COPING WITH MUSCULOSKELETAL PAIN AT WORK
AND THE EFFECTS ON WORK PERFORMANCE

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A thesis submitted to the University of Surrey for the degree of
Doctor of Philosophy

October 2006

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ABSTRACT

Musculoskeletal disorders (MSDs) describe a wide range of degenerative and inflammatory disorders of the musculoskeletal system. They result in pain and disability and threaten the future of many workers and the effectiveness of many organisations. The literature shows that MSDs follow a pathological process that may lead to disability and during this process workers may be present at work despite experiencing symptoms. To date, workers’ experiences of musculoskeletal pain in the work context have received little attention. The present research aimed to gain insight into the musculoskeletal pain experiences of office workers while at work. The study explored the range of coping strategies that office workers use in order to deal with musculoskeletal pain at work and the factors that have an effect on their decision making in using particular coping strategies. It also assessed the effects of musculoskeletal pain on work performance.

A mixed methods approach was taken that used both a questionnaire survey and qualitative interviews. A number of sampling methods were used for the questionnaire survey including convenience sampling, and distribution to local companies. In this way the survey was administered to a group of 720 office workers. After checking for eligibility against the criteria for entry to the study, 120 useful responses were entered into the SPSS (version 13.0) for statistical analysis. Factor analysis was applied to the questionnaire coping items that led to an eight factor solution. The extracted factors, pacing, ignoring pain, self-talk, social support, stretching, distraction/relaxation, resting, and exercise explained 69.8% of the variance in coping. Most of the variance was explained by the factors, pacing (21.8%), ignoring pain (10.8%), and self-talk (9.1%); whereas resting (4.7%) and exercise (4.7%) explained the least variance in coping. Ignoring pain (99.2%), stretching (69.7%), and pacing (60.5%) were found to be the most common ways of dealing with musculoskeletal pain at work. Seeking social support (30.3%) and distraction/relaxation (24.4%) were the least frequently used strategies.
33% of the participants reported that musculoskeletal pain reduced their productivity on average, by 16%, where work pace, time spent working on tasks, and the amount of work done were the main factors affecting productivity. Quality of work done and time spent on work that had to be redone were reported as the least affected productivity areas.

The survey results were used to inform the interview sampling process. A purposive sample of 18 participants was recruited based on their gender, age, musculoskeletal symptoms, and organisation. Semi-structured, individual and tape recorded interviews were performed with these participants at their convenience. Tapes were transcribed verbatim and transferred to the qualitative data analysis software NUD*IST (N6) for analysis. The pre-specified themes, coping strategies, decision making, and work performance, were used as key themes for the analysis. A conceptual framework was developed based on these themes and data collection was continued until no new information was uncovered.

As a result, the interviews revealed that the office workers used a range of both cognitive and behavioural strategies in order to deal with pain while at work. These strategies were confirmed by the questionnaire survey. The use of coping strategies was affected by job characteristics, as well as personal and pain characteristics.

Some of the office workers reported, during the interviews, that they kept their pain hidden due to lack of trust, fear and feelings of job insecurity. A number of them developed poor coping strategies (e.g. cutting down from rest breaks) in order to keep up with their productivity requirements. The results demonstrate the importance of creating an atmosphere of trust that will allow workers to discuss their musculoskeletal health issues, and not hide them using poor coping methods. If pain remains hidden the future outcomes may be more serious health problems or progress to disability.
ACKNOWLEDGEMENTS

Firstly I would like to thank my supervisors Professor Peter Buckle and Professor Helen Cowie for their valuable advice and support throughout the accomplishment of this thesis.

I am also grateful to Dr Akin Cellatoglu who encouraged me in doing my Ph.D. at the University of Surrey and provided me with peerless support when things got difficult.

I would also like to thank all the participants who gave their valuable time in participating in the study.

I am grateful to all the staff of the Robens Centre for Health Ergonomics for their help and advice during different phases of the study. I am especially grateful to Mr Geoff David and Dr Val Woods for their guidance and advice at different stages of the thesis.

I am also thankful to my grandparents, brother in law Mustafa and my sister Nurhan for their continued support.

Last but not least, I would like to thank to my parents who sponsored this valuable study. Dear mum and dad, thank you for your peerless support and faith in me throughout this tough journey. Without your support it would have never been possible.

I dedicate this thesis to my family.
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<td>Available Motions Inventory</td>
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<tr>
<td>BLS</td>
<td>Bureau of Labour Statistics</td>
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<td>BPS</td>
<td>British Psychological Society</td>
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<td>CPCI</td>
<td>Chronic Pain Coping Inventory</td>
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<td>CSQ-R</td>
<td>Coping Strategies Questionnaire-Revised</td>
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<tr>
<td>CTD</td>
<td>Cumulative Trauma Disorder</td>
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<td>CTS</td>
<td>Carpal Tunnel Syndrome</td>
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<td>EU</td>
<td>European Union</td>
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<td>ESWC</td>
<td>European Survey of Working Conditions</td>
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<td>EWPS</td>
<td>Endicott Work Productivity Questionnaire</td>
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<td>HSWA</td>
<td>Health and Safety at Work Act</td>
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<td>Health and Labor Questionnaire</td>
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<td>HWQ</td>
<td>Health and Work Questionnaire</td>
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<td>HSE</td>
<td>Health and Safety Executive</td>
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<td>IASP</td>
<td>International Association for the Study of Pain</td>
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<td>IOM</td>
<td>Institute of Medicine</td>
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<td>JCS</td>
<td>Jalowiec Coping Scale</td>
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<td>LBP</td>
<td>Low Back Pain</td>
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<td>LFS</td>
<td>Labour Force Survey</td>
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<td>MCI</td>
<td>Multidimensional Coping Inventory</td>
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<td>MSD(s)</td>
<td>Musculoskeletal Disorder(s)</td>
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<td>National Research Council</td>
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<td>PCI</td>
<td>Pain Coping Inventory</td>
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<td>PI</td>
<td>Pain Index</td>
</tr>
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<td>Pt</td>
<td>Participant</td>
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<tr>
<td>SD</td>
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<td>SPS</td>
<td>Stanford Presenteeism Scale</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
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<td>Description</td>
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<tr>
<td>SWI</td>
<td>Self-reported Work-related Illness</td>
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CHAPTER 1

1 INTRODUCTION

Musculoskeletal disorders (MSDs) are a great concern for individuals, organizations and governments with its impact both health wise and also as financial impact they have on countries’ economies (Buckle, 2005; Buckle and Devereux, 2002). To date the focus of both organizations and researchers have been on the cost of these disorders in terms of compensations paid by the employers and also the days spent off-the job as a measure of productivity loss; however, there is now a growing interest in assessing the impact of ill-health conditions while workers are on-the job and are suffering from the symptoms of an illness (Loafland, 2004; Meerding et al., 2005).

1.1 Definition of pain

Pain has been defined as a protective sign for the human body that can be physical or psychological in origin (Jacques, 1994). As Fields (1999) writes, for the ancient Greeks, pain was grouped with the emotions or appetites, not with sensation. They considered pain to be the opposite of pleasure and that this view of pain as pure emotion went into decline in the late 19th century, with the development of quantitative psychophysical methods to study sensation.

As emphasised by Loeser and Melzack (1999) the best definition for pain is the one explained by The International Association for the Study of Pain (IASP):

"An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."

(Merskey et al., 1979)
Nociception is the other term used to describe pain and is viewed as a protective mechanism that occurs when tissues are being damaged, causing the individual to react to remove the painful stimulus (Barber, 1997). According to Tanelian and Brunson (1994), nociception (as the perception of a real or potentially damaging stimuli) might be a more accurate term to represent the equivalent of pain in humans.

1.2 Classification of pain

Pain is a complex physiological and psychological phenomenon that could not be categorised easily. As it is stressed by Hawthorn and Redmond (1998) no single universal system exists to classify pain and a single pain may fall into more than one category (Chong and Bajwa, 2003). Pain is often classified according to its duration. Therefore, in terms of its temporal descriptions, it has been divided into two categories as acute (short term) and chronic (long term). According to Carr and Goudas (1999), acute pain is "the normal, predicted physiological response to an adverse chemical, thermal or mechanical stimulus associated with surgery, trauma and acute illness". As Loeser and Melzack (1999) writes, it is elicited by substantial injury of body tissue and activation of nociceptive transducers at the site of local tissue damage. Acute pain is short lasting and usually manifests itself in very objective ways that can be easily described and observed. It may, for example, cause sweating or an increased heart rate. It can last for several days, increasing in intensity over time (subacute pain), or it can occur intermittently (episodic or intermittent pain). Chronic pain on the other hand, usually triggered by an injury or disease, but may be perpetuated by factors other than the cause of the pain (Loeser and Melzack, 1999). It is defined as, "pain that persists for longer than the expected time frame for healing or pain associated with progressive non-malignant disease" (Ashburn and Staats, 1999). This kind of pain usually affects a person's life in many ways. It can change somebody's personality, their ability to function, and their overall life style.

1.3 Pain in the general population

Pain is expressed as a major health concern in the general population (Hasselstrom et al., 2002). According to Hasselstrom et al. (2002) in Swedish adult population between 7-59% individuals suffer from pain. A Finnish study reported that pain was
identified as the reason for 40% of the visits to seeing a physician, which was mostly attributed to pain localised in the lower back, followed by abdomen and head (Mantyselka et al., 2001). Mantyselka et al. (2001) reported that half of the pains diagnosed in their study were musculoskeletal. Picavet and Schouten (2003) suggest that musculoskeletal disorders and complaints are major concern in the public population as being the major cause of disability and absence from work. In their study the authors presented the estimates on the prevalence of musculoskeletal pain among Dutch population (25 years and older). The cross-sectional study with a population based survey revealed that lower-back pain was the most prevalent condition reported by 26.9% of the participants. The second and third most prevalent conditions however, were shoulder and neck pain with prevalence rates of 20.9% and 20.6% respectively (Picavet and Schouten, 2003).

Walker-Bone et al. (2004) expressed the impact of all musculoskeletal disorders within the general population. The authors stressed that, even though musculoskeletal disorders are infrequent cause of mortality, they are a major cause and therefore a significant health problem leading to disability and suffering.

1.4 Musculoskeletal pain among workers

According to a recent survey by Health and Safety Executive (HSE, SWI03/04), it is estimated that in 2003/04 more than 2.2 million people in the Great Britain suffered from an illness, which in their opinion was caused or made worst by current or past employment. Among these work-related illnesses, it is estimated that MSDs were most frequently reported conditions among others, with a prevalence of 1.1 million.

MSDs are defined as degenerative diseases and disorders that may be work-related (Work-related Musculoskeletal Disorders, WRMSDs) and result in pain and functional impairment. These conditions are shown to affect neck, shoulders, elbows, forearms, wrists and hands (Buckle and Devereux, 2002). As Hagberg et al. (1995) suggests, MSDs can be defined as work-related when certain work related factors contribute to their development. In the literature there are various other descriptive names used to define these conditions. For example 'repetitive motion injury',

3
'repetitive strain injury', and 'cumulative trauma disorder (CTD)' are the other names used to refer to those musculoskeletal conditions that seem to be work-related (Putz-Anderson, 1997). The world Health Organization defines work-related health conditions as multi-factorial, where multiple factors may contribute to their development (e.g. physical, work organizational, psychosocial, individual, and socio-cultural).

The epidemiological literature shows that external factors such as repetitive movements, awkward postures, static work and continuous loading of the tissue structures or lack of recovery time may lead to a pathological process that reveal itself as a MSD (Hagberg et al., 1995).

1.5 Implications for individuals

MSDs are not just a source of pain and suffering for the workers but also a significant burden on their families, employers, and may be a bigger community who they interact with (Boden et al., 2001). Dembe (2001) expresses his views on this issue as: "An injury or illness, whether caused by occupationally or not, can represent a significant life event becoming part of a person’s individual identity and approach to daily existence. An injury or illness thus potentially affects every aspect of life: the pursuit of a career, leisure activities, religious orientation and practice, personal and group relationships, family responsibilities, involvement in political activities, and so forth" (Dembe, 2001).

A study by Keogh et al. (2000) reported that 38% of participants (with upper extremity cumulative trauma disorders) in their study reported that they had been laid off, fired or quit the job they were possessing at the time of their injury. Moreover, half of those who were interviewed reported that their condition had resulted in family problems. Injured worker's inability to continue to work and to fulfil some social roles within the family and work settings may be comprised by diminished earnings and long term physical disability (Boden et al., 2001). This may lead to experiencing emotional problems such as depression. A similar study by Pransky et al. (2000) also found that participants who involved in their study experienced
injury-related anxiety due to persistent pain, which was more common in those with low back pain. The study also revealed that 44% of respondents suffered significant injury-related financial problems, in relation to the time spent off-sick (Pransky et al., 2000).

1.6 Implications for employers

According to Boden et al. (2001) the costs of occupational illnesses for employers are far more than it is estimated. The authors suggests that the studies have mainly focused on the costs of compensations paid to the employees; however hidden costs such as hiring and training replacements for injured workers, the impact on the productivity of co-workers, administrative and supervisory time devoted to the consequences of an injury or illness, and other productivity interruptions also needs to be explored (Boden et al., 2001; Reville et al., 2001).

1.6.1 Absenteeism

According to a survey performed by HSE (SWI03/04), it is estimated that in total 11.8 million days were taken off by the British workforce who suffered from a work-related musculoskeletal disorder comprising the period 2003/04. The same survey also revealed that of days taken off, 80% were attributed to the conditions mainly affecting the back (4.9 million days) and those mainly affecting the upper limbs or neck (4.7 million days). The remainder 20% were accounted for the lower limb conditions (2.2 million days). Moreover it is estimated that, people who had suffered from a musculoskeletal condition during this period (2003/04), took on average 19.4 days off-work in relation to their complaint. Despite these statistics however, almost two fifth of sufferers, 283 000 people, did not take any time off with respect to their condition. Many researchers are now alarming for the hidden impact on productivity of workers being present at work despite experiencing ill-health conditions (Aronsson, et al., 2000; Dew et al., 2005; Meerding et al., 2005; Berger et al., 2001; Stewart et al., 2003; Hemp, 2004).
1.6.2 Sickness presenteeism

Up to date many studies assessed the impact of ill-health conditions on lost productivity based on sickness absenteeism data; however many researchers are now drawing attention on the employees who are present at work and may have experience decreased productivity caused by impaired work functioning in relation to ill-health problems (Berger et al., 2001; Meerding et al., 2005). The phenomenon of being at work despite experiencing symptoms of a disease or illness is defined as ‘sickness presenteeism’ (Aronsson et al., 2000). A study conducted in Sweden reported that during a period of 12 months about 37% of the workforce were present at work despite experiencing ill-health problems mainly related to musculoskeletal pain, fatigue and depression (Aronsson et al., 2000). Hemp (2004) argues that being on the job despite experiencing the symptoms of an ill-health condition may reduce work productivity of a person by one-third or more. The author also suggests that sickness presenteeism might be a much costlier problem with respect to sickness absenteeism (Hemp, 2004); however lack of studies in the field makes it difficult to assess the impact of ill-health symptoms on the workplace productivity and leads to a new debate among researchers.

1.7 Aims of the study

This section states the aims of the present research. The results of the literature review revealed that there are office workers who are present at work despite experiencing musculoskeletal pain; however, how these workers deal with pain at work and the effects on work performance has not been addressed sufficiently. Therefore this study mainly aimed to gain insight into the musculoskeletal pain experiences of office workers. The sub aims were formulated as below:

- To explore the range of coping strategies that office workers use in order to deal with musculoskeletal aches and pains at work
- To explore the factors that have effect on the decision making of office workers in using or not using particular coping strategies
- To assess the effects of musculoskeletal pain on work performance
1.8 Overview of the thesis

The present thesis is made up of eleven chapters of which the first four chapters contain background information relevant to the study. The second chapter defines MSDs and gives an overview about the magnitude of the problem in society. The chapter furthermore discusses the existing models to conceptualise MSDs and reviews the risk factors that are shown to trigger or aggravate them.

Chapter three defines coping and reviews the studies that have assessed various coping strategies and their effects on different outcome measures. Moreover, the study discusses the coping dimensions that have frequently appeared in the reviewed studies. Finally the chapter reviews the studies (e.g. coping with musculoskeletal pain) that have been performed in the work settings.

Chapter four is concerned with ill-health and work performance. Therefore it considers the studies that have focused on different health problems and their effects on work performance. It reviews the studies that have focused on MSDs and work performance, of which performed in the experimental settings and work settings.

Chapter five is concerned about the methods in the literature that are used to assess musculoskeletal symptoms, coping and work performance.

Chapter six explains the methodological development of the study, which comprised of three stages. The first stage was an experimental pilot study performed in the laboratory. In the second stage the issues raised as a result of the first pilot study are addressed, which led to an observational field study. Finally in the third stage the issues raised as a result of the first and second pilot studies are addressed. That has led to a qualitative pilot study where focused groups were used as a methodology of investigation. Having done this, the chapter suggests methodological improvements for the main study.

Chapter seven is concerned about the methods and study design. It compares qualitative and quantitative methods; reviews qualitative research approaches and
compares them. Finally it explains the main study design consisting of two combined methodologies; questionnaire survey and qualitative interviews.

Chapter eight presents the results of the questionnaire survey.

Chapter nine presents the results of the qualitative study that comprised of three main themes, coping strategies, decision making, and work performance.

Chapter ten is concerned about the discussion of the results in the context of the present research. It provides a rationale for the study and reminds the formulated research questions, which is then followed by the discussion of the main findings, limitations of the study, and future research needs.

Chapter eleven (conclusions) refers to the main findings discussed in chapter ten and draws final conclusions about the study.
CHAPTER 2

2 MUSCULOSKELETAL PAIN AT THE WORKPLACE

The aims of this chapter are (1) to define and assess the impact of musculoskeletal symptoms on society, (2) to review the existing epidemiological evidence of work factors that have causal effect on the development of MSDs, and (3) to gain more insight to the existing approaches used in conceptualising these disorders.

2.1 Definition of musculoskeletal disorders

MSDs are very common ill-health conditions, which describe a wide range of inflammatory and degenerative diseases and result in pain, disability and functional impairment (Buckle and Devereux, 2002). Action has been taken in investigating and preventing these costly phenomenons, which may lead to sickness-absence and impaired work performance (Buckle, 2005). As it is stressed by Hagberg et al. (1995) MSDs are defined as work-related (WRMSDs) when it is evident that there exist work related components in their development (Armstrong et al., 1993). Armstrong et al. (1993) states that MSDs should be characterized as ‘work-related’ rather than ‘occupational diseases’, thus occupational diseases are characterised as those where there is a direct cause-effect relationship between hazard and disease. World Health Organization (WHO) also defines disorders as ‘work-related’ when various work factors significantly contribute in their development or exacerbation (Buckle and Devereux, 2002). WRMSDs can be classified under different clusters based on their pathological origin, such as those related to tendons, nerves, muscle, circulation, and joints or bursae (see Table 2.1; Hagberg et al., 1995).

Other names used to describe WRMSDs are ‘cumulative trauma disorders’, ‘repetitive motion disorders’, ‘repetitive strain injury’, ‘occupational overuse syndromes’, or ‘occupational cervicobrachial disorders’ (Hagberg et al., 1995; Silverstein et al., 1997).
Table 2.1: Classification of WRMSDs according to their pathology  (Hagberg et al., 1995)

<table>
<thead>
<tr>
<th>Tendon-related disorders</th>
<th>Nerve-related disorders</th>
<th>Muscle-related disorders</th>
<th>Circulatory/vascular type disorders</th>
<th>Joint-related disorders</th>
<th>Bursa-related disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tendinitis/ peritendinitis/ tenosynovitis</td>
<td>Carpal tunnel syndrome</td>
<td>Tension neck syndrome</td>
<td>Hypothenar hammer syndrome</td>
<td>Osteoarthritis</td>
<td>Bursitis</td>
</tr>
<tr>
<td>Epicondylitis</td>
<td>Cubital tunnel syndrome</td>
<td>Muscle sprain and strain</td>
<td>Raynaud's syndrome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>De Quervain's disease</td>
<td>Guyon canal syndrome</td>
<td>Mayalgia and myositis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dupuytren's contracture</td>
<td>Pronator teres syndrome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trigger finger</td>
<td>Radial tunnel syndrome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ganglion cyst</td>
<td>Throcic outlet syndrome</td>
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<td></td>
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<tr>
<td></td>
<td>Cervical syndrome</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Digital neuritis</td>
<td></td>
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</tbody>
</table>
According to Yassi (1997) differing terminology used and lack of case definitions is an obstruct in communicating research findings among researchers. Moreover Van Eerd et al. (2003) emphasised that an accurate identification of true cases, is a vital issue in epidemiological research into WRMSDs. Lack of a standardised classification system for the assessment of MSDs have resulted in inconsistent findings, and therefore hampered the management of these disorders (Davies, 1998). Buckle and Devereux (2002) state that development of a standardised classification system should be one of the priorities in the field of WRMSDs. Van Eerd et al. (2003) define a classification system as made up of two components: (1) the disorders/syndromes identified within the classification and (2) the criteria required for each disorder.

2.2 The magnitude of the problem

According to a survey performed within the EU (EC LFS ad hoc module 1999), it is estimated that almost 8 million people were suffering from a work-related health condition during a year period in 1998-1999. Of the cases the majority was attributed to the MSDs with a proportion of 53%. MSDs were followed by stress, anxiety and depression with a proportion of 18%, and pulmonary disorders 8%. An estimated 350 million working days were lost in relation to these health conditions. A similar figure, 340 million days lost (past year) was estimated as a result of the ESWC (The European Survey on Working Conditions) that was performed in 2000 (Vaughan-Whitehead, 2005).

According to a national survey by Health and Safety Executive (HSE), in 2003/04 it is estimated that 1.1 million people in the UK believed that they were suffering from a MSD that was caused or made worst by their current or past employment. Of these disorders 0.5 million were reported as those mainly affecting the back, whereas the number of people who were suffering from a musculoskeletal disorder mainly affecting the upper limbs or neck were 0.5 million. In total it is estimated that 11.8 million working days were lost in 2003/04 in relation to MSDs. On the average each person suffering took an estimated 19.4 days off during this period. This number equates to an estimated annual loss of 0.5 days per worker in the UK workforce. The
MSDs are also a great burden on the economy. The impact on the British economy is estimated to be £5.7 billion per year (Buckle, 2005).

MSDs are also shown to be one of the major constituent of the cost of work-related illnesses in the United States (US). The accurate cost of MSDs can not be estimated accurately due to technical difficulties, however it is estimated that the cost of LBP itself was more than $49.2 billion dollars in 1992 (Waters, 2004). An investigation carried out by the Bureau of Labor Statistics (BLS) in the US revealed that 522,528 people who were suffering from an MSD of which 75% were reported to be related to over-exertion and another 11.5% to be in relation to repetitive motion disorders (Waters, 2004). The same survey also revealed that 67% of the over-exertion injuries were back related. The median number of sick-leave days in relation to an MSD was 8 days, whereas the median sick-leave days for the rest of the injuries and illnesses together were 6 days. In addition, more than 43% of the sufferers took at least 20 days off from work, and almost 25% were off-sick for at least 31 days (Waters, 2004).

