSD. The problems were serious and similar in the two countries. China: low back pain most prevalent problem. Problem frequency varied between industries, tasks and individuals. Influence of working conditions, age, number of years employed and type of tasks</td>
<td>Majority</td>
<td>Self report questionnaire during medical surveillance exams</td>
<td>After adjusting for age, race and occupation gender difference diminished. Difference in race diminished when other variables were controlled.</td>
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<tr>
<td>Ekberg et al., 1994</td>
<td>Risk factors for MSD in relation to physical, organisational and psychosocial aspects of work environment</td>
<td>Case control study</td>
<td>Neck and shoulder</td>
<td>Odds ratios calculated to identify main individual risk factors: being female (11.4), being an immigrant worker (4.9) and being a smoker (3.7). Physical work: repetitive movement demanding precision (7.5), light lifting (13.6), uncomfortable sitting postures (3.6), rushed pace (3.5). Work role ambiguity (16.5), low quality work (2.6), demands on attention (3.8). Work organisation and psychosocial work conditions are as important for MSD as physical work conditions</td>
<td>Minority</td>
<td>Clinical examinations, questionnaires</td>
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<tbody>
<tr>
<td>Ekberg et al., 1995</td>
<td>Risk factors (individual, ergonomic, organisational and psychosocial) for MSD problems.</td>
<td>Cross-sectional of nine hundred randomly drawn subjects of the working population in a semi-rural community in Sweden</td>
<td>Neck and shoulder</td>
<td>Last 6 months</td>
<td>43% neck and 32% shoulders – slighter higher than Nordic sample. Significant determinants for early symptoms were being female, being an immigrant worker and conducting jobs involving repetitive movements and jobs demanding precision. High work pace, low work content and work role ambiguity were significant organisational risk factors while lifestyle characteristics did not appear to be risk factors. Reasons discussed for high prevalence among female and immigrant workers e.g. different reporting, low status, repetitive work, longer stay in jobs.</td>
<td>Minority</td>
<td>The study recommended that special attention is paid to female and immigrant workers in preventative interventions</td>
<td>Self report questionnaire</td>
<td></td>
</tr>
<tr>
<td>Waluyo et al., 1996</td>
<td>Differences in ergonomics, health and satisfaction among assembly workers in Sweden and Indonesia</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Last 12 months, last 7 days</td>
<td>Many work culture differences between two countries in perception of work. High MSD prevalence in both groups; Sweden higher in the upper limbs and lower back and Indonesians had more lower extremities problems. Physical job demands were associated with MSD symptoms. Competence development was associated with increased satisfaction. Work tasks in Indonesia were physically heavier but less monotonous with lower productivity demands and the workers were more satisfied with their jobs</td>
<td></td>
<td></td>
<td>Questionnaire, interviews and company documents</td>
<td></td>
</tr>
<tr>
<td>Feuerstein et al., 1997</td>
<td>Prevalence of musculoskeletal-related disability, gender, and military occupational specialties in US Army personnel</td>
<td>Analysis of 41, 750 disability cases</td>
<td>General</td>
<td>Any cases submitted over 4 years to the database - unfit for duty, temporarily or permanently retired</td>
<td>Back disorders represented most prevalent source of disability. Certain occupations specialties were associated with higher disability risk. Women experienced higher overall (rr=1.3, 1.26-1.33) and musculoskeletal (rr= 1.22, 1.17-1.27) disability risk. Specific jobs were identified in which women experienced higher rates of MSD. Majority (94%) of physical disability sample were under 45 years with largest group in 25-34 years. White people experienced more MSD than Black (rr=1.18, 1.16-1.21) personnel.</td>
<td>Majority</td>
<td>MSD represent a prevalent source of outpatient visits, duty restrictions, lost work time, hospitalisation and disability. Women’s psychosocial experiences in the army may be different to men.</td>
<td>Disability agency database</td>
<td></td>
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</tbody>
</table>
**Ethnicity (cont.)**

