

# Social support and musculoskeletal disorders

Literature review and data analysis

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## Literature review and data analysis

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This report examines the role of work-related social support as a risk factor for musculoskeletal disorders (MSD). A review of the literature is presented, and empirical data analyses reported.

- The literature review evaluates recent findings, and notes some methodological issues. Although some prospective studies report findings linking low social support to MSD outcomes, many inconsistencies are apparent in the results.
- Three data sets were analysed using descriptive and multi-variate methods:
  - i) cross-sectional survey data (N=2906, oil industry);
  - ii) certificated MSD absence data covering a five-year period (N=531, civil servants);
  - iii) longitudinal survey data (N=195, onshore oil industry).
- The analyses demonstrated that high supervisor support was associated with lower rates of MSD problems, lower pain severity, and fewer MSD-related absences (after adjustment for prior absences).
- The findings for co-worker support were less clear; in two analyses, no overall relationship with MSD was found; in one analysis, high co-worker support was a risk factor for back pain. However, interactions of co-worker support with other factors revealed a more complex pattern of results.
- In the analysis of MSD sickness absence, high partner support was a significant risk factor for subsequent absence episodes, after adjustment for prior episodes, work-related social support, and control variables.

These results are considered in relation to existing literature findings in a final section of the report.

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## 1. A REVIEW OF THE LITERATURE

Musculoskeletal disorders (MSD) constitute the largest category of work-related illness in developed countries (Cherry, 1999; European Agency for Safety and Health at Work, 2000), and are a major source of pain, disability, restricted activity, lost work days, reduced productivity, and costs to industry and the public service (e.g. Baldwin & Butler, 2006; Collins et al., 2005; Ekman, Johnell, & Lidgren, 2005; Goetzel, Hawkins, Ozminkowski, & Wang, 2003; E. K. Hansson & Hansson, 2005; Punnett et al., 2005). In view of the individual distress, occupational limitations, and economic costs associated with MSD, the topic has attracted much research attention in the fields of epidemiology, medicine, physiology, and psychology. The extent of this research effort in recent years is clear from the identification (in a search of 15 databases) of more than 2500 systematic reviews of the MSD literature, and in excess of 5000 empirical studies published from 1999 - 2004 (Boocock et al., 2007).

The present review does not seek to cover the whole range of issues addressed in this vast research output; rather, it focuses on material directly relevant to the topic of this report, that is, the role of social support, particularly work-related social support, in relation to MSD symptoms and MSD-related sickness absence. The part played by the psychosocial work environment in general, and by social support in particular, in the onset and maintenance of MSD is less well understood than that of work-related physical risk factors, such as heavy manual tasks, lifting, and repetitive movements. As a background to reviewing existing published findings<sup>1</sup>, the high prevalence rates of MSD are noted, and issues of defining and measuring social support, of study designs, and of potential confounding factors are considered.

### 1.1 MSD prevalence rates

In relation to lower back pain (LBP), Shelerud (2006, p.501) comments that “*With such high rates of prevalence and recurrence, it is becoming well established that LBP is likely an inevitable part of being human and walking on two feet.*” Similarly, other authors have questioned the whole concept of incidence rates; thus, Andersen, Haahr, and Frost (2007) note the very small proportion (7.7%) of their sample (N=4006) who had been entirely free of MSD-related pain over the previous year. They observe that “*It looks as if regional musculoskeletal pain problems are here to stay, and are perhaps a ubiquitous part of modern life*” (p.1355), and suggest “*there is no such thing as a pain-free population, and*

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<sup>1</sup> A search of three databases was carried out to identify the literature included in the present review: Scopus (medical, social science and psychological literature), PsychInfo (psychological literature) and Medline (medical literature). The main search terms used were social support, supervisor support, co-worker support, musculoskeletal disorders/complaints, low back pain, neck/shoulder pain, and other closely-related terms. Studies of patient groups were excluded; search terms used to identify studies of the working population included work, employment, occupation, industry, and public service. Review articles published from 2000 onwards were included in the present report, together with empirical studies published from 2005 onwards. Some earlier papers, illustrating particular methodological issues, were also noted.

*even if there were, the characteristics of such a small group would be so special that it would hamper its use as a reference group in epidemiologic studies” (p.1362).*

These quotations reflect the high prevalence of MSD in occupational samples, and in the population generally, as reported in numerous studies. However, estimates vary widely. For instance, reported one-year prevalence rates for upper extremity MSD have been found to range from 2 - 41% (Huisstede, Bierma-Zeinstra, Koes, & Verhaar, 2006). In other recent studies, similar or even higher prevalence rates for upper extremity disorders have been reported (e.g. Aasa, Barnekow-Bergkvist, Angquist, & Brulin, 2005; Ijzelenberg & Burdorf, 2005; Mehlum, Kjuus, Veiersted, & Wergeland, 2006).

Low back problems are no less frequent; one-year prevalence rates of 49.9% for women and 38.5% for men (Clays et al., 2007), and of 25% for severe back pain (Andersen et al., 2007) have been reported. In the German population, seven-day prevalence rates for back pain were estimated to be 32% for men and 40% for women (Schneider, Randoll, & Buchner, 2006) while, in another recent study, prevalence rates for chronic musculoskeletal pain in any body location were 39% for men and 45% for women (Wijnhoven, De Vet, & Picavet, 2006). In view of these high prevalence rates, it is clearly important to identify risk factors, particularly physical and psychosocial work conditions, associated with high MSD levels.

## **1.2 Methodological issues in studies of social support in relation to MSD**

Methodology plays a critical role in research into social support in relation to MSD as choice of suitable measures, study designs, and analyses can have a significant impact on the study findings and their interpretation. It is therefore necessary to consider some of the main methodological issues as a background to the empirical research findings considered later in this review.

### ***1.2.1 Defining and measuring work-related social support***

The research literature identifies a range of different, but over-lapping, definitions of social support. Thus, Woods (2005) grouped definitions of support into six broad categories, general social support, good communications, satisfactory relationships at work, understanding of pain, help when things are difficult, and support away from work (e.g. from family and friends). Of these, general support (which includes supervisor and co-worker support, acceptance by peers, commitment of management to health and safety, and support from health and safety personnel in raising health problems with management), together with good communications and relationships at work, are the most frequently assessed in work-related studies.

However, the nature and breadth of social support measures varies widely across studies. Some research focuses on social network size (e.g. Clays et al., 2007; Espwall & Olofsson, 2002; Skov, Borg, & Orhede, 1996), but studies in occupational settings normally use measures of perceived support, often employing separate scales of supervisor and co-worker support (e.g. Elfering et al., 2002). A number of standardized scales are available for measuring perceived support at work; scales derived from the Demand-Control Questionnaire (R. Karasek & Theorell, 1990) and those described by House, 1981) are among the most frequently reported.

The use of *ad hoc*, non-standardized scales (sometimes consisting of only one item) is also common (e.g. Östlund, Cedersund, Alexanderson, & Hensing, 2001). Indeed, in one study (Davis & Heaney, 2000), it was noted that single, unvalidated items (e.g. “*Do you get along with coworkers?*”) were used to assess psychosocial work characteristics, including social support, in almost a third of the 66 studies of low back pain reviewed. Whilst some studies sum scores across different sources of support, Elfering et al. (2002) caution against this approach, pointing out that the effect of support from one particular source may depend on the level of another source of support, i.e. sources of support may interact in predicting a particular outcome.

### ***1.2.2 Study designs***

Study designs used in research into psychosocial factors in relation to MSD outcomes can be divided into three types: (i) cross-sectional studies, in which all the data are collected at the same time point (e.g. Cole et al., 2001), (ii) prospective or longitudinal studies in which a cohort is followed over time, at least one further assessment taking place after the baseline data collection (e.g. Ariens, Bongers et al., 2001), and (iii) case control studies which compare groups of participants in whom the outcome of interest (e.g. low back pain) is, or is not, present (e.g. Fredriksson et al., 2000). Methodologically, prospective designs are the most favourable as they potentially allow causal interpretation of findings; in the light of familiar criticisms of cross-sectional research in this area, researchers have welcomed the marked increase in the number of prospective studies of MSD in relation to psychosocial factors published in recent years as an important development (e.g. Bongers, Ijmker, Van Den Heuvel, & Blatter, 2006; Hartvigsen, Lings, Leboeuf Yde, & Bakketeig, 2004).

### ***1.2.3 Confounding factors***

In studies of psychosocial factors, including social support, in relation to MSD outcomes, it is important to take into account the possible effects of confounding factors; the significance and interpretation of the results may depend on whether potential confounding variables were included in the analyses. Two types of variables that may act as confounds in MSD research have been identified (Davis & Heaney, 2000). Thus, demographic variables such as age, gender, and occupation are found to be associated with both exposure

to psychosocial work characteristics and with MSD (e.g. Leino & Hanninen, 1995; Thorbjornsson et al., 1998), and may therefore confound the observed relationships between these variables.

In addition, biomechanical demands (e.g. lifting heavy loads, awkward postures, repetitive work) tend to be associated with a poor psychosocial work environment, including low social support. Thus, it is important to include both physical and psychosocial exposure variables when examining MSD outcomes; this point is illustrated by the finding that, in one study, controlling for physical demands resulted in a 20% increase in null results as compared with the unadjusted analyses (Davis & Heaney, 2000).

#### **1.2.4 *Quality of MSD measures***

Observed relationships between social support and MSD outcomes may be influenced by the quality of the MSD measure; although most studies use self-report questionnaires to assess MSD symptoms, other approaches (e.g. medical diagnoses, or MSD-related sick leave) are also possible. Thus, in a review of psychosocial factors in relation to low back pain, the great majority of studies (n=59) were found to use self-report questionnaires; only 10 studies included physical examination, and nine used some form of archival data, such as time lost from work (Davis & Heaney, 2000).

The authors point out that the most appropriate measure for any particular study depends on the research question being addressed, but they note it may be useful to include different types of measures (e.g. MSD-related symptoms, pain severity, and sickness absence) in the same study. The widely-used Nordic Musculoskeletal Questionnaire (Kuorinka et al., 1987) assesses MSD in different body parts for time-scales of one week and one year, and includes items covering several aspects of MSD.

The magnitude of the associations observed may depend on the type of outcome measure used; thus, more positive associations with psychosocial work characteristics were found when self-reported back pain symptoms were assessed (35% of the associations were positive) than when the outcome was diagnosed by physical examination (about 13% of the associations were positive) (Davis & Heaney, 2000). This finding suggests that it is important to include measures of negative affectivity in studies of MSD that depend on self-reports of psychosocial factors (including social support) and MSD symptoms so as to control for possible biases due to negative response styles.

Also relevant in this context, it has been suggested that the role of psychosocial factors becomes more important as lower back disorders progress over time from initial discomfort through symptoms, illness, to eventual disability (Ferguson & Marras, 1997). Only 8% of the studies reviewed in this article assessed psychosocial risk factors using injury, incidence, or sickness absence outcome measures; the authors advocate additional research studies examining psychosocial factors in relation to these outcomes rather than relying on symptom reports.

### ***1.2.5 Tests of interactive effects***

Although it is widely recognised that both physical work factors and psychosocial characteristics impact on measures of MSD (e.g. Davis & Heaney, 2000; Warren, 2001), and that demographic variables may modify these relationships, most researchers do not test for interactions between different types of factors. However, some studies do evaluate interactive effects; for instance, neck/shoulder disorders among men were found to be predicted by an interaction between high physical workload and poor social relations at work (Fredriksson et al., 2000). Similarly, excess risk for low back pain was predicted by the combination of poor social relations and overtime (Thorbjornsson et al., 2000).

Tests of the combined effects of the dimensions of the demand-control-support work stress model (Karasek et al., 1998) are also quite commonly reported in relation to MSD outcomes (e.g. Leroux, Brisson, & Montreuil, 2006; Rugulies & Krause, 2005). In most cases, however, only additive effects are examined, rather than interactions, although there are some exceptions (e.g. (Aasa et al., 2005). Greater attention to evaluating interactive effects among predictor variables could enhance understanding of the mechanisms by which psychosocial and physical risk factors jointly impact on MSD outcomes. A similar argument can be made for examining patterns of mediation among psychosocial variables in the prediction of MSD (e.g. Kjellberg & Wadman, 2007)

## **1.3 Reviews of the role of social support in relation to MSD outcomes**

A number of review articles concerned with the role of psychosocial factors in general, and social support in particular, in relation to MSD outcomes have been published since 2000. In the material presented in this section, the main conclusions from these reviews are outlined as a starting point for noting findings from the more recent empirical literature (i.e., that published from 2005-2007). Whilst some reference is made to other work-related psychosocial factors, the main focus throughout is on findings relating social support in the work environment to MSD outcomes. The studies included are based on employed samples; studies of patient populations are not considered.

Ten review articles that examined work-related MSD (including symptom reports, pain, disability, and sickness absence) in relation to social support were retrieved, but no meta-analyses relevant to this issue could be found. The reviews identified fell into three main categories, those concerned with (i) MSD pain in neck, shoulders, and upper extremities; (ii) MSD pain in lower back, and (iii) MSD outcomes other than symptom and pain reports, e.g., studies of sick leave and activity limitation due to MSD. Some articles included data relevant to more than one of these categories; in addition, there was one review of social support in relation to MSD complaints in general.

### ***1.3.1 Social support in relation to neck, shoulder, and upper limb pain***

Epidemiological findings relating psychosocial aspects of the work environment to shoulder, elbow and hand/wrist MSD symptoms have been reviewed in several published articles. In one such review, following application of screening criteria and quality assessment, 28 studies published between 1980 and 2000 were considered (Bongers, Kremer, & Ter Laak, 2002). The authors highlight the weakness of cross-sectional designs, the modest size of the relative risk ratios reported, and the discrepancies in results. The inconsistency in findings, as also noted by other researchers (e.g. Feuerstein, Shaw, Nicholas, & Huang, 2004), was particularly true of social support for which the number of null associations was equal to that of positive associations reported (seven in each case).

A review of ten cross-sectional studies of neck pain in relation to work-related social support and other psychosocial factors also drew attention to inconsistencies across studies (Ariens, Van Mechelen et al., 2001). In this review, some evidence was found for a positive relationship between neck pain and low co-worker support; however, for low supervisor support the evidence was inconclusive. A further analysis in which studies that did not control for physical work demands were excluded did not change these conclusions, but the authors note that the quality rating system used to distinguish between strong and weak methodologies had a considerable influence on the level of evidence. Thus, changes in this procedure could have a major impact on the conclusions reached.