### 2.3 Pathogenesis of WRMSDs

WRMSDs are defined as heterogeneous in their nature that have multiple causes such as repeated pattern of movements or postures, static work, and continuous loading of tissue structures or lack of recovery time lead to a pathological process, which results as a WRMSD (Hagberg et al., 1995). Several authors have attempted in developing a model that would conceptualise the possible mechanisms in the occurrence of these disorders (Buckle and Devereux, 1999). One of these models was developed by Armstrong et al. (1993), which consider the interaction of four sets of different variables: exposure, dose, capacity, and response (see Figure 2.1). The model shown in the Figure 2.1 represents the state of the system where external factors such as work requirements produce an internal dose on the soft tissue structures (e.g. tendons, muscles, nerves etc.), which is then dealt by the organism by producing a physiological response to it (Armstrong et al., 1993). Despite that the model has shown to be useful in explaining the overall nature of the WRMSDs, it has also expressed that alternative pathways also exist that has not been considered in this model (Buckle and Devereux, 1999).
Another conceptual model was adopted by the NRC (see Figure 2.2) where factors are divided into two broad categories as 'workplace factors' and 'characteristics of the person'. Workplace factors consist of the external physical loads associated with work, organizational factors, and social context variables. The person on the other hand, as a biological entity, consists of a three-stage pathway that may be influenced by individual factors (e.g. age, gender, smoking habits, personal dispositions etc.) and lead to musculoskeletal outcomes such as pain, impairment, or disability (Feuerstein et al., 2004).

External loads resulting from biomechanical factors, such as posture, exertions and motions, which may also be mediated through individual factors (e.g. anthropometry, strength, and skill level etc.), are transmitted as internal loads on soft tissues and other anatomical structures. When the load exceeds the mechanical tolerance level of a particular structure that is differing among individuals, tissue deformation occurs.

‘Organizational factors’ on the other hand may influence the external demands of work through the organization of tasks, work pace, individual interactions, and the use of ergonomic principles in order to adopt the tasks according to both physical
and cognitive capacity of workers. ‘Social context factors’ however may affect external demands of work and individual’s response to these demands through influencing worker expectations and motivations. The impact of both organizational and social factors on individuals may be different. For example individuals may produce different cognitive and behavioural responses to musculoskeletal stimuli (represented by individual factors in Figure 2.2), which may result in difference in the experience of pain, impairment or disability (Feuerstein et al., 2004).

Feuerstein et al. (2004) suggests that some individual factors may play a mediating role on the workplace factors; apart from having an independent effect on biomechanical loadings, internal tolerances, and musculoskeletal outcomes. For instance the characteristics of an individual may be deterministic in the effects of workplace physical loads, organization, and social support on musculoskeletal outcomes. Therefore the authors suggests that the rectangle representing the ‘individual factors’ in the Figure 2.2 might have better been placed between the elements of ‘the workplace’ and ‘the person’ as specific mediators.

Indeed the NRC’s model considers individual as a passive element of the system, where the effects of workplace factors on the person are mediated through individual differences; however the model doesn’t consider that the workplace factors may also be mediated by individuals using different coping mechanisms. For example Feuerstein et al. (2004) suggests that the way that individuals perform work tasks (work-style model) may determine the future experience of musculoskeletal symptoms; which may then lead to work disability. It is also suggested that individual cognitions such as perfectionism, task persistence, and as such other cognitive and behavioural responses to work demands may lead to musculoskeletal symptoms. Feuerstein et al. (2004) defines ‘work-style’ as a way of coping with increased job demands; however, individual’s cognitive and behavioural responses to musculoskeletal symptoms (e.g. muscular pain, numbness, tingling etc.) and the way these symptoms dealt at work remains unclear.
Devereux (1997) suggests that psychosocial and organizational work factors may have direct effect on physical work factors (see Figure 2.3). Devereux’s model considers ‘individual’ as an active element in the system, such that the individual’s capacity may be altered through psychosocial and physical work factors. Individuals then can react to this change with cognitive and behavioural responses (e.g. changing work technique). In the model one of the factors that may lead individual to seek new work-system-self interaction is the level of pain sensation. Person’s interpretation of pain sensations (e.g. cognitive responses) and behavioural responses in order to deal with musculoskeletal pain sensation remains unclear and requires further insight.
Figure 2.3: A WMSD research model (Devereux, 1997).
2.4 WRMSDs: Risk factors

The previous section revealed that 'individual' as an element of the conceptual models for the development of the WRMSDs has been considered as a passive entity; however there is evidence to suggest that individuals can alter their exposures to risk factors at work (Feuerstein et al., 2004). This section reviews the existing epidemiological evidence regarding the relationship between various work factors and WRMSDs.

The epidemiological evidence would play an important role in heightening employee's awareness to risk factors and their management in preventing the occurrence of WRMSDs.

2.4.1 Physical work factors

A series of multidisciplinary panels were commissioned in the US with the aim to establish the relationship among occupational risk factors and MSDs (Punnett and Wegman, 2004). One of these panels was performed by the National Institute of Occupational Safety and Health (NIOSH) in the US where researchers and practitioners from different backgrounds came together in order to review the existing epidemiological evidence on WRMSDs (NIOSH, 1997). The review comprised of MSDs of the upper extremity and the low-back by means of exposure to physical factors at work; however the relationship of psychosocial factors to MSDs was also reviewed as these factors may play a role in the development of these disorders (Knardahl, 2005; Devereux et al., 2004).

In Table 2.2 (NIOSH, 1997) a summary of the strength of evidence is presented, which is classified into four different categories as 'strong evidence' of work relatedness, 'evidence' of work relatedness, 'insufficient evidence' and 'evidence of no effect'. According to NIOSH (1997) the evidence was classified as strong when a causal positive relationship was very likely between work-related risk factor and MSD, of which chance, bias and confounding factors could be ruled out with reasonable confidence. 'Evidence of work-relatedness' category were used when some convincing epidemiologic evidence were found to show a causal positive relationship between risk factor and MSD. The evidence was categorised as
'insufficient' when the available studies were not able to satisfy the required qualities (e.g. validity, reliability, statistical power) and were scarce in number to allow conclusions regarding the presence or absence of any causal relationship. 'Evidence of no effect' category was used to represent the risk factor(s) that was not related to development of MSD as a result of the conclusions drawn from adequate studies.

For the evolvement of neck and upper limb disorders a combination of repetition, force, posture, and vibration variables are reported to be responsible, with varying levels of evidence existing to support the contribution of these variables in the disease development process. For the neck and neck/shoulder disorders there is strong evidence to support the relationship with posture as a single variable. For repetition and force there is only evidence of relatedness of these variables with the neck and neck/shoulder musculoskeletal disorders. For vibration work factor however there is insufficient evidence to support a relationship of this variable with the MSDs of the neck/shoulder region. For shoulder region there exist no strong evidence of any variables to support a positive relationship with the shoulder MSDs; however there exist evidence for posture and vibration as single variables to be responsible from the MSD development of this region. There is no sufficient evidence to support the association of force and vibration with the shoulder MSDs. For the development of elbow MSDs NIOSH (1997) reports that a combination of repetition, force, and posture is positively associated with the development of the MSDs of this region, in which chance, bias and confounding factors could be ruled out with reasonable confidence. In addition NIOSH (1997) reports evidence that supports the positive association of force with the elbow MSDs, but there is insufficient evidence of relatedness of repetition and posture to the MSDs of this region.

The report focused on three different MSDs of the hand/wrist region, among which carpal tunnel syndrome (CTS) is one of them. For CTS the report suggested strong evidence of association with the combination of repetition, force, posture, and vibration work factors. For repetition, force, and vibration as single factors, evidence of association is reported; however there is insufficient evidence of positive

18
Table 2.2: Evidence for causal relationship between physical work factors and MSDs (from NIOSH, 1997).

<table>
<thead>
<tr>
<th>Body part</th>
<th>Risk factor</th>
<th>Strong Evidence</th>
<th>Evidence Insufficient evidence</th>
<th>Evidence of no effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck and Neck/Shoulder</td>
<td>Repetition</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Posture</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vibration</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Shoulder</td>
<td>Posture</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repetition</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vibration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Repetition</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Posture</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combination</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand/wrist</td>
<td>Carpal tunnel syndrome</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repetition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Force</td>
<td></td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>Posture</td>
<td></td>
<td></td>
<td>✓</td>
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<tr>
<td></td>
<td>Vibration</td>
<td></td>
<td>✓</td>
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<tr>
<td></td>
<td>Combination</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Tendinitis</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repetition</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Force</td>
<td></td>
<td>✓</td>
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<td></td>
<td>Posture</td>
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<td>✓</td>
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<td></td>
<td>Combination</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hand-arm vibration syndrome</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vibration</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Back</td>
<td>Lifting/forceful movement</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Awkward posture</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heavy physical work</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Whole body vibration</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Static work posture</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
association, between posture and CTS. Tendinitis is another hand/wrist MSD where it is shown that a casual relationship is very likely with intense or long-duration exposure to the combination of repetition, force, and posture work factors. Evidence also exist that repetition, force, and posture as single factors are associated with the development of tendonitis. Another hand/wrist related condition, hand-arm vibration syndrome is shown to be associated with vibration, where this causal relationship is reported to be very likely.

In addition to the work-related upper limb disorders (WRULDs), the NIOSH (1997) also reviewed the strength of evidence supporting a relationship between work factors and back pain. Among these factors, lifting(forceful movement and whole body vibration are shown to have a very likely causal relationship with back pain. Evidence also reported that supported the causal relationship between awkward posture and heavy physical work; however there were insufficient evidence to support the positive relationship among static work posture and back pain.

After the NIOSH’s review, the NRC in the US hosted a series of workshops on WRMSDs, with the aim to evaluate the relationship between MSDs (upper limbs and back) and occupational factors (Punnett and Wegman, 2004). The outcomes of these workshops were reviewed in two different reports, (NRC, 1998; NRC/IOM 2001) where the second report (NRC/IOM, 2001) agreed with the findings of the first one (NRC, 1998; Punnett and Wegman, 2004). In these panels the experts were also inquired about the approach taken by NIOSH to evaluate the epidemiologic evidence related to the WRMSDs. As a result the researchers concluded that NIOSH’s approach in reviewing the epidemiological evidence was reasonable and didn’t substantially alter the inferences made. In general it is emphasised that there was strong evidence from many studies to suggest that a positive causal relationship exist between the performance of work and the occurrence of MSDs of the upper limbs and the back (NRC, 1998).

2.4.2 Psychosocial work factors
The term ‘psychosocial work factors’ is defined as an umbrella term, which consists of factors that have impact on health, and are non-physical in origin. It comprise of
cultural and societal factors, psychological and personality traits, health beliefs, environmental and social circumstances at work and at home, coping resources, mood and psychopathology (Feuerstein et al., 2004). In the work domain, factors such as job demands (work load, pace, fluctuations); job content (task variability, meaningfulness, and integration); job-control (decision-latitude, control over work pace and breaks), work-role ambiguity; social relationships and support, and job satisfaction are considered to be the psychosocial factors that may influence WRMSD development process (Faucett and Werner, 1999). According to Faucett and Werner (1999), poorly designed jobs, high workload and pace demanding jobs and low levels of worker control on the job can be associated with higher prevalence of MSDs. The NIOSH (1997) has reviewed the studies to explore the relationship between psychosocial work factors and WRMSDs. The review revealed that high workload; low job control, low social support and perceived monotonous work may influence the pathways that lead to WRMSDs; however, inconsistencies in the studies reviewed were also reported. Moreover the NRC (2001) has made further reviews in linking the existing epidemiological evidence for psychosocial factors and WRMSDs. The psychosocial factors that were most frequently related with the upper extremity symptoms were high perceived job demands, and high levels of job stress. For low back disorders it was reported that there were associations with job satisfaction, monotonous work, work-relations, work demands, stress, and perceived ability to work. In another study however American researchers Davis and Heaney (2000) could not draw any causal relationship between psychosocial work factors and LBP. The researchers reported that psychosocial characteristics were related to LBP; furthermore employees’ reactions to work characteristics, such as job dissatisfaction and job stress, were reported to be more likely related to LBP than the psychosocial work characteristics themselves. Hoogarden and Bongers (2000) reported a strong evidence for low social support in the workplace, and low job satisfaction as risk factors for back pain; however insufficient evidence of causal relationship was reported for high work-pace, high qualitative demands, low job content, and low job control.

Bongers et al. (2002) made an extensive systematic review of the evidence linking the psychosocial work factors to the upper-limb disorders. As a result of their study
the authors reported that at least one psychosocial work factor was reported in the reviewed studies as being related to the upper extremity disorders. In addition, high perceived job stress was found to be consistently related to upper extremity problems. Some evidence was also suggested linking high job demands to the upper extremity disorders.

2.4.3 Interactions among physical and psychosocial risk factors
Until recently many reviews have considered the effects of physical and psychological risk factors on MSDs independently (Devereux et al., 2002); or psychosocial factors have been studied as confounding variables. According to Feuerstein et al. (2004), analyzing certain psychosocial factors as control variables might have obscured the exploration of complex relationships by ignoring that these variables may affect each other mutually. In addition, this approach tends to ignore the possible interaction among these variables, where they may be the effect of each other. As Devereux et al. (2002) reported, there is epidemiological evidence to suggest an interaction effect among the physical and psychosocial work variables exist (Devereux et al., 1999; Devereux et al., 2002). For example in their study Devereux et al. (1999) found that the highest increase in the risk, among workers with symptoms of back disorders, was associated with being in the high physical and high psychosocial exposure groups. In another study Devereux et al. (2002) reported that workers highly exposed to both physical and psychosocial workplace risk factors were more likely to report symptoms of MSDs.

2.4.4 Individual factors
Individual factors are the characteristics of persons that contribute to the development of WRMSDs (Cole and Rivilis, 2004). These factors comprise of age, gender, anthropometry, and cigarette smoking (NIOSH, 1997), and are shown to be potential confounders. Their influence may distort the identification of the effects of work-related factors on the development of MSDs.

2.4.4.1 Age
As Gagliese and Melzack (2000) stress it, pain and ageing has been one of the priority areas of the IASP. It is suggested that the prevalence, cost and impact of pain
may vary as a function of chronological age (Edwards et al., 2003). Even though many researchers have been addressing this issue there are still debates about the effects of ageing on pain perception and pain reporting (Gagliese and Melzack, 2003; Chakour et al., 1996; Pickering et al., 2002). As mentioned by Edwards et al. (2003) there are contradictions among the findings of some researchers. For example some of the studies reported possible associations of senescence with greater expectations of pain, more pain sites, and greater interference of pain with daily activities. On the other hand a group of them suggested that the frequency of pain complaints might reach a peak at mild-life and decline afterwards. Contrary to this there are some studies that reported age-related decrease in the prevalence or pain intensity for some of the chronically painful conditions (Edwards et al., 2003). A literature review by HSE (2002) reported that increasing age is related to a general increase in risk in relation to several MSDs; however the results may differ depending on the type of outcome measured (e.g. reporting of symptoms, sickness absence, disability). NIOSH (1997) emphasised the confounder nature of age with years of employment, where their adjustment in determining relationships to work is highly recommended. NIOSH suggested that the lack of any causal relationship between aging and increased risk for MSDs may be attributed to the ‘healthy worker effect’, such as workers who have health problems leave their jobs or change to another job that has less effect in their condition (NIOSH, 1997).

2.4.4.2 Gender

As suggested by Fillingim et al. (1998), females exhibited greater perceptual responses to a variety of noxious experimental stimuli than males. The same findings were also verified by Wise et al. (2002) who found that women generally have an increased sensitivity to experimental pain, compared to men. Nevertheless, it is also suggested that these differences have not been found consistent in the clinical settings. The possible reasons for the differences were hypothesised as being derived from the laboratory settings where psychosocial constructs are activated differentially for either sexes (Wise et al., 2002). The authors conclude that the gender specific pain beliefs, expectations, and behaviours would be the reasons that man adhering to a male gender role may under-report pain in the experimental settings. Unruh (1996) reported that women are more likely then men to experience a
variety of recurrent pains. In addition to this the author emphasised that in most studies women report more severe levels of pain, more frequent pain and pain of longer duration than do men; however the debate in this field is still ongoing and further research is required.

2.5 Summary

MSDs describe a range of degenerative and inflammatory disorders of the musculoskeletal system which result in pain and disability and reduced work performance. Recent statistics shows that these disorders are very prevalent ill-health conditions across the EU and other parts of the world, and have substantial affects in country's economies.

WRMSD is the term used to cover those MSDs which several work-related factors have significant effect in their development or exacerbation. WRMSDs are defined as multi-factorial as many different factors contribute in their development. These factors may be classified as physical, psychosocial and individual factors depending on their nature.

Up to date various models have been suggested in conceptualising the WRMSDs. In these models the 'individual' has been considered as a passive entity being exposed to various work-related risk factors; however there is now evidence to suggest that individuals can be active and change the way of work performance as a result of their cognitive and behavioural responses to increased job demands (Feuerstein's work-style model as a coping mechanism). The interpretation of musculoskeletal symptoms and cognitive and behavioural responses to these symptoms at work (e.g. coping with musculoskeletal pain) however remains unclear. The following chapter will focus on exploring coping with pain, with particular emphasis on the experience of musculoskeletal pain at work.
CHAPTER 3

3 COPING WITH PAIN: MUSCULOSKELETAL PAIN

The previous chapter has focused on reviewing the existing epidemiological evidence on MSDs, and how they were conceptualised. The review showed that individuals may cognitively and/or behaviourally react to musculoskeletal symptoms at work. The way individuals deal with MSDs may influence their work performance. This chapter will focus on defining coping and exploring various coping strategies that have been used to deal with different pain conditions. The review will also focus on the outcomes of using particular coping strategies.

3.1 Definition of coping

As Lazarus and Folkman (1984) writes the definition and measurement of coping has been affected from various psychological models that resulted in defining coping as a trait (stable properties of a person) or a style (Anderson and Willebrand, 2003) rather than as a dynamic process where individual-environment interaction is also considered. Therefore the authors redefined coping with taking into account that individual and environmental factors may be deterministic in ones way of coping. This definition of coping, which considers individual-environment interaction may be more appropriate for a study performed in the ergonomics context, and therefore has been taken as a basis for the rest of this thesis. Lazarus and Folkman (1984) defines coping as:

"Constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person"
3.2 Stages in Coping Process

As stressed by Lowe and Bennet (2003) coping is a process, which individuals attempt to minimise the negative emotions that occur as a result of negative events. The nature of these emotions is explained as resulting from the exact nature of the individual’s cognitive appraisals of the associated event. As a result of an event appraised as harmful, beneficial, threatening, or challenging a behavioural flow starts. The appraisal process generates emotion that effects coping processes and hence the person-environment relationship. The altered person-environment relationship again reappraised which in turn leads to a change in emotion quality and intensity (Folkman and Lazarus, 1988). This process is explained as in the Figure 3.1.

![Figure 3.1: Coping as a mediator of emotion (from Folkman and Lazarus, 1988).](image-url)
The transactional model by Lazarus and Folkman (1984) suggest that before any coping actions performed the person who encounters the stressful situation first evaluates 'what is at stake', this process is termed as 'primary appraisal' (See Section 3.2.1) and then another process comes into play that is 'secondary appraisal'. This process determines 'what can be done to respond and how to cope' (Kim and Duda, 2003) (See Section 3.2.2).

### 3.2.1 Primary Appraisal
As it is stressed by Lazarus and Folkman (1984) primary appraisal determines whether an event is stressful or not. For example “Am I in trouble or being benefited, now or in the future, and in what way?” The primary appraisal can result in three different types: (1) the event is irrelevant, (2) it is benign-positive, and (3) stressful (Carlson, 2001; Lazarus and Folkman, 1984). When an event is appraised as ‘irrelevant’ that means that the environment has no any implication for one’s well being. There is no gain or loss in the process.

‘Benign-positive’ appraisals on the other hand are shown to occur when an encounter is appraised as having or promising to have positive effect on one’s well being. For example joy, love, happiness, exhilaration, or peacefulness are characterised as pleasurable emotions and are within this domain (Lazarus and Folkman, 1984).

‘Stress’ appraisals are characterised as having harm/loss, threat, and challenge. ‘Harm/loss’ is defined as sustaining some damage like incapacitating injury or illness, or recognition of some damage to self- or social esteem, or loss of a loved or valued person (Lazarus and Folkman, 1984).

‘Threat’ however is related with harms and losses that are anticipated and have not yet occurred. Folkman and Lazarus (1984) stated that threat permit people to use anticipatory coping which means they can plan for it and work through some of the difficulties in advance. This has been shown to be one of the characteristics of threat that distinguishes it from harm/loss.
Another kind of stress appraisal 'challenge' focuses on the potential for gain and growth inherent in an encounter and are characterised by pleasurable emotions such as eagerness, excitement, and exhilaration. The challenge appraisals are explained as being different than the treat appraisal in the sense that threat appraisal focuses on the potential harms and is characterised by negative emotions such as fear, anxiety, and anger. However both appraisals are shown to have a common characteristic as calling for the mobilization of coping efforts (Lazarus and Folkman, 1984).

3.2.2 Secondary Appraisal

'Secondary appraisal' takes its turn when the primary appraisal leads to a conclusion that an event is stressful (Lazarus and Folkman, 1984; Carlson, 1997). At this stage a person evaluates coping options and likelihood that a particular action will result with its intended outcome and the likelihood that s/he can actually carry it out effectively (Carlson, 1997; Lowe and Bennet, 2003). These two outcomes are termed as 'outcome expectancy' to refer to the person's evaluation that a given behaviour will lead to certain outcomes and 'efficacy expectation' is to refer to the person's conviction that s/he can successfully perform the behaviour required to produce the outcomes (Lazarus and Folkman, 1984). As Lazarus and Folkman (1984) write, secondary and primary appraisals interact with each other and that interaction shapes the degree of stress, the strength and quality of the emotional reaction.

3.2.3 Reappraisal

Reappraisal is defined as modification of appraisal depending on the new information obtained from the environment. Lazarus and Folkman (1984) stated that reappraisal is a modification of the previous appraisal that occurs in the same encounter. Another type of reappraisal is expressed as 'defensive reappraisal'. It consists of any effort made in order to reinterpret past more positively, or to deal with the existing harms by viewing them in a less damaging and/or threatening way (Lazarus and Folkman, 1984).
3.3 Coping with pain

In this section the studies that have assessed various coping strategies and their effects on different outcome measures have been reviewed with the aim to explore different coping strategies used to cope with pain, and also to identify the outcomes of using particular coping strategies. Moreover the methods used in assessing coping strategies have also been discovered and reported in the section 5.2. In doing this different search engines were used. The keywords used were as below:

“Coping” and “Strategy” and “Outcomes” or “Adaptation” and “Pain” or “Musculoskeletal symptoms” and “Work” and “Measurement” or “Assessment”

The studies identified as a result of this search, have been reviewed in the Appendix A. Additional studies were identified from the reference lists of some other studies.

3.3.1 Studies performed within the clinical context

A range of outcome measures were used in assessing the affects of different coping strategies on the adaptation of individuals to various stressful health conditions. Cohen et al. (1986) writes that the way a person copes with stressful events can influence his or her emotional, physiological, and behavioural reactions. The authors also write that coping is linked to neuroendocrine response, immunological response, and to increased risk for disease, moreover they write that coping outcomes could be assessed in three domains as physiological, psychological, and social. The psychological outcomes include emotional reactions (e.g. how depressed or anxious one is), general well being, and performance on tasks. Social outcomes on the other hand include changes in the interpersonal relationships and in the ability to fulfil social roles (Cohen, 1987). The outcomes measures identified as a result of the literature review fits into these categories suggested by Cohen.

The studies that have been identified as a result of the literature review revealed that the researchers have mostly relied on survey methods in order to assess coping strategies in the clinical settings (See section 5.2 for a review). Another finding of this review was that the questionnaires used to assess coping were varying widely in the dimensions that they measured. As Cohen (1987) expressed, there was no
consensus among researchers about which dimensions are most useful, or the level of
generality required. Sections below comprise of the coping dimensions that
frequently appeared in the reviewed studies as associated with different outcome
measures.

3.3.1.1 Catastrophizing
As Gracely et al. (2004) states, pain catastrophizing or negative thoughts and
feelings about pain experience (e.g. characterizing pain as awful, horrible, and/or
unbearable), has been acknowledged as an important factor in dealing with pain. It
has been reported that pain catastrophizing had a direct link with pain intensity and
pain-related disability. The literature review performed in this section revealed that
pain catastrophizing is associated with various outcome measures such as disability,
pain severity, mood, and psychological distress.