<table>
<thead>
<tr>
<th>Focus</th>
<th>Study type</th>
<th>Problem e.g. back</th>
<th>Onset</th>
<th>Incidence of disorders</th>
<th>Association with MSD / disability</th>
<th>Coping and recovery disability, retirement etc</th>
<th>Reporting</th>
<th>Control for variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shimaoka et al., 1998</strong></td>
<td>Comparative study of physical load in Japanese &amp; Swedish nursery teachers</td>
<td>Cross-sectional</td>
<td>General MSD</td>
<td>Current</td>
<td>Musculoskeletal problems higher in Japanese teachers, particularly those in charges of very young children. Physical workload not sufficient to explain differences.</td>
<td></td>
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<tr>
<td><strong>Gorsche et al., 1998</strong></td>
<td>Prevalence and incidence of trigger finger and hand tool use in a meat packing plant</td>
<td>Cross-sectional study and follow-up examinations of 665 workers</td>
<td>Hand and fingers</td>
<td>Current</td>
<td>Increased prevalence of TF (14% point prevalence). Hand tool use increased risk. Although a significant relationship was found between ethnicity and presence of trigger finger in prevalence data, this was not confirmed in incidence study.</td>
<td></td>
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</tr>
<tr>
<td><strong>Gorsche et al., 1999</strong></td>
<td>Prevalence and incidence of carpal tunnel syndrome (CTS) in a meat packing plant and explore relationship between ethnicity and CTS</td>
<td>Cross-sectional study and follow-up examinations</td>
<td>Wrist</td>
<td>Current</td>
<td>Prevalence and incidence of CTS were higher than in general population. No relation was found between ethnicity, age, body mass index and CTS for either prevalence or incidence.</td>
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</table>
DISCUSSION

The aim of this report was to provide an overview of the relationship between aspects of work, inequality and musculoskeletal disorders.

Limitations of the literature

Each area of the Dahlgren and Whitehead (1991) model is recognised as being of potential importance in defining and understanding the relationship between inequality and health in general.

This review has found that there is a paucity of evidence with respect to musculoskeletal health and its relationship with many of the areas shown in the model. For example, in considering living and working conditions, our review found that the relationship of musculoskeletal disorders to poor housing, access to health care services and unemployment has been investigated rarely.

Likewise, the interaction of the person with their social and community networks has received little attention (e.g. social support received away from work). This is surprising given that these factors may be important in determining how workers cope with problems or in their return to work after a musculoskeletal problem.

In the opinion of the reviewers, the limited research literature relating to these factors may have arisen for a number of reasons:
a) Lack of a standardised model of inequality: in the same way that the Armstrong et al (1993) model for the development of musculoskeletal disorders guided research, a similar consensus model for inequality and musculoskeletal factors might now be required. The cognitive framework and systematic approach that such a model would afford to all researchers would be of immense benefit.

b) Failure to define terms: terminology for many of the most critical factors (e.g. socio-economic, job insecurity, social support) appears to have little or no standardisation. The problems are exacerbated by cross-cultural and international differences. Thus the concepts used (and by implication the findings) in Northern European research may translate poorly to countries with weaker economies or substantially different cultures.

c) Origin and setting of most epidemiological studies of musculoskeletal disorders: the emphasis in most studies has been on the relationship between physical workplace factors and the prevalence or incidence of the disorders. It is only comparatively recently that psychosocial factors have been studied widely and lack of definitions and the standardisation of terms remain significant problems.

The impact of these failings has been to limit both the scope and findings of the review. In addition the cross-sectional nature of many studies limits the possibility of determining causal relationships between work factors and musculoskeletal disorders. However cross-sectional studies based on large well defined and representative populations can give reliable estimates of prevalence rates and suggest risk factors worthy of testing in more rigorously designed studies (e.g. prospective designs).

Future research areas

Social support and musculoskeletal ill heath
Many studies have investigated social support and its association with ill health. The studies vary significantly in their definitions of social support (e.g. amicability with co-workers, good relationship with supervisor, good social support at work) and it is impossible to know if these various definitions all have the same meaning.

The majority of studies indicated that a lack of social support whether from co-workers, supervisors or managers appears to be a risk factor for general and musculoskeletal ill health. When people have musculoskeletal problems at work or are returning to work after problems, social support seems to be important in their coping strategy.
Areas for further research
- Clear definitions are required for social support.
- The role of support received away from the work place should be investigated.
- How people use social support as a coping strategy for dealing with musculoskeletal disorders requires investigation.
- Ways of providing additional support at work and an evaluation of the benefits of such a provision should be studied.
- The extent to which good social support might impact on the recovery from musculoskeletal disorders should be established.