A more recent review (Bongers et al., 2006) examined the dimensions of job demand, control, and social support in relation to work-related neck and upper limb MSD symptoms. The review was limited to 24 prospective studies (published from 2000 - 2005). The authors concluded that psychosocial factors were modestly related to MSD neck and upper limb complaints; however, they noted that, although these factors were relevant to the development of MSD symptoms, independently of physical exposures, no one single dimension was specifically implicated. They also suggested that social support may be a more relevant factor in mixed occupational populations than in office settings where much of the research reviewed was conducted.

Also relevant in this context, a review of 31 articles assessing interventions for the prevention and management of neck/upper extremity MSD (Boocock et al., 2007) identified no single-dimensional or multi-dimensional strategy for intervention that was considered effective across occupational settings; in particular, evidence of the benefits of organisational culture interventions (which could include enhancing management support) was found to be lacking.

### ***1.3.2 Social support in relation to low back pain***

In a review of psychosocial factors in relation to lower back pain, 40 prospective cohort studies met the specified inclusion and quality criteria (Hartvigsen et al., 2004); ten of these studies were considered to be of high quality. Of 11 studies of low back pain in relation to social support, only three were of higher quality, and all reported no significant

associations. Among the lower quality studies, six studies reported no association while two reported positive associations but no relative risk values. In contrast, an earlier review (Hoogendoorn et al., 2000) concluded that there was evidence for an effect of low workplace social support as a risk factor for back pain; four out of five high-quality studies reviewed by these authors indicated a positive effect. However, as also found by other researchers (e.g. Ariens, Van Mechelen et al., 2001), the conclusions were sensitive to slight changes in the quality rating system applied to evaluate methodology.

Perhaps the strongest claim that low work-related social support is associated with back pain comes from a review by Linton (2001); in this review, 21 studies met the inclusion criteria, and the author states that ‘*strong*’ evidence (from 5 out of the 6 studies that included social support measures) was found of an association between back pain and low support. However, a number of severe criticisms of this article (including incomplete literature retrieval, some studies mistakenly labelled as ‘prospective’ when in fact they did not employ prospective designs, no critical appraisal of the studies reviewed, and the inclusion of some studies with outcomes different from back pain) have been made (Hartvigsen et al., 2004). Thus, the conclusions drawn by Linton (2001) should be regarded with some caution.

### ***1.3.3 Social support in relation to sickness absence and disability due to MSD***

The review by Hartvigsen et al. (2004) also included information on psychosocial factors in relation to the consequences of lower back pain (e.g. sickness absence, lost work time, injury claims). Five higher quality studies were identified, but only two of them showed significant positive associations; in one study, in which the outcome used was sickness absence >8 days, the finding for low social support at work was highly significant (odds ratio 3.4, CI 1.6 - 7.3). However, four studies of lower quality reported no significant findings for social support in relation to sickness absence due to low back pain.

In a more detailed review, the causes of sick leave attributed to back and neck MSD problems, classified into three categories (acute, recurring, and chronic) were examined (T. Hansson & Jensen, 2004). Reviewing 48 studies, the authors concluded that, for acute back and neck disorders, “*There is no scientific evidence that social support from managers influences sick leave from back problems*” (p.119); in contrast, they noted that there was evidence that perceptions of control influenced sick leave.

In relation to longer-term MSD problems, the authors concluded “*There is limited scientific evidence that social support at work does not influence sick leave for chronic back disorders*” (p.128). In the studies reviewed, most of the occupational samples were men, often in blue-collar jobs in manufacturing industry, and the authors emphasize the need for further studies of women and of different types of workplace (e.g. public sector, service sector).

More recently, nine articles concerned with risk factors for lower back pain disability were identified in a review of intervention strategies intended to reduce sickness absence due to low back pain (Shaw, Linton, & Pransky, 2006). Consistent with the evidence above, the authors noted that there appeared to be little agreement among reviewers as to the significance of the various factors considered, including social support.

### ***1.3.4 Social support and musculoskeletal health in general***

The articles outlined above review studies of particular MSD outcomes in relation to work-related psychosocial factors in general; in contrast, Woods (2005) presents a review of musculoskeletal health specifically in relation to social support. This review covers a wide range of MSD-related outcomes (e.g. pain, symptom reporting, medical consultation for MSD, sickness absence) irrespective of the body area affected. A total of 52 studies (23 cross-sectional, 4 case control, and 25 prospective) were included, but no quality assessment or exclusion criteria were applied.

The conclusion reached from this general review was that “*a lack of social support (whether from co-workers, supervisors or managers) is a risk factor for musculoskeletal ill-health*” (p.186). The author also considered that there was some evidence that poor social support was associated with MSD-related sickness absence, restricted activity, and not returning to work after a musculoskeletal problem. In addition, the review raises questions about coping, specifically the use of social support as a coping strategy, and how it may play a role in responses to MSD, noting the need for further research in this area.

### ***1.3.5 Overview***

It is apparent from the review articles outlined above that there are marked inconsistencies both within the findings included in the individual reviews, and across the overall conclusions drawn by the reviewers. Methodological issues noted in Section 1.1 (including differences in how social support is defined and measured, the reliability and validity of the measures used, the populations studied, the assessment of MSD, and the analyses carried out) may, at least in part, account for these discrepancies in findings. In general, with few exceptions, the balance of evidence did not point to significant associations between poor work-related social support and MSD symptoms, pain, or MSD-related sickness absence; still less could definitive causal conclusions be drawn.

It should also be noted that the two articles making the strongest claims that social support does play a significant role in MSD were the least selective in choosing which studies to include in their evaluation of the evidence. Thus, Woods (2005) did not exclude any published work on the basis of methodological quality or study design, and the screening and evaluation of the studies covered in the review by Linton (2001) was considered to be seriously deficient in a later review (Hartvigsen et al., 2004).

If greater weight is accorded to the conclusions reached in reviews that applied more rigorous quality criteria, and to reviews of prospective studies, it would appear that, as presented in these review articles, the evidence for a specific association between MSD and work-related social support is inconclusive, even though other dimensions of the psychosocial environment at work (e.g. job control and demand) may indeed have a more significant impact. A systematic meta-analysis would help to clarify the uncertainty reflected in these findings.

## **1.4 Recent empirical studies of social support in relation to MSD**

The material presented above is updated in the following sections by a review of recently published findings (2005 to the present), again divided into studies concerned with neck/shoulder symptoms, with low back pain, and with sickness absence and activity restriction.

### ***1.4.1 Neck/shoulder MSD symptoms***

Several recent studies have examined neck/shoulder MSD symptoms in relation to work-related social support. Thus, in a cross-sectional self-report study of white-collar workers (N=1543), high strain (defined in terms of job control and demand) was found to be associated with a higher prevalence of neck-shoulder symptoms if combined with low social support (Leroux et al., 2006). Use of more rigorous cut-off points for defining low job control and high demand in these analyses revealed stronger effects of social support.

Also in a cross-sectional self-report study, neck/shoulder complaints, assessed by the Nordic Standardized Musculoskeletal Questionnaire (Kuorinka et al., 1987) were found to be associated with low social support at work (Aasa et al., 2005). In prospective research, it was found that low co-worker support was a risk factor for elbow/wrist/hand symptoms but not for neck/shoulder symptoms; however, supervisor support was not significant in relation to either outcome (van den Heuvel et al., 2005).

In a recent study of MSD problems among assembly workers in relation to job demands, control and social support, separate logistic regression analyses of shoulder and neck MSD were carried out (Kjellberg & Wadman, 2007). For shoulder complaints, the findings for social support were non-significant, but for neck complaints, social support was found to interact with job control.

Further analyses showed that low support was a risk factor only when control was also low; in this group, 60.8% reported neck complaints, as compared with approximately 40% in the groups with high control. However, no explanation was suggested for the finding that neck complaints were least frequent (20%) among those with low control and high support. A similar study of hospital workers (Wadman & Kjellberg, 2007) showed no significant findings for social support after adjustment for other work-related variables.

All but one of these studies of social support in relation to neck/shoulder problems depended on cross-sectional self-report data; as such, they add relatively little to the earlier reviews, in which a substantial proportion of the studies included used prospective designs. However, there is some indication from two of the studies that interactions between social support and other work dimensions contribute to risk over and above the main effects of the predictors concerned. This issue could usefully be further explored in prospective studies.

#### ***1.4.2 Low back MSD***

Aasa et al. (2005) assessed low back complaints, physical work factors, and psychosocial factors, including social support, in a random sample of 1500 ambulance personnel. In unadjusted analyses, low social support was associated with low back complaints among men, but not among women; this result remained significant when adjusted for other factors in the model, including physical and psychosocial work demands.

In a six-year longitudinal study of a large sample of employed middle-aged men and women, Clays et al. (2007) found that psychosocial factors constituted ‘non-negligible’ risks for lower back MSD. In particular, among men, low social support was a significant predictor of lower back problems, independently of other work-related psychosocial and physical factors; there was no evidence that psychosocial and physical factors interacted in predicting low back pain. Over a six-month follow-up period, low supervisor support (but not low co-worker support) was found to be a risk factor for low back pain in a predominantly male sample (Ijzelenberg & Burdorf, 2005).

However, other recent studies have reported no significant findings for social support in relation to low back pain. Thus, after controlling for physical work factors, job demands, decision latitude, job satisfaction, negative/positive affect and pain-related fear, low supervisor and co-worker support were not found to be risk factors for either short-term (<30 days during the past year) or long-term (>30 days in past year) low back pain (Gheldof et al., 2005). Similarly, neither of two other studies reported significant effects of social support on low back pain (Kjellberg & Wadman, 2007; Wadman & Kjellberg, 2007), and in a two-year follow-up study, social support was not a significant predictor of new onset of severe low back pain (Andersen et al., 2007).

Again, there are inconsistencies in the findings from these recent studies of low back pain; some findings support a positive view of the role of social support in relation to low back pain, (e.g. Hoogendoorn et al., 2000), while other findings support the negative conclusion reached by Hartvigsen et al., 2004). However, it is of interest that significant findings in two of the recent studies applied to men but not to women; this possibility would merit further research, preferably testing the significance of gender interactions with social support variables, rather than analysing data for men and women separately.

### ***1.4.3 Sick leave and activity limitation***

Several recent studies have examined measures of sickness absence and activity limitation in relation to work-related social support. Two studies found no significant effect on MSD-related sick leave (Aasa et al., 2005; Ijzelenberg & Burdorf, 2005), but one study reported that social support predicted the occurrence of future absence for low back pain and upper limb disorders, but not the duration of absence (Bartys, Burton, & Main, 2005). In addition, low social support was found to be a risk factor for MSD-related healthcare use (Ijzelenberg & Burdorf, 2005), and for activity limitation (Aasa et al., 2005).

Gheldof et al. (2005) reported that low or medium co-worker support (relative to high co-worker support) reduced the risk of long-term sickness absence (>30 days in the year) for lower back pain, although there were no similar effects on short-term absence. The authors had no explanation for this unexpected finding, but earlier studies have also reported favourable effects of low co-worker support on MSD-related outcomes (Elfering et al., 2002; Skovron et al., 1987). As sickness absence associated with MSD is costly in terms of lost work time and reduced productivity, more research effort could usefully be directed towards investigating the extent to which psychosocial factors, including social support from supervisors and co-workers, reduce the risk of MSD-related absence from work, and the duration of absence, and the conditions under which they do so.

## **1.5 Intervention studies**

The high costs of MSD in terms of individual distress, and costs to industry and health care organizations, has led to research into the effectiveness of interventions intended to reduce MSD symptoms, and associated sickness absence and activity restriction. However, studies in this area have rarely directly addressed the role of work-related social support or other aspects of the psychosocial work environment. Indeed, an earlier review (Linton & Van Tulder, 2001) concluded that the results of studies concerned with prevention of MSD among people not seeking medical care were ‘sobering’; sufficient evidence of effectiveness was only found for exercise interventions.

A more recent review of interventions for the prevention and management of neck/upper extremity MSD concluded that some ‘modifier interventions’ (e.g. exercise, relaxation, education and cognitive behaviour therapy), particularly if they involved exercise in addition to a range of other strategies, did have positive effects on MSD outcomes (Boocock et al., 2007). However, there was insufficient evidence of positive health effects resulting from ergonomic changes to work equipment, other than changes to VDU workstations which were more successful. Moreover, only one of the intervention studies reviewed included social support (testing the effectiveness of social support with and without self-help education), and this study was carried out with patients rather than a working population.

Nonetheless, the potential importance of considering the role of the psychosocial work environment when designing and evaluating interventions for MSD problems has been widely recognised (e.g. Sullivan et al., 2005; Truchon & Fillion, 2000; Warren, 2001). Researchers have also emphasized the need to match intervention strategies to modifiable risk factors (Shaw et al., 2006); in addition, as noted by Ijzelenberg et al. (2005), prevention strategies designed to reduce the risks of MSD symptoms, and those designed to reduce sick leave due to MSD, may need to focus on different sets of risk factors. More generally, it has recently been noted that, although our understanding of effective interventions for back pain has increased in recent years, this is not true of upper extremity MSD, for which further evaluation of the effectiveness, and particularly the cost-effectiveness of intervention strategies is required (Bongers, 2007) .

## **1.6 Future research directions**

It is clear from the earlier review articles, and from the recent empirical studies outlined, that the findings of research into the role of work-related social support as a factor affecting MSD risks tend to be inconsistent and fragmented. The inconsistencies are apparent not only in that social support is found to be a significant MSD risk factor in some studies but not in others; more confusingly, for some aspects of social support (particularly co-worker support), different studies have reported significant effects in opposing directions, (e.g. van den Heuvel et al., 2005; Gheldof et al., 2005; Elfering et al. 2002).

An important aim of future research in this area should be to establish more clearly the conditions under which social support of different kinds (including both perceived support from different sources, and network size) has favourable effects on MSD outcomes. In this context, evaluating interaction effects between social support and other work environment, demographic, and individual factors is an important strategy, and one that has been more frequently adopted in recent studies.

In particular, the extent to which the dimensions of demand and control act interactively with social support in predicting MSD in work settings has been examined. Future research in this area could benefit from addressing a wider range of interactive effects and indirect effects. One possibility is that gender plays a role in determining the extent to which MSD outcomes are associated with levels of work-related social support; this issue would merit further study, not least because of its potential practical importance.