Various studies found associations between catastrophizing and pain reporting. For
example, Tan et al. (2001) found that catastrophizing was a powerful predictor of
pain severity among a group of chronic pain patients. Giardino et al. (2003) found
positive associations among catastrophizing and pain reporting among patients with
spinal cord injury. Martin et al. (1996) reported significant associations between
catastrophizing and total functional disability, which comprised of the dimensions
such as physical and psychosocial disability among patients with fibromyalgia.

3.3.1.2 Active/Passive coping
The coping efforts have been classified broadly based on whether their function is to
modify the source of the harm, threat, or challenge (Problem focused or active
coping) or to regulate or minimise the accompanying emotional distress (Emotion-
focused or passive coping) (Folkman and Lazarus, 1984; Aldwin and Revenson,

'Problem-focused' coping strategies are shown to have directed effort in defining the
problem, generating alternative solutions, evaluating the alternatives, choosing
among them and acting (Lazarus and Folkman, 1984). As Lazarus and Folkman
(1984) mentioned, problem-focused coping strategies are similar to strategies used
for problem solving. The ‘emotion-focused’ form of coping on the other hand consists of cognitive processes that are directed at diminishing emotional distress. These processes are shown to include strategies such as avoidance, minimisation, distancing, selective attention, positive comparison, and wresting positive value from negative events (Lazarus and Folkman, 1984).

In the studies explored as a result of the literature review, a range of coping outcome measures, such as psychological distress, depression, pain severity, functional status, and disability were found to be related to active and passive coping.

Snow-Turek et al. (1996) found that passive coping was associated with general psychological distress, and depression, whereas active coping was associated with activity level and was inversely related to psychological stress among chronic pain patients. Moreover, Evers et al. (1998) reported that frequent use of passive coping strategies (e.g. worrying and resting) were found to predict a decrease in functional status (e.g. mobility, self-care, grip-strength) between rheumatoid arthritis patients. Mercado et al. (2000) studied coping strategies among a group of neck and low back pain patients. As a result the authors found that passive coping was associated with greater pain severity, depression, and poor health. Active coping however was found to be associated with less depression, and good health.

3.3.1.3 Social support
Social support is defined as ‘social interactions or relationships that provide individuals with actual assistance or with a feeling of attachment to a person or group that is perceived as loving or caring’ (Hobfoll and Stokes, 1988). As it is emphasised by Lazarus and Folkman (1984) ‘social support’ has been one of the important topics as a coping resource in different fields such as stress research, behavioural medicine, and social epidemiology.

In the field of work-related musculoskeletal disorders Woods (2005) has recently reviewed the existing studies, which considered a relationship between social support and work-related musculoskeletal ill-health. As a result the author concluded that social support has been defined differently and that these definitions might be
grouped under six headings as: 1) general social support, 2) good communication, 3) satisfactory relationships at work, 4) understanding of pain, 5) help when things are difficult, and 6) social support away from work.

Woods also reported that there was good evidence to support the relationship between poor social support and an increased risk of having musculoskeletal problems; however, only a few studies had shown the effects of good social support as an important factor in prevention of musculoskeletal disorders.

The literature review performed in this study has captured a small number of studies that reported social support and its outcomes. One of these studies was performed by Evers et al. (2003), where the authors studied the associations among various coping strategies, social support and functional disability in outpatients recently diagnosed with rheumatoid arthritis. Consequently social support and pain coping was found to predict functional disability.

### 3.3.2 Studies performed within the work context

Only 9 studies were identified as a result of the literature survey (For a summary see Table 3.1). These studies can broadly be categorised as those that assessed the effects of psychosocial work factors on the use of coping strategies, and those that investigated the effects of various interventions on the use of coping strategies.

Chorus et al. (2001) investigated the effects of work factors and behavioural coping in relation to withdrawal from the labour force among a group of rheumatoid arthritis sufferers. The researchers reported that adjusting job demands had a significant effect in terms of decreasing the risk of withdrawal from the workforce. Moreover the authors also explored the factors that had a positive effect in terms of increasing the risk of ones’ withdrawal from the workforce. Decreasing activities, diverting attention, and pacing was found to be associated and reported to account for the 67% of withdrawals from the workforce.

Grossi et al. (1999) researched the associations between psychosocial variables and sick-leave among a sample of musculoskeletal pain sufferers. The researchers found
that those who had been on sick-leave for 30 days or more were the individuals who had poorer coping capacity. In addition, people in this group were found to report high scores on job strain, more symptoms of burnout, anxiety/depression and posttraumatic stress reactions.

Morken et al. (2002) studied the effects of a one year training programme on musculoskeletal symptoms, psychosocial factors and coping, where the participants from 8 different aluminium plants were allocated into three intervention groups: 1) shift group with supervisor, 2) shift group without supervisor, and 3) managers only. As a result the authors reported that the participants in the intervention group who didn’t have a supervisor, used coping strategies more often and sought more frequent social support. No significant differences in terms of musculoskeletal symptoms were reported; however, the implementation group implemented changes in their work environment for instance redesigning the workplace, changing working tools and increasing job variation.

The studies that have investigated the use of various coping strategies seem to lacking. To my knowledge Torp et al. (1997, 1999, and 2001) are the only studies that are performed in order to investigate coping with musculoskeletal symptoms in work settings.

Torp et al. (1997) investigated the influence of psychosocial work characteristics on coping with musculoskeletal symptoms, among a group of car mechanics. The authors reported that the use of coping strategies such as ‘changing working technique’, ‘using lifting equipment’, ‘taking micro pauses’, ‘avoiding strenuous work’, ‘asking the foreman for less strenuous work for a period’, and ‘taking part in the company’s health and safety work’ were associated with work demands, control, and social support. Similar results were also reported by Torp et al. (1999) where work demands, social support, control, managers’ involvement in health and safety work, and whether the garages had regular meetings between management and workers, were found to be associated with how mechanics coped with their musculoskeletal symptoms.
Table 3.1: Coping with pain: Summary of studies performed in the work settings

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Aims</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chorus et al., 2001</td>
<td>Patients with rheumatoid arthritis</td>
<td>To assess the effects of work factors and behavioural coping in relation to withdrawal from the labour force</td>
<td>Adjusting job demands was found to be the most relevant factor in terms of decreasing the risk of withdrawal from the workforce and accounted for 63% of patients to be still in the labour force. Decreasing activities, diverting attention, and pacing was found to be positively associated with withdrawal from the labour force. Pacing was found to account for (67%) most of the withdrawals from the work force.</td>
</tr>
<tr>
<td>Coury and Padula, 2002</td>
<td>9 asymptomatic and 10 symptomatic industrial workers</td>
<td>To compare two groups of workers, with and without musculoskeletal symptoms, when simulating handling tasks, regarding trunk movements and load support</td>
<td>Significant differences were identified among symptomatic and asymptomatic workers. Symptomatic workers supported the load on their trunk, whereas asymptomatic workers did not. Moreover symptomatic workers performed more lumbar flexion compared to the asymptomatic workers.</td>
</tr>
<tr>
<td>Grossi et al., 1999</td>
<td>586 patients with musculoskeletal pain</td>
<td>To assess the associations between psychosocial variables and sick-leave</td>
<td>The patients who had been on sick-leave for more than 30 days were significantly and more frequently divorced, immigrants, blue-collar workers and less educated than the rest of the sample. These patients were also found to report high scores on job strain, more symptoms of burnout, anxiety/depression and posttraumatic stress reactions, and poorer coping capacity.</td>
</tr>
<tr>
<td>Haugli et al., 2001</td>
<td>121 patients with chronic pain (77 in the intervention group and 44 in the control group)</td>
<td>To explore the effects of a group learning programme</td>
<td>Patients in the intervention group were found to significantly report pain reduction, increased pain-coping abilities, and a higher reduction of health care consumption compared to the control group. No significant differences were identified in the reduction of absenteeism; however differences identified in the number of people receiving disability pension at time T3 (fewer in the intervention group).</td>
</tr>
</tbody>
</table>
Table 3.1: Coping with pain: Summary of studies performed in the work settings (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Aims</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linton and Buer, 1995</td>
<td>63 female hospital workers with back pain (37 who were on the job, “copers group” and 26 who were off-work, “dysfunctional group”)</td>
<td>To examine possible differences on psychosocial variables between copers group and dysfunctional group</td>
<td>Dysfunctional group were found to have more stronger beliefs that pain was directly related to activities, that they had little control over their pain, their health was poor, and that they tended to focus more on their pain compared to copers group.</td>
</tr>
<tr>
<td>Morken et al., 2002</td>
<td>5654 workers from 8 different aluminium plants (549 comprised of the intervention groups 1-shift group with supervisor, 2-shift group without supervisor, and 3-managers only)</td>
<td>To examine the effects of a 1-year training program on musculoskeletal symptoms, psychosocial factors and coping</td>
<td>Participants in the intervention group who didn’t have a supervisor, used coping strategies more often and tended towards increased social support. No significant differences in musculoskeletal symptoms were reported. The implementation groups implemented changes in the work environment such as redesigning the workplace, changing working tools and increasing job variation.</td>
</tr>
<tr>
<td>Torp et al., 1997</td>
<td>103 car mechanics from 12 different garages</td>
<td>To investigate the relationship between psychosocial work environment and how mechanics cope with their musculoskeletal symptoms while being at work</td>
<td>Positive and significant associations were reported between the use of ergonomic coping strategies (e.g. “changing working technique”, “using lifting equipment”, “taking micro pauses”, “avoiding strenuous work”, “asking the foreman for less strenuous work for a period, and “taking part in the company’s health and safety work”) and work demands, control and social support.</td>
</tr>
</tbody>
</table>
Table 3.1: Coping with pain: Summary of studies performed in the work settings (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Aims</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torp et al., 1999</td>
<td>103 car mechanics from 12 different garages</td>
<td>To test the hypothesis that negative social and organizational factors may prevent workers from implementing coping strategies (e.g., changing working technique, using lifting equipment and discussing health)</td>
<td>Positive associations were reported between how mechanics coped with their musculoskeletal symptoms and psychosocial work factors such as work demands, social support, control, managers' involvement in health and safety work, and whether the garages had regular meetings between management and workers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“Ask colleagues for help,” “change working technique,” and “use equipment to reduce physical strain,” were the most frequently used coping strategies; whereas, “discuss the problems with the health and safety deputy,” “work on tasks that were less strenuous” and “take longer breaks were the least frequently used strategies respectively. Decision authority, social support, health, environment, and safety related management support and control were found to affect how workers in garages cope with their musculoskeletal symptoms.”</td>
</tr>
<tr>
<td>Torp et al., 2001</td>
<td>1567 automobile garage workers</td>
<td>To test the hypothesis that negative social and organizational factors may prevent workers from implementing coping strategies (e.g., changing working technique, using lifting equipment)</td>
<td></td>
</tr>
</tbody>
</table>
3.4 Summary

The literature reviewed in the present chapter has revealed that up to date the pain coping literature has been dominated by the studies performed in the clinical context. The researchers mostly relied on survey questionnaires in assessing coping with various pain conditions (both with musculoskeletal and other origin). The lack of consensus amongst researchers, in what to measure (e.g. what coping dimensions are more useful and the level of generality required) led to have different methods varying widely in dimensions that they assess (See Section 5.2 for a review of coping assessment methods). This has made the comparison difficult among studies.

In work context, the literature about coping with musculoskeletal symptoms is lacking. Only a small number of studies were identified as a result of the literature review, where these studies can broadly be categorised as those that assessed the effects of psychosocial work factors on the use of coping strategies, and those that considered the effects of different interventions on the use of coping strategies.

The literature reviewed in this chapter has shown that the use of coping strategies may lead to various psychological and behavioural outcomes (e.g. work performance); however, to date the use of coping strategies in work context hasn’t received enough attention. Thus, further research is necessary.
4 WORK PERFORMANCE

Chapter 3 explored a range of coping strategies used in different contexts in order to deal with various pain conditions, and the outcomes of using particular coping strategies (e.g. disability, depression, mood etc.). The way that individuals deal with musculoskeletal pain may influence their emotional, physiological, and behavioural reactions, and hence work performance when coping takes place in the work context.

In this chapter the studies in the field of health and work performance, and more specifically the studies that have been performed to assess the possible effects of MSDs on work performance, have been reviewed. Methods that have been used in the reviewed studies were also explored and reviewed in Chapter 5.

The literature survey was performed by using Ergonomics Abstracts, Science-Direct, PubMed, Psychology and Behavioral Sciences, and PsycInfo databases. The following words were used as mesh-terms for title, keyword, abstract and in-text searches. “Health” OR “Musculoskeletal disorders” OR “Impairment” OR “Pain” “Musculoskeletal pain” OR “Occupational Disease” OR “Illness” AND “Performance” OR “Productivity” OR “Work” OR “Work loss” OR “Work performance” OR “Job Performance”.

The studies that have been included in this review are shown in Tables 4.1, 4.2 and 4.3.

4.1 Definition of Productivity

The term “productivity” has been used for different purposes such as, to indicate the productivity of a single worker, or a group of workers, or an organisation in general.
As related to the productivity of an individual, a proper definition is shown to be the one explained by Muckler (1982):

“Productivity is the amount of goods and/or services produced per hour of human labour”

Judson (1976) suggested that the word “productivity” could be explained with three different definitions as “technical”, “economic” and “social” productivity:

**Technical Productivity:** This is related to the productivity in the workplace, either the amount of goods or services produced by individuals or work groups.

**Economic Productivity:** This is the productivity of investments. Muckler (1982) emphasised that greater investments at workplace may increase technical productivity, conversely may result with increased and non-competitive costs.

**Social Productivity:** It is defined as the desirability and/or usefulness of products or services produced.

### 4.2 Health and work productivity

Organisations always need to consider different strategies to improve their productivity and to be competitive in any specific market sector. Throughout the 1990’s some countries achieved substantial gains in their economic well being by improving productivity that was attributed to the implementation of newer technology in different areas (e.g. telecommunication, internet, production systems etc.) (McCunney, 2001). On the other hand the implementation of technology would not be the only solution since it costs a substantial amount of money. In addition, it can not be ignored that whatever the technology is, there is always the need for human users, and the efficient usage of technology also depends on effectiveness of its human users. As McCunney (2001) states “recently the economists, business leaders and health professionals have focused on the role of health as a competitive advantage”. As Riedel et al., (2001) concluded, greater gains may be achieved through the direct influence of positive worker health on individual
or group productivity (i.e. improved quality of goods and services, greater creativity and innovation, enhanced resilience, and increased intellectual capacity; see Figure 4.1).

![Interventions and Results Table]

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Results</th>
<th>Desired Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease Prevention, Health Promotion</td>
<td>Reduced Absenteeism</td>
<td>Increased Productivity</td>
</tr>
<tr>
<td>Acute &amp; Chronic Illness Management</td>
<td>Improved Performance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Creativity, Motivation</td>
<td></td>
</tr>
<tr>
<td>Environmental Health &amp; Safety</td>
<td>Reduced Accidents, Cost</td>
<td>Cost Reduction</td>
</tr>
<tr>
<td></td>
<td>Savings</td>
<td></td>
</tr>
<tr>
<td>Healthy Corporate Culture</td>
<td>Reduced Health Care Costs</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.1: Pathways to productivity (Riedel et al., 2001)

The relationship between ill health and work performance is a new field of study that has become the focus of many researchers. In this section the studies that have been performed in the field of ill-health and productivity and the methods used (see Chapter 5) have been reviewed. Searches have been undertaken using the Medline-Pub-Med, Science Direct and Psychological and Behavioural Sciences Collection. The review covers the studies that have been performed between 1985 and 2003. Mesh terms used were ‘illness’, ‘health’, ‘work loss’ and ‘productivity’ (See Table 4.1).

In their studies, Burton et al. (2001) reported a 10% decrease in the productivity of telephone customer representatives suffering from allergic disorders. Another study by Cockburn et al. (1999) considered the effects of different medications on the productivity of claim processors in an insurance company. The investigators explained the variation in output by considering the subject's demographic characteristics, their jobs, and the type of treatment that they had received (sedating vs. non-sedating antihistamines). Differences of up to 13% were found between the sedating and non-sedating groups.
Kessler and Frank (1997) investigated the relationships between psychiatric disorders and work impairment in major occupational groups among US labour force. As a result 18.2% of workers were found to suffer from a psychiatric disorder during the last 30 days. The average prevalence of work loss days (i.e. days when totally unable to work) was 6 days per month per 100 workers, and the work cutback days (e.g. did not get as much done as usual) were 31 days per month per 100 workers.

Headaches have also been found to have an impact on the individual’s work performance. In a study Bigal et al. (2001) demonstrated the effects of migraine and episodic tension-type headaches on the studying performance of a group of university students. Consequently 25% of the students were found to suffer from migraine headaches, which reduced their productivity (while studying) by 62%. 32.9% of the student was found to suffer from episodic tension type headaches where the productivity of this group was reduced by 24.4%.
Table 4.1: Health and performance: Summary of studies that considered any ill health condition

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>Condition</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berndt et al., 1998</td>
<td>635 patients</td>
<td>Chronic depression</td>
<td>• Questionnaire &lt;br&gt;• Performance measure(s): direct &lt;br&gt;response concerning work &lt;br&gt;performance and indirect &lt;br&gt;measures of work performance (concentration, energy etc.)</td>
<td>The level of perceived work performance was negatively related to the severity of depressive status.</td>
</tr>
<tr>
<td>Berndt et al., 2000</td>
<td>1713 full time employees with and &lt;br&gt;without anxiety, treated with different medications</td>
<td>Anxiety and other mental disorders</td>
<td>• System output &lt;br&gt;• Productivity measure(s): average daily productivity</td>
<td>No evidence of difference were found in the average daily at-work productivity.</td>
</tr>
<tr>
<td>Bigal et al., 2001</td>
<td>1022 university students (256 with migraine and 336 with ETTH)</td>
<td>Migraine and Episodic Tension Type Headache (ETTH)</td>
<td>• Interview &lt;br&gt;• Productivity measure(s): productivity while studying</td>
<td>Students with migraine, 62.7%, and those with ETTH reported a 24.4% decrease in productivity while studying</td>
</tr>
</tbody>
</table>
Table 4.1: Health and performance: Summary of studies that considered any ill health condition (continued)

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>Condition</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blyth et al., 2003</td>
<td>484 adults aged 18 or over</td>
<td>Chronic pain</td>
<td>• Computer assisted telephone interview&lt;br&gt;• Chronic Pain Grade (CPG) questionnaire was used for severity measurement&lt;br&gt;• Performance measure(s): percent reduction in effectiveness</td>
<td>On an average 83.8 work days were lost during the past 6 months.</td>
</tr>
<tr>
<td>Burton et al., 2001</td>
<td>327 employees with reported allergy symptoms and 307 without</td>
<td>Allergic disorders</td>
<td>• System output&lt;br&gt;• Performance measure(s): handle time per call, transfer or hold time after call work and amount of auxiliary time</td>
<td>Workers without allergies were found to be 10% more productive compared to the workers with allergies (P for trend = 0.0464)</td>
</tr>
<tr>
<td>Cady et al., 1998</td>
<td>135 patients injected either sumatriptan or placebo</td>
<td>Migraine</td>
<td>• Self-report&lt;br&gt;• Performance measure(s): mean productivity loss</td>
<td>Mean productivity loss was lower (p≤0.002) in the sumatriptan group during the first 2 hrs (38.6 min vs. 53.6 min) after dosing, and across the work shift (85.6 min vs. 167.9 min).</td>
</tr>
</tbody>
</table>
Table 4.1: Health and performance: Summary of studies that considered any ill health condition (continued)

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>Condition</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohen et al., 1999</td>
<td>148 patients treated with either sumatriptan or usual therapy</td>
<td>Migraine</td>
<td>• Questionnaire&lt;br&gt;• Performance measure(s): average days missed from work, average days worked with symptoms, average percentage of effectiveness, average number of hours of work affected and average number of days affected.</td>
<td>All mean productivity assessments were found to be significantly more favourable for sumatriptan after 3, 6, and 12 months of treatment compared with usual therapy.</td>
</tr>
<tr>
<td>Cokburn et al., 1999</td>
<td>6000 claims processors either treated with sedating versus nonsedating antihistamines</td>
<td>Nasal allergies</td>
<td>• System output&lt;br&gt;• Performance measure(s): average work output between years 1993-1995</td>
<td>The workers who used sedating had an 8% reduction and those who used nonsedating antihistamines had a 5% improvement in their daily work output in comparison to the overall average.</td>
</tr>
</tbody>
</table>
Table 4.1: Health and performance: Summary of studies that considered any ill health condition (continued)

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>Condition</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
</table>
| Keech et al., 1998      | 411 employees                 | Subjects who either reported influenza or influenza-like illness symptoms or on return to work | • Doctors diagnosis of I/ILI or upper respiratory infection.  
• Questionnaire for the assessment of symptoms  
• Self-reported Productivity measures: number of days absent from work, estimated effectiveness at work while symptomatic, number of days confined to bed or incapacitated, ability to maintain normal levels of activity at home and during leisure time. | On average employees incapacitated or confined to bed for 2.4 days, missing 2.8 days from work per episode of illness. On return to work, reduced effectiveness and inability to resume normal activity until a mean 3.5 days after the onset of symptoms. |
| Kessler and Frank, 1997 | 4091 employees                | Psychiatric disorders                         | • Interview  
• Performance measure(s): number of work loss days, number of work cutback days.                                                   | An average of 6% psychiatric work loss days and 31% cutback days were reported.                                                                                                                        |
| Lim et al., 2000        | 10641 employees (4579 full-time employed) | Mental Disorders                              | • Self-report  
• Performance measure(s): number of work loss days and number of work cutback days.                                                                                                             | In the past month having a current mental disorder was associated with an average of one lost day from work, and three days of reduced work performance.                                                    |
<table>
<thead>
<tr>
<th>Condition</th>
<th>Sample</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis C</td>
<td>912 patients</td>
<td>Self-reported work functioning or productivity; Performance measure(s); missed work days, hours worked and on-the-job productivity.</td>
<td>Patients who responded to therapy showed improvements in work functioning and productivity. Lost workplace activity and non-workplace activity was 3.5% lower with sumatriptan therapy compared to usual therapy.</td>
</tr>
<tr>
<td>Migraine</td>
<td>43 men or women treated either with usual therapy or sumatriptan</td>
<td>Diary; Performance measure(s); lost workplace activity, time missed from work, time worked with symptoms, time normal activities carried out.</td>
<td></td>
</tr>
<tr>
<td>Major depression</td>
<td>290 adults</td>
<td>Structured interviews; Severity of depression assessed using Hamilton Depression Rating Scale; Performance measure(s); number of work days missed</td>
<td></td>
</tr>
<tr>
<td>Gastroesophageal reflux disease (GERD)</td>
<td>136 patients</td>
<td>The severity and frequency of symptoms were recorded by GP. Work Productivity and Activity Impairment Questionnaire was used to assess productivity.</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1: Health and performance: Summary of studies that considered any ill health condition (continued)
4.3 Musculoskeletal Disorders and work productivity

The following sections consist of the studies done in the field of musculoskeletal disorders and work performance. The studies are grouped into two categories (1) experimental studies; the studies done in laboratory setting; and (2) the studies done in real work settings.

4.3.1 Experimental studies

There has been a little work done about WMSDs and their performance outcomes. In this section a review on experimental studies has been performed. The review only covers these studies where a particular task was designed in a laboratory setting for investigation. The studies with clinical functional measures have not been included (see Table 4.2). Among the experimental studies, two were performed by inducing hypertonic saline (experimental pain) to the participants and the rest were performed with participants who were either diagnosed with or were symptomatic to WMSDs.

Birch et al. (2000) investigated the influence of experimental muscle pain on task performance. A computer task was designed where the participants were asked to use a computer mouse with high and low levels of precision requirements. The task performance was measured as work cycle time, cursor movement on the screen and velocity of cursor movement. The pain was induced by infusing hypertonic saline (0.3 ml, 5% NaCl) into the extensor carpi ulnaris muscle\(^1\) and the experiments were performed in two different sessions. However, no effects of muscle pain on either low precision or high precision tasks were reported. The authors expressed the methodological limitations as follows.