Access to health information at work and musculoskeletal ill health
The success of providing information that promotes healthy working practices either at work or in the community is an under researched area. However, there is support from the literature that provision of ergonomics and health and safety information is important.

Areas for further research
- Evaluation of different types of education programmes at work.
- Investigate ways in which health information (other than occupational health provision) is provided and managed and how successful this is in preventing ill health.
- More investigation into how inequality in access to information could effect exposure to known physical and psychological risk factors is required.
- Intervention studies are needed to investigate the usefulness of health information in encouraging people to report a musculoskeletal problem, helping them cope with these health problems and in the reduction of problems.

Job insecurity, temporary contract work, piece work and musculoskeletal ill health
Job insecurity has increased with changes in the labour market. As with job insecurity, temporary contracts at work are common. The findings of the studies that have investigated job insecurity, temporary, part time and piece work show that these job conditions have an effect on general and musculoskeletal ill health. However the number of studies on job insecurity and musculoskeletal health is limited.

Areas for further research
- Job insecurity is under researched with regard to musculoskeletal ill health. Current economic trends suggest that further research to establish its importance is now required.
• The relationship between reporting behaviour and job insecurity should be investigated.
• The extent to which these job conditions might impact on the recovery from musculoskeletal disorders might be researched.

**Low status work and musculoskeletal ill health**
Conditions typical of ‘low-status’ jobs were considered to be unskilled, paced, repetitive work, jobs where little/no training is required, low requirement to make decisions, low pay, and low control over the job. A sample of studies that investigated 'low status' jobs show an association with these job characteristics and ill health. All studies reviewed indicated that workers in jobs of lower status are at increased risk for the development of musculoskeletal disorders.

**Areas for further research**
• Standardised terms and definitions are required. These require validation and application in future epidemiological studies of musculoskeletal disorders.
• The extent to which low status work might impact on the recovery from musculoskeletal disorders should be established.

**Income and musculoskeletal ill health**
Research on income and ill health indicates that low income contributes to health problems. Similarly, the small number of studies investigating income and musculoskeletal health show that lower income levels are associated with an increased risk for musculoskeletal disorders.

**Areas for further research**
• The relationships between low income and exposure to known workplace risk factors requires elucidation.
• The extent to which low income might impact on the recovery from musculoskeletal disorders should be established.

**Education level and musculoskeletal ill health**
Cohort studies show that those with low levels of educational achievement have poor adult health (Bynner and Parsons, 1997; Montgomery and Schoon, 1997). Studies that have included low educational level as a factor for investigation have found associations with musculoskeletal ill health.

**Areas for further research**
• Research is needed to confirm this relationship. Studies should control for potential confounders (e.g. the relationship between low level of educational attainment and exposure to heavy physical work).
• If an association is confirmed through more research, techniques to compensate for a lack of education in (and away from) the workplace need to be identified to ensure inequalities do not exist.
• The relationship between low education level and recovery from musculoskeletal disorders should be explored.

Age and musculoskeletal ill health
The results of the studies looking at the relationship between age and ill health are not consistent. In general, older age appears to be a risk factor for the development of musculoskeletal disorders. However, younger age groups are at particular risk in some occupations. The changing demographics of the population make this factor an important one for research attention.

Areas for further research
• Consider the relationship between age and specific musculoskeletal conditions.
• Generate estimates of the likely impact of the changing demographic trends (notably increasing age of workforce) on musculoskeletal health.
• Better study designs are required that control for possible confounders in studies of age and musculoskeletal problems.

Gender and musculoskeletal ill health
In general, the musculoskeletal literature shows that women are more likely to experience a musculoskeletal problem than men. However, some of these studies highlight differences without exploring further potential confounders. Some researchers have found that variation in, for example, job conditions, job type or responsibilities away from work, account for gender differences in musculoskeletal health.