It was also apparent from recent studies of social support and MSD that there is still considerable reliance on cross-sectional self-report methodology; more prospective research studies are needed to identify causal sequences in the complex process by which individual and environment factors combine to give rise to MSD complaints. Along with the use of prospective designs, improvements are needed to the reliability and validity of the measures used to assess not only dimensions of social support but also the nature and severity of MSD pain and disability.

Attention to methodological issues such as these would allow more definitive conclusions about the role of social support in MSD to be drawn. In the longer term, such research could provide better information to underpin the design and evaluation of interventions intended to reduce the high prevalence of MSD pain and associated work absences. To date, few studies focusing on modifying psychosocial aspects of the work environment as a way of reducing MSD problems have been reported, although this may prove to be a potentially effective means of intervention.

## 1.7 Summary

This chapter presents a review existing studies of the role of social support in relation to musculoskeletal disorders (MSD) in the working population; it is noted that such disorders are a major source of pain, disability, restricted activity, lost work days, reduced productivity and other costs to industry and public services. The detailed material reviewed covers the following topics:

- As a background to considering the role of social support, published MSD prevalence rates are noted. In particular, high rates for MSD in the neck/shoulder areas and the low back area have been widely reported, although estimates vary widely across studies.
- Relevant methodological issues are outlined; particular topics considered were the definition and measurement of social support; study designs (cross-sectional, prospective/longitudinal, and case-control designs); confounding factors; the nature and quality of MSD measures; and the need to test for interactive effects.
- Ten review articles concerned with the role of social support in relation to MSD (published from 2000 onwards) were evaluated; the main outcome measures considered were MSD pain and symptom reports, and MSD-related sickness absence. Marked inconsistencies were apparent in the conclusions drawn as to whether social support played a significant role in relation to MSD; in general, the more rigorous the quality criteria used to screen the studies in any particular review, the more likely the review was to conclude that the evidence was inconclusive.
- Findings from empirical studies published from 2005 onwards were evaluated. This more recent research included several examples of prospective studies, and several studies in which supervisor support was distinguished from co-worker support. In general, the evidence that high social support played a favourable role in relation to MSD was stronger for supervisor support than for co-worker support; some evidence suggested that high co-worker support was associated with adverse MSD outcomes.
- The lack of intervention studies assessing the role of social support in relation to MSD is noted. Indeed, the literature more generally presents a discouraging picture of MSD interventions, although some studies have shown exercise to be effective (particularly in combination with other strategies).

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## **2. SOCIAL SUPPORT IN RELATION TO THE OCCURRENCE AND SEVERITY OF MUSCULOSKELETAL SYMPTOMS**

### **2.1 Introduction**

The work described in this chapter is based on cross-sectional survey data obtained from male UK oil industry personnel (N=2906); the data set included information about MSD symptoms, demographic and individual variables, and measures of the psychosocial and physical environment. These data provided an opportunity to examine the role of social support from supervisors and co-workers, and of other work environment factors, as predictors of MSD symptoms. Although the main focus of the study was on the role of social support in relation to MSD, the dimensions of job demand and job control (and possible interactive effects of these variables with social support) were also of interest. The specific issues addressed in the study derive from the literature reviewed in Chapter 1, and can be set out in a series of questions, as outlined below.

- Overall, what proportion of this sample of industrial workers reports one or more MSD symptoms? To what extent do prevalence rates vary across age groups and job types? What are the separate prevalence rates for MSD problems in neck, shoulder, and lower back? Among those with MSD symptoms, what are the distributions of perceived severity ratings for neck, shoulder, and back pain?
- To what extent are measures of work-related social support (supervisor and co-worker support) associated with occurrence of MSD symptoms after adjustment for demographic and individual factors?
- Is the magnitude of associations between MSD and social support measures changed by including other aspects of the psychosocial/physical work environment in the predictive model?
- Is there evidence of an interaction between supervisor and co-worker support in predicting risk of MSD?
- Do interactions among social support, job demand, and job control measures predict MSD occurrence over and above the main effects of these variables?

### **2.2 Composition of the data set**

Survey data sets from three samples were combined for use in this study. Two data sets were obtained from oil industry personnel working on offshore oil/gas installations: platforms and drilling rigs, N=1598, data collected in 1995-6; and Floating Production, Storage and Offloading (FPSO) vessels, N=484, data collected in 2002). The remaining data were obtained from personnel working at onshore oil/gas terminals (N=941, data collected in 2000).

For the offshore groups, response rates were in excess of 80%; onshore, the overall response rate was slightly lower, 69%. Each data set included demographic information, measures of

psychosocial and physical work environment, and measures of MSD symptoms and other health-related variables such as BMI and smoking behaviour. The combined data set (N=3023) was screened to remove participants with missing data on any of the variables used in the analyses, so that the results all related to the same sample size (N=2906).

## 2.3 Measures

### 2.3.1 *Independent variables*

The independent variables used in the study, and the measures used to assess them, are outlined below.

#### 2.3.1.1 *Job type and location group*

Participants recorded their job titles and brief descriptions of their jobs; this information was used to categorize jobs into seven broad groups, applicable to each of the three samples that made up the data set. The proportions of the sample in each group were: maintenance (33.7%), production (20.8%), heavy manual work, i.e., drilling, construction, and deck work (18.1%), management and supervisory (13.5%), administration/office (5.6%), catering (5.0%), and a residual 'other' category (3.4%). Job type was treated primarily as a control variable in the analyses reported; a second control variable, group, was used to control for overall differences among the three samples (offshore platforms and drilling rigs, onshore oil industry, and FPSO offshore installations) that made up the data set.

#### 2.3.1.2 *Demographic and individual variables*

In addition to the measures described above, several demographic and individual variables were assessed for control purposes:

- *Demographic variables.* Information about age and marital status (married =0, single/divorced =1) was obtained.
- *Negativity affectivity.* The 12-item scale from the Eysenck Personality Questionnaire (Eysenck, Eysenck, & Barrett, 1985) was used to assess neuroticism.
- *Height, weight, and body mass index (BMI).* Self-reported height and weight were used to assess BMI, calculated as  $(\text{weight in kg}) / (\text{height in ms})^2$ . Height was also included in the multi-variate analyses as an independent predictor.
- *Smoking behaviour* was coded as 0 = non-smoker and 1 = smoker. The proportion of smokers in the sample was 30.2%.

### 2.3.1.3 *Psychosocial work environment*

The social support measure developed by House (1981) was used to assess two aspects of work-related social support and a further measure assessed partner support.

- *Co-worker support.* The scale assessing support from co-workers had three items each scored on a 0-3 scale. Mean item scores were calculated; higher values represented greater levels of support. The coefficient alpha value was .81.
- *Supervisor support.* The scale assessing supervisor support had five items, three of them corresponding to those for the co-worker support scale; in addition, this scale had a further two items concerned with help from senior staff. Mean item scores were calculated; the coefficient alpha value was .85.
- *Job demand.* A five-item scale assessed job demand; it focused mainly on time pressures and quantitative workload. Responses were scored on a five-point scale, coded 0-4, higher scores representing higher job demand. Coefficient alpha = .81.
- *Job control.* A four-item scale assessed job control; the items were concerned with the extent to which individuals had opportunities for control, discretion, and autonomy in their work situation. Responses were scored on a five-point scale, coded 0 - 4, higher scores representing control. Coefficient alpha = .68.

### 2.3.1.4 *Physical environment stressors*

The scale assessing physical environment stressors was made up of six items concerned with exposure to adverse physical environment, including poor workplace design, noise, vibration, cold, poor ventilation, and chemical hazards. Coefficient alpha = .80.

## 2.3.2 *Assessment of MSD*

### 2.3.2.1 *Back pain, shoulder pain, and neck pain*

MSD pain in specific body areas was assessed by three items which asked individuals to indicate whether they had experienced back pain, neck pain, or shoulder pain over the previous six weeks; those who responded positively were also asked to rate the severity of pain in each area on a three-point scale (Vaernes et al., 1988). This measure was coded as 0 = no symptoms, 1 = mild pain, 2 = moderate pain, and 3 = severe pain). These scores were recoded to distinguish between the presence and absence of disorder in each body area (dichotomous, 0 - 1 scores), and the severity of the disorder, if present (scores of 1 to 3)

### 2.3.2.2 *Total MSD score*

Scores on the three separate items (back, neck and shoulder pain) were summed to form an total MSD score. In addition, a dichotomous overall score was calculated by assigning a score of 0 to participants who recorded no MSD symptoms, and 1 to everyone whose total score was 1 or greater.

## 2.4 Results: Descriptive data

### 2.4.1 Means and standard deviations of the study variables

Means, standard deviations and ranges for each of the continuous predictor variables are shown in Table 2.1. Mean values for most of the variables shown differed significantly across job types and across groups working in different locations; these two factors were therefore taken into account in the multi-variate analyses reported.

**Table 2.1**  
**Descriptive statistics for study variables**

	Mean	SD	Range
Age (years)	40.8	9.5	18 - 64
Negativity affectivity (neuroticism)	3.8	2.9	0 - 12
Supervisor social support	1.6	0.7	0 - 3
Co-worker social support	1.9	0.6	0 - 3
Job demand	2.3	0.9	0 - 4
Job control	2.7	0.8	0 - 4
Physical environment stressors	1.9	0.9	0 - 4
Subjective health	3.6	0.9	1 - 5
Height (m)	1.8	.07	1.5 - 2.0
Body mass index (kg/m <sup>2</sup> )	25.0	2.9	17.6 - 44.7

N=2906

### 2.4.2 Prevalence and severity of MSD symptoms in neck, shoulder, and back

Table 2.2 shows the proportions of the sample reporting MSD symptoms in each of the body areas assessed. Tested non-parametrically (using Kendall's coefficient of concordance), the difference in MSD prevalence in the three body areas was significant ( $p < .001$ ). Back pain was the most frequently occurring MSD complaint; 30.8% of the sample reported experiencing some degree of back pain. For those reporting MSD symptoms, Table 2.3 shows the severity ratings (mild, moderate, or severe symptoms) for each body area. As shown in this table, approximately half of those reporting some degree of MSD pain considered its severity to be mild, and only 10% or less of those experiencing pain rated it as severe.

**Table 2.2**  
**The prevalence of MSD symptoms in neck, shoulders, and back**

MSD	Body area			MSD total
	Neck	Shoulder	Back	
Prevalence	25.5%	19.2%	30.8%	48.5% (At least one MSD symptom)
No symptoms	74.5%	80.8%	69.2%	51.5%

*Participants reported the occurrence of MSD symptoms in each of the three body areas over the previous six-week period.*

**Table 2.3**  
**Perceived severity of MSD symptoms in neck, shoulders, and back**

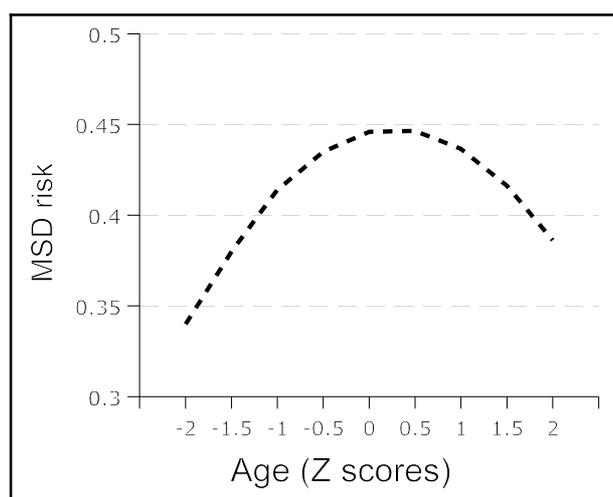
MSD severity rating	Body area		
	Neck n=738	Shoulder n=556	Back n=892
Mild	50.7%	45.1%	51.8%
Moderate	41.8%	44.4%	38.5%
Severe	7.5%	10.4%	9.8%

*The n values refer to the number of individuals on whom the percent values in each column are based.*

### 2.4.3 MSD symptoms in relation to age

Mean age for personnel who reported at least one MSD symptom (40.9 years, n=1408) did not differ significantly from the mean age of the group with no MSD symptoms (40.7 years, n=1498). However, the distributions across age groups of those with MSD symptoms and those without MSD symptoms differed significantly ( $\chi^2 = 17.0$ , df=8,  $p < .05$ ); the form of the data suggested a curvilinear relationship between age and probability of occurrence of MSD.

A logistic regression analysis was carried out to evaluate this curvilinear effect; the dichotomous outcome variable was coded 1 for those reporting at least one MSD symptom, and 0 for the symptom-free group. The linear and quadratic age terms entered as independent variables. The linear term was non-significant, but the quadratic term was significant ( $B = -0.081$ ,  $p < .02$ ). Following the method described by Flom and Strauss (2003), the B values and the constant term from the analysis were used to evaluate the form of the curvilinear relationship between age and MSD risk. As shown in Figure 2.1, MSD risk is greatest in the middle of the age range (the mean age was 40.8 years, SD 9.5), and is lower at young and older ages. The finding of decreased MSD risk at older ages most probably reflects the early retirement from the workforce of those with MSD problems.



*MSD risk was defined as the reporting of any one symptom from the responses to back, neck, and shoulder items.*

**Figure 2.1**  
**Curvilinear relationship between age and probability of MSD occurrence**

### 2.4.4 MSD symptoms in relation to job type

Logistic regression was also used to examine the effect of job type on MSD risk. Controlling for group (onshore / offshore platform / FPSO), job type was a significant predictor of MSD probability ( $p < .02$ ). The most marked effect was the high risk of MSD among personnel doing 'heavy manual work' (drilling, construction, and deck work) relative to the reference group (maintenance workers). The relative risk for 'heavy manual workers' was 1.38 (CI, 1.1 - 1.71).

## 2.5 Results: multivariate analyses

### 2.5.1 Additive logistic analysis predicting MSD risk

The role of social support in relation to MSD occurrence was examined in a logistic regression analysis in which the control variables (group, job type, age, negative affectivity, body mass index, height and smoking) were entered at the first step, together with the measures of supervisor and co-worker support. Measures of job demand, job control, and physical environment stressors, were entered at the second step. The results of this analysis (including the relative risk and confidence limits for variables in the full model) are shown in Table 2.4.