1- It is not possible to investigate the long-term effects of pain due to ethical reasons;
2- Real life pain is always accompanied by psychological and emotional distress; and
3- The work related musculoskeletal pain might be affected by muscle work, whereas the experimental pain may not.

\(^1\) Extensor carpi ulnaris muscle is a muscle, located in the forearm of human bodies that acts to extend and adduct the wrist.
Table 4.2: Musculoskeletal disorders and performance: Summary of experimental studies

<table>
<thead>
<tr>
<th>Authors</th>
<th>Subjects and Case</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roe <em>et al.</em>, 2001</td>
<td>10 workers with and 10 without chronic shoulder myalgia</td>
<td>• Three different cognitive tasks</td>
<td>No significant effect of localised chronic muscle pain found on cognitive performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Figure draw</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Two-choice reaction time</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Pattern finding operation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performance measure(s):</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average response time</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of wrong responses</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pain reported on VAS</td>
<td></td>
</tr>
<tr>
<td>Birch <em>et al.</em>, 2000</td>
<td>13 men with experimental muscle pain (extensor carpi ulnaris muscle)</td>
<td>• Standardised computer task</td>
<td>No significant influence of experimental pain were found on any of the performance variables</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performance measures(s):</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>work cycle time (wct) and velocity as pixels/wct</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pain reported on VAS</td>
<td></td>
</tr>
<tr>
<td>Birch <em>et al.</em>, 2001</td>
<td>12 subjects with experimental muscle pain (Trapezius muscle and extensor carpi ulnaris muscle)</td>
<td>• Standardised computer task</td>
<td>A 6% decrease in work cycle time (p&lt;0.05) during the experimental pain (extensor carpi ulnaris muscle) session compared to baseline. Experimental pain in trapezius muscle didn’t have a significant effect on any of the performance variables</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performance measure(s):</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>work cycle time, button clicks per cycle, number of pixels that cursor was moved</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pain reported on VAS</td>
<td></td>
</tr>
</tbody>
</table>
Table 4.2: Musculoskeletal disorders and performance: Summary of experimental studies (continued)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Subjects and Case</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brouwer et al., 2001</td>
<td>45 volunteers with one or two upper extremity symptoms of cumulative trauma disorders (CTD) and 22 without</td>
<td>• Manual tracking task (computerised)</td>
<td>Performance accuracy was significantly lower in subjects with CTD symptoms and the overall performance was significantly associated with physical disability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performance measure(s): error of linear distance from the target</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disability of the Arm, Shoulder and Hand (DASH) questionnaire</td>
<td></td>
</tr>
<tr>
<td>Fernandez et al., 1989</td>
<td>8 individuals diagnosed with carpal tunnel syndrome (CTD) and 13 controls</td>
<td>• A.M.I. short cycle assembly task</td>
<td>A significant performance decrement was found for the CTD group (mean=41 sec) compared to the control group (mean=32 sec).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performance measure(s): speed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pain reported on Pain and Distress (PAD) scale</td>
<td></td>
</tr>
<tr>
<td>Douglas and Happ, 1993</td>
<td>9 participants</td>
<td>• Data entry-task by using three different keyboards</td>
<td>No significant relationship was found between aggregate discomfort ratings and characters typed/hour.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Body-map (Corlett&amp;Bishop, (1976)) and Borg’s CR-10 scale for the assessment of discomfort (pain) for each part</td>
<td>A significant correlation was found between total errors and aggregate discomfort.</td>
</tr>
</tbody>
</table>

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Table 4.2: Musculoskeletal disorders and performance: Summary of experimental studies (continued)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Subjects and Case</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
</table>
| Liao & Drury, 2000       | 6 college students with no history of MSDs| • Typing task (three different keyboard heights)  
• Performance measure(s): speed, error rate and error correction rate  
• Borg’s CR-10 scale for the assessment of discomfort (pain) for each body-part | Error rate increased with Borg scale ratings.  
No significant effect of discomfort ratings found on both speed and error correction rates. |
| Bhatnager et al., 1985   | 12 subjects                              | • Defect detection task  
• Performance measure(s): search time, stopping time and error percentage  
• The Corlett and Bishop (1976) scale of body-part discomfort (BPD) | Significant high correlations were found between BPD frequency vs. stopping time, BPD frequency vs. error rate, severity vs. stopping time, BPD severity vs. error rate. |
| Nicholls and Grieve, (1992)| 11 subjects                             | • Typing task  
• Performance measure(s): typing speed and errors  
• The Corlett and Bishop scale of body-part discomfort | Decreased performance by 8.3% for the stooped vs. erect posture activity  
Increased low back discomfort during the stooped posture activity vs. erect standing activity were found. |
Table 4.2: Musculoskeletal disorders and performance: Summary of experimental studies (continued)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Subjects and Case</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
</table>
| Wickstrom, 1988 | 11 subjects       | • The Minnesota Rate of Manipulation Turning Test (stoop vs. erect postures)  
                   |                                                                |                                                                                                  | Decreased performance by 8.3% for the stooped vs. erect posture Activity.   |
|                 |                   | • Performance measure(s): Number of blocks turned                        |                                                                                                  | Increased low back discomfort during the stooped posture activity vs. erect standing activity |
|                 |                   | • The modified Corlett and Bishop scale (VAS included for the assessment of each body-part) |                                                                                                  |                                                                                   |
In their second study Birch et al. (2001) investigated the influence of muscle pain on work performance during computer work with a digitizer and puck. Again muscle (trapezius\textsuperscript{2} and extensor carpi ulnaris muscles) pain was experimentally induced in two different sessions. A high-precision standardised computer task was designed and the subjects were asked to point the cursor to the targets that were activated by button clicks on the puck. The work cycle time, number of puck button clicks, and screen pixels that the cursor had moved per cycle were assessed. As a result, no effect of shoulder pain was found on any of the performance variables; furthermore, a significant decrease in cycle time was reported during the pain in the extensor carpi-ulnaris muscle. The increased performance due to the muscle pain was not an expected result. The adaptation hypothesis of Lund et al. (1991) suggested that muscle nociception leads to changes in muscle co-ordination of the painful region, resulting in decreased velocity and amplitude of movement (Birch et al., 2001). This contradictory result could be explained by the fact that the subjects were aware of the characteristics of the induced pain, i.e. as not being harmful and also its duration caused them to override any influence of it voluntarily.

Roe et al. (2001) examined whether workers with shoulder myalgia exhibit altered cognitive performance compared to the workers without any symptoms. In this experiment the subjects were asked to perform three different computer tasks. As a result it is reported that localised chronic shoulder muscle pain was not related with major changes in cognitive performance. In another study Brouwer et al. (2001) examined whether the computer generated manual tracking task was sensitive to the presence of musculoskeletal symptoms and whether performance was related to physical disability. A significant difference was found, as the symptomatic subjects demonstrated larger errors than the controls. A moderately strong association was also found for overall tracking performance and the level of physical disability when slow and fast target speeds were considered.

Fernandez et al. (1989) found a significant difference on the A.M.I. (Available Motions Inventory) assembly task, between the subjects diagnosed with CTS and the

\textsuperscript{2} In human anatomy, the trapezius is a large superficial muscle on a person's back.
healthy controls (i.e. the mean performances of controls were better than the diagnosed subjects).

4.3.2 Studies performed in real work settings

Hagberg et al. (2002) performed a study with a group of computer operators where the subjects were asked to report their reduced productivity due to musculoskeletal symptoms. As a result 8% of women and 8.4% of men reported 15% and 13% decreased productivity respectively compared to the previous month. Yu and Ting (1993) selected the same method as Hagberg et al. (2002) and used a self-administered questionnaire to determine the relationship between musculoskeletal discomfort (pain) and job performance among keyboard operators in an academic institution. The researchers found a significant difference in sickness-absence days of those who reported musculoskeletal pain within the preceding three months (on the average 1.36 days) and those who didn't (0.75 days). Neck and shoulder pain were the most significant factors, which influenced the absence of operators. In addition significant differences were also identified in ‘task-related job performance’ (typing speed, errors and unscheduled rest breaks) and ‘general office work related job performance’.
Table 4.3: Musculoskeletal disorders and performance: Summary of field studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>Condition</th>
<th>Method(s)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hagberg et al., 2002</td>
<td>1283 computer users</td>
<td>Musculoskeletal symptoms</td>
<td>• Self-reported reduced productivity (questionnaire)</td>
<td>8% of women reported 15%, and 8.4% of men reported 13% reduced productivity due to musculoskeletal symptoms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Performance measure(s): reduced productivity in previous month due to musculoskeletal symptoms</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Nordic Musculoskeletal Questionnaire</td>
<td></td>
</tr>
<tr>
<td>Yu and Ting, 1993</td>
<td>221 office workers</td>
<td>Musculoskeletal symptoms</td>
<td>• Self-reported musculoskeletal discomfort and job performance</td>
<td>Pain group was absent for 1.36 days on the average, whereas no-pain group for 0.75 days within the preceding three months. A higher degree of discomfort was associated with worse performance (not significant).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Performance measures: 1- type performance (type speed, type error, type rest); 2- general performance (general speed, general error, general rest); 3- sickness absenteeism</td>
<td></td>
</tr>
</tbody>
</table>
4.4 Summary

The relationship between ill-health and work performance is a new field of investigation for many researchers and organisations. There are a sufficient number of studies that have considered the effects of psychological ill-health on the work performance to enable tentative conclusions to be drawn. When considering MSDs however, most of the studies have been performed in the experimental settings, and the findings are limited in their generalizeability to real work settings. The experimental studies are constrained by ethical issues such as studying the long term effects of pain or where the pain exceeds tolerable limits in its intensity. Moreover, musculoskeletal pain experienced in the work context may be accompanied by psychological and emotional distress; however this is not the case in the experimental studies.

The number of studies performed in the field so far is insufficient, and therefore the mechanisms that might lead to diminished work productivity are unclear. Further studies are needed to investigate the effects of musculoskeletal pain on work performance, with an emphasis on the ways that coping could influence the work performance.
CHAPTER 5

5 HOW TO STUDY MSDs AT WORKPLACE: COPING AND WORK PERFORMANCE

The earlier chapters 2, 3, and 4 reviewed the existing epidemiological evidence on MSDs, explored various coping strategies used to deal with different pain conditions, and discussed the effects of MSDs on work performance. The present chapter will review various methods that can be used to study MSDs at workplace. Furthermore it will consider coping measurement methods together with methods that are used to assess the effects of ill health conditions on work productivity.

5.1 Assessment of MSDs

There are a number of methods that can be used to assess MSDs at the workplace. These methods may include workers’ compensation records, sickness-absence records, companies’ medical records, self-administered questionnaires, professional interviews and clinical examinations (Silverstein et al., 1997; Franzblau et al., 1993). However, it is demonstrated that the symptoms questionnaires are more sensitive indicators of ergonomic problems than the rest of the methods and suggested for health surveillance screening (Silverstein et al., 1997). Thus this section will only consider self-reported questionnaires.

5.1.1 Self-report questionnaires for assessing MSDs

The Nordic Musculoskeletal Questionnaire (Kuorinka et al., 1987) is a standardised and widely used instrument, particularly in the EU, for the subjective assessment of musculoskeletal symptoms (Schierhout and Myers, 1996; Baron et al., 1996). The questionnaire has two forms, a general one, and a specific one focusing on the low-back and neck/shoulders. The purpose of the general questionnaire is to allow a simple surveying, whereas the specific one permits a more profound analysis. The
questionnaires may be used as outcome measures for epidemiological studies, but not as a basis for clinical diagnosis (Kuorinka et al., 1987).

In addition to the NMQ, another symptom survey has been developed and further adapted by the NIOSH. The survey uses a similar approach as NMQ (e.g. a similar body map) where a series of questions are asked to determine the severity of discomfort by quantifying the frequency, duration, and intensity of symptoms (Baron et al., 1996).

5.2 Measurement of coping

Different approaches have been used to assess coping. These measures differ in a number of ways, such as conceptual model chosen; however, can not be distinguished between in terms of their usefulness. The choice of measures usually depends on the theoretical assumptions made, as well as the type of stress situation to be studied, and the psychometric and predictive properties of the measure (Cohen, 1987). The measures can be classified into three general categories; disposition, trait/style, and episodic (Cohen and Lazarus, 1979; Lazarus, 1993). These are further discussed in the following sections.

5.2.1 Self-report methods

Cohen (1987) suggests that people may be more aware of the coping strategies that they struggle to use (or the ones that are problematic to use), than the strategies that they successfully using (or that have resolved the situation). It is also possible that people may not be aware of particular coping strategies that they use (e.g. seeking social support) if the strategies merge with life routines (e.g. daily telephone calls to friends).

However, self-report methods can produce important information. Cohen (1987) reported that there are significant relationships between self-reported coping strategies and adaptational outcomes.
5.2.1.1 Dispositional (Trait) and style methods

‘Coping dispositions’ are defined as “the tendencies of an individual to use a particular type of coping across a variety of stressful encounters” (Cohen, 1987). Questionnaires or other projective measures are used to assess the tendency of an individual to use one or another coping mode.

‘Coping style’ on the other hand is defined as “an individuals enduring disposition to deal with challenges and stresses with a specific constellation of techniques” (Crow at al., 1996).

By using dispositional or coping style assessment methods, researchers try to predict the particular type of coping behaviour that an individual may use in a stressful situation under study. This approach does not consider the influence of situational context and time on the choice of coping strategy (Lazarus, 1993). For a summary of the dispositional and style methods see Table 5.1.

According to Cohen and Lazarus (1979), one weakness of the dispositional and style approaches is their assumption in proposing consistency in coping behaviour. For example, it is reported that situational factors and situational demands together with the constraints on coping resources available, have significant effects on coping strategies that an individual selects to use. Moreover, it is also stressed that during a stressful encounter, such as an illness, several stages of coping can take place where each one may have its own pressures leading to the use of different modes of coping (Cohen and Lazarus, 1979).

In the literature there are a number of coping questionnaires designed to assess dispositional/style coping strategies. Among these the Pain Coping Style Inventory (PCSI) is the one that has been designed to measure pain coping style of individuals experiencing pain. The inventory consists of 50 items and can be used as a paper/pencil self-report instrument (Crow et al., 1996). As Crow et al., (1996) advised the PCSI can
Table 5.1: Summary of dispositional and style methods

<table>
<thead>
<tr>
<th>Reference</th>
<th>Questionnaire</th>
<th>Condition</th>
<th>Dimensions</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nowack, 1989</td>
<td>Coping Style Scale</td>
<td>Physical and psychological health status</td>
<td>1. Intrusive positive thoughts 2. Intrusive negative thoughts 3. Avoidance 4. Problem focused coping</td>
<td>Adult</td>
</tr>
<tr>
<td>Endler and Parker, 1990</td>
<td>Multidimensional Coping Inventory (MCI)</td>
<td>Stressful events</td>
<td>1. Task 2. Emotion 3. Avoidance</td>
<td>Adult</td>
</tr>
</tbody>
</table>
Table 5.1: Summary of dispositional and style methods (continued)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Questionnaire</th>
<th>Condition</th>
<th>Dimensions</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fernander et al., 2003</td>
<td>John Henry Active Coping Scale</td>
<td>Psychosocial environm ental stressors</td>
<td>1. Commitment to succeed through hard work 2. Personal efficacy</td>
<td>Adult</td>
</tr>
</tbody>
</table>
be used with individuals from adolescence through adulthood. The questionnaire uses a 10 cm Visual Analog Scale (VAS) as a method of assessing the frequency of coping strategies used.

Another coping style measure, Multidimensional Coping Inventory (MCI), has been constructed by Endler and Parker (1990). The instrument was developed to identify three types of coping style: task-oriented, emotion-oriented, and avoidance oriented. The authors suggest that the questionnaire is a highly valid and reliable measure in assessing coping styles (Endler and Parker, 1990).

The Jalowiec Coping Scale (JCS) on the other hand is a 60-item questionnaire which has been developed by Jalowiec et al. (1984). The questionnaire consists of eight coping styles: confrontive, evasive, optimistic, fatalistic, emotive, palliative, supportive and self reliant.

5.2.1.2 Episodic methods
One of the approaches undertaken for measuring coping has been the 'process' (or episodic) one. With this approach researchers assess the stressors that are defined as the events temporary in nature and are part of the constantly changing type of environments (Bailey and Bhagat, 1987; For a summary see Table 5.2). For example an individual’s behaviour can be observed in a stressful situation and the mode of coping deduced from it.

Cohen and Lazarus (1979) writes that coping consist of different acts and thoughts that may occur at the same time. These acts and thoughts are triggered by a complex set of demands that may change in time.

The Chronic Pain Coping Inventory (CPCI) is an episodic pain coping measurement tool, which has been developed to assess both cognitive and behavioural dimensions of pain among chronic pain patients (Jensen et al., 1995). The original CPCI consists of 65 items that assess 11 pain coping dimensions. These dimensions are guarding, resting, asking for assistance, relaxation, task persistence, exercise/stretch, seeking social support, coping self-statements and medication use.
Jensen et al., (1995) reports that the CPCI scales have demonstrated an adequate to excellent internal consistency, test-retest stability, and concurrent validity in a sample of chronic pain patients.

Another version of the CPCI was abbreviated by Romano et al., (2003), which yielded a 42 item measure. The tool was found to satisfy the psychometric properties, such as criterion validity, internal consistency, test-retest stability, and responsiveness to change with treatment (Romano et al., 2003).

Nielson et al., (2001) suggested that many pain treatment programs were advocating activity pacing techniques, but there were no available measures to assess 'pacing' as a dimension of coping. The authors developed the six item Activity Pacing Scale and advised that it could be administered as part of the CPCI, as valid, and reliable measure of 'pacing' construct (Nielson et al., 2001).

Coping Strategies Questionnaire (CSQ) is another widely used episodic coping measurement tool that is used in the clinical settings for assessing coping among patients with chronic pain conditions (Rosenstiel and Keefe, 1983). The CSQ consists of two broad dimensions, cognitive and behavioural coping. The cognitive coping dimension is made up of six subscales that are diverting attention, reinterpreting pain sensations, coping self-statements, ignoring pain sensations, praying and hoping and catastrophizing. The behavioural coping section on the other hand has two subscales. These are increasing activity level, and increasing pain behaviour. In addition, an effectiveness assessment section has been provided, where the responders can report their perceived levels of control over pain and also the ability to relieve pain. The CSQ (Rosenstiel and Keefe, 1983) have 48 items in total. Since its development there have been number of studies performed that analysed the factor structure of the CSQ (Tuttle et al., 1991; Robinson et al, 1997; Harland and Georgieff, 2003). Among these studies, Robinson et al., (1997) suggested a six-factor solution (CSQ-R) that was later verified by Riley and Robinson (1997). The six-factor model by Robinson et al., (1997) retains 27 of the original items.
In addition to the previous studies, a four factor-solution was demonstrated by Harland and Georgieff (2003). The new solution consisted 24 items under catastrophizing, diversion, cognitive coping, and reinterpreting factors.

The Pain Coping Inventory (PCI) assesses coping in various types of patients with chronic pain (Kraaimaat and Evers, 2003). Kraaimaat and Evers (2003) expressed that the PCI is a standardised comprehensive measure with a balanced inclusion of both cognitive and behavioural coping responses. It has been developed to be applicable to various categories of patients with chronic pain. The PCQ consist of six factors that are pain transformation, distraction, reducing demands, retreating, worrying, and resting.

Kraaimaat and Evers (2003) mentioned that commonly used pain coping measures were developed to assess coping in subtypes of chronic pain. For example CSQ is developed to assess coping strategies in patients with chronic low back pain. The authors also add that the CSQ was used in different chronic pain disorders; however, factor analytic studies failed to find a reliable factor structure across patient samples (Kraaimaat and Evers, 2003).

The Vanderbilt Pain Management Inventory (VPMI, Brown and Nicassio, 1987) has been developed for patients with arthritis (Kraaimaat and Evers, 2003). The VPMI consists of 19 items that are under the dimensions; ‘active’ and ‘passive coping’.

The Ways of Coping Checklist (WCC) was developed by Lazarus and his colleagues (Folkman and Lazarus, 1980). This questionnaire consist of a series of items which each represent a ‘coping thought’ or ‘action’ that individuals sometimes engage when they encounter a stressful event. In responding to the WCC, the responders indicate whether they used each of questionnaire coping strategies in a given stressful encounter, by giving a ‘yes’ or ‘no’ response.

Folkman and Lazarus (1985) later developed the Ways of Coping Questionnaire (WCQ) that was adapted from the WCC. These two questionnaires differed in several ways. For example the authors rewrote items, dropped items, and added new
items. In addition they have changed the response format from yes/no to a 4-point Likert scale for the 66 remaining items (Endler and Parker, 1990). The Ways of Coping Questionnaire (WCQ; was later factor analysed (Cohen, 1987; Lazarus, 1993), which provided the eight factor solution: Confrontive coping, distancing, self-controlling, seeking social support, accepting responsibility, escape-avoidance, planful problem solving, and positive reappraisal.
Table 5.2: Summary of episodic methods

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<tr>
<th>Reference</th>
<th>Questionnaire</th>
<th>Condition</th>
<th>Dimensions</th>
<th>Population</th>
</tr>
</thead>
</table>
| Folkman and Lazarus, 1980| Ways of Coping Questionnaire           | Stressful encounters                 | 1. Emotion focused  
                           |                                                          | 2. Problem focused | Adults           |
| Rosenstiel and Keefe, 1983| Coping Strategies Questionnaire (CSQ)   | Chronic pain                         | A- Cognitive strategies  
                           |                                                          |                   | Low back pain    |
|                           |                                        |                                      |   - Diverting attention  
                           |                                                          |                   | patients         |
|                           |                                        |                                      |   - Reinterpreting pain sensations  
                           |                                                          |                   |                   |
|                           |                                        |                                      |   - Coping self-statements  
                           |                                                          |                   |                   |
|                           |                                        |                                      |   - Ignoring pain sensations  
                           |                                                          |                   |                   |
|                           |                                        |                                      |   - Praying or hoping  
                           |                                                          |                   |                   |
|                           |                                        |                                      |   - Catastrophising  
                           |                                                          |                   |                   |
|                           |                                        |                                      | B- Behavioural strategies  
                           |                                                          |                   |                   |
|                           |                                        |                                      |   - Increasing activity level  
                           |                                                          |                   |                   |
|                           |                                        |                                      |   - Increasing pain behaviour  
                           |                                                          |                   |                   |
| Billigs and Moss, 1984    | Not named                              | Stress (e.g. recent negative life    | 1. Information seeking  
                           |                                                          | recent negative  | Adults           |
|                           |                                        | change events and indices of life    |   - Problem-solving  
                           |                                                          | strains)         |                   |
|                           |                                        | strains)                             |   - Affective regulation  
                           |                                                          |                   |                   |
|                           |                                        |                                      |   - Emotional discharge  
                           |                                                          |                   |                   |
Table 5.2: Summary of episodic methods (continued)

<table>
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<tr>
<th>Reference</th>
<th>Questionnaire</th>
<th>Condition</th>
<th>Dimensions</th>
<th>Population</th>
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</thead>
<tbody>
<tr>
<td>Folkman and Lazarus, 1985</td>
<td>Ways of Coping Questionnaire-revised</td>
<td>Stressful encounters</td>
<td>1. Confrontive coping</td>
<td>Adults</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Distancing</td>
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<td></td>
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<td>3. Self-controlling</td>
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<td></td>
<td>4. Seeking social support</td>
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<td></td>
<td></td>
<td></td>
<td>5. Accepting responsibility</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>6. Escape-avoidance</td>
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<td></td>
<td></td>
<td></td>
<td>7. Planful problem solving</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>8. Positive re-appraisal</td>
<td></td>
</tr>
<tr>
<td>Riley and Robinson, 1997</td>
<td>Coping Strategies Questionnaire (CSQ-R)</td>
<td>Chronic pain</td>
<td>1. Distraction</td>
<td>Chronic pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Catastrophising</td>
<td>patients</td>
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<td></td>
<td></td>
<td></td>
<td>3. Ignoring pain</td>
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<td></td>
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<td></td>
<td>4. Distancing from pain</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>5. Coping self statements</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>6. Praying</td>
<td></td>
</tr>
<tr>
<td>Fava et al., 1998</td>
<td>Rhode Island Stress and Coping Inventory</td>
<td>Stress</td>
<td>1. Stress</td>
<td>Adolescents</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Coping</td>
<td>and Adults</td>
</tr>
<tr>
<td>Oakley et al., 1999</td>
<td>Depression Coping Scale (DCQ)</td>
<td>Depression</td>
<td>1. Positive depression coping</td>
<td>Adults</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Negative depression coping</td>
<td></td>
</tr>
<tr>
<td>Harland and Georgieff, 2003</td>
<td>Coping Strategies Questionnaire (CSQ-24)</td>
<td>Chronic pain</td>
<td>1. Catastrophizing</td>
<td>Adults</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Diversion</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>3. Reinterpreting</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>4. Cognitive coping</td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Questionnaire</td>
<td>Condition</td>
<td>Population</td>
<td>Dimensions</td>
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<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Patterson, 2002</td>
<td>Law Enforcement Stress and Coping Questionnaire</td>
<td>Stressful events</td>
<td>Police officers</td>
<td>1. Problem-focused coping, 2. Emotion-focused coping, 3. Seeking social support</td>
</tr>
</tbody>
</table>
5.3 Work productivity measurement

The literature reviewed in chapter 4 revealed that researchers have mostly used worker self-reports (questionnaires and interviews) and objective measures (e.g. work system output) in assessing the effects of ill-health conditions on workers' productivity at the workplace. The following sections will consider these methods.