Areas for further research
• More research is required to investigate whether musculoskeletal ill health risk varies between women and men in jobs with the same occupational exposures and status.
• More research is needed on gender differences in musculoskeletal disorders outcomes and what mediates these from an inequality perspective.
• Studies of poor working conditions have generally focussed on women; subjects of both genders should be included in the study design to see whether differences exist.
• Research on the relationship between gender and the reporting of musculoskeletal problems is required. Some researchers have suggested that women are more likely to report health problems and an understanding of this gender difference might enable more early reporting of musculoskeletal ill
health. This would then allow for earlier, more effective interventions to be made.

**Ethnicity and musculoskeletal ill health**
The findings of studies in the general health literature indicate that differences exist in ill health conditions experienced by minority and majority ethnic groups. There is some indication that health is not as good among minority groups. The majority of studies that have investigated the association of ethnicity and musculoskeletal problems have found variations in musculoskeletal health among people from different ethnic backgrounds but findings vary. In some studies, minority and immigrant workers had a higher prevalence of musculoskeletal ill health; in other studies majority ethnic groups had more musculoskeletal problems. In making these comparisons the studies have generally failed to control for other known risk factors.

**Areas for further research**
- There have been no systematic studies of ethnicity and musculoskeletal health. More ergonomic research is required on the musculoskeletal health of different ethnic/cultural groups in the UK.
- Investigation of the musculoskeletal health of people from different cultural and ethnic backgrounds conducting the same work is essential to determine if there are work related determinants of inequality in musculoskeletal health.
- Clearer definitions of ethnicity for epidemiological studies are needed as the studies reviewed used different definitions.
- Future research studies need to control more closely for individual factors including ethnicity
- There is a need to investigate the cultural specificity of ergonomic research.
CONCLUSIONS

Few studies have attempted to generate data that would allow the aetiological contribution or risk associated with each factor to be ascertained. Thus it has not been possible to establish the extent to which factors might predict inequality in musculoskeletal health. Future researchers should be encouraged to quantify the risk attributable to those variables identified in this review.

The reporting of musculoskeletal health is, of necessity, limited by the reporting structures available. Therefore in countries with high occupational health coverage of the labour force, access to support services might encourage early reporting. Early intervention is often seen as important for influencing the natural history of the disorders. Thus inequality in the provision of such systems may impact on the patterns of reporting behaviour, the natural history and the return to work.

An overview of the relationship between aspects of work, inequality and musculoskeletal health has identified a number of factors of significance. Gaps in knowledge are evident and basic terms and definitions are missing. This along with the complex interrelationship and lack of independence of the variables has meant that attributing causal relationships is not possible. In view of the strength of many of the associations with both general health and musculoskeletal health, areas of future research have been advanced and prioritised.
REFERENCES


Board of Occupational Safety and Health (Arbetarskyddsstyrelsen), Solna, Sweden, Arbete och Halsa No. 1985:37.


Gorsche, RG., Wiley, JP., Renger, RF., Brant, RF., Gemer, TY. and Sastyiuk, TM. 1999, Prevalence and incidence of Carpal Tunnel Syndrome in a meat packing plant, Occupational and Environmental Medicine, 56, 6, 417-422.


Hagberg, M. 1992, Exposure variables in ergonomic epidemiology, American Journal of Industrial Medicine, 21, 91-100.


McKeigue, P. and Sevak L. 1994, Coronary Heart Disease in South Asian Communities. London: Health Education Authority.


Messing, K. 2000, Ergonomic studies provide information about occupational exposure differences between women and men, Journal of American Medical Women's Association, Spring, 55, 2, 72-5.


Niemcryk, SJ., Jenkins, CD., Rose, RM. and Hurst, MW. 1987, The prospective impact of psychosocial variables on rates of illness and injury in professional employees, Journal of Occupational Medicine, 29, 8, 645-652.


Smith, MJ. 1997, Psychosocial aspects of working with video display terminals (VDTs) and employee physical and mental health, *Ergonomics*, October, 40, 10, 1002-15.


Symonds, TL., Burton, AK., Tillotson, KM. and Main, CJ. 1995, Absence resulting from low back trouble can be reduced by psychosocial intervention at the work place, *Spine*, 20, 24, 2738-45.