**Table 2.4**  
Prediction of the occurrence of MSD from social support measures

	<i>Model 1</i>		<i>Model 2</i>		Relative risk (RR) and confidence intervals (CI) from Model 2	
	Control variables		Control variables and social support			
	B	Significance	B	Significance	RR	95% CI
Group	-	p<.005	-	p<.001	-	-
Job type	-	p<.005	-	p<.05	-	-
Age (linear)	.061	ns	.071	ns	1.07	.99 - 1.17
Age (Quadratic)	-.074	p<.05	-.064	[p=.07]	.94	.88 - 1.00
Negativity affectivity	.379	p<.001	.338	p<.001	1.40	1.29 - 1.52
Body mass index	-.033	ns	-.028	ns	.97	.90 - 1.05
Height	.086	p<.05	.094	p<.02	1.10	1.02 - 1.19
Smoking	.170	p<.05	.164	[p=.06]	1.18	.99 - 1.40
Supervisor support	-.193	p<.001	-.136	p<.002	.87	.80 - .95
Co-worker support	-.026	ns	-.025	ns	.98	.90 - 1.06
Job demand			.122	p<.005	1.13	1.04 - 1.23
Job control			-.105	p<.02	.90	.83 - .98
Physical environment			.254	p<.001	1.13	1.04 - 1.23
<i>Constant</i>	-.226	p<.02	-.280	p<.005		
<i>Nagelkerke R<sup>2</sup></i>		.081		.103		

*Note.* N=2906. The data shown are derived from two simultaneous models; in each model all predictor variables are adjusted for all others. Continuous variables were standardized prior to entry. Marital status was not significant at any stage of the analysis and was not included in the final model.

The main findings relating to the social support variables in Table 4 can be summarised as follows:

- Four of the five work environment variables were significant predictors of MSD risk. In particular, in Model 1, supervisor support was a strong negative predictor, implying that higher levels of support from supervisors are associated with lower risk of MSD occurrence. In this analysis, supervisor support was significant over and above other variables in the model; thus, its effects were independent of the effects of the demographic and individual factors (for instance, differences in job type, age, negative affectivity) entered earlier in the model. In contrast, co-worker support was non-significant.
- Entry of other work environment variables in Model 2 did not markedly change the magnitude of the effects for social support found in Model 1; supervisor support remained highly significant, and co-worker support remained non-significant. Thus, in this model, low supervisor support was a direct contributor to MSD risk, with no evidence that its effects were mediated by, or confounded with, other work environment variables.
- The physical work environment measure was a strong positive predictor of MSD, over and above the main effects of job type and other variables in the model. However, job demand and job control (which, with social support, characterize the demand-discretion-support model) were also significant in Model 2.
- The effects of job type on MSD risk which were highly significant in Model 1 were greatly reduced in Model 2. In particular, 'heavy manual jobs' which had significantly elevated MSD risk in Model 1 (RR = 1.34, 95%CI, 1.07 - 1.68) were no longer significantly different from the reference group (maintenance jobs) in Model 2. This result suggests that the effects of heavy manual work on MSD risk are mediated by psychosocial work factors, and, in particular, by physical environment variables.

### ***2.5.2 Separate multivariate analyses of back, neck, and shoulder MSD***

Separate analyses were carried out for each of the three MSD measures (back, neck and shoulders) to examine the extent to which the risk factors differed according to the body part involved. The results, in terms of relative risk values, levels of significance, and associated confidence intervals, are summarized in Table 2.5. In general, the patterns of significant factors were similar across the three body areas. Thus, high negative affectivity, high job demand, low social support, and adverse physical environment were significant risk factors for each of the MSD outcome measures, and their relative magnitudes were similar in each case.

These results suggest that, in relation to the factors examined in the present study, the processes underlying MSD pain are generalised, rather than specific to one body area. However, there were two exceptions to this general pattern; height and smoking were both significant predictors of back pain, but not of neck or shoulder pain (although height was marginally significant in relation to shoulder pain,  $p < .10$ ).

**Table 2.5**  
**Individual and psychosocial/physical environment measures as risk factors for back, neck, and shoulder MSD**

	Back		Neck		Shoulder	
	RR	95%CI	RR	95% CI	RR	95% CI
Age (linear)	1.02	.94 - 1.12	1.08	.98 - 1.19	1.09	.98 - 1.22
Age (Quadratic)	.96	.89 - 1.04	.95	.87 - 1.02	.98	.90 - 1.07
Negativity affectivity	1.31***	1.21 - 1.42	1.46***	1.34 - 1.60	1.32***	1.20 - 1.46
Body mass index	.93	.85 - 1.01	1.01	.93 - 1.11	1.08	.98 - 1.19
Height	1.16***	1.07 - 1.26	1.04	.96 - 1.14	1.10 <sup>†</sup>	1.00 - 1.21
Smoking	1.32**	1.11 - 1.58	1.04	.86 - 1.26	1.07	.86 - 1.32
Supervisor support	.89**	.81 - .98	.90*	.81 - .99	.86**	.77 - .96
Co-worker support	1.01	.93 - 1.11	.95	.87 - 1.04	1.01	.92 - 1.13
Job demand	1.12**	1.03 - 1.23	1.15**	1.05 - 1.27	1.17**	1.05 - 1.30
Job control	.93	.85 - 1.01	.91*	.83 - 1.00	.95	.86 - 1.04
Physical environment	1.33***	1.21 - 1.46	1.17***	1.06 - 1.30	1.27***	1.14 - 1.42

*Notes.* N=2906. All data shown were obtained from a simultaneous logistic regression model in which all variables were controlled for all others. All models also included two categorical variables (job type and group). Continuous variables were standardized prior to entry.

\*\*\* p<.002 \*\* p<.025 \*p<.05 <sup>†</sup> p<.10

### 2.5.3 Analysis of interactive effects

#### 2.5.3.1 Demand, control, and support dimensions

The results reported in Sections 2.4.1 and 2.4.2 were derived from logistic regression models which included only additive main effect terms. However, the literature reviewed in Section 1.4 suggests that the dimensions of the demand-control-support model of work stress may interact in relation to MSD outcomes. This possibility was tested in the present data set by entering the two-way interactions (*demand x control*, *demand x supervisor support*, *control x supervisor support*) as a further step in the logistic regression analysis shown in Table 2.4. None of these two-way interactions, nor the three-way interaction (*demand x control x support*) was significant in relation to MSD risk. Similar non-significant results were found when interactive effects of job demand and control with co-worker support were tested.

### 2.5.3.2 Interactions among supervisor support, co-worker support and negative affectivity

Elfering et al. (2002) suggests that the effect of one type of support on health outcomes, specifically back pain, may depend on the level of another type of support, i.e., that different types of support may interact in predicting MSD risk. This possibility was tested by entering a product term representing the interaction between supervisor and co-worker support as further step in the logistic model in Table 2.4. This interaction term was significant ( $p < .05$ ).

### 2.5.3.3 Interactions of supervisor support and co-worker support with negative affectivity

Individuals high in negative affectivity (NA) tend to be more vulnerable to work stress than those who are low on this dispositional trait. It is therefore possible that high NA individuals derive particular benefit from social support at work. Accordingly, the two interaction terms, *supervisor support x NA*, and *co-worker support x NA*, were tested in the logistic model. Both these interactions were significant ( $p < .05$  and  $p < .025$ , respectively), over and above the *supervisor support x co-worker support* interaction, which remained significant ( $p < .05$ ). The higher-order three-way interaction among these variables was not significant. Similar analyses of interactive effects were carried out for the three separate MSD outcomes, back, neck and shoulder pain. Whilst two of the interactions tested were significant, there appeared to be no consistency across the different body areas, and these findings were not further considered.

### 2.5.3.4 Patterns of interactions

The pattern of three significant two-way interactions among the two types of social support and negative affectivity suggests that the process by which social support impacts on the occurrence of MSD symptoms is complex and depends on the combined effects of individual and environmental factors. It should be noted that for a large sample ( $N=2906$ ), significance levels of  $p < .05$ , or even  $p < .025$ , do not represent very strong effects, but it was of interest nonetheless to evaluate the form of the significant interactions found; these diagrams are shown in Figure 2.2. Possible interpretations of the interaction effects are outlined below.

*Figure 2.2 (a).* For both high and low supervisor support, higher levels of negative affectivity (NA) are associated with higher risk of MSD. The form of the interaction between supervisor support and NA is such that supervisor support has a more favourable effect in reducing MSD risk for those low in NA than for those high in NA. At NA levels more than +1SD above the mean, supervisor support has no beneficial effect on MSD. This result is contrary to the idea that individuals high NA might particularly benefit from supervisor support.

*Figure 2.2 (b).* For the interaction between co-worker support and NA, a favourable effect of high support on MSD risk is only apparent at high levels of NA. For those low in NA, high co-worker support actually has an adverse effect. However, although the interaction is significant, the actual difference in the slopes of the lines representing high and low co-worker support is relatively small.

*Figure 2.2 (c).* The form of the interaction between supervisor support and co-worker support shows that, if co-worker support is low, the level of supervisor support does not affect MSD risk. In contrast, if co-worker support is high, supervisor support has a marked effect, low support being associated with high MSD risk, and high support with low MSD risk. The least favourable situation (i.e. the highest MSD risk) is associated with the combination of high co-worker support and low supervisor support, a finding also reported by Elfering et al. (2002).

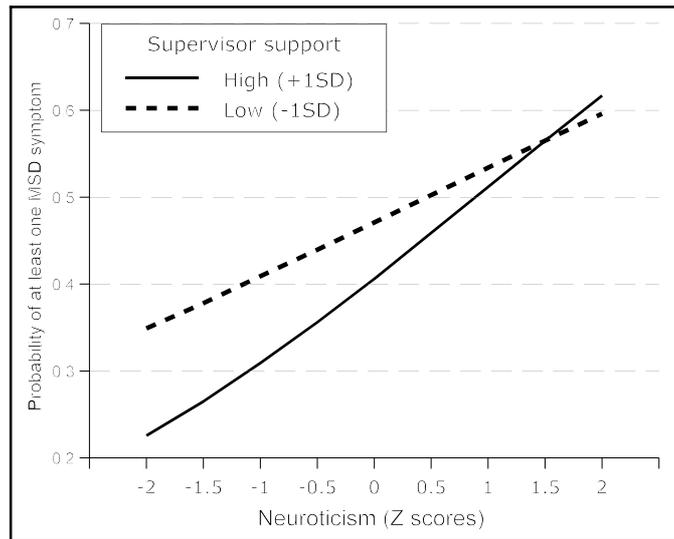


Figure 2.2 (a)

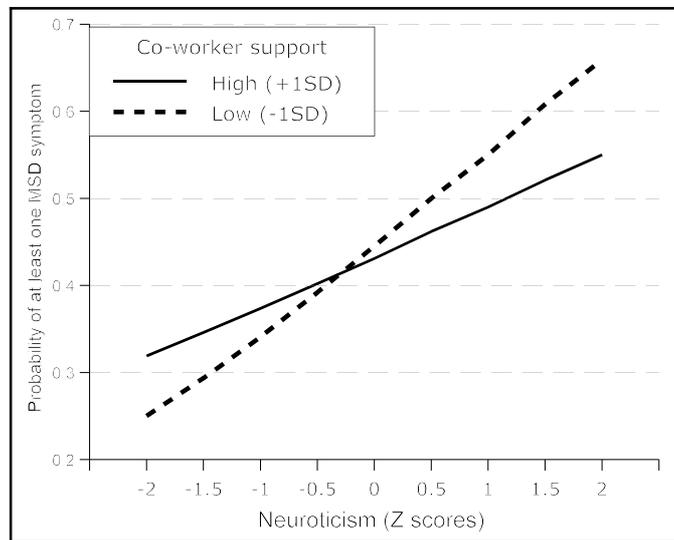


Figure 2.2 (b)

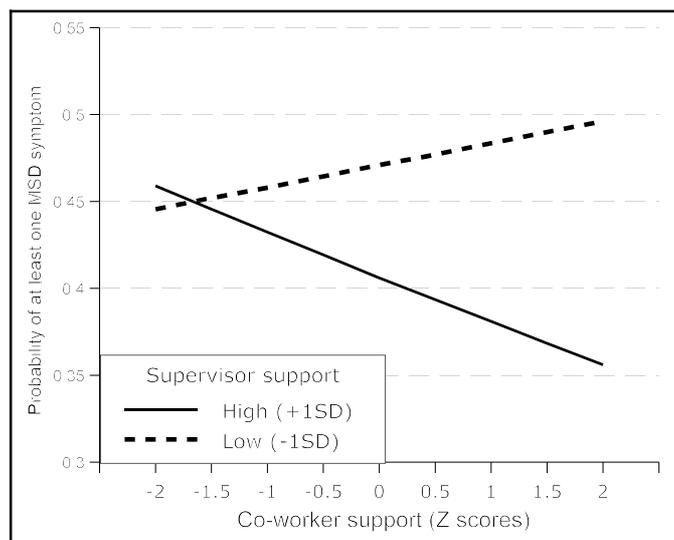


Figure 2.2 (c)

**Figure 2.2**  
Interactions among social support, co-worker support and negative affectivity in predicting occurrence of MSD

### 2.5.4 Analysis of MSD pain severity ratings

Respondents who had experienced MSD symptoms in back, neck, or shoulder (N=1408) were also asked to rate the severity of pain on a three-point scale ('mild' = 1, 'moderate' = 2, 'severe' = 3). These data were analysed separately for back, neck, and shoulder pain. In each case, symptom-free respondents were excluded; only data from those who reported some degree of pain in the body area concerned were included in the analysis. Thus, different but partially overlapping samples were used for the analyses of back (n=892), neck (n=738), and shoulder (n=556) complaints.

Ordinal logistic regression was used to identify factors associated with the level of pain reported. The individual, psychosocial and physical environment predictor variables in the ordinal regression model were the same as those used in the binary logistic regression analysis of MSD occurrence (Section 2.5.1). The strongest predictor of level of pain was negative affectivity, which was a highly significant and positive factor in each analysis; thus, high negativity was associated with high levels of reported back pain, shoulder pain, and neck pain. However, supervisor support was also a significant predictor of pain level for both back pain ( $p < .01$ ) and shoulder pain ( $p < .025$ ); the direction of effect was negative; higher supervisor support was associated with lower levels of reported pain. For neck pain, the direction of effect for supervisor support was also negative, but non-significant. Co-worker support was consistently non-significant, but age showed weak positive effects in each analysis.