5.3.1 Worker self-reports

Worker self-reports are very useful where work does not include discrete outputs or where obtaining an objective measure is not feasible due to time and budget constraints (e.g. observing a worker for long periods).

For assessing productivity decrements due to any ill-health condition, various questionnaires have been developed (See Table 5.3). In addition to the questionnaires, there are three other methods in the literature that depend on individuals' self reports for assessing productivity. These methods are called O, VR and QQ methods (Brouwer et al., 1999) and are further discussed in the following sections.

5.3.1.1 O Method

The O method uses a two-week recall period and asks the workers to assess on a VAS their average work efficiency while on the job and suffering from health problems. As Brouwer et al. (1999) emphasised, the difficulty of the method is that it is unknown whether the workers indicate their efficiency in comparison to their normal work performance (when not experiencing any ill-health problems), and if so, it is not clear how much this difference is.

5.3.1.2 VR Method

The method asks the responders to indicate the days that they were less able to perform their work by using a two-week recall period and the extra hours required to make up the lost time from work.
5.3.1.3 QQ Method

This method was developed to measure productivity decrements more precisely compared to the O and VR methods. Thus, the workers are asked to indicate on a VAS the amount of work performed compared to normal hours. Further questions are provided asking for the required additional (regular or overtime) hours needed in order to recover the lost time. In addition the method asks workers to assess their quality of work performed, again on a VAS. Brouwer et al. (1999) suggests that the multiplication of both dimensions (quantity and quality) gives a performance score; however, it remains unclear whether this is an optimum way, since the importance of the quantity and quality dimensions vary according to the type of the job.

5.3.1.4 Questionnaires

Lofland et al., (2004) writes that in order to be able to estimate the health related loss in productivity, there is a need to capture individual absenteeism, presenteeism, and compensation. Absenteeism is defined as the number of days missed from workplace, whereas presenteeism is defined as the reduced productivity while at paid work (Koopman et al., 2002; lofland et al., 2004). In the literature there are a number of questionnaires that have been developed for assessing health related productivity losses (See Table 5.3). Some of these are specifically designed to assess productivity loss due to a specific illness, while the others are capable of assessing lost workplace productivity due to different health conditions. The questionnaires also show differences based on the dimensions measured. For example some of them are designed to only assess presenteeism, while some others can assess both absenteeism and presenteeism. In this section only the most generic questionnaires are reviewed.

The questionnaires that are reviewed in this section have been found as a result of searches performed on various databases such as Medline Pub-Med, Science Direct and Psychology and Behavioural Sciences Collection. In addition, review papers were also used and some of the methods have been identified from these sources. The review consists of the studies that have taken place between the years of 1985 and 2004. The meshed-terms used were ‘health’ and ‘illness’ and ‘productivity’ and ‘loss’ and ‘questionnaire’ or ‘assessment’ or ‘instrument’.
Among the instruments the Endicott Work Productivity Scale (EWPS) has been developed to assess the degree to which a medical condition affects the work functioning of individuals. The questionnaire is a self-report tool that is designed to assess individuals with a wide variety of mental and medical disorders (Endicott and Nee, 1997). It can measure both absenteeism and presenteeism, and has been designed to capture lost productivity data in clinical trials (Lofland et al., 2004). The EWPS has 25 items and can be used as a self-report measure, which is shown to be suitable for assessing the work functioning of patients with various disease states. However, Lofland et al. (2004) stressed that to date the EWPS has only been used in patients with depression.

The Stanford Presenteeism Scale (SPS) initially launched as a 32-item scale that was developed to measure the ability to function in a knowledge-based job despite health problems (Turpin et al., 2004). In a later study the instrument was further studied by Koopman et al. (2002) and a new scale with 6-items, which showed excellent psychometric properties, were developed (SPS-6) (Turpin et al., 2002).

The SPS-6 has been developed to assess the relationship between the presenteeism, health problems and productivity within the workplace (Koopman et al., 2002). It consists of a Likert type 5-item response scale ranging from 'strongly disagree with the statement' to 'strongly agree with the statement' (Koopman et al., 2002; Lofland et al., 2004). The sum of the items represents an overall score where a high SPS-6 score indicates a high level of presenteeism (e.g. greater ability to concentrate on and accomplish work despite health problems; Koopman et al., 2002).
Table 5.3: Health and performance: Summary of developed questionnaires

<table>
<thead>
<tr>
<th>Author</th>
<th>Questionnaire</th>
<th>Condition</th>
<th>Dimensions</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endicott &amp; Nee (1997)</td>
<td>Endicott Work Productivity Scale (EWPS)</td>
<td>Various disorders</td>
<td>• Work functioning&lt;br&gt;• Number of hours the subject expected to work&lt;br&gt;• Number of hours worked&lt;br&gt;• The reason the subject worked fewer hours than expected</td>
<td>Self-report&lt;br&gt;One week</td>
</tr>
<tr>
<td>Koopman et al., (2002)</td>
<td>Standford Presenteeism Scale (SPS-6)</td>
<td>Possible health problems</td>
<td>• Cognitive&lt;br&gt;• Emotional&lt;br&gt;• Behavioural aspects of concentration</td>
<td>Self-administered&lt;br&gt;Recall period 1 month</td>
</tr>
<tr>
<td>Kopec &amp; Esdaile (1998)</td>
<td>Occupational Role Questionnaire (ORQ)</td>
<td>Back pain</td>
<td>• Amount of time spent on occupational activities&lt;br&gt;• Productivity/Efficiency&lt;br&gt;• Quality of work&lt;br&gt;• Overall satisfaction&lt;br&gt;• Job security&lt;br&gt;• Relations with co-workers</td>
<td>Self report&lt;br&gt;No recall period</td>
</tr>
<tr>
<td>Lerner et al., 1998</td>
<td>The Angina-related Limitations at Work Questionnaire</td>
<td>Chronic stable angina</td>
<td>• Changes in work behaviour&lt;br&gt;• Absences from work&lt;br&gt;• Difficulty performing work activities</td>
<td>Self-report&lt;br&gt;4-weeks recall period</td>
</tr>
</tbody>
</table>
Table 5.3: Health and Performance: Summary of developed questionnaires (continued)

<table>
<thead>
<tr>
<th>Author</th>
<th>Questionnaire</th>
<th>Condition</th>
<th>Dimensions</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davies, 1999</td>
<td>The Migraine Work and Productivity Loss Questionnaire (MWPLQ)</td>
<td>Migraine headache</td>
<td>• On the job difficulty</td>
<td>Self-report Recall period is the most recent migraine attack</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Time missed from paid work</td>
<td></td>
</tr>
<tr>
<td>Lerner et al., 2001</td>
<td>The Work Limitations Questionnaire (WLQ)</td>
<td>Chronic health problems</td>
<td>• Time demands</td>
<td>Self-report Recall period 2 or 4 weeks</td>
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<td></td>
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<td>• Physical demands</td>
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<td>• Mental-interpersonal demands</td>
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<td></td>
<td></td>
<td></td>
<td>• Output demands</td>
<td></td>
</tr>
<tr>
<td>McHutchison et al., 2001</td>
<td>Unnamed Hepatitis Instrument</td>
<td>Hepatitis</td>
<td>• Days not been able to work</td>
<td>4 weeks recall period</td>
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<td></td>
<td></td>
<td></td>
<td>• Hours worked</td>
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<td></td>
<td></td>
<td></td>
<td>• Productivity</td>
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</tr>
<tr>
<td>Reilly et al., 1993</td>
<td>Work Productivity and Activity Impairment Instrument (WPAI)</td>
<td>Poor health and symptoms or problem</td>
<td>• Number of days and hours missed from work</td>
<td>Self-report Recall period 7 days</td>
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<td>• Days and hours worked</td>
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<td></td>
<td>• Days which performing work was difficult</td>
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<td>• Extent to which the individual was limited at work (work impairment)</td>
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</tr>
<tr>
<td>Author</td>
<td>Questionnaire</td>
<td>Condition</td>
<td>Dimensions</td>
<td>Administration</td>
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</tr>
<tr>
<td>Shikiar et al., 2004</td>
<td>Health and Work Questionnaire (HWQ)</td>
<td>Any health condition</td>
<td>• Productivity</td>
<td>Self-report</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Concentration/focus</td>
<td>1 week recall period</td>
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<td></td>
<td></td>
<td></td>
<td>• Supervisor relations</td>
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<td>• Impatience/irritability</td>
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<td></td>
<td></td>
<td></td>
<td>• Work satisfaction</td>
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<td></td>
<td>• Non-work satisfaction</td>
<td></td>
</tr>
<tr>
<td>Turpin et al., 2004</td>
<td>Stanford Presenteeism Scale (SPS-13)</td>
<td>Primary health condition</td>
<td>• Work output</td>
<td>Self-report</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Work impairment</td>
<td>4 weeks recall period</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>• Absence</td>
<td></td>
</tr>
<tr>
<td>Van Roijen et al., 1996</td>
<td>The Health and Labor Questionnaire (HLQ)</td>
<td>Any illness or disease</td>
<td>• Absence from paid work</td>
<td>Self report</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Reduced productivity at paid work</td>
<td>2 weeks recall period</td>
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<td></td>
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<td></td>
<td>• Unpaid production</td>
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<td></td>
<td></td>
<td></td>
<td>• Impediments to paid and unpaid labour</td>
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</tbody>
</table>
Turpin et al. (2004) studied a newer version of the instrument (SPS-13) by focusing on the assessment of the prevalence and nature of health-related work loss in a workforce. In addition, the SPS-13 was designed to provide a sufficient description of the nature of the work loss that allowed an assessment of how impairments in presenteeism may differ by given characteristics (e.g. by health condition, age, health status, and so on) to be determined (Turpin et al., 2004). Another objective of Turpin et al. (2004) was to include a global question to capture the responder’s perception of the effects of health impairment on their work output during a 4-week recall period. Finally another feature that wasn’t included in the previous versions (i.e. hours of absence caused by health-related incidences) was also included.

The Work Productivity and Activity Impairment Instrument (WPAI) was developed with the aim of collecting productivity loss data in clinical trials (Lemer et al, 2001). There are various versions of the questionnaire available for the assessments. These are specific to different health conditions, such as the WPAI-allergy, WPAI-gastro-oesophageal reflux disease (WPAI-GERD) and others.

The Work Limitations Questionnaire (WLQ) has been developed for measuring the degree to which chronic health conditions interfere with performing job roles (Lerner et al., 2001). The questionnaire assesses the performance of occupational roles demanded by any specific job in four distinct dimensions. These are limitations handling time, physical, mental-interpersonal and output demands. The WLQ has been found to be a valid and reliable source to assess the “on-the-job” impact of osteoarthritis (Lerner et al., 2001).

The Health and Work Questionnaire (HWQ) is a multidimensional scale that has been developed with the aim of measuring workplace productivity and worker health (Shikiar et al., 2004). The HWQ consists of six sub-scales that were identified as a result of factor analysis. These scales were named as productivity, concentration/focus, supervisor relations, impatience/irritability, work satisfaction, and non-work satisfaction. The HWQ may be a useful scale in assessing the influence of workplace interventions on workplace productivity; however, further validations are needed.
The Health and Labor Questionnaire (HLQ) on the other hand is a self-administered questionnaire that has been developed for measuring productivity with respect to the extent to which the respondent was limited by health problems during work time in the previous two weeks (Van-Roijen et al., 1996). The respondent then with a confirmatory question is subsequently asked to estimate the number of hours needed to compensate for the work loss due to sickness presenteeism in the last two weeks. The productivity loss is calculated as the number of hours per work day needed to compensate for work loss (van Roijen et al., 1996; Meerding et al., 2005).

5.3.1.5 Interviews

Interviews are a common method of inquiry in qualitative research. A key characteristic of the qualitative interviews is the interaction between the researcher (interviewer) and the interviewee (King, 2004). As Whitley and Crawford (2005) suggest, an intimate and open interaction of an interview can usefully explore the questions under investigation (e.g. why people act in the way they do). The interviews may be advantageous when interviewing individuals who may prefer a confidential setting to talk about sensitive issues (e.g. ill health and work productivity).

Interviews, though not as common as self-report questionnaires, have been used in a number of studies for assessing the effects of ill health conditions on work productivity (Bigal et al., 1998; Blyth et al., 2003; Kessler and Frank, 1998).

Bigal et al. (1998) interviewed 1022 students with migraine and episodic tension-type headache where reductions up to 62.7% in productivity (while studying) were reported. Hagberg et al. (2002) investigated reduced productivity due to musculoskeletal symptoms among a group of computer users where the interviews were used as a complementary method to validate the results of a questionnaire survey. Blyth et al. (2003) interviewed a sample of chronic pain sufferers (62% suffering from a work-related pain) by interviewing responders over the phone. On average 83.8 days were reported as lost during the last 6 months.
Even though the method is very flexible in investigating different research questions, yet caution should be taken when assessing the impact of ill health conditions on work performance. As in other self-report methods interviews may also face limitations regarding their credibility since workers may tend to underreport reduced productivity due to job related concerns (e.g. losing job or salary; Hagberg et al., 2002).

5.3.2 **System output**

The easiest way of obtaining objective productivity data is directly from the system output. This method is only possible where the system output is discrete and tangible (e.g. production lines). A good example for this category would be the study performed by Burton et al. (1999) where the productivity of phone-centre workforce was measured by using the objective data in timings, kept directly by the system itself (customer, time spent in electronic queue, service time, amount of holding time).

5.4 **Summary**

Earlier chapters (2, 3, and 4) revealed the need to investigate how workers cope with musculoskeletal symptoms at work, and the possible effects on work performance. This chapter reviewed the available methods that may be used in assessing musculoskeletal symptoms, coping strategies and work performance.

The Nordic Musculoskeletal Questionnaire (NMQ) is a widely used tool that is standardised and used by a wide number of researchers in assessing musculoskeletal symptoms. The use of NMQ would make the comparison of results of this study easier as the method is standardised and widely used.

The review has revealed that the researchers frequently used questionnaire survey methods in assessing coping strategies. The existing measures that have been developed to be used in clinical settings and the measures to be used in work context are small in number.
The existing measures used in assessing coping strategies are based on two different approaches; dispositional/style methods and episodic methods. The difference in these two approaches is that dispositional/style methods do not consider interaction between the individual and the situational context and time on the choice of the coping strategy. A study investigating coping strategies in an ergonomic context however should not ignore the interaction between individual and the physical and psychosocial factors in work settings.

Various methods have been used in assessing work productivity in different studies. These methods could be categorised into two major groups as objective (e.g. system output data, observational data) and subjective methods (e.g. worker self-reports, interviews); however none of these methods have a gold standard and have their own strengths and weaknesses. Pilot studies should be conducted for the assessment of the feasibility of methods in a particular context before further work is undertaken.
CHAPTER 6

6 PILOT STUDY DEVELOPMENT AND DESIGN

The earlier chapters (2, 3, and 4) discussed how musculoskeletal disorders were conceptualised, and the role that both cognitive and behavioural reactions to musculoskeletal symptoms might play in the experience of future symptoms. The way that individuals deal with musculoskeletal symptoms at work may also influence their work performance.

The methods to study musculoskeletal disorders, with particular focus on coping and work performance have been reviewed in chapter 5. This chapter outlines the methodological development of the present research.

6.1 Pilot work

The present research consisted of pilot work, (1) laboratory study, (2) observational field study, (3) focus groups, and then in the light of the findings, the main study was designed (qualitative interviews and questionnaire survey). The following sections discuss the pilot work performed.

6.1.1 Laboratory study

The literature reviewed in the chapters 2, 3, and 4 showed that the way individuals react to musculoskeletal symptoms (e.g. cognitive and behavioural reactions) at work may influence the experience of future symptoms and also work performance. However, the number of studies that have focused on investigating how workers cope with musculoskeletal symptoms at work, and the effects on work performance is small in number. The researchers have mostly relied on self-report methods; however, studies comprising of objective methods (e.g. direct observation) in order to assess the effects of musculoskeletal symptoms on work performance is insufficient. This study therefore designed to test the usability of a ‘direct
observation' method in the laboratory settings. An experimental approach has been selected as this research approach provides the opportunity to strictly control the extraneous variables.

6.1.1.1 Aims
The aims of the study were to assess the usability and suitability of two methods, which were a 'pain assessment scale' and the 'observer method' in the experimental settings.

6.1.1.2 Participants and methods
Two subjects, one male and one female, participated in this experimental study, where they were provided with a number of electricity plugs (See Figure 6.1) that were required to be disassembled and assembled as two separate tasks. During the experiment one of the subjects was disassembling while the other was assembling the plugs simultaneously. The experiment was limited to 30 minutes where both participants provided with 2 minute breaks following every 10 minutes. During the break times the participants were given a short questionnaire for their responses. The questionnaire consisted of two sections, where the first section was enquiring about the existence of any musculoskeletal pain or discomfort and the body part/s that were affected. In this section the responders were also provided with VAS scales allocated for each body part so that they were able to rate the intensity of experienced pain.

Figure 6.1: A disassembled electricity plug

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The second part of the questionnaire was inquiring about perceived productivity. In this section the participants were asked to report their perceived level of productivity despite experiencing musculoskeletal pain/discomfort.

Productivity was also measured by using the observer method (Noldus Information Technology, 1995). The Observer method is based on software that gives researchers the opportunity to observe and analyse any behaviour objectively based on the duration, frequency and intensity of behavioural categories of interest (Martin and Bateson, 1993). In this study the cycle times\(^3\) were measured as an objective measure of productivity.

6.1.1.3 Results
Due to a small number of participants the results of this study was analysed descriptively and therefore presented as graphs and/or in tables.

During the experiment, the participants reported that they experienced musculoskeletal pain/discomfort in various parts of their bodies, such as neck, shoulders, upper back, low back and wrist/hands. The most frequently reported body part was wrists and hands. Throughout the experiment there was an increasing trend in pain/discomfort ratings (See Table 6.1). Self-reported productivity showed a decreasing trend throughout the experiment, whereas there was an increasing trend in measured productivity.

6.1.1.4 Discussion
The results revealed that both pain ratings and objectively measured productivity showed increasing trends which means, as pain intensity was increasing, the participants were becoming more productive. A similar result was also reported by Birch \textit{et al.}, (2001) where the authors studied the effects of experimental muscle pain on the productivity of a group of computer task performers in the laboratory. As a result Birch \textit{et al.}, (2001) attributed this to the characteristics of pain and that subjects might have overrode it; however, caution is also required because of

\(^3\)Cycle time: The time it takes a worker to complete one unit of production.
potential learning effects in the laboratory studies. In this study it is also observed that both subjects were learning their tasks throughout the experiment and therefore the cycle times were diminishing which can be explained as a result of learning (Figure 6.2). In Figure 6.2 the line graph shows the times taken for each item to be done (cycle times) by the subjects where the tendency of decrease in performance times (productivity) can be observed from the trend lines.

Table 6.1: Pain and productivity scores obtained in different phases of the experiment

<table>
<thead>
<tr>
<th>Variables</th>
<th>Periods</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td>1st</td>
<td>2nd</td>
</tr>
<tr>
<td>Total body pain/discomfort</td>
<td></td>
<td>14.2</td>
<td>17.7</td>
<td>19.3</td>
<td>2.7</td>
<td>6.6</td>
</tr>
<tr>
<td>Self-reported productivity</td>
<td></td>
<td>94.5</td>
<td>80.9</td>
<td>67.2</td>
<td>100</td>
<td>95.6</td>
</tr>
<tr>
<td>Measured Productivity</td>
<td></td>
<td>70.0</td>
<td>76.0</td>
<td>85.0</td>
<td>62</td>
<td>74</td>
</tr>
</tbody>
</table>

In contrary to increasing measured productivity, the subjects reported that their productivity was diminishing over time. This might possibly be related with the fact that the subjects knew the aims of the experiment, which might possibly biased the results. In addition to this it might also be possible that the subjects were motivated to report diminished productivity as the level of pain was increasing.
6.1.1.5 Conclusion

Due to both ethical limitations and its cost, it is difficult to design experimental studies in the field of pain and work performance. In addition to this, the results obtained in the laboratory may not predict the real life situation, since subjects could override the experimental pain (Birch et al., 2001). As it is unethical to study high levels of pain in the laboratory settings, it may not be possible to obtain significant results with pain levels that are within the tolerable limits to the subjects.

Figure 6.2: Line curves showing the progress of learning during the experiment
6.1.2 Observational field study

The literature reviewed in the earlier chapters (2, 3, and 4) showed that the way individuals deal with musculoskeletal symptoms may affect the experience of future symptoms and also work performance. However, the number of studies that have investigated coping with musculoskeletal symptoms, and work performance is small in number. The researchers have mostly considered self-report methods, but studies that have used objective methods (e.g. direct observation) is lacking in its number. Therefore the direct observation method was selected and tested in the prior study (laboratory study) in the experimental settings. As a result, the previous study revealed that it might be impractical to study pain and work performance in the experimental settings due to the limitations such as ethical issues (e.g. exposing participants to pain levels that are above the tolerable limits), and also the likelihood that the participants may override the pain levels that are tolerable. Moreover studies as such may not be generalized to the real work settings, as psychosocial constructs may be activated differently in the real work context. In order to address these issues, the present study was therefore designed and performed in real work context.

6.1.2.1 Aims

The aims of this study were to test whether workers presenting with any musculoskeletal pain/discomfort were performing differently to those without any pain/discomfort and also to assess the usability and suitability of the selected methods.

6.1.2.2 Participants and methods

The present study was performed in a manufacturing company where diesel motor pumps were being produced for the vehicles. Assembly line\(^4\) workers were selected as study sample as this type of job is quite static and therefore might not be obtrusive during observations (e.g. following the worker around). The selected tasks were all short-cycle\(^5\), which was demanding workers to performing repetitively the same

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\(^4\) Assembly line: Manufacturing process in which interchangeable parts are added to a product in a sequential manner to create an end product.

\(^5\) Short-cycle tasks: Tasks that involves sequence of actions to be repeated in less than a minute.
pattern of movements. 10 assembly line workers volunteered to take part in the study, where 9 of them were females and 1 was male.