A further analysis was carried out in an attempt to identify factors associated with relatively severe general MSD pain. In this analysis, a total pain score (ranging from 1 to 9) was created by summing the separate pain scores for everyone who reported some degree of MSD in back, neck or shoulders (N=1408). These scores were dichotomized to create a 'severe pain' group (n=306, scores of 4+, coded 1) for comparison with respondents reporting lesser degrees of pain (n=1102, scores of 3 or less, coded 0).

**Table 2.6**  
Relative risk values and confidence intervals for significant predictors in the logistic regression of MSD pain

<i>Variable</i>	<i>Relative risk (RR)</i>	<i>95% Confidence intervals</i>
Negative affectivity	1.45***	1.27 - 1.66
Physical environment stressors	1.18*	1.02 - 1.38
Supervisor support (low)	1.22**	1.06 - 1.41

\*\*\*  $p < .001$     \*\*  $p < .01$     \*  $p < .05$

Logistic regression analysis, again using demographic, psychosocial and physical environment variables as predictors, indicated three significant risk factors. Negative affectivity, physical environment stressors, and low social support from supervisors, were positively associated with severe pain. There were no significant effects of co-worker support, and no significant

interactions among negative affectivity, supervisor support, and co-worker support. The relative risk (RR) values, and the associated 95% confidence limits, for the significant factors are shown in Table 2.6.

## 2.6 Summary of findings

- In a cross-sectional survey of male oil industry personnel (N=2906), the prevalence rates (over the previous six weeks) of MSD in back, neck, and shoulders were 30.8%, 25.5% and 19.2% respectively. The overall prevalence (i.e. MSD in at least one of these body areas) was 48.5%. These values are consistent with other research findings.
- Age was related to MSD risk in a curvilinear manner; at low and high ages, MSD risk was lower than in the middle range of age. Irrespective of age, personnel doing heavy manual work were at higher risk than other job groups.
- Supervisor support was significantly negatively related to MSD risk, over and above the effects of age, job type, negative affectivity, and other control variables. Co-worker support was non-significant. These findings were not changed by adjustment for other psychosocial and physical work environment variables (although these variables were significant independent risk factors).
- When data for back, neck, and shoulder MSD were analysed separately, the patterns of risk factors found in each case were not markedly different.
- There was no evidence of interactive effects among social support measures and measures of job demand and control in predicting MSD occurrence.
- Supervisor support and co-worker support were found to interact significantly in relation to MSD risk. Over and above this interaction effect, both supervisor support and co-worker support were found to interact significantly with negative affectivity. Possible interpretations of these interactions are considered.
- Among those reporting MSD symptoms, pain severity was primarily predicted by high negative affectivity, exposure to physical environment stressors, and low supervisor support; each of these variables was significant.

### 3. SOCIAL SUPPORT, MSD, AND SICKNESS ABSENCE IN A CIVIL SERVICE GROUP

#### 3.1 Aims of the work

The main aims of the analyses reported in this section were to examine the role of social support in relation to a self-reported indicator of musculoskeletal problems (*'currently receiving medical treatment for MSD'*), and in relation to sickness absence episodes (duration one week or more, medically certificated as due to MSD). The primary emphasis was on the sickness absence measure which was derived from formal archival records.

#### 3.2 Participants

The study participants were Driving Examiners working in government Driving Test Centres. The survey questionnaire was sent out by mail in 1985 to a representative sample of Examiners located throughout the UK. The response rate was approximately 83%; a total of 624 completed questionnaires were received. Following listwise deletion of missing data, the analyses were based on a sample size of 531.

#### 3.3 Measures

##### 3.3.1 Survey data

###### 3.3.1.1 Social support from supervisors and co-workers

The social support measure developed by House (1981) was used to assess work-related social support. Each of the two scales (support from supervisors, and support from co-workers) had three items each scored on a 0-3 scale, higher values representing greater levels of support.

###### 3.3.1.2 Partner social support

A measure of the extent to which spouses/partners provided social support in relation to work issues was also obtained from the House (1981) questionnaire. This measure applied only to participants who had partners with whom they discussed work-related matters (N=434). This measure also had three items each scored on a 0-3 scale, higher values representing greater levels of support

###### 3.3.1.3 Current MSD treatment

Participants were asked if they were currently received any prescribed medication or other medical treatment for MSD complaints. Responses were scored dichotomously (0=no, 1=yes).

### 3.3.1.4 Demographic and individual variables

In addition to the measures described above, a number of demographic and individual variables were assessed for control purposes.

*Demographic variables.* Information about age (years), gender (female=0, male=1), and marital status (married = 1, single/divorced = 0) was obtained.

*Negativity affectivity.* The 23-item neuroticism scale from the Eysenck Personality Questionnaire (Eysenck et al., 1985) was used to assess negative affectivity (NA).

*Body mass index (BMI).* Self-reported height and weight were used to assess BMI, calculated as  $(\text{weight in kg})/(\text{height in ms})^2$ .

*Exercise.* Participants were asked how frequently, on average, they took physical exercise. Responses were scored on a 0-3 scale; 0 = never or very rarely, 1 = Less than once per week, 2 = 1-2 days per week, 3 = 3 or more days per week.

*Smoking behaviour.* Smokers were distinguished from non-smokers.

*Other measures.* Information about a number of other measures was available for control purposes in the multivariate analyses; these variables included job tenure, education, self-rated physical health, job satisfaction, and the number of GP visits made in the past year. They were not used in the main analyses, but were included in some further analyses carried out to explore possible confounding effects.

### 3.3.2 Archival data

*Sickness absence.* Information about the frequency and duration of certificated sickness absence episodes due to musculo-skeletal disorders (MSD), was obtained year-by-year across the five-year period (1982-87). Information about sickness episodes due to other conditions was also obtained. For longitudinal analyses, the absence measures were divided into two scores relating, respectively, to the three years prior to the collection of survey data (the 'prior' measures), and to the two years following the survey (the 'follow-up' measures).

## 3.4 Results

### 3.4.1 Sample characteristics

Descriptive data for the study variables (based on N=531) are presented in Table 3.1 and 3.2. As shown in this table, the sample was predominantly male, middle-aged, and married (this demographic profile closely replicated that of Driving Examiners as an occupational group). More than one third of the sample reported that they never participated in sports or other physically active recreations, and one third were current smokers.

**Table 3.1**  
**Descriptive statistics for categorical study variables**

<i>Categorical variables</i>	N	%
Gender		
Men	516	97.2
Women	15	2.8
Marital status		
Married	470	88.5
Single/divorced/separated	61	11.5
Participation in active sports, exercise, etc		
Never	195	36.7
Less than once per week	109	20.5
1-2 times per week	131	24.7
3 or more times per week	96	18.1
Smoking habits		
Non-smoker	352	66.3
Current smoker	179	33.7

**Table 3.2**  
**Descriptive statistics for continuous study variables**

<i>Continuous variables</i>	Mean	SD	Range
Age (years)	48.4	8.2	31 - 64
Negativity affectivity (neuroticism)	9.2	5.1	0 - 23
Supervisor social support	6.3	2.5	0 - 9
Co-worker social support	6.2	2.4	0 - 9
Body mass index	25.0	2.9	16.6 - 38.4

N=531

### 3.4.2 Medical treatment for MSD complaints

The majority of participants (81.4%) did not report receiving any prescribed medication or other medical treatment for MSD complaints. Those who did report some form of MSD treatment were significantly higher in negative affectivity ( $p < .001$ ) and significantly lower in perceived support from supervisors ( $p < .001$ ) than those who did not report such treatment. In addition, smokers were significantly more likely to be receiving treatment than non-smokers ( $p < .01$ ), and there was a similar tendency ( $p < .07$ ) for married participants to be more likely to be receiving treatment than those who were single/divorced.

### 3.4.3 Sickness absence episodes

Table 3.3 shows the distributions of MSD sickness episodes over each of the five separate years for which data were available, together with the distribution of the total number of episodes over the five-year period. As assessed by the non-parametric Friedman test, differences in absence frequencies across years were marginally significant ( $\chi^2 = 9.2$ ,  $df = 4$ ,  $p < .06$ ), but there was no consistent trend of increase or decrease across successive years. There was also no evidence of gender differences in the frequencies of MSD sickness episodes. Over the five-year period for which data were available, certificated sickness absence due to MSD complaints accounted for 37.4% of all certificated absence episodes, a higher proportion than any other single diagnostic category.

**Table 3.3**  
Sickness episodes due to MSD during three years prior to the collection of the survey data, and the two year follow-up period

Number of MSD episodes	Frequencies for each year					Five-year total	Percent
	1	2	3	4	5		
None	463	486	466	468	458	323	60.8%
1	63	42	62	56	65	123	23.2%
2	2	3	3	5	6	52	9.8%
3+	3	0	0	2	2	33	6.2%

*N=531. In this table, sickness episodes due to musculo-skeletal disorders were defined as absences of  $\geq 7$  days supported by a medical certificate with MSD diagnosis. Years 1-3 were prior to survey data collection, and Years 4-5 were the follow-up years.*

### 3.4.4 Stability and change in MSD episodes across the five-year study period

A further analysis examined whether episodes of MSD sickness absence during the three years prior to the survey significantly predicted further episodes during the subsequent two-year follow-up period. The data are summarised in Table 3.4.

The majority of participants (61%, n=323) had no long-term MSD sickness episodes during the entire five-year study period. Only 8% (n=44) of the total sample had MSD episodes during the three years prior to the survey and during the two follow-up years. Of those who had no prior episodes (n=390), 17% (n=67) had one or more episodes during the two follow-up years. Conversely, of those who had at least one episode prior to the survey (n=141), 69% (n=97) had no episodes during the subsequent two follow-up years. Thus, although there was a significant association between prior and follow-up MSD episodes (McNemar test,  $\chi^2 = 5.1$ ,  $p < .025$ ), there was also evidence that MSD symptoms severe enough to necessitate certificated absence from work do not necessarily persist across periods of several years.

**Table 3.4**  
**Stability and change in MSD sickness absence: episodes during the 3-year period prior to the survey data collection in relation to the 2-year follow-up period**

		Follow-up MSD episodes		
		None	$\geq 1$	Total
Prior MSD episodes	None	323	67	390 (73%)
	$\geq 1$	97	44	141 (27%)
Total		420 (79%)	111 (21%)	531(100%)

*The percentage values shown in the table are percentages of the total sample (N=531)*

### 3.4.5 Multivariate analyses

**3.4.5.1 Predicting the use of prescribed medication or other medical treatment for MSD**  
Logistic regression was used to examine the extent to which receiving prescribed medication, or other medical treatment for MSD complaints, was associated with prior MSD sickness episodes and demographic and individual control variables (entered simultaneously in Model 1), and with supervisor and co-worker social support (entered stepwise in Model 2). Interactions of prior MSD episodes and social support were tested in the further model but were found to be non-significant and were dropped from the analysis. The results of this analysis are shown in Table 3.5.

**Table 3.5**  
**Reported medical treatment for MSD problems in relation to prior MSD sickness episodes, control variables, and supervisor/co-worker social support**

	<i>Model 1</i>		<i>Model 2</i>	
	Prior MSD episodes and control variables		Prior MSD episodes, control variables and social support	
	B	Significance	B	Significance
Prior MSD episodes	.40	p<.005	.42	p<.005
Age	.20	ns	.25	[p<.06]
Gender	-.28	ns	-.20	ns
Marital status	1.03	p<.05	.94	p<.05
Negativity affectivity	.42	p<.001	.38	p<.005
Body mass index	.16	ns	.17	ns
Exercise	.12	ns	.13	ns
Smoking	.69	p<.005	.78	p<.005
Constant	-1.61	p<.05		
Supervisor support			-.35	p<.005
Co-worker support			-.09	ns
Constant			-1.79	p<.025
<i>Nagelkerke R<sup>2</sup></i>		.11		.15

**Note.** N=531. In each model all predictor variables are adjusted for all others. Continuous variables were standardised prior to entry.

As would be expected, prior MSD sickness absence was a strong predictor of receiving MSD medication or treatment, but other factors in the model also made significant contributions. In particular, negative affectivity and smoking were both positive predictors, and married individuals were more likely than those who were not married to report MSD treatment. In addition, when entered at the second step (Model 2), supervisor support was a negative predictor; employees with more supportive supervisors were less likely to report MSD medication/treatment.

### 3.4.5.2 MSD sickness absence episodes during follow-up years

A similar logistic regression analysis was carried out in which the occurrence of one or more MSD sickness episodes during the follow-up years was treated as the outcome variable. The analysis was carried out in three stages, corresponding to Models 1, 2, and 3 as shown in Table 3.6. Again, prior MSD sickness absence was a strong predictor of subsequent episodes, but in other respects the pattern of results differed from those shown in Table 3.5 for the analysis of MSD medication/treatment. In particular, exercise was a positive predictor in this analysis; more frequent participation in physical activities was associated with a higher probability of subsequent MSD episodes.

**Table 3.6**  
**Prediction of the occurrence of follow-up MSD sickness episodes from prior MSD episodes, control variables, and supervisor/co-worker social support**

	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>	
	Prior MSD episodes and control variables		Prior MSD episodes, control variables and social support		Prior MSD episodes, control variables, social support, and interactions	
	B	<i>Significance</i>	B	<i>Significance</i>	B	<i>Significance</i>
Prior MSD episodes	.39	p<.005	.39	p<.005	.42	p<.005
Age	-.02	ns	-.01	ns	-.01	ns
Gender	-.51	ns	-.48	ns	-.51	ns
Marital status	-1.03	p<.025	-1.02	p<.025	.99	p<.05
Negativity affectivity	.24	p<.025	.23	p<.05	.24	p<.05
Body mass index	.01	ns	-.01	ns	.01	ns
Smoking	-.02	ns	.01	ns	.01	ns
Exercise	.28	p<.005	.27	p<.005	.27	p<.01
Supervisor support			.04	ns	.20	ns
Co-worker support			-.09	ns	-.19	ns
Prior MSD * supervisor support					-.41	p<.03
Prior MSD * co-worker support					.24	ns
Constant					-2.31	p<.005
<i>Nagelkerke R<sup>2</sup></i>	.07		.08		.09	

*Notes.* N=531. The data shown are derived from three simultaneous models; in each model all predictor variables are adjusted for all others. Continuous variables were standardised prior to entry.

Supervisor support, as a first-order term in the final model shown in Table 3.6, was positive but non-significant; however, the interaction of supervisor support with prior MSD sickness episodes was significant and negative in sign. Thus, in general terms, at higher values of supervisor support, the impact of prior MSD episodes on subsequent episodes was reduced relative to that at low levels of social support.

*Relative risk values for significant factors predicting follow-up MSD sickness episodes.* The full analysis (Model 3 in Table 3.6) was used to derive the relative risk (RR) values and their 95% confidence intervals (CI) for significant factors predicting follow-up MSD sickness episodes. These values are shown in Table 3.7.

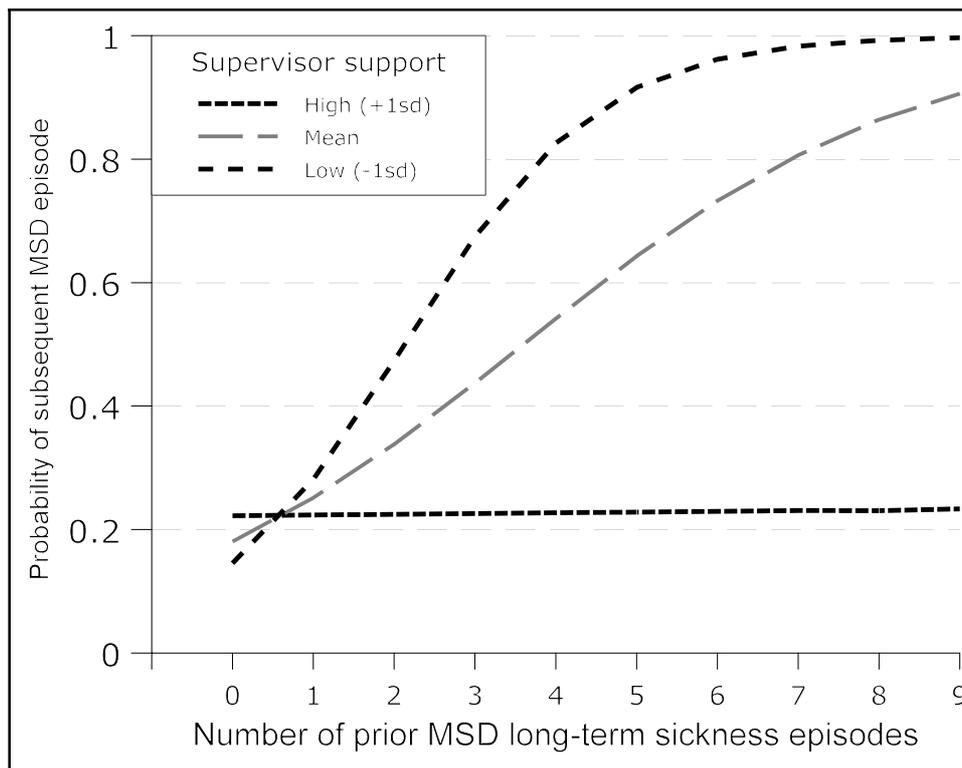
**Table 3.7**  
**Relative risk values and confidence intervals for significant predictors of follow-up MSD sickness absence**

<i>Variable</i>	<i>Relative risk (RR)</i>	<i>Confidence intervals</i>
Prior MSD sickness episodes	1.53	1.17 - 2.0
Marital status	2.68	1.10 - 6.58
Negative affectivity	1.27	1.03 - 1.58
Exercise	1.31	1.08 - 1.59
Supervisor support	1.23	0.92 - 1.64
Prior episodes x supervisor support	0.66	0.46 - 0.96

Whilst the RR values for other variables in the model are not directly relevant to the issue of social support, it is interesting to note the high RR value associated with marital status. The value implies that, other things being equal (including prior MSD episodes), married people are 2.68 times more likely to take subsequent absence than their single counterparts.

*Form of the interaction between supervisor support and prior MSD episodes.* Using the method described by Flom and Strauss (2003), the B values from the logistic regression analysis (Model 3 in Table 3.6) were used to calculate the relationship between prior MSD episodes and the occurrence of one or more subsequent episodes during the follow-up period for high (+1SD) and low (-1SD) levels of supervisor support.

As shown in Figure 3.1, at high levels of supervisor support (+1SD), the number of prior MSD sickness episodes was unrelated to the risk of one or more further episodes in the following two years; irrespective of the number of prior episodes, the risk remained approximately constant at .25. In contrast, at low (-1SD) levels of supervisor support, the risk initially increased sharply with increase in the number of prior episodes, and then rose more slowly, levelling off at a level close to unity for more than seven prior episodes.



**Figure 3.1**  
**Probability of one or more subsequent MSD sickness episodes in relation to number of prior episodes and level of supervisor support**

#### 3.4.6 Analysis of data for sub-sample with no prior MSD-related sickness episodes

A further logistic regression analysis was carried out based only on data from participants who had no prior MSD sickness episodes, i.e. the analysis focused on new onset of MSD-related absence. This analysis confirmed that, as is evident from Figure 3.1, in this group, level of supervisor support had no effect on subsequent MSD episodes. Indeed, exercise was the only predictor variable that did have a strong effect on subsequent MSD episodes among those with no prior episodes; higher frequency of exercise was a risk factor for subsequent episodes among those with no previous episodes.

#### 3.4.7 Further analyses

Several exploratory analyses were carried out in which the possible contributions of additional variables to the model shown in Table 3.6 were tested. None of the variables examined in this way altered the main findings from the model shown. In particular, whether or not the individual reported receiving medical treatment for MSD complaints, when entered as a predictor variable, was non-significant in relation to MSD sickness episodes at each stage of the analysis; moreover, inclusion of this variable did not substantially affect the significance of the other variables in the model. Thus, receiving current treatment for MSD at the start of the follow-up years was not a significant factor in relation to the risk of MSD sickness episodes during the subsequent two years.

Similarly, other potentially relevant variables (tenure, education, self-rated physical health, and job satisfaction) all failed to contribute significantly to the model. The only exception was that the number of GP visits reported for the year prior to the collection of survey data was a highly significant, positive predictor of MSD sickness absence episodes over and above the variables shown in Table 3.6. However, the significance of the interaction between supervisor social support and prior MSD episodes was very robust irrespective of other variables added to the model.

#### **3.4.8 Role of partner support**

In addition to examining the roles of support from supervisors and co-workers in relation to MSD sickness episodes, it was of interest to examine the role of work-related social support from partners; however, this analysis was restricted by the fact that although ratings of supervisor and co-worker support were relevant to all participants, the partner support measure did not apply to those who did not have partners, or those who had partners but never discussed work matters with them. A separate logistic regression analysis was therefore carried out based only on the sample (N=434) who had partners and who provided ratings of the degree to which their partners were supportive in relation to work issues.

The results of this analysis showed that partner support was a significant predictor of follow-up MSD sickness episodes, over and above the variables in the model shown in Table 3.6. However the direction of effect was positive ( $B = 0.16, p < .05$ ) rather than negative. Thus, having a more supportive partner appeared to *increase* the probability that an individual would respond to MSD problems with sickness absence episodes of 7 days or more. Including partner support in the model, and the consequent restriction of the sample size had little effect on the findings relating to supervisor support described above.

When partner support was examined in relation to receiving medical treatment for MSD, the tendency was again positive (i.e. those with more supportive partners were more likely to report receiving treatment), but the significance of the effect did not reach the .05 probability level.

### **3.5 Summary of findings**

- The study combined survey data with sickness absence data. The five-year study period over which sickness absence data were available was divided into 3 years prior to, and 2 years following, survey data collection.
- Over the five-year period, certificated absence episodes due to MSD (i.e. absences of 7+ days, with medical certificate stating MSD diagnosis) accounted for 37% of all certificated absence episodes, more than any other single diagnostic category. However, 60% of the sample (N=531) had no MSD-related episodes during the five-year period.

- Number of prior MSD sickness episodes, low supervisor social support, and marital status were significant predictors of reported use of prescribed medication for MSD, and of follow-up sickness absence, over and above the other variables in the model. Co-worker support was non-significant in both analyses, but exercise frequency was positively associated with subsequent episodes.
- The interaction between social support and prior episodes was a significant predictor over and above the main effects of these variables. Under conditions of high support, prior episodes did not predict subsequent episodes, but under low support conditions, prior episodes were strongly predictive of subsequent episodes.
- A further analysis (restricted to those who had partners) was carried out to evaluate the effect of partner support on MSD absence episodes. Partner support was a significant predictor of subsequent episodes over and above prior episodes and the other variables in the model. However, the direction of effect was positive; high partner support *increased* the risk of subsequent episodes.

## **4. SOCIAL SUPPORT AND MUSCULOSKELETAL DISORDERS IN THE ONSHORE OIL INDUSTRY: A LONGITUDINAL STUDY**

### **4.1 Aims of the work**

This longitudinal study evaluated the extent of change in MSD symptoms over the course of a five-year period (2000 - 2005), and the role played by low supervisor and co-worker support as risk factors for MSD complaints. It also examined whether individuals who report a strong tendency to seek social support as a means of coping with work demands respond differently (in terms of MSD symptoms) from those in whom this tendency is less marked and, if so, whether the magnitude of this effect is dependent on the level of work-related social support afforded by the work environment.

In addition, the analyses examined whether personnel who reported that they had been on a course designed to reduce MSD problems (e.g. instruction in correct methods of manual handling) showed significantly different patterns of symptoms from those who had not done such a course. The pathways that link MSD, mental health, and work ability were also examined.

### **4.2 Data collection**

#### ***4.2.1 Sample and procedure***

Personnel working at onshore oil processing plants in the UK took part in the study. The baseline data were collected in 2000 as part of a wider survey of work and health in the oil industry. Of those who took part in the baseline survey, 889 personnel were potentially eligible for inclusion in the follow-up (i.e. males, age <60 years in 2000); of these, 514 personnel indicated at the time of the original data collection that they would be willing to be contacted for follow-up purposes, and attempts were made to contact this group early in 2005.

However, only 331 of the individuals concerned could be located; survey questionnaires were sent out to these personnel at their home or their work addresses (whichever was originally provided) with a pre-paid envelope for reply. Reminders were sent out two weeks later to those who had not responded. In total, completed questionnaires were received from 204 individuals (a response rate of 61.6% of those contacted, but only 23% of the original sample). A small number had retired early but the great majority (N=195) of those followed-up were still working in the oil industry, almost all of them at the same site as in 2000. This group formed the basis of the longitudinal analysis reported here.

In view of the relatively low follow-up rate, it was important to examine the extent to which the follow-up group was representative of those who participated in 2000. In general, although some differences in demographic variables were found between the follow-up group and the group who were not followed up, after these factors had been taken into account, measures of work environment, health, and psychological well-being did not differ between the groups.

## 4.2.2 Measures

The main measures analysed in the present study are described below. In addition, basic demographic and work-related information (e.g. age, marital status, job type, day/night shiftwork, physical environment stressors) was obtained, together with body mass index (derived from self-reported height and weight), negative affectivity (assessed by the 12-item neuroticism scale (Eysenck et al., 1985), and ratings of subjective health ranging from 1 (poor) to 5 (excellent). These measures were used as control variables in the multi-variate analyses.

### 4.2.2.1 Social support

*Support from supervisors and co-workers.* The social support measure developed by House (1981) was used to assess work-related social support from supervisors and co-workers; these measures were used in 2000 and in 2005. The co-worker support scale had three items each with a 0 - 3 response scale; higher values represented greater levels of support (coefficient alpha = .82). The supervisor support scale included three items analogous in wording to those of the co-worker support scale; it also had two additional items. Coefficient alpha for this five-item scale was .86.

*'Support-seeking coping'.* The effects of social support on health-related outcomes may depend on the extent to which individuals chose to seek support from supervisors and co-workers when experiencing demanding work situations; it would be expected that social support would be a particularly effective resource for those whose tendency is to adopt coping strategies characterised by seeking support and advice from others in the environment. A six-item scale assessed the extent to which participants used this form of coping (coefficient alpha = .88).

### 4.2.2.2 Musculo-skeletal disorders (MSD)

*Assessment of back pain, shoulder pain, and neck pain (Vaernes et al. 1988).* In the baseline survey, musculo-skeletal disorders were assessed by three items which asked participants to indicate whether they had experienced back pain, neck pain, and shoulder pain, respectively over the previous six weeks; those who responded positively were also asked to rate the severity of pain on a three-point scale. This measure was coded as 0 = no symptoms, 1 = mild pain, 2 = moderate pain, and 3 = severe pain). At the five-year follow-up assessment, these items were again included.

*Nordic Musculo-skeletal Questionnaire (NMSQ).* Two sets of items from the NMSQ (Kuorinka et al., 1987) were used at the follow-up assessment: first, the initial NMSQ items provided a general assessment of MSD in different body parts over the past year and the past week: second, pain and incapacity due to back problems was assessed in more detail.

*Participation in MSD prevention courses.* Participants were asked to record whether they had ever attended a course designed to reduce musculo-skeletal problems and, if so, how long ago, and whether it had been helpful, rated on a 1 (not at all) to 5 (very helpful) scale.

## 4.3 Results

### 4.3.1 Descriptive data

Table 4.1 shows descriptive statistics (means, SD's, and ranges) for the study variables.

**Table 4.1**  
**Descriptive statistics for study variables at baseline and follow-up**

	Mean	SD	Range
<i>Baseline data (2000)</i>			
Age (years)	43.2	8.2	21-59
Negativity affectivity (neuroticism)	4.0	3.1	0 - 12
Supervisor social support (item mean)	1.5	.74	0 - 3
Co-worker social support (item mean)	1.9	.66	0 - 3
Body mass index	26.3	3.0	20.7 - 37.4
MSD back pain rating	0.52	.84	0 - 3
<i>Follow-up data (2005)</i>			
Supervisor social support (item mean for 5 items)	1.5	.74	0 - 3
Co-worker social support (item mean for 3 items)	1.9	.66	0 - 3
'Support-seeking' coping	2.4	.68	1 - 4
MSD back pain rating	0.75	.94	0 - 3
NMSQ proportion with lower back problems during previous year	49%		
NMSQ proportion with at least one MSD problem during previous year	84%		
<i>Participation in MSD prevention course</i>			
Percentage reporting participation at some time	42%		
Percentage reporting participation in past 3 years	23%		
Rating of the perceived helpfulness of the course*	3.7	.95	1 - 5

\* This item is based on n=74 (those who had attended the MSD prevention course); for all other data, N=187

### 4.3.2 *Change in social support, 2000 - 2005*

Mean scores on both supervisor support and co-worker support increased over the five-year follow-up period; however, the magnitude of the change was significant only for supervisor support ( $F=18.1$ ,  $df=1$ ,  $p<.001$ ). Moreover, the extent of the change was not affected by job type, age, or negative affectivity (NA), although NA was negatively related to supervisor support at baseline (2000) and at follow-up (2005).