Two methods were used; the first was pain assessment scale and the second was the observer method. The Observer method is based on software where researchers have the opportunity to observe and analyse any behaviour objectively based on the duration, frequency and intensity of behavioural categories of interest (Martin and Bateson, 1993). In the present study the cycle times\textsuperscript{6} were measured as an objective measure of productivity.

The pain assessment scale consisted of two body maps (front and back) showing how the body was divided (See Figures 6.3-a, and 6.3-b). The body maps in total consisted of 47 body-parts each numbered from 1 to 47 and were provided with a 100mm VAS for the assessment. VAS is shown to be a highly reliable and valid measure and have been used widely in the clinical settings therefore it has been chosen to be used in the present study as well.

At a previous visit to the company the participants were met and made familiar with the aims of the study, so that they would be feeling more comfortable on the day of data collection and willing to participate. Explaining the aims of the study and the use of the results might prevent any bias that would arise as a result of being observed (e.g. Hawthorn effect). The study consisted of two phases where every participant video recorded for two times as 5 minutes and 10 minutes slots. The average gap between each recording was approximately 2 hours. For recordings, a video camera (Sony Trv-340) was fixed at a feasible distance from the workers where the work performance would be recorded as clearly as possible. After every recording the workers were asked to report their level of musculoskeletal pain/discomfort on VAS scales by taking the body-maps as references.

\textsuperscript{6}Cycle time: The time takes for a person to complete one unit of production.
6.1.2.3 Results

In the first stage of the study, of 10 workers, 5 reported that they were experiencing musculoskeletal pain/discomfort in various parts of their bodies. Due to the number of body-parts, grouping was applied in order to ease the data analysis. Therefore the 47 body parts were grouped as below:

**Neck**: body parts 2, 3

**Left arm**: body parts 7, 13, 17, 21, 27, 4, 10, 14, 18, and 24

**Right arm**: body parts 5, 11, 15, 19, 25, 6, 12, 16, 20, and 26

**Trunk**: body parts 9, 23, 8, and 22

**Left leg**: body parts 31, 35, 39, 43, 47, 28, 32, 36, 40, and 44

**Right leg**: body parts 29, 33, 37, 41, 45, 30, 34, 38, 42, and 46
The most frequently reported body part was the right-arm. Of 5 painful participants all reported pain in their right-arms in the first stage of the study. In the second stage right-arm pain was the most prevalent condition; however the prevalence diminished to 4 (See Figure 6.4).

![Figure 6.4: Frequency of painful body-parts in stages 1 and 2](image)

In order to be able to compare participants based on a single measure the following formula was used to calculate whole-body pain index (PI) (Stuart-Buttle, 1994):

\[
PI = \frac{\sum \text{Intensity of areas reported}}{\sum \text{Possible areas to be reported} \times \text{Maximum intensity}}
\]  

(1)

The pain indexes for both stage 1 and 2 calculated separately for every participant. The productivity measures for every participant however, were calculated by taking the lowest cycle time as basis for normalization as percentage scores. The aim in doing this was to obtain a single productivity measure for every worker as the tasks
that they were performing was different from each other. The productivity scores were calculated for both stage 1 and 2.

In comparing whether there was a difference among low-pain and high-pain groups, the PI scores were then calculated by taking the mean PI score as cutting point (See Table 6.2).

Table 6.2: The average pain and productivity scores obtained in pilot study 2.

<table>
<thead>
<tr>
<th>Worker</th>
<th>PI₁</th>
<th>PI₂</th>
<th>PI_average</th>
<th>Productivity score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.00</td>
<td>2.51</td>
<td>1.26</td>
<td>88.07</td>
</tr>
<tr>
<td>2</td>
<td>5.74</td>
<td>2.06</td>
<td>3.90</td>
<td>92.14</td>
</tr>
<tr>
<td>3</td>
<td>1.98</td>
<td>1.81</td>
<td>1.89</td>
<td>79.28</td>
</tr>
<tr>
<td>4</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>87.21</td>
</tr>
<tr>
<td>5</td>
<td>4.17</td>
<td>1.02</td>
<td>2.60</td>
<td>65.50</td>
</tr>
<tr>
<td>6</td>
<td>0.43</td>
<td>0.47</td>
<td>0.45</td>
<td>82.90</td>
</tr>
<tr>
<td>7</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>78.91</td>
</tr>
<tr>
<td>8</td>
<td>2.26</td>
<td>2.57</td>
<td>2.41</td>
<td>82.60</td>
</tr>
<tr>
<td>9</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>91.70</td>
</tr>
<tr>
<td>10</td>
<td>0.00</td>
<td>0.87</td>
<td>0.44</td>
<td>86.67</td>
</tr>
<tr>
<td>Mean</td>
<td>1.29</td>
<td></td>
<td>83.50</td>
<td></td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>1.36</td>
<td></td>
<td>7.82</td>
<td></td>
</tr>
</tbody>
</table>

The mean of PI results were 1.29, therefore those with PI level below 1.29 were allocated in low-pain group and those with higher PI level were allocated into high-pain group.

As it is seen in the Figure 6.5, the low-pain group were found to be more productive compared to the high-pain group. The difference in productivity among groups was approximately 6%.
Another analysis was performed in order to test the feasibility of the observer method, such as the number of observations that would be required in order to make unbiased inferences. With this purpose 10 tasks were selected. The cycle times of these tasks were analysed based on the statistical method suggested by Kanawaty (1992). With this method the number of required observations for every task was calculated according to 95.45 confidence level and a margin of error of ±5 percent. The number of required observations for every task was then multiplied with the average cycle times, which gave an estimation of the observation times required in order to have a representative sample (See Table 6.3).

6.1.2.4 Discussion
As a result of this pilot study the pain assessment tool used was found to be impractical, since the number of body regions provided was too many and caused some difficulty during the assessment. In addition to this, VAS was found to be unsuitable as it demanded responders to interrupt their work performance for the assessment. A scale such as verbal rating or a numerical rating scale may do a better job.
Table 6.3: An estimation of the required observation times for tasks

<table>
<thead>
<tr>
<th>Task #</th>
<th>Required number of observations (cycles)</th>
<th>Average cycle time (sec)</th>
<th>Required Observation time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48</td>
<td>55.51</td>
<td>44.69</td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>30.36</td>
<td>6.70</td>
</tr>
<tr>
<td>3</td>
<td>115</td>
<td>60.00</td>
<td>115</td>
</tr>
<tr>
<td>4</td>
<td>498</td>
<td>19.66</td>
<td>163.28</td>
</tr>
<tr>
<td>5</td>
<td>486</td>
<td>40.34</td>
<td>326.40</td>
</tr>
<tr>
<td>6</td>
<td>271</td>
<td>44.28</td>
<td>199.96</td>
</tr>
<tr>
<td>7</td>
<td>176</td>
<td>51.23</td>
<td>150.03</td>
</tr>
<tr>
<td>8</td>
<td>64</td>
<td>42.41</td>
<td>45.53</td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>32.74</td>
<td>16.61</td>
</tr>
<tr>
<td>10</td>
<td>303</td>
<td>5.06</td>
<td>25.56</td>
</tr>
</tbody>
</table>

The pilot study also revealed that a study in a context such as this one would require strict control of extraneous variables (e.g. within subject experimental design) as the effect size of pain on performance seems to be little; for example 6% in this study.

The analysis on the cycle times showed that there were significant variations in the production, which requires the observer to do longer observations; however as it is seen in Table 6.3 the estimated observation times are mostly beyond the feasible level and therefore would not be performed in this study due to the time and budget constraints.

Another issue that this pilot study has raised is, whether measuring the cycle-times as productivity measures would reveal what’s really going on in individual’s world, and what experiences do they go through as a result of having musculoskeletal symptoms at work? It may be that the workers who suffer from musculoskeletal symptoms have discovered the ways to deal with these symptoms and still keep up with required productivity standard; however using a direct observation method may not reveal the
whole picture of lived experiences of individuals at work. Exploring the ways that workers deal with musculoskeletal symptoms could be enabled by qualitative methods (Murray, 1998). Murray writes that qualitative methods are more appropriate for the study of complex phenomenon that can not be reduced to the form of quantitative variables. Moreover Murray suggests that qualitative methods may also be used in researching complex phenomenon.

There are various methods used in gathering qualitative data (e.g. In-depth interviews as in the form of individual and/or focus groups). For example in-depth interviews provide the opportunity for the researcher to explore an individual’s beliefs, attitudes and feelings in detail (Murray, 1998). Among in-depth interviews, focus groups is one of the form where a group of people (e.g. 6-9 in number) are brought together in order to explore the ideas, and or feelings, attitudes or perceptions about a topic, under the guidance of a facilitator (Denscombe, 1998). The focus groups are shown to be a quick and convenient way of data collection, which uses group interaction as part of the method.

6.1.2.5 Conclusion

This pilot study has revealed that the use of objective methods (e.g. direct observation) in a context where the variables of interest (e.g. cycle times) show great variation might not be feasible, when the constraints such as time, and financial resources considered.

By keeping in mind that measuring productivity as a single measure wouldn’t reveal the whole picture of experiences of people who are present at work despite experiencing musculoskeletal pain, qualitative methods such as focus groups may be a better option in overcoming these problems.
6.1.3 Focus group study

The literature reviewed in the present thesis (Chapters 2, 3, and 4) revealed that the way individuals cope with musculoskeletal symptoms at work may affect the experience of future symptoms and also work performance. However, the number of studies that have investigated coping with musculoskeletal symptoms, and work performance in the context of work is small in number.

The earlier pilot studies have revealed that the use of indirect observation method for the assessment of the effects of musculoskeletal pain on work performance was infeasible, when time and financial constraints were considered. Moreover, measuring productivity as a single measure may not reveal the whole picture of the experiences of those who are at work despite experiencing pain. Qualitative research methods could help to gain better insight into the experiences of those who are at work despite pain. Meadows (2003) writes that qualitative research could help in understanding of social phenomena (e.g. experiencing musculoskeletal pain while at work) in a natural rather than an experimental setting with a particular focus on the meanings, experiences, attitudes, and views of the participants rather than providing quantified answers to a research question.

Different data collection methods are available (e.g. in-depth-individual interviews, focus groups etc.) in generating qualitative data; however focus-group method is shown to be an effective way of collecting large amount of qualitative data in a quicker basis compared to the other methods available (e.g. individual interviews). Nevertheless, this method further needs to be tested in a pilot study.

6.1.3.1 Aims

• To explore the ways that workers deal with musculoskeletal pain at work
• To explore the likely outcomes of dealing with musculoskeletal pain at work
• To test the usability of focus groups as a method of data collection
6.1.3.2 Participants and methods

Five focus groups interviews were performed in order to collect information on the research questions identified. The participants were obtained via personal contacts and the sample included individuals who had experienced musculoskeletal symptoms within the past month.

<table>
<thead>
<tr>
<th>Session</th>
<th>Group</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PhD students</td>
<td>3 male / 2 female</td>
</tr>
<tr>
<td>2</td>
<td>PhD students</td>
<td>6 male</td>
</tr>
<tr>
<td>3</td>
<td>Post office workers</td>
<td>4 male</td>
</tr>
<tr>
<td>4</td>
<td>Market cashiers</td>
<td>4 female</td>
</tr>
<tr>
<td>5</td>
<td>Course administrators</td>
<td>1 male / 4 female</td>
</tr>
</tbody>
</table>

Data were collected using semi-structured and tape-recorded focus-group interviews where five different sessions were performed with people from different job backgrounds. Based on musculoskeletal disorders literature a semi-structured flexible interview guide was devised and used throughout the whole process. The guide was further developed in order to gain more insight into the issues that were raised in the previous sessions.

Interviews were all conducted in a silent and convenient room at the University of Surrey at a time that was convenient to all the participants. Interviews lasted up to an hour with including the recording times. The recorded interviews were transcribed verbatim and prepared for analysis in QSR NUD*IST (N6), a qualitative software package. The prepared material was then coded according to the research questions. Therefore the results comprised of two main themes ‘coping strategies’ and ‘outcomes’ that have further divided into sub-categories. These are further elaborated in the following sections.
6.1.3.3 Findings and discussion
All the interviews were coded and grouped under two main themes, 'coping strategies', and 'outcomes'. These themes are further elaborated in the following sections.

➢ Coping strategies
Participants reported that they used a variety of coping strategies in order to feel better and continue performing their work. These strategies have been further discussed in the following sections; however, caution should be taken since there might be more strategies that have not been explored in the present small scale study, where the data did not reach to the saturation point.

♦ Treatment
Treatment category comprised of use of medication (e.g. pain killers) and other alternative techniques (e.g. massage) in order to treat musculoskeletal pain. In terms of medication use, the workers frequently relied on pain killers.

*I think the first thing I do, is to just take something like pain killers. It depends of course on the degree of pain...* (HK, Male, 33 years old, PhD student)

However, taking pain killers sometimes had a price for them. For example IA expressed that taking pain killers made him feel sleepy and interrupted his ability to concentrate on his work.

*...in my left side [low-back] I suddenly felt pain, a strong pain yeah. Sometimes I can handle this a little bit without taking any pain killers, but I couldn’t and I took them [pain killers]; however, I started feeling sleepy that made me unable to concentrate and write up [report].* (Male, 40 years old, PhD student)
KB regular reliance on pain killers led her experiencing stomach problems.

_In the beginning I used to take pain killers but then it continued and my stomach got upset, so I needed to see a chiropractor._ (Female, 33 years old, PhD student)

The awareness of the issues related to the medication use led some to rely on the alternative therapies. Some of them received this from professionals employed by their organization as expressed by KB in the below quote.

_I go to the sport centre, they have like sport therapies. She gives a kind of massage, I think it is called 'acupressure', and that helps a lot really._ (Female, 33 years old, PhD student)

♦ _Exercise/stretch_

The use of exercises/stretches was common among the participants. One of them (SE) exercised in order to prevent pain occurring. By following strict exercise and stretching procedures he was able to prevent it progressing to an unpleasant stage.

_...when I can and where it is possible I would try to stretch. I would rather try to cope with this pain before it arrives because I can now more or less know when it will come. So before it comes I can do certain exercises that can prevent it from happening hopefully. But if it comes we have nothing much to do._ (Male, 30 years old, PhD student)

Another one followed the advice given by her chiropractor and did stretches at her desk.

_Well I found out that when I start to get that [pain], only because that the chiropractors told me, I get up and walk around and do some stretching exercises at my desk..._ (Female, 42 years old, Administrator)
ES explored his own way of exercising that was to climb up the stairs. It helped him with his low-back pain.

... for low back pain if I climb stairs makes it a little bit better but lovely ground is fine, walking a lovely ground, but just slow. (Male, 36 years old, PhD student)

♦ Pacing, pretending and breaks

The use of breaks was common among the PhD students. They had the flexibility to take breaks and pace their work. LB expressed that his pain sometimes reached to an unbearable level where he needed to take breaks from his work. He found it useful to go into the student’s common room and lie down on the chairs provided in the room.

Well, I often have pain in the left shoulder and it’s very, can be very very painful and sometimes I have to stop work and I have to lay down on the chairs [in the common room] (Male, 24 years old, PhD student)

CA on the other hand gets away from her workstation. She finds it helpful to walk away and get some refreshments while she is recovering from the pain.

I find it if I got something that needs a lot of concentration you start to do it and then you think ‘oh I am not getting anywhere with this; it’s not really working’. I know what I will do, I will go up and walk away, get a cup of tea or something come back, sit down, back to whatever you doing and it’s sort of a ‘oh, that’s it, that’s right’.... (Female, 42 years old, Administrator)

Some of the participants who didn’t have the flexibility in taking breaks whenever needed came up with different tactics.
I think I will admit to having done that [going to the toilet unnecessarily] because there is no manager around. You just go to the toilet unnecessarily just to walk around. I mean I have seen people like if you are tired or having painful back you just take a trolley and go from one end to the other end, like all trying to pretend to be very busy where you are actually not busy. There is one guy I know he used to take a trolley, walk with it to the other end talk to the people, and walk back with it. You know just when the manager sees you walking around with that they think that you are very busy but you actually not doing anything. (Male, 29 years old, post office worker)

RR on the other hand took short breaks when the pain was intolerable. He slowed down in order to bear with his pain and be able to keep working.

I go for a little walk; that’s gonna take me five minutes. I come back you know charge batteries to keep on working for two hours more sitting there and working with a fair lower pace.

HA also used pacing as a way of coping with pain while on the task. By reducing the speed of work performance he was able to tolerate the pain.

In case you are doing tipping [bags full of parcels] the strategy, which you should do is to change your speed. If you are doing it fast just reduce the speed. (HA, Male, 33 years old, Post office worker)

♦ Postural adaptations
Another common strategy used to tolerate pain was to adopting different postures while performing work tasks. Participants frequently relied on this method as it didn’t require them to take breaks from their work; however, this method was not always helpful in relieving the pain.
First I try to adjust my position, so to be straighter [means sitting upright]. Sometimes it’s enough but sometimes it’s not enough, so if it’s not enough I try something else. (Male, 24 years old, PhD student)

Sitting for a long time in front of the till was causing KA to having a painful back. Therefore she preferred to working stood rather than sitting in order to prevent this happening.

*When I am working at the check out, I always stand up. I never sit down, because it’s not good you know. Sometimes sitting for a long time you really feel very painful back, so I always choose to stand up...* (Female, 22 years old, supermarket cashier)

HA didn’t have control over his breaks therefore he had to cope with the pain by changing his posture and standing up time to time.

...*the chair I don’t think is a comfortable one. So sitting more than thirty minutes to one hour the pain will start to build up. You either have to stand up or you have to change your position. It will help to relieve the pain to some extent, a little bit but not completely. It doesn’t help much.* (Male, 32 years old, post office worker)

♦ Task variation

Task variation was common among those who were limited in taking unscheduled rest breaks and also their job involved multiple tasks. HA was one of them and changed his tasks to a less strenuous one to get an opportunity to recover from pain.

*For me I think, doing some other job in the same area, for example doing boxing [the letters] even though you don’t need to do so, its just to move your body because you have to show that you are doing something.* (Male, 32 years old, post office worker)

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Distraction

Distraction was frequently used by the supermarket cashiers in order to tolerate pain and continue work performance. This group of workers were limited in pacing their jobs, and taking breaks whenever needed, therefore they had to rely on distraction as a way of tolerating pain while on the task. In the following quote MA expresses how she distracted herself from the pain.

Sometimes you work for long hours may be four hours on the checkout and you still not given a break and then I think one of the way is to talking to the customers and just focusing on your customers, chatting with them. (Female, 23 years old, supermarket cashier)

MO has found that singing a song helps her in taking her attention away from the pain since she only focuses on recalling the words of the song.

I sometimes sing a song, the favourite song very quietly; of course you wouldn’t like anybody to hearing it but it helps me...You forget everything, you just try to remember what you are singing. (Female, 25 years old, supermarket cashier)

Outcomes

Three sub-categories have emerged as outcomes of dealing with musculoskeletal pain while at work. These were ‘work-related’, ‘psychological’ and ‘psychophysiological’ outcomes that are further explained in the following sections.

Work-related outcomes

Work-related outcomes comprised of consequences such as time spent on tasks and delays in work accomplishment, reduced productivity, and time taken off from work due to pain.
I can’t go to the lab and I can’t stand for three hours! No, I can go say if I have something to do for ten minutes to check it or whatever, but I can not do the whole function [experiment] which is three hours and I usually delay it until I get better. (HK, Male, 33 years old PhD student)

ES tried stretching to gain some comfort; however this didn’t completely remove the pain. Pain hindered with his ability to concentrate on his work. According to him he had accomplished about one third less of which he could had done without pain.

I went through of the paper, I did a bit a of stretching down in every couple of minutes or something, I went through of the paper but I wouldn’t say it was the ideal situation in terms of concentrating and reading... I needed more time, in terms of quality I would say if I didn’t have the pain, [thinking] probably I lost one third of what my I should have gained if I didn’t have the pain. (ES, Male, 36 years old, PhD student)

RO on the other hand expressed that pain sometimes interrupts his attention that leads him to do errors on the task.

... Sometimes, well if you get distracted especially in the CFC area [Letter processing section in the post office], well this is my case during the tipping and separating the letters, sometimes I find myself putting things in the wrong place. (Male, 29 years old, post office worker)

Musculoskeletal pain caused some participants to take time off from work. In the following quote RO expresses how work activities led him to be absent from work.

I think like a few weeks back I did a lot of tipping [bags full of parcels] and when I went home the pain was still there. When I got up on Monday morning I couldn’t go to my next job and I had to take a
Psychological and psycho-physiological outcomes

Musculoskeletal pain often caused participants to experience a variety of emotions (e.g. frustrations, angriness, worry, and anxiousness) and inability to concentrate and accomplish their work tasks. Moreover it has affected their quality of life as DM expresses as following.

I was in pain and it affected my quality of life for sure, but I am not sure about a dramatic effect on my work. I was not actually in pain when I was sitting. It was only affecting me when I was moving and walking around, going up the stairs. If you are asking me if it effected my productivity, I wouldn’t say it did that much, but if you are asking me whether it effected my life, it did, yeah. (Male, 27 years old, PhD student).

The experience of musculoskeletal pain sometimes reduced sufferers’ ability to perform at times when they were pain free. For some of them the pain was exhausting.

Yeah you get the feeling though when you get bad back, I don’t know how anybody else feels about this but I get really tired...

It sometimes caused frustrations; however, when combined with work pressures it has been distressing. SE outlines his experience in the following phrase.

Because you try to achieve your task and the pain is an indirect factor that sort of prevents you from giving hundred percent concentration to what you are doing, and that therefore makes you angry and if you are working against a deadline you may as well get anxious. (Male, 30 years old, PhD student)
6.1.3.4 Conclusion

The results of the present interviews revealed that the workers used a variety of coping strategies in order to relieve their pain and continue to performing their work tasks. They had a tendency to initially try strategies that were not time demanding; however inefficient in providing long lasting relief (e.g. stretches, postural adaptations). The use and utilisation of various coping strategies were affected from factors such as lack of autonomy on the job and also severity of condition; nevertheless there might be other factors that shape worker’s decision making in choosing or not choosing to use particular coping strategies at work. These factors were not explored in the present study; however it could be useful to address this issue in a future study. The exploration of such factors may lead us to understand the barriers to accessing effective coping strategies.

The experience of musculoskeletal pain has led to different outcomes that were subcategorized as ‘work-related outcomes’ and ‘psychological and psycho-physiological outcomes’. The participants often reported that the pain intervened with their work activities by physically limiting work performance or affecting their ability to concentrate and accomplish work. One of the participants reported that pain took his attention away that resulted in making errors on the task. The extent to which pain affects work performance needs to be further investigated in the future.

Moreover, pain caused suffering and diminished quality of life. Some of the participants felt anxious, and sometimes angry with pain making them feeling exhausted and interrupting their work performance.

As this study consisted of five focus group interviews, it has not been possible to further develop the existing themes. The results showed that qualitative methodology is a feasible approach in investigating the experiences of those who were present at work, despite experiencing musculoskeletal pain. However, the present work revealed that workers may use coping strategies that they may not be willing to report in a group setting (e.g. pretending like working).
6.2 Summary

The present research comprised of three pilot studies, (1) experimental study, (2) observational field study, and (3) qualitative interviews where focus groups were used as methodology of investigation.

The experimental study revealed that it was not feasible to study pain in the laboratory for ethical reasons, and also for the reason that psychosocial constructs may be activated differently in the field compared to the laboratory. Moreover, the participants could not be exposed to intolerable pain levels for ethical reasons, which may cause pain to be overridden during the task performance. The present experimental study revealed that there was a potential learning effect that needed to be controlled; however this was impractical when time and budget constraints were considered.

The second study (observational field study) was designed based on the issues raised as a result of the experimental study and conducted in the field. The present research also showed that a study in a real work setting would require strict control of extraneous variables (e.g. within subject experimental design) as the effect size of pain on performance was little (6% in the present study). However, applying such design in a manufacturing environment where the workers were being rotated and the flow of production was varying was impractical. In addition, the analysis on the cycle times showed that there were significant variations in production, which required longer observations to be done; however that was not feasible as well.