### 4.3.3 *Change in MSD, 2000 - 2005*

*Back pain.* The proportion of the sample reporting some degree of back pain increased significantly from baseline (34%) to follow-up (46%),  $\chi^2 = 6.5$ ,  $p<.02$ . Among those reporting back pain at baseline ( $n=85$ ), there was a highly significant increase in the perceived severity of pain at follow-up (non-parametric Sign test,  $Z=5.5$ ,  $p<.001$ ); 66% of this group reported an increased level of back pain.

*Shoulder pain.* The proportion of the sample reporting some degree of shoulder pain increased from baseline (22%) to follow-up (29%), but this increase was only marginally significant,  $\chi^2 = 2.72$ ,  $p<.10$ . There was no evidence that the degree of pain increased among those who reported some level of pain at baseline.

*Neck pain.* There were no significant changes from baseline to follow-up in the incidence or severity of neck pain

### 4.3.4 *Multivariate analysis of social support in relation to back pain*

Binary logistic regression was used to examine the roles of social support from supervisors and co-workers as predictors of back pain at follow-up, controlling for baseline back pain levels. Additional control variables included at the initial step of this model were age, BMI, subjective health rating (from 1 = 'poor' to 5 = 'excellent'), NA, and physical environment stressors. Back pain at baseline was a positive and highly significant predictor ( $p<.005$ ) of back pain in 2005, reflecting the fact that 21% of the total group ( $N=187$ ) reported back pain at both time points. Over and above this baseline measure, subjective health ratings were negatively related to back pain at follow-up ( $p<.05$ ), while the measure of physical environment stressors was a significant and positive predictor ( $p<.02$ ).

In addition, both supervisor support and co-worker support were significant; however, as shown in Table 4.2, the direction of effect was different for the two measures. Supervisor support was a negative predictor of the occurrence of back pain at follow-up; thus, low supervisor support acted as a risk factor for back pain at follow-up. In contrast, co-worker support was a significant positive predictor, with a relative risk value of 1.99. Thus, high levels of co-worker support (+1SD above the mean) almost doubled the risk of back pain at follow-up. The measure of 'support-seeking coping', also included at this stage of the analysis, was non-significant.

The second stage of the model tested the possibility of person-environment interaction, i.e. that individuals who report high scores on the measure of support-related coping will benefit disproportionately from an environment that provides high levels of support. The *support-seeking coping x social support* interactions were therefore included in the model (Model 2) at this stage. The interaction between coping and supervisor support was non-significant and was dropped from the model, but the *support-seeking coping x co-worker support* term was significant.

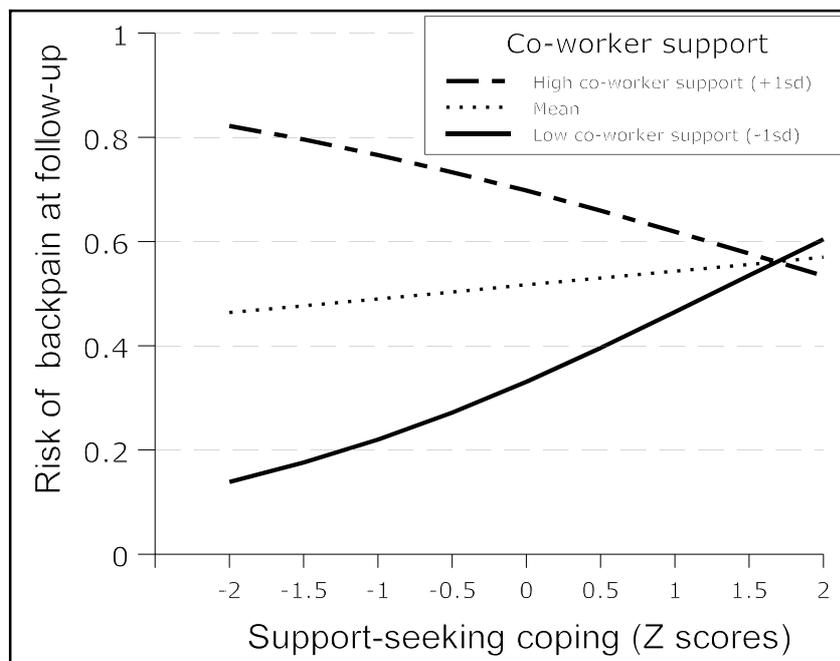
**Table 4.2**  
**Prediction of back pain at follow-up from back pain at baseline, control variables, and social support measures**

	<i>Model 1</i>		<i>Model 2</i>		Relative risk (RR) and confidence intervals (CI) from Model 2	
	Control variables, social support, and coping Main effects only		Control variables, social support, and coping. + Interaction term			
	B	Significance	B	Significance	RR	95% CI
Baseline back pain	1.07	p<.005	1.2	p<.001	3.5	1.66 - 7.39
Supervisor support	-.43	p<.025	-.49	p<.02	0.61	.42 - .90
Co-worker support	.57	p<.005	.69	p<.001	1.99	1.31 - 3.01
'Support-seeking' coping	-.02	ns	.03	ns	1.03	.73 - 1.47
Co-worker support x 'support-seeking' coping			-.47	p<.02	.63	.43 - .92
<i>Constant</i>	-.57	p<.01	-.54	p<.01		
<i>Nagelkerke R<sup>2</sup></i>		.25		.29		

*Note.* N=187. The data shown are derived from two simultaneous models; in each model all predictor variables are adjusted for all others. Baseline back pain, and control variables age, NA, health ratings, physical environment, and BMI (not shown) were included in both models. Continuous variables were standardized prior to entry.

The form of the interaction is represented graphically in Figure 4.1. It can be seen that, in a cohesive environment with high support from co-workers, the probability of back pain at follow-up, after taking into account baseline back pain and other control variables, decreases with an increase in individual tendency to cope by seeking social support, i.e. it appears that this form of coping has a favourable effect in a supportive environment. However, in a low co-worker support environment, the probability of back pain at follow-up increases with increase in the tendency to seek support, suggesting that in this environment the needs of those high in support seeking are not being met.

Overall, personnel who are low in support-seeking and who work in a low support environment show the lowest probability of back pain at follow-up, whilst those who do not tend to seek support in a high support environment show the highest probability. Thus, there is some evidence of person-environment fit effects although it is not clear why co-worker support is associated with increased probability of back pain at follow-up. However, as noted in the Chapter 1, other studies have also found that high co-worker support can act as a risk factor for MSD complaints and MSD-related sickness absence.



**Figure 4.1**  
Interaction between co-worker support and support-seeking coping in predicting back pain at follow-up

#### 4.4 MSD complaints, social support, and ‘work ability’

Whilst the analyses presented in the previous sections treated MSD as an outcome predicted by work conditions, individual factors and, in particular, social support, the present data set also provided an opportunity to examine the role of social support and MSD as predictors of ‘work ability’, a construct which has attracted considerable research attention in recent years, particularly in the context of an ageing workforce.

A self-report measure of ‘work ability’ (Tuomi et al., 1991; Tuomi et al., 2004) has been widely used in Scandinavia to assess factors affecting the extent of decline in work capacity (physical and psychological) with age. The scale covers seven aspects of work capacity (current ability in relation to lifetime best, work ability in relation to physical and mental job demands, number of current diseases, and subjective rating of impairment due to these diseases, sickness absence in past year, prognosis of work ability in two years’ time, and current mental resources). One aim of examining work ability in relation to age is to identify work-related risk factors that could guide work re-design interventions intended to reduce the extent to which work capacity declines with age.

In the present context, the roles of age, social support, MSD and psychological were of particular interest well-being in relation to work ability. Tuomi et al. (1991) found a significant negative relationship between MSD and work ability ratings but did not consider the role of social support as a potential moderator of this relationship. These authors also found a significant negative relationship between psychological distress and work ability. The analyses reported here sought to examine this pattern of findings in more detail, with particular reference to mediating and moderating relationships.

#### **4.4.1 Measures**

*Work ability.* The measure of 'work ability' was based closely on the Scandinavian measure, but with some revision to improve clarity. The scale as used here had 10 items. Coefficient alpha for this revised measure was .79.

*Psychological distress.* The 12-item General Health Questionnaire (GHQ-12) was used to assess current level of psychological distress; the total score, based on Likert scale scoring (0-3), was calculated.

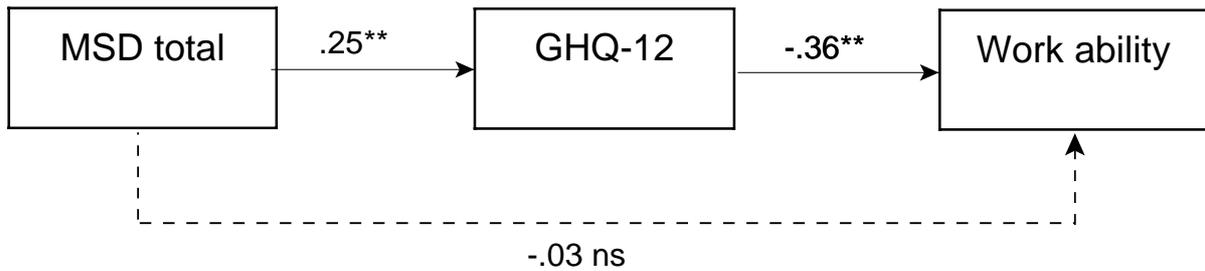
The other measures used in this analysis (age, social support from supervisors, physical environment stressors) were those described in Section 4.2.2.

#### **4.4.2 Analyses**

In these analyses, work ability was treated as the outcome measure, and age, total MSD scores, GHQ-12 scores, physical environment stressors, and social support as predictor variables.

*Mediating role of psychological distress.* Initial regression analyses demonstrated that both MSD and GHQ-12 scores were significant predictors of work ability when entered separately into the regression (in this analysis, age and physical environment stressors were treated as control variables, and both had significant negative effects on work ability). However, when MSD and GHQ-12 were entered together, only GHQ-12 remained significant ( $p < .001$ ); MSD was non-significant ( $t < 1$ , ns). These results are consistent with a pattern of mediation by which MSD gives rise to psychological distress which in turn impacts adversely on work ability (see Figure 4.2).

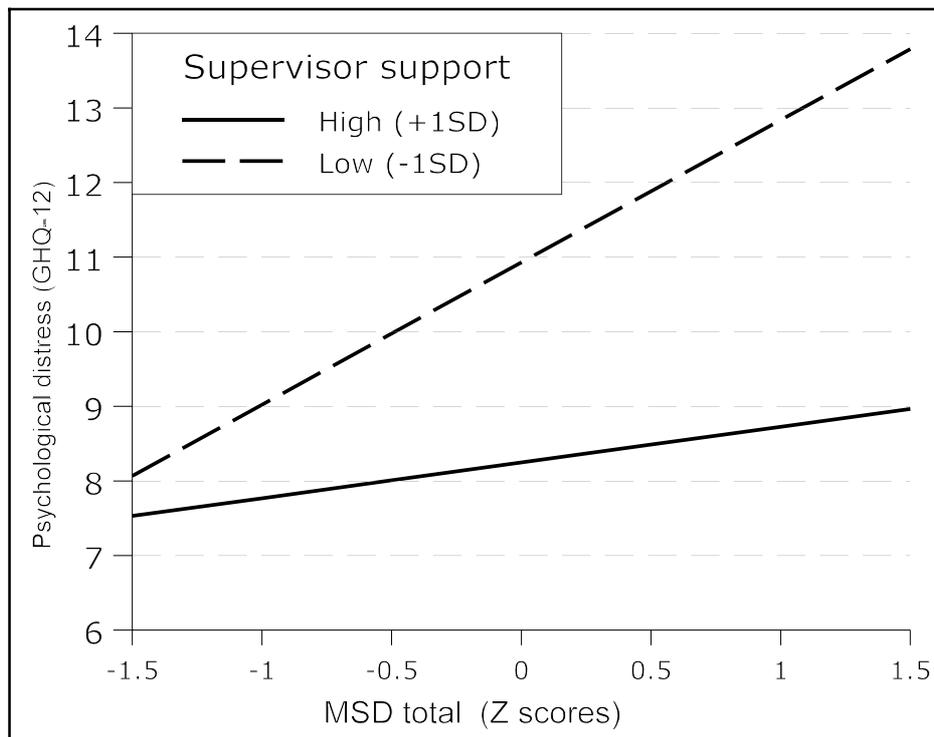
*Moderating role of supervisor support.* In the next step of the analysis, the role of social support as a potential moderator of the relationships shown in Figure 4.2 was tested. There was no evidence of an interaction between GHQ-12 and supervisor support in predicting work ability; however, supervisor support did moderate the relationship between MSD and GHQ-12. For the interaction term,  $t = -2.21$ ,  $df = 1,182$ ,  $p < .05$ .



*Note. The coefficients shown are the unstandardized regression coefficients (B values)*

**Figure 4.2**  
**Psychological distress as a mediator of the MSD / work ability relationship**

The form of the interaction is shown in Figure 4.3. At low levels of supervisor support (1 SD below the mean), there is a direct and significant ( $t=3.90$ ,  $df=1,182$ ,  $p<.001$ ) relationship between MSD and GHQ-12. In contrast, at high levels of supervisor support (1 SD above the mean), the relationship is weak and non-significant ( $t=1.18$ ,  $df=1,182$ , ns). Thus, the pattern of results suggests that high levels of distress occur when individuals with high MSD symptom levels work in environments with low levels of social support.



**Figure 4.3**  
**Relationship between MSD and psychological distress (GHQ-12) for high and low levels of social support**

The moderating effect of social support also has implications for work ability; under conditions in which MSD is not related to psychological distress (i.e. under high support conditions), the overall mediating effect shown in Figure 4.2 would not occur as the first stage in the process (i.e. the effect of MSD on psychological distress) is not significant. However, under low support conditions, MSD has a strong effect on psychological distress; thus, under these conditions, the indirect pathway by which MSD affects work ability acts through the mediation of psychological distress would apply.

These results add to the evidence of the role of social support in relation to the effects of MSD, and indicate that psychological distress may also play a role in the process by which MSD symptoms are associated with low work ability and other adverse work-related outcomes. However, it should be noted that the work ability analyses are based on cross-sectional data (all variables were assessed at the 2005 follow-up), and therefore do not permit causal interpretation, although the results are consistent with the causal sequences hypothesised.

#### **4.5 Participation in MSD prevention course**

In 2005, respondents were asked if they had ever attended a course designed to prevent or alleviate MSD problems; 42% of the sample had done so, 23% within the past three years. The perceived helpfulness of the course was also assessed (1-5 scale). Chi-square tests were carried out to determine if attendance at a course was associated with a lower rate of MSD problems as recorded by the NMSQ questionnaire in 2005. Only lower back pain showed significant associations ( $p < .05$ ) with course attendance; a higher proportion (58%) of those who had attended a course reported lower back problems as compared with those who had not attended a course (42%). This result suggests that personnel with a history of back problems are more likely to be offered MSD-prevention courses, although it is also possible that attendance at such courses may increase an individual's awareness of MSD problems.

#### **4.6 Summary of findings**

- The proportion of the sample reporting some degree of back pain increased significantly from baseline to five-year follow-up. Among those reporting pain at baseline, there was also a significant increase in the perceived severity of pain.
- In a longitudinal multivariate analysis, both supervisor support and co-worker support were significant factors in back pain at follow-up, after adjustment for back pain at baseline and other control variables. However, the effects were in opposite directions; high supervisor support reduced the risk of back pain, while high co-worker support was associated with increased risk.
- A significant interaction was found between co-worker support and 'support-seeking' coping strategies in predicting back pain at follow-up. Individuals in high co-worker support environments were particularly at risk of back pain if they were low in support-seeking coping tendencies.
- MSD symptom levels were found to impact on 'work ability' (as assessed by a self-report scale) indirectly; thus, MSD was associated with psychological distress, which in turn was associated with poor 'work ability'. Supervisor support moderated the association between MSD and distress; the relation was stronger for high support.

## 5. CONCLUSIONS

The analyses described in this report examined measures of work-related social support in relation to MSD outcomes, including symptoms, pain ratings, and sickness absence. These analyses are set out in Chapters 2, 3 and 4; this final section brings together the findings from the separate analyses, relates them to existing published literature, and considers some more general issues.

The MSD prevalence rates found in the two survey studies were consistent with those reported elsewhere for industrial groups (e.g. Aasa, Barnekow-Bergkvist, Angquist, & Brulin, 2005; Ijzelenberg & Burdorf, 2005; Clays et al., 2007). Thus, in this respect, the present samples can be considered representative of a wider population of workers, and the findings relating to social support at work can be regarded as potentially relevant to male industrial employees more generally.

In each of the three studies, different patterns of results were found for supervisor support and co-worker support; accordingly, these two aspects of work-related support are considered separately in reviewing the findings. In one of the studies, the role of partner support (over and above the two measures of work support) was examined, and these findings are also noted. However, to present the findings of the present empirical work in a wider context, it is useful first to consider issues relating to the nature and assessment of social support in work settings.

### 5.1 The nature and assessment of social support in work settings

Researchers have distinguished several different types of social support. For instance, House (1981) addressed these issues in some detail; focusing on the role of support in work settings, he identified four types of support, and noted the patterns of behaviours that characterized each of them, as outlined below.

- *Emotional support* (the provision of empathy, caring, love, and trust); supportive behaviours include listening, encouraging, understanding, showing concern and respect).
- *Instrumental support* (direct help for the person in need); supportive behaviours include provision of money and other tangible aid, resources, and assistance.
- *Informational support* (provision of information that people can use in coping with personal and environmental problems); supportive behaviours include offering advice, suggestions, directions, and information.
- *Appraisal support* (provision of information that individuals can use in evaluating themselves); supportive behaviours include feedback, affirmation, praise, and social comparison.

Emotional support is generally regarded as the most important form of support in relation to health and psychological well-being, but in the work environment the other kinds of support also play potentially important roles. The importance of social support at work is recognized in the Management Standards document produced by the Health and Safety Executive ([www.hse.gov.uk/stess/standards](http://www.hse.gov.uk/stess/standards)) to provide guidance for reducing stress at work, in which social support (“*encouragement, sponsorship, and resources provided by the organisation, line management and colleagues*”) is one of the six main areas of concern.

The four types of support identified by House (1981) were reflected in the measures of supervisor and co-worker support used in the present studies. Thus, three items (each rated on a 0–3 scale) asked respondents to what extent co-workers could “*be relied on when things got tough at work*”, were “*willing to listen to your work-related problems*”, and were “*helpful to you in getting your work done*”. The same three items were also asked in relation to supervisor support, but this scale had two additional items asking to what extent supervisors were perceived to be “*concerned about the welfare of the member of their work group*”, and to what extent they “*went out of their way to praise good work*”. Partner support in relation to work problems was assessed by items analogous to the first two items used to assess supervisor and co-worker support. These scales thus allowed separate assessment of several aspects of work-related social support from people in three different roles (supervisors, co-workers, and partners).

## 5.2 Supervisor support

Considering, first, the two survey studies, both the cross-sectional large-sample analysis (described in Chapter 2) and the longitudinal analysis (described in Chapter 4), found that high supervisor support was associated with a lower risk of reported MSD problems. Thus, in cross-sectional data, high supervisor support was associated with low risk of MSD problems (RR = 0.87, 95% CI, 0.80 - 0.95); the relative risks for the separate analysis of MSD in back, neck and shoulders were similar in magnitude to the overall value. This multivariate analysis incorporated adjustment for age, negative affectivity, and other dimensions of the psychosocial and physical work environment. In addition, low supervisor support was found to predict the severity of pain perceived by those who reported at least one MSD symptom.

Similarly, in the longitudinal analysis of survey data which allowed control for prior levels of MSD (specifically, back pain), high supervisor support significantly predicted lower risk of back pain at follow-up after a five-year interval (Chapter 4). In this study, the relative risk value was RR = 0.61, 95% CI, 0.42 - 0.90. Thus, both cross-sectional and longitudinal survey findings suggest that high supervisor support plays a favorable role in relation to MSD symptoms. Moreover, the findings agree with other published work based on survey data (e.g., Aasa et al., 2005; Ijzelenberg & Burdorf, 2005) which also concluded that high social support was associated with reduced risk of MSD.

However, non-significant findings have also been reported for supervisor support in relation to MSD (e.g. Gheldof, Vinck, Vlaeyen, Hidding, & Crombez, 2005; van den Heuvel, van der Beek, Blatter, Hoogendoorn, & Bongers, 2005) and, as noted in Chapter 1, most authors who have reviewed this literature have concluded that there is not sufficient evidence of

significant effects of supervisor support on MSD outcomes. One limitation of this literature is that supervisor and co-worker support are not always treated separately in collecting and analyzing data (e.g. Wadman & Kjellberg, 2007). Failure to assess supervisor and co-worker support separately may have led to some of the conflicting findings in the published literature.

The present work also examined MSD-related sickness episodes in relation to social support at work (Chapter 3). In this analysis, the main finding was that, although supervisor support did not have an overall effect on absence episodes, there was a significant interaction between supervisor support and prior episodes in predicting subsequent episodes. Thus, prior episodes only predicted subsequent episodes when supervisor support was low. This finding implies that a supportive supervisor can break the cycle whereby previous absence tends to predict future absence; in view of concerns expressed about the cost of repeated absences among individuals experiencing MSD problems (Hansson & Hansson, 2005), this is a potentially important result.

Although some researchers have reported findings suggesting links between supervisor support and absence (e.g., Bartys, Burton, & Main, 2005), review articles have questioned the strength of the available evidence (e.g., Hansson & Jensen, 2004). To date, no published studies appear to have examined the particular interaction effect found to be significant in the present analysis, but it would clearly be of interest to pursue this research question.

Overall, the results of the present analyses tend to support the view that lack of social support is a risk factor for poor musculoskeletal health (e.g. Woods, 2005; Linton, 2001). However, this judgment applies only to supervisor support; as considered below, findings from the analyses of co-worker support in the present study present a more complex picture.

### **5.3 Co-worker support**

The results of the analyses of co-worker support in relation to MSD outcomes, as described in this report, are less clear-cut than those for supervisor support. Overall, neither the cross-sectional analysis of MSD symptoms, nor the analysis of MSD sickness absence, found significant main effects for co-worker support. Moreover, in the longitudinal analysis, co-worker support was positively related to the risk of back pain at follow-up, after adjustment for baseline back pain and for control variables, with relative risk values of  $RR=1.99$ , 95% CI, 1.31 - 3.01. The finding that high co-worker support has unfavorable effects on MSD outcomes appears surprising, but similar adverse effects have also been reported by other researchers (e.g., Gheldof et al., 2005; Elfering, Semmer, Schade, Grund, & Boos, 2002; Skovron et al., 1987).

However, the main effects, or lack of them, for co-worker support in relation to MSD outcomes do not fully reflect the pattern of results found in the present analyses. In particular, in analysis of the cross-sectional data, complex patterns of significant interaction effects were apparent; thus, the three two-way interactions among co-worker support, supervisor support and negative affectivity were all simultaneously significant in predicting MSD risk. The

significance of these interactive effects underlines the point made by other authors who emphasize the importance of considering possible interactions among psychosocial factors in relation to MSD outcomes (e.g. Elfering et al., 2002; Leroux, Brisson, & Montreuil, 2006; Kjellberg & Wadman, 2007; Regulies & Krause, 2005).

The form of the interaction between co-worker and supervisor support found in the present analysis is consistent with that reported by Elfering et al. (2002) in that, in both studies, the combination of low supervisor support and high co-worker support was associated with adverse outcomes (in the present case, high risk of MSD symptoms). Elfering et al. suggest that being dependent on one source of support in an unsupportive environment may create feelings of dependence, incompetence, and reciprocity obligations; this explanation could also serve to explain why, in the present study, interactions of social support measures with negative affectivity were also found. However, in the Elfering et al. study, co-worker support was assessed in terms of support from closest co-worker, rather than co-workers in general, as in the present study.

Further light is thrown on the issue of interactive effects involving co-worker support by findings from the longitudinal analysis of survey data (Chapter 4). In this analysis, an interaction between co-worker support and ‘support-seeking coping’ was significant. The form of this interaction was such that in a cohesive environment with high support from co-workers, the probability of back pain at follow-up decreases with increase in individual tendencies to cope by seeking social support. However, in a low co-worker support environment, the risk of back pain increases with increase in the tendency to seek support, suggesting that the needs of those high in support-seeking are not being met.

Thus, there was some evidence of person-environment fit effects; individuals low in ‘support-seeking’ coping working in a low co-worker support environment showed the lowest risk of back pain whereas, in a high co-worker support environment, individuals low in this form of coping showed the highest risk. However, the overall effect of low co-worker support in reducing back pain risk was more marked than the interaction effects, and the underlying causes of this effect remain unclear.

Overall, the findings relating to co-worker support suggest that individual and environmental characteristics influence the nature and magnitude of relations between co-worker support and MSD outcomes. However, it would be unwise to place too much emphasis on interpreting the particular interaction effects observed in the present analyses. The more important implication is that interactive effects should not be overlooked in analyzing MSD risks; it is still the case that many researchers focus solely on additive main effect models. In doing so, they may find that the main effects they report are weak because potentially significant interactions have not been taken into account. One area in which greater attention has been given to analyzing interactions is in relation to the dimensions of the demand-control-support model of work stress (e.g., Kjellberg & Wadman, 2007; Leroux et al., 2006). In the present study, however, predicted interactions among these dimensions were not found to be significant.

## **5.4 Partner support**

Only one of the three studies described in this report examined the role of partner support. The analysis of MSD-related sickness episodes showed that partner support was a significant predictor of follow-up episodes, after adjustment for prior episodes and other control variables, including supervisor and co-worker support. However, the direction of effect was not as expected; having a supportive partner increased, rather than decreased, the likelihood of sickness episodes during the follow-up years. There was a similar, but non-significant, trend for reporting medical treatment for MSD problems. It appears that a supportive partner may encourage individuals to be more health conscious, more sensitive to MSD problems, and more likely to stay away from work when experiencing MSD pain. In this context, it may be relevant that the data analyzed all related to male samples. Findings for partner support may depend on gender; studies of female samples would throw light on this issue.

## **5.5 Methodological issues**

As a background to the present findings, it is important to note a number of methodological limitations of the studies reported. Thus, the MSD measures used were limited to back, neck, and shoulder symptoms; the same measures of work-related social support were used throughout; the longitudinal survey data were only available for a relatively small sample; and the analyses in Chapters 2 and 4 relied entirely on self-report data (although Chapter 3 was based on archival records of MSD-related absence episodes). Moreover, all the study participants were men. The findings reported must therefore be regarded with some caution; however, they serve to highlight some areas which would merit further investigation. Moreover, as noted in the Introduction (Chapter 1), methodological issues are important in research into social support and MSD, and improvements in methodology would help to resolve some of the many inconsistencies and conflicting findings apparent in the published literature.

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<sup>1</sup> This reference list covers all literature cited in Chapters 2 – 5. References cited in the literature review in Chapter 1 are listed in Section 1.7 (Page 14) immediately following the review.

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# Social support and musculoskeletal disorders

## Literature review and data analysis

This report examines the role of work-related social support as a risk factor for musculoskeletal disorders (MSD). A review of the literature is presented, and empirical data analyses reported.

- The literature review evaluates recent findings, and notes some methodological issues. Although some prospective studies report findings linking low social support to MSD outcomes, many inconsistencies are apparent in the results.
- Three data sets were analysed using descriptive and multi-variate methods:
  - i) cross-sectional survey data (N=2906, oil industry);
  - ii) certificated MSD absence data covering a five-year period (N=531, civil servants);
  - iii) longitudinal survey data (N=195, onshore oil industry).
- The analyses demonstrated that high supervisor support was associated with lower rates of MSD problems, lower pain severity, and fewer MSD-related absences (after adjustment for prior absences).
- The findings for co-worker support were less clear; in two analyses, no overall relationship with MSD was found; in one analysis, high co-worker support was a risk factor for back pain. However, interactions of co-worker support with other factors revealed a more complex pattern of results.
- In the analysis of MSD sickness absence, high partner support was a significant risk factor for subsequent absence episodes, after adjustment for prior episodes, work-related social support, and control variables.

These results are considered in relation to existing literature findings in a final section of the report.

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