Finally to address the issues that have been raised as a result of the observational field study, qualitative interviews were selected and applied in the form of focus groups. The focus groups provided more richer and in-depth data by directly interacting with the individuals who had experiences with the phenomenon (musculoskeletal pain). As a result of the study a range of coping strategies were explored, which the workers were using at work in order to cope with musculoskeletal pain. The present qualitative study showed that participants often camouflaged their pain, and did not reflect its effects on their work performance (e.g. pretending).
I mean I have seen people like if you are tired or having painful back you just take a trolley and go from one end to the other end, like all trying to pretend to be very busy where you are actually not busy. (RO, Male, 29 years old, post office worker)

Since this was the case using an observational approach needs extra caution to be taken, as the results might be biased with recording workers as working whereas they were not. Moreover, focus groups revealed that the workers used cognitive strategies (e.g. distraction) that could only be explored with self-report methods (e.g. qualitative interviews, questionnaire surveys).

Focus group interviews were found to be practical in terms of generating rich data in a quicker basis. In the present study the participants who took part in the focus groups were all familiar with each other; therefore they might not felt uncomfortable in admitting strategies like the one expressed in the quote above; however, this might not be the case and the participants might feel unwilling to disclose their confidential experiences in a group setting. This could be addressed by replacing focus groups with individual interviews in the future.

Finally the pilot work showed that the way that workers cope with musculoskeletal pain at work could be studied better by involving those in the research process who have the experience; however, using qualitative interviews as a ‘stand alone method’ may restrict the study findings to be generalizable to a wider population. This could be addressed by using multiple methodologies (e.g. qualitative interviews vs. questionnaire survey) that might further add credibility to the results. Therefore the methodology for the main study was adapted and reframed as in Section 7.4.
CHAPTER 7

7 METHODS AND MAIN STUDY DESIGN

As discussed at the end of the chapters 2, 3, and 4 and in the discussion of the pilot work (Chapter 6), there are three important areas to explore.

This chapter reviews the qualitative methods together with their advantages and disadvantages. It also reviews the existing qualitative approaches and considers the steps undertaken before the methodology was applied in the field.

In the present study, two methodologies, qualitative interviews and questionnaire survey were used to address the aims of the present research. The interview and questionnaire survey development phase and administration has been explained together with the steps undertaken in the analysis of the results of the studies.

7.1 Rationale for studying ‘coping strategies’

To date various models have been suggested in conceptualising the WRMSDs (See Chapter 2). In these models the ‘individual’ has been considered as a passive entity being exposed to various work-related risk factors; however there is now evidence to suggest that individuals can be active and change the way of work performance as a result of their cognitive and behavioural responses to the increased job demands (Feuerstein’s work-style model as a coping mechanism). The interpretation of musculoskeletal symptoms and cognitive and behavioural responses to these symptoms at work (e.g. coping with musculoskeletal pain) however remains unclear and needs further investigation.
7.2 Rationale for studying ‘decision-making’

The transactional model by Lazarus and Folkman (1984) suggests that before any coping actions take place, the individual who encounters the stressful situation (e.g. musculoskeletal pain) first evaluates the situation and gives it a meaning, resulting with an emotion (primary appraisal). If this situation is appraised as harming or potential risk for the well-being, then another appraisal (secondary appraisal) comes into play. Secondary appraisal refers to ‘what can be done?’ where the available coping resources and strategies are evaluated before any behaviour takes place (Dewee et al., 1993). To date the number of studies that have investigated the factors affecting secondary appraisal at work is very small in number (See Chapter 3). The understanding of such factors is important and would help us in removing the barriers restricting or preventing individuals in accessing useful coping resources at work.

7.3 Rationale for studying ‘work performance’

The relationship between ill health and work performance is a new field of investigation for many researchers and organizations. There are a sufficient number of studies that have considered the effects of psychological ill-health on work performance to enable tentative conclusions to be drawn (See Chapter 4). When considering MSDs however, most of the studies have been performed in experimental settings, and the findings are limited in their generalizeability to real work settings.

The number of studies performed in the field so far is insufficient, and therefore the mechanisms that might lead to diminished work productivity are unclear. Further studies are needed to investigate the effects of musculoskeletal pain on work performance, with an emphasis on the ways that coping could influence the work performance.
7.4 The modified aims of the study

Based on three important areas, ‘coping strategies’, ‘decision-making’, and ‘work performance’ the aims of the present research were specified as below.

The main aim of the study was:

“To gain insight into the musculoskeletal pain experiences of office workers at work”

Sub-aims were:

➢ To explore the range of coping strategies that office workers use in order to deal with musculoskeletal aches and pains at work
➢ To explore the factors that have effect on the decision making of office workers in using or not using particular coping strategies
➢ To assess the effects of musculoskeletal pain on work performance

The pilot work performed revealed that the best approach to study musculoskeletal pain experiences of workers while at work would be to involve the individuals in the research process; thus, using qualitative methods. The following section will discuss the qualitative research.

7.5 Qualitative research

As it is defined by Strauss and Corbin (1998), with the term ‘qualitative research’ it means ‘any type of research that produces findings not arrived by statistical procedures or other means of quantification. It can refer to research about persons’ lives, lived experiences, behaviours, emotions, and feelings as well as about organizational functioning, social movements, cultural phenomena, and interactions between nations’.

Strauss and Corbin (1998) emphasized that there are many valid reasons to do qualitative research. The first reason might be the preferences and/or experiences of researchers. The second reason, which Strauss and Corbin (1998) suggested as a
more valid reason, is the nature of research problem. For example research that aims to understand the nature and experiences of people with health problems, such as chronic illness and addiction. In addition, qualitative methods can be used to gain insight into the feelings, thought processes, and emotions that are difficult to extract and learn about in the course of using more conventional research methods. However, despite these facts Malterud (2001) stressed that qualitative research is still regarded with skepticism, due to its subjective nature and the absence of facts.

7.6 Qualitative vs. Quantitative research

The terms qualitative and quantitative are simply describing two types of data as words and numbers respectively; however, the methods related with them is expressed as approaching to the research process from different perspectives (Thompson and Walker, 1998). In Table 7.1 some of these contrasts have been summarized.

Table 7.1: Contrasts between qualitative and quantitative approaches (from Thompson and Walker, 1998)

<table>
<thead>
<tr>
<th></th>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Aims to describe phenomenon or generate theory</td>
<td>Explores causes, makes predictions</td>
</tr>
<tr>
<td><strong>Perspective</strong></td>
<td>Subjective view of participants</td>
<td>Objectivity increased through use of precise measurement</td>
</tr>
<tr>
<td><strong>Sample</strong></td>
<td>Small samples; purposive selection of participants based on their experience</td>
<td>Large, representative samples; random selection of subjects or random assignment to group</td>
</tr>
<tr>
<td><strong>Data</strong></td>
<td>Consist of words (interviews, diaries, other written documents) or pictures of other artifacts in which the significance has been rendered into words</td>
<td>Generated from responses to questionnaires or some objective measurement (e.g. temperature)</td>
</tr>
<tr>
<td><strong>Analysis</strong></td>
<td>Interpretive</td>
<td>Statistical</td>
</tr>
</tbody>
</table>

Abusabha and Woelfel (2003) argue that the core of the qualitative research is to capture human life as it lived. Researchers observe people in their own settings and
interact with them on their own terms. The qualitative researchers believe the best way to understand a phenomenon is to study it in its context and to become engrossed in it. In addition to this it is also suggested that they perceive quantitative research as limited in nature, studying people in artificial settings and looking at a small section of reality (Abusabha and Woelfel, 2003).

In contrast to the qualitative viewpoint, quantitative researchers argue that knowledge means measurement, cause and effect, and reductionism. The philosophy is considered as detailed plan of operation with predetermined hypothesis, which uses statistical sampling techniques to study representative samples and allow generalizations to the population being studied. Quantitative researchers consider themselves as being unbiased, taking an outside and objective view to study the subject at hand and criticize qualitative research as for being biased, and effected with prejudices, views, and beliefs of the researcher as well as the participants. In addition to these they also suggest that qualitative research is too particularistic, focusing too closely on the individual and failing to make connections to larger situations (Abusabha and Woelfel, 2003).

Sogunro (2001) expressed that the debate between supporters of these two distinguishable research approaches is in essence ideological and political. In fact the two methods differ in their ways of conducting research.

7.7 Choosing between qualitative and quantitative methods

According to Miles and Huberman (1994) the quantitative and qualitative argument is in fact unproductive. The authors stressed that the issue is not quantitative-qualitative, but it is a matter of whether an ‘analytic’ approach or a ‘systematic’ approach to understanding the interaction of control variables in a complex environment is being undertaken.

Sarantakos (1998) emphasized that both qualitative and quantitative research methodologies are important, but suitable for different types of inquiry. The author adds that there is no ‘better’ or ‘right’ methodology. Both of the methodologies are good and right depending on the circumstances.
Rossman and Wilson (1985) suggested that both qualitative and quantitative methods could be used in combination. For example, qualitative methods could be used to provide richness or detail to quantitative findings.

Qualitative and quantitative methods differ in the type of questions they could answer and both methods have their own strengths and weaknesses. Using a combination of both quantitative and qualitative methods could cross out their corresponding weaknesses (Abusabha and Woelfel, 2003).

In all research, the research questions could both be answered using qualitative and quantitative methodology or, one of either methods could predominantly answer the questions under investigation, depending on the answers required. Using a mixed methods design could also contribute to the research in various ways. These are summarised by Darlington and Scott (2002) as triangulation; complementarity; development; initiation; and expansion.

There are four different approaches used in mixing methods. These are (1) qualitative then quantitative, when the findings of the qualitative study are used to develop the quantitative phase; (2) quantitative then qualitative, when the findings of the quantitative research are required to develop the qualitative phase; (3) qualitative and quantitative concurrently, when the methods are not interdependent of each other and the conduct of one does not depend on the other. The final approach is to (4) mixing qualitative data collection approaches (e.g. mixing in-depth interviews and focus groups) (Darlington and Scott, 2002). The present study used a combination of both approaches (2) and (3), hence part of the quantitative data was used to inform the purposive sampling process in the qualitative phase; and the methods were also used to answer the following formulated questions interdependently.

7.8 Quality in qualitative research

Qualitative research has often been criticized as lacking scientific rigour. The most frequently made criticisms are; that qualitative research is simply an assembly of anecdote and personal impressions, which are strongly exposed to researcher bias. It
is also disputed that it lacks reproducibility and criticized as lacking generalizability such as, tendency to generate large amounts of detailed information about a small number of settings (Mays and Pope, 1995). As it is stressed by Mays and Pope (1995), the basic strategy to ensure scientific rigour in qualitative research is systematic and self-conscious research design, data collection, interpretation, and communication, as in quantitative research. In addition to these, there are two goals that qualitative researchers should seek to achieve: to create an account of method and data which can stand independently (e.g. another researcher could analyze the same data in the same way and come essentially to the same conclusions); and to produce a credible and coherent explanation of the phenomenon under study (Mays and Pope, 1995).

As Mays and Pope (2000a) writes there has been a considerable debate about whether qualitative and quantitative methods can and should be assessed according to the same quality criteria. After all two opposing views have been evolved as relativist and realist. The authors who support the realist view agree that all research involves subjective perception and that different methods produce different perspective; however, unlike the anti-realist, they argue that there is an underlying reality which can be studied. The relativist view on the other hand suggest that all research perspectives are unique and each equally valid in its own terms, therefore assessment criteria are feasible but distinctive ones are required to evaluate qualitative research. In addition, this view suggests that qualitative research represents a distinctive paradigm and as such it cannot and should not be judged by conventional measures of validity, generalizeability, and reliability.

As it stressed by Mays and Pope (1995) the basic strategy to ensure scientific rigour in qualitative studies is systematic and self-conscious research design, data collection, interpretation, and communication. Further, there are two more goals that should be achieved. These are to create an account of method and data which can stand independently so that another trained researcher could analyze the same data.
Guba and Lincoln (1989) suggest four different approaches to considering the quality of goodness of naturalistic research. These are credibility, transferability, dependability and confirmability. Further information about these approaches can be seen in section 7.14.4.

7.9 Qualitative research methods

As it is stated earlier in section 7.6 the aim of qualitative research is to help in understanding the social phenomena in a natural rather than an experimental setting with an emphasis on the meanings, experiences, attitudes and views of the participants rather than providing quantified answers to a research question (Meadows, 2003; Pope and Mays, 1995). The data obtained from the qualitative methods of inquiry are usually in the form of words rather than numbers, where the generation of these words is usually based on the observations, interviews or documents (Miles an Huberman, 1994; Meadows, 2003).

As it is stressed by King (1998) the interviews are one of the most commonly used methods of data gathering in qualitative research; however not every interview could be considered as qualitative. Among those that fit under the label of ‘qualitative’ are variously referred to as ‘depth’, ‘exploratory’, ‘semi-structured’, or ‘un-structured’ and in general could be named under the umbrella term ‘qualitative research interviews’ (King, 1998). The research interviews can also be categorized as one to one and group interviews. Both methods of inquiry involve the elucidation of subjective meaning, experience, beliefs, and attitudes. They can last between 1 and 2 hours and are usually recorded, and then transcribed to be analyzed in the later stage (Whitley and Crawford, 2005).

As it is emphasized by Whitley and Crawford (2005), the group interviews also called focus groups, differ from one-to-one interviews in that they are collective act that can access group norms, collective opinions, and shared ‘knowledge,’ rather than individual views (Morgan, 1993).
Observation on the other hand, which includes ‘participant observation’, ethnography, and field research, is defined to be the most complex and multidimensional approach to qualitative inquiry and therefore pointed out to be hardest to describe from its extensiveness point of view (Safman and Sobal, 2004). It involves the systematic description and analysis of behaviour and talk in real-world settings. The method is theoretically driven, as relevant times and places are selected to explore a research question where everyday occurrences, speech, dress, acute events, interpersonal interaction, and unwritten rules of behaviour may be recorded (Whitley and Crawford, 2005).

Qualitative document analysis is shown to employ different textual and non-textual sources including books, periodicals, letters, records, broadcast media, web sites, art work, and recordings (Safman and Sobal, 2004).

7.10 Qualitative research approaches

There are several research approaches that are grouped under the heading of qualitative methods; however in this section only major methods have been reviewed (Thompson et al., 1998).

7.10.1 Biography

A biographical study is defined as “the study of an individual and her or his experiences as told to the researcher or found in documents and archival material” (Creswell, 1998). As it is emphasized by Creswell (1998), the term ‘biography’ is used as an umbrella term for biographical writings such as individual biographies, autobiographies, life histories, and oral histories.

7.10.2 Phenomenology

Phenomenology is a qualitative method, which has evolved from philosophy (McPhail, 1995). Its emergence is from the works of philosophers such as Husserl, Kierkegaard, Heidegger and Merleau-Ponty (Thompson et al., 1998; Ng and White, 2005). The method is used when researchers are interested in answering a research question such as “What is the lived experience of X?”; or further Heideggerian
hermeneutic phenomenology, where experiences are interpreted possess the question, “What is the meaning of the lived experience of Y?” (Krasner, 2000).

According to Miller (2004), phenomenology attempts to describe phenomena and human experience. It should be described as a philosophy rather than a research method. Hence when phenomenology used as a research method, it is actually a philosophy being adapted that assesses the participants’ subjective experiences for a phenomena under investigation. Thopmson and Walker (1998) write that the data for a phenomenological study mainly comes from the interviews, where in the later stages recorded interviews are transcribed verbatim and analyzed. During the analysis the generated data is summarized and synthesized into themes that communicate the essence of the experience.

7.10.3 Grounded theory

Grounded theory is defined as “a general methodology for developing theory that is grounded in data systematically gathered and analyzed” (Strauss and Corbin, 1994). Theory develops during the actual research where there is a continuous interaction between analysis and data collection. As it is stressed by Strauss and Corbin (1994) a fundamental characteristic of this analytic approach is “a general method of [constant] comparative analysis” (Glaser and Strauss, 1967, p.vii); therefore the approach is often referred to as the ‘constant comparative method’ (Strauss and Corbin, 1994).

Grounded theory is developed by two sociologists, Barney Glaser and Anselm Strauss (Glaser and Strauss, 1967) who formulated the approach in reaction to the sociological stance prevalent in the 1960s which insisted that studies should have a firm ‘a priori’ theoretical orientation (Robson, 2002).

As it is emphasised by Robson (2002) grounded theory is both a strategy for doing research and also a particular style of analyzing the data that evolves from that research. This approach gives the opportunity to researchers in developing theories at any level, which is shown to be one of the major differing characteristics of the methodology compared to the others (Strauss and Corbin, 1994). As it is stressed by
Straus and Corbin (1994) the grounded theory shares some similarities with other methods. For example sources of data that are the same: interviews and field observations, as well as documents of all kinds (including diaries, letters, autobiographies, biographies, historical accounts, and newspaper and other media materials). In addition videotapes may also be used.

Robson (2002) stressed that although the methodology is a qualitative approach to research, there is no reason not to use some form of quantitative data collection. This point was also made explicit by Strauss and Corbin (1998) that grounded theory is a general methodology that can be used both in quantitative and qualitative studies.

Table 7.2: Attractive and problematic features of grounded theory (from Robson (2002)).

<table>
<thead>
<tr>
<th>Attractive features of grounded theory</th>
<th>Problems in using grounded theory</th>
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<tbody>
<tr>
<td>1. Provides explicit procedures for generating theory in research.</td>
<td>1. It is not possible to start a research study without some pre-existing theoretical ideas and assumptions.</td>
</tr>
<tr>
<td>2. Presents a strategy for doing research which, while flexible, is systematic and co-ordinated.</td>
<td>2. There are tensions between the evolving and inductive style of a flexible study and the systematic approach of grounded theory.</td>
</tr>
<tr>
<td>3. Provides explicit procedures for the analysis of qualitative data.</td>
<td>3. It may be difficult in practice to decide when categories are 'saturated' or when the theory is sufficiently developed.</td>
</tr>
<tr>
<td>4. Particularly useful in applied areas of research, and novel ones, where the theoretical approach to be selected is non-existent.</td>
<td>4. Grounded theory has particular types of prescribed categories as components of the theory which may not appear appropriate for a particular study.</td>
</tr>
<tr>
<td>5. Wide range of exemplars of its use in many applied and professional settings now available.</td>
<td></td>
</tr>
</tbody>
</table>
7.10.4 Ethnography

Ethnography is shown to be the oldest qualitative research method, which is developed by the anthropologist to study cultures (Ng and White, 2005). Its purpose is to study the features of a defined group’s daily life, including their beliefs and patterns of activities, and meanings attached to these activities and behaviours (Thompson and Walker, 1998). In this kind of research the researcher becomes part of the group under investigation, therefore he or she enters to the life of the culture being studied and uses multiple methods such as interviews, observations, but also may include diaries, pictures and various other cultural artefacts (Thompson and Walker, 1998). As it is emphasised by Thompson and Walker (1998), the aim is to understand the group or culture being investigated rather than theory building.

7.10.5 Case study methods

As it is defined by Creswell (1998) “a case study is an exploration of a bounded system or a case (or multiple cases) over time through detailed, in-depth data collection involving multiple sources of information rich in context.” The bounded system is expressed as being bounded by time and place, and it is the case being studied such as; a program, an event, an activity, or individuals (Creswell, 1998). As sources of data, observations, interviews, audio-visual material, and documents and reports could be used.

7.11 Comparison of the approaches

Creswell (1998) states that there are several ways of distinguishing the five qualitative research approaches. At the most fundamental level, the five differ in what they are trying to achieve (e.g. their foci or the primary objectives of the studies) Creswell (1998). For a summary of all dimensions see Table 7.3.
<table>
<thead>
<tr>
<th>Dimension</th>
<th>Focus</th>
<th>Discipline origin</th>
<th>Data collection</th>
<th>Data analysis</th>
<th>Narrative form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biography</td>
<td>Exploring the life of an individual</td>
<td>Anthropology, Literature, History</td>
<td>Interviews and documents</td>
<td>Statements, Epiphanies, Historical content</td>
<td>Detailed picture of an individual's life</td>
</tr>
<tr>
<td>Grounded Theory</td>
<td>Understanding the essence of an experience about a phenomenon</td>
<td>Philosophy, Sociology, Psychology</td>
<td>Long interviews with up to 10 people</td>
<td>Open coding, Axial coding, Selective coding</td>
<td>Theory or theoretical model of the &quot;essence&quot; of the experience</td>
</tr>
<tr>
<td>Phenomenology</td>
<td>Understanding the essence of a phenomenon</td>
<td>Philosophy, Literature, History</td>
<td>Long interviews with up to 30 individuals to &quot;saturate&quot; categories and detail a theory</td>
<td>Statements, Meanings, General description of the experience</td>
<td>Description of the &quot;essence&quot; of the experience</td>
</tr>
<tr>
<td>Ethnography</td>
<td>Describing and interpreting a cultural and social group</td>
<td>Cultural anthropology, Sociology</td>
<td>Interviews with 20-30 individuals to &quot;saturate&quot; categories and detail a theory</td>
<td>Analysis, Interpretation</td>
<td>Description of the cultural behaviour of a group or an individual</td>
</tr>
<tr>
<td>Case Study</td>
<td>Developing a theory grounded in data from the field</td>
<td>Sociology</td>
<td>Multiple sources of data, including additional artefacts and observations, physical and planned artefacts</td>
<td>Description, Themes, Assertions</td>
<td>In-depth study of a &quot;case&quot; or a &quot;case&quot;</td>
</tr>
<tr>
<td>Table 7.3: Dimensions for comparing five research approaches in qualitative research (from Creswell, 1998).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.12 Main study design

The literature reviewed in the previous sections of the present chapter shows that mixing qualitative and quantitative approaches would contribute to the study in various ways. Firstly, it would give the opportunity for triangulating two different methods (e.g. qualitative interviews, and questionnaire survey) that might further strengthens the credibility of the study; and also, mixing two methods would help for further elaboration and clarification of the results from one method with the results of the other method (Darlington and Scott, 2002).

The pilot work performed in the present research showed that coping with musculoskeletal pain at work could better be studied by giving a voice to the people who have the experience of musculoskeletal pain at work. Therefore the present study has used qualitative interviews and questionnaire surveys as two different approaches in order to address the research aims presented in the section 7.4.

7.13 Quantitative study

The questionnaire used in this study consists of selected questionnaires from the literature and also items which were developed on the basis of the results of the pilot studies. Mail questionnaire method was selected due to time limitations and cost as a method of data collection.

Another reason for selection questionnaire method was that it allows a bigger sample and it gives the opportunity to the responders to discuss with other people or think about the answers, which is an advantage in the perspective of the retrospective approach of the study. The questionnaire collected data on coping strategies used by of office workers when they were at work and suffering from musculoskeletal problems such as musculoskeletal aches and pains in the last seven days.

7.13.1 Formation of the questionnaire

The questionnaire was developed with the collaboration of the principal researcher and other experts who have experience in developing questionnaire surveys. As it is discussed earlier the majority of the studies in the field of coping have been based on
questionnaire surveys. In this study a questionnaire survey has been selected as an additional research method with the aim to compare the results with the findings that have arisen as a result of the qualitative interviews.

7.13.2 Content of the questionnaire
As there no questionnaires in the literature that has been designed to assess coping with musculoskeletal aches and pains within the work context, a new questionnaire was formed, which consists of six parts: i) personal information, ii) Information about responders job, iii) musculoskeletal symptoms, iv) coping strategies, v) efficiency, and vi) work activity. These sections will be described in more detail in the following sections. For a copy of the questionnaire please see Appendix C.

7.13.2.1 Personal information
This part of the questionnaire has been designed with the aim to collect brief information on the demographical characteristics of the participants such as their age category and gender. The first question which was inquiring about the date of questionnaire completion was involved with the aim to be taken as a reference in the qualitative stage of the study.

7.13.2.2 Information about responders job
Basic information about the responder's job such as job title, days worked per week, and the extent of computer use were also inquired for better understanding of the sample used in the study. The information was also used as a filter in including or excluding participants from the study.

7.13.2.3 Musculoskeletal symptoms
Musculoskeletal symptoms of upper limbs and back experienced within the past week were assessed by using the NMQ (Kuorinka et al, 1987). The questionnaire is a standardized and widely used tool for assessing musculoskeletal symptoms in an ergonomic and occupational health context.
7.13.2.4 Coping strategies
As there are no coping measures developed in order to assess coping with musculoskeletal pain in the work context, a questionnaire was selected among the measures that are used in clinical settings. In the selection process only the episodic (process) measures were involved as dispositional (trait) measures doesn’t consider the human-environment interaction, which is against the spirit of ergonomics. The criteria considered for the rest of the measures in the selection process, were based on the literature and the outcomes of the focus group study (See Section 6.1.3).

Criteria:
A- To be a process measure
B- Ability to assess coping with musculoskeletal pain
C- Validated with musculoskeletal pain patients
D- Suitability of theoretical dimensions
E- Length

Based on the above criteria the Chronic Pain Coping Inventory (CPCI-42) (Romano et al., 2003) was selected to be used in the study. However, Nielson et al., (2001) suggested that ‘activity pacing’ as a significant concept in multidisciplinary pain treatment programs, should also be combined and used with the CPCI-42 when assessing coping in the clinical context. The present CPCI was limited in its capacity to assess activity pacing.

Pacing was found to be one of the coping strategies that the participants reported during the focus groups (See Section 6.1.3) that they were using to deal with musculoskeletal pain while at work. Therefore CPCI-42 was combined and administered with the activity pacing scale (APC; Nielson et al., 2001). The APS is demonstrated as a valid index of pacing that can be used as either single or combination with the CPCI (Nielson et al., 2001).
7.13.2.5 Efficiency
This section was included with the aim to assess the possible effects of musculoskeletal symptoms on the productivity of participants. As single ‘productivity’ as a construct, wouldn’t actually mean what aspects of it are affected, a group of variables (e.g. work pace, quality, amount of work done etc...), which were identified from the literature and also raised during the qualitative pilot study were included for the assessment. A 10cm VAS, which was adapted from the Work Productivity and Activity Impairment Questionnaire (WPAIQ, Reilly et al., 1993; Wahlqvist et al., 2002) were included for the assessment of diminished productivity. The scale was inquiring whether musculoskeletal symptoms experienced within the past week had any effect on the responders’ productivity, and if so they were asked to indicate the percentage decrease on a scale provided. The question was worded as ‘please indicate the percentage decrease compared to the most recent week when you were not in pain?’

7.13.2.6 Work activity
‘Sickness presenteeism’ is defined as ‘a phenomenon that workers turn up at work, despite experiencing health problems’ (Meerding et al., 2005). It is a new field, which has started to draw the attention of many researchers (Aransson et al., 2000; Pelletier et al., 2004; Dew et al., 2005). As the number of studies related to sickness presenteeism in the field of musculoskeletal disorders are lacking, a section on assessing this measure has been provided with the aim to validate the results of the previous section (See Section 7.13.2.5).

The Stanford Presenteeism Scale (SPS-6) (Koopman et al., 2002) as a valid and reliable measure, which gives a single score of ‘presenteeism’, and takes only a few minutes to fill in has been selected and involved in the main questionnaire.

7.13.2.7 Volunteering for interviews
In the final page of the questionnaire a small form was provided for the volunteers for their contact details. A direct telephone number, e-mail address and also a time slot/s when they would prefer to be contacted were the fields that were included in the form.
7.13.3 Design of the questionnaire
In order to increase the response rate, the questionnaire was designed to be simple and to appear personal by the use of coloured cover page. All the copies were printed in a professional printing office with the aim to give the impression of professionalism and trust.

7.13.4 Pilot testing and improvements
The questionnaire design process consisted of several steps including the initial formation and obtaining experts opinion before conducting a small scale pilot study with a group of potential office workers.

7.13.4.1 Experts opinion
The questionnaire was formed by the principal researcher in collaboration with the supervisors and four independent researchers with expertise in questionnaire design assessed the layout and the feasibility of the questionnaire. The feedback provided were used in revising and further improvement of the questionnaire.

7.13.4.2 Office workers' pilot study
The questionnaire was given to a group of 5 office workers who were obtained through personal contacts, for testing the content validity and feasibility of the questionnaire. The 5 office workers were given an assessment form (See Appendix D) to assess the Coping and Work Efficiency Questionnaire. As a result none of the participants reported any problems with filling in the questionnaire.

7.13.4.3 Improvements
Regarding the expert's opinion and also the office workers' pilot study, only minor changes had been made to the questionnaire, which were mostly spelling and labelling related mistakes. In addition to these, based on the experts' opinion the questions 5.1a and 5.1b in the 'efficiency section' were combined under the question 5.1. After this improvement the questionnaire were administered to additional 5 office workers for their feedback; where all the participants reported that they didn't face any difficulties filling in the questionnaire.
7.13.5 Ethics
Ethics is defined as 'the science of morality: those who engage in it determine values for the regulation of human behaviour' (Homan, 1991). Every study which involves the use of human subjects either directly or indirectly, must obtain ethics approval (Meadows, 2003). Therefore this section is devoted to ethical considerations in the study and the process of obtaining ethical approval.

7.13.5.1 Cover letter and information sheet
As suggested by the British Psychological Society (BPS, 2000), the researchers should always ensure that the participants have adequately understood the nature of the investigation or intervention and also the possible physical or psychological effects occurring during the research (Charlton, 1995). In this study a cover letter and information sheet was designed, where detailed explanation of the study with regards to the rights of the volunteer, and the commitments of the volunteer were explained in a way that could be easily understood. The cover letter was printed on University of Surrey headed paper, whereas the information leaflet designed and printed with colour front page to appear personal and to motivate potential participants to take part in the study. A copy of the cover letter can be seen in Appendix E and the information leaflet can be viewed in Appendix F.

7.13.5.2 Ethical approval
The ethical approval was obtained from the University of Surrey Ethics Committee (See Appendix G).

7.13.6 Administration of the questionnaire
In this study the target population was the office workers who were employed in the UK, as this group has been under high risk of developing MSDs in parallel with the implementation of new technology in the offices.
7.13.6.1 Calculation of the sample size
The sample size calculation is based on a non-statistical estimation. Sarantakos (1998) suggested that a minimum of 100 subjects is required to allow statistical inferences.

7.13.6.2 Sampling strategy
Multiple sampling strategies were used in recruiting participants, where the strategies were based on a non-probability sampling. Among these strategies the initial method was to approach a few medium-small scale organizations. Two organizations were initially approached out of which one refused to take part and the other (Organization #1) accepted to take part in a restricted way. This organization was employing 500 office workers and was dealing with education related work. According to a protocol with this organization, 105 questionnaires, all coded were located in a room which was accessible to everyone and the study was advertised through the organization’s intranet. With this method 16.5% of the questionnaires were returned. For a summary of other results please see Appendix H.

The second method employed was to meeting participants accidentally also called accidental sampling (Sarantakos, 1998). For this purpose the researcher went to different locations in the University of Surrey (UNIS) at different times of a day and met participants accidentally on their way. The method was that the researcher was wearing a t-shirt with a message worded as, ‘Dealing with musculoskeletal aches and pains at work? We need you!’ both on its front and back (See Appendix I). The aim of this was to draw the attention of potential participants and motivating them to approach to the researcher. When the researcher was meeting people, he was stopping them and asking whether they were office workers and explaining the study. Those who were volunteering were given a free-post envelope, which was consisting of a cover letter, information-sheet, consent form and a questionnaire.

The third method was to place adverts around the University of Surrey campus. For this purpose an advert was designed with a pocket where the information leaflets were placed (See Appendix J) for those who paid their interest in taking part in the study. This method returned only 2 volunteers.
7.13.7 Questionnaire evaluations

All the questionnaires were checked for their eligibility before they were included for further processing. The questionnaires that were satisfying the eligibility criteria were then entered into the database. The coded questionnaires were used in order to follow up with the response rates and intervene wherever required (e.g. low response rate organizations were requested for further reminding their workers about the study).

7.13.7.1 Checking eligibility

Once the questionnaires were received, every questionnaire was checked for the eligibility of responders in terms of their age group and job title by the principal researcher. The participants who didn’t satisfy the criteria were excluded from the study. Those who were eligible were then checked whether they volunteered to be interviewed as part of the qualitative study. The responses of volunteers were then entered into a database spreadsheet for later use as part of the sampling procedure in the qualitative study.

7.13.7.2 Data tabulation and analysis

The responses to the questionnaire were coded and entered into the SPSS 13.0 for analysis, where the level of significance was set to $p < 0.05$. The data was initially analyzed via using descriptive statistics for describing its basic features. Factor analysis was applied on the questionnaire coping items and bivariate statistics applied in order to test relationships. Finally, univariate statistics were applied for comparing groups for differences. For further information see Chapter 8.
7.14 Qualitative study

7.14.1 Selection of the research approach - Grounded theory

As it is mentioned earlier in section 7.10, qualitative research approaches can be differentiated in many ways; however, mainly the approaches can be differentiated in terms of their focus and questions that each of them could answer (Creswell, 1998). In the present research the main aim was to gain insight into the musculoskeletal pain experiences of office workers at work and to develop a conceptual framework of these experiences. Grounded theory is about generating a theory of the phenomenon under investigation and would satisfy this requirement in terms of its focus (Strauss and Corbin, 1998). Further rationale for selecting the grounded theory methodology is as follows:

- Strauss and Corbin (1994) expressed the view that, although grounded theory shares some similarities with other methods (e.g. phenomenology, case study etc.), it’s distinctive characteristic lies in the opportunity it provides for developing theories at any level that are grounded in the data. Thus, grounded theory in the present study provides the opportunity to explore coping strategies in depth through a process of ongoing comparison of participant’s experiences.

- In the present study the main themes were pre-specified; nevertheless, the grounded theory approach could help to explore these themes by adopting its systematic and coordinated procedures during the data collection and analysis process.

- The approach provides the opportunity to use the theoretical sampling method, where the participants could be recruited based on their characteristics and experiences during the ongoing process of data collection. Hence, recruiting a wide array of participants would help in gaining a deeper understanding of the experiences of the office workers and also facilitate the development of the theory and the concepts that would emerge in the research (Glaser and Strauss, 1967).
7.14.2 Recruitment

In this study, theoretical sampling method that is a non-probability approach was used (Strauss and Corbin, 1998). This approach provides the opportunity to build and broaden theoretical insights in the ongoing process of data collection and analysis (Maykut and Morehouse, 1998).

Using the theoretical sampling approach a convenience sample, consisting of 18 office workers who were all employed in the UK were recruited for the interviews. The participants were all aged between 18 and 65 years, and were selected among a group of (n=67) volunteers, who had reported in the questionnaire that they were willing to be interviewed. Based on the questionnaire survey results, the participants were recruited to reflect a range of characteristics. With this approach the aim was:

1. To include equal number of males and females as to reflecting the prevalence of musculoskeletal disorders,
2. To have at least one male and one female participant from every age group, where the groups were 18-29, 30-39, 40-49, and 50-65
3. To include participants with different musculoskeletal conditions
   a- to have participants with different pain locations
   b- to have participants with both chronic and acute pain experience
4. To have participants from different organizations

Based on the above criteria the selected participants were contacted via telephone wherever possible and invited for an individual interview at their convenience.

7.14.3 Data collection and analysis

Semi-structured and individual interviews were performed with the volunteers to their convenience, at their workplace or at the University of Surrey. A flexible interview guide was developed based on both musculoskeletal disorders and coping literature (See Appendix K).
The interviews preceded an open-up with assuring participants of the confidentiality and other ethical issues considered in the study, and followed by simple questions for allowing interviewees and the interviewer (O.O.) to settle down. Furthermore in-depth questions were followed.

The last phase of the interviews was to repeat the issues that rose during the interviews with the aim of ensuring that the participants were in agreement with what they had said during the interviews.

All the interviews were tape-recorded using a digital voice recorder (Sanyo ICR-B150) and lasted up to an hour in duration. The tapes were all transcribed verbatim and imported into the NUD*IST (N6) software as text files for qualitative analysis.

7.14.4 Ensuring scientific rigour

As it is discussed in section 7.8, the strict scientific standards of quantitative research cannot be applied to qualitative studies and discussion of alternative indicators are required (Hamberg et al. 1994). Hamberg et al. (1994) writes that credibility, dependability, confirmability, and transferability are criteria that fit qualitative research (Guba and Lincoln, 1989); therefore, in this study these criteria were used in order to ensure scientific rigour.

7.14.4.1 Dependability

Miles and Huberman (1994) describe dependability as consistency of the study process, whether it is stable over the time and across the researchers and methods. In order to enhance dependability researchers should make research questions clear, explicitly describe their role and status within the site, involve multiple researchers, collect data across the full range of appropriate settings, times, and respondents, and check the quality of data collected for bias, deceit and informant knowledgeability (Miles and Huberman, 1994).

In this study the dependability was satisfied with different approaches. One of the approaches was to develop an interview guide that would be clear to understand by the interviewees and suitable in terms of it’s content. This was achieved by
performing two pilot interviews and improving the guide. The interview guide was further developed and emerging issues that were raised during the interviews were included in the guide as suggested in the grounded theory approach (Glaser and Strauss, 1967).

Another approach used to satisfy the dependability of the study was to use suitable recording media device and keeping notes and memos. Thus all the interviews were tape-recorded and transcribed verbatim in order to give a true account of the data.

7.14.4.2 Confirmability
Confirmability is expressed as parallel to the conventional criterion of objectivity (Guba and Lincoln, 1989). Like objectivity, confirmability concerns whether conclusions depend on “subjects and conditions of the inquiry”, rather than the inquirer. It is sometimes labelled as “external reliability,” with emphasis on the replicability of a study by others (Miles and Huberman, 1994). In the present research this criterion was satisfied through triangulating different sources of data (e.g. questionnaire survey and qualitative interviews). This provided the opportunity to collecting data from different sources, looking for patterns of convergence and corroborating the overall interpretation (Mays and Pope, 1995, 2000; Barbour, 2001).

7.14.4.3 Transferability
Hamberg et al (1994) defines transferability as evaluation of qualitative study for its plausibility, inner logic and ability to be communicated to others and considered as reasonable. In order to be able to achieve transferability it is essential to describe the context which the study took place. As Hamberg et al. (1994) stressed, it is also important to describe demographics such as ethnicity, family situation and socioeconomics in the population or group investigated.

7.14.4.4 Credibility
Hamberg et al (1994) express that credibility is a criterion that is related to internal validity in traditional research. The criterion inquires about whether the results of the study make sense and are credible to the people studied and readers of the study.
(Miles and Huberman, 1994). It applies both to the collection of data and to the analysis (Hamberg et al, 1994).

In this study credibility was initially achieved via methodological triangulation. With this purpose a questionnaire survey (See Section 7.13) was used for establishing the validity of the results. Furthermore another measure, interview technique, which is based on the skills of the researcher, was assessed by the participants in two pilot studies.

The verbatim quotes from the interviews described the stunning and loyal interpretations of human experience of musculoskeletal pain sufferers in a way that could be recognized by other sufferers. In addition, use of multiple methods helped to ensure credibility in the study.

Credibility has been also achieved through triangulation of data sources, which helped in maximizing the range of data that might contribute to the complete understanding of the concept. With this purpose, participants with different personal characteristics and musculoskeletal symptoms (e.g. painful body-part) were recruited (Krefting, 1991). The recruitment of the participants was ongoing until the interviewees said nothing new about the concepts explored (Cutcliffe, 2000).

7.15 Summary

The terms qualitative and quantitative are describing two types of data as words and numbers respectively; however, the two different sets of methods approach the research process from different perspectives. Both methodologies are used to answer different types of research questions.

There are several qualitative research approaches used; however the most commonly used ones are biography, phenomenology, grounded theory, ethnography and case study methods. The research approaches can be distinguished in several ways but at the most fundamental level, the five differ in what they are trying to achieve.
In this study both quantitative (questionnaire survey) and qualitative (semi-structure individual interviews) were used with the aim to answer the research questions stated in Section 7.4. In analysing the data both statistical and qualitative procedures were used. The rigour was ensured by satisfying the dependability, confirmability, transferability and credibility criteria.
8 RESULTS OF THE SURVEY

The present research used a mixture of both questionnaire survey and qualitative interviews in order to investigate musculoskeletal experiences of office workers while at work. The aim of the questionnaire survey was to inform the qualitative study sampling process (e.g. purposeful sampling), and to study the topic from a different perspective as opposed to qualitative interviews (Darlington and Scott, 2002).

The questionnaire survey was used to investigate the coping strategies used by office workers in order to deal with musculoskeletal pain at work, and to assess the effects of musculoskeletal pain on work performance. The research questions formulated were as follows:

- Which coping strategies do office workers use in order to deal with musculoskeletal pain at work?
- How do office workers perceive the effects of musculoskeletal pain on their work performance?

If there is an effect;
- What areas of productivity were interrupted by musculoskeletal pain?
- What are the differences in the use of coping strategies among those who reported a decrease in their productivity and those who did not?

In order to address the above questions the coping items in the questionnaire survey were factor analysed using the SPSS (version 13.0) software. The reliability of the resultant scales was assessed using the Cronbach’s Alpha coefficient and the prevalence of the coping strategies were calculated based on the factor solution obtained. The effects of musculoskeletal pain on work performance were assessed using descriptive statistics.
8.1 Participants

Overall 720 questionnaires were given out where 148 of them were uncompleted in relation to volunteers not satisfying the eligibility criteria. Among those that were returned as completed, 5 participants were excluded from the study due to the following reasons:

- One participant for being younger than 18 years old.
- One participant for using a computer on the average less than an hour per day and not being an office worker.
- Three participants for working less than three days per week.

Finally 120 responses, representing 17 percent response rate, were considered for further analysis.

8.1.1 Demographics

Among 120 participants 56 were male and 64 were female. The participants represented four age categories which were 18-29 (22 male and 18 female), 30-39 (20 male and 14 female), 40-49 (6 male and 12 female), and 50-65 (8 male and 20 female).

Table 8.1: Age and gender profile of participants

<table>
<thead>
<tr>
<th>Age group</th>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-29</td>
<td>count</td>
<td>22</td>
<td>18</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>within age (%)</td>
<td>55.0%</td>
<td>45.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>within gender (%)</td>
<td>39.3%</td>
<td>28.1%</td>
<td>33.3%</td>
</tr>
<tr>
<td>30-39</td>
<td>count</td>
<td>20</td>
<td>14</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>within age (%)</td>
<td>58.8%</td>
<td>41.2%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>within gender (%)</td>
<td>35.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td>count</td>
<td>6</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>within age (%)</td>
<td>33.3%</td>
<td>66.7%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>within gender (%)</td>
<td>10.7%</td>
<td>18.8%</td>
<td>15.0%</td>
</tr>
<tr>
<td>50-65</td>
<td>count</td>
<td>8</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>within age (%)</td>
<td>28.6%</td>
<td>71.4%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>within gender (%)</td>
<td>14.3%</td>
<td>31.3%</td>
<td>23.3%</td>
</tr>
<tr>
<td>Total</td>
<td>count</td>
<td>56</td>
<td>64</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>within age (%)</td>
<td>46.7%</td>
<td>53.3%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>within gender (%)</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
8.1.2 Job characteristics

The sample was comprised of office workers who were employed as either part or full-time. Days worked per week ranged from 3 days a week to 7 days a week. The mean days worked however was approximately 5 days. Cases with less than three working days a week were excluded from the analysis. In terms of computer use the participants reported average hours spend using a computer at work, which ranged between 1 and 13 hours per day. The mean for average hours of computer use was 6 hours per day.

Table 8.2: Job characteristics of participants

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days worked (per week)</td>
<td>120</td>
<td>3</td>
<td>7</td>
<td>4.97</td>
<td>0.73</td>
</tr>
<tr>
<td>Av. Computer use (hrs/day)</td>
<td>120</td>
<td>1</td>
<td>13</td>
<td>6.26</td>
<td>2.08</td>
</tr>
</tbody>
</table>

The t-test performed revealed that genders differed significantly in terms of days worked per week (mean difference= 0.4 days, p<0.05); however no significant differences were identified in use of computer (hours/day).

No significant differences were found among different age groups in terms of the days worked per week; however the age groups differed in the use of computer. The mean hours of computer use was 6.65 (SD= 1.87) for group 1 (18-29), 6.84 (SD= 2.46) for group 2 (30-39), 5.76 (SD= 2.01) for group 3 (40-49), and 5.28 (SD= 1.55) for group 4 (40-65).

8.2 Musculoskeletal symptoms

Overall the majority of participants (62%) reported that they had experienced lower-back pain within the last seven days. This was followed by neck pain, which was reported by 54% of the participants. Upper-back and right-shoulder pain was reported by 33% and 32% of participants respectively.
8.2.1 Number of symptoms
The participants reported a range of musculoskeletal symptoms. Most of the participants; 31% reported only one symptom. The range of reported symptoms was 7. The second mostly reported number of symptoms was 3 with 27%, where the number of symptoms reported less frequently was 6, which was corresponding to 1%. No gender or age differences were identified for the number of symptoms reported.

Table 8.3: Number of symptoms reported by participants in the last 7 days

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37</td>
<td>30.8</td>
<td>30.8</td>
<td>30.8</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>18.3</td>
<td>18.3</td>
<td>49.2</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
<td>26.7</td>
<td>26.7</td>
<td>75.8</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>12.5</td>
<td>12.5</td>
<td>88.3</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>7.5</td>
<td>7.5</td>
<td>95.8</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>0.8</td>
<td>0.8</td>
<td>96.7</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>3.3</td>
<td>3.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
8.2.2 Pain persistency

Among the symptoms reported, neck pain had the greatest persistency. The range of pain persistency reported for the neck was 5 days whereas the mean persistency of symptoms was 3 days. The range of pain persistency for the rest of the body parts was 2 days. Statistical tests performed revealed no significant differences among different genders and also no significant differences were identified for different age groups.

Table 8.4: Descriptives for the persistency of musculoskeletal symptoms
(last 5 working days)

<table>
<thead>
<tr>
<th>Body parts</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>St.Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>65</td>
<td>1</td>
<td>5</td>
<td>3.06</td>
<td>1.65</td>
</tr>
<tr>
<td>Shoulders</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>38</td>
<td>1</td>
<td>2</td>
<td>1.45</td>
<td>0.50</td>
</tr>
<tr>
<td>Left</td>
<td>37</td>
<td>1</td>
<td>2</td>
<td>1.32</td>
<td>0.48</td>
</tr>
<tr>
<td>Elbows</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>1.50</td>
<td>0.53</td>
</tr>
<tr>
<td>Left</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>1.29</td>
<td>0.49</td>
</tr>
<tr>
<td>Wrists/hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>31</td>
<td>1</td>
<td>2</td>
<td>1.29</td>
<td>0.46</td>
</tr>
<tr>
<td>Left</td>
<td>15</td>
<td>1</td>
<td>2</td>
<td>1.40</td>
<td>0.51</td>
</tr>
<tr>
<td>Back</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>39</td>
<td>1</td>
<td>2</td>
<td>1.41</td>
<td>0.50</td>
</tr>
<tr>
<td>Lower</td>
<td>73</td>
<td>1</td>
<td>2</td>
<td>1.39</td>
<td>0.49</td>
</tr>
</tbody>
</table>

8.2.3 Pain severity

The participants reported their severity of pain on a 10cm VAS scale ranging between 0 and 10. Among the body parts the most painful body part was reported as the right elbow with a mean of 4.9. This was followed by the upper back and lower back with means of 3.9 and 3.8 consecutively. The least painful body part however was found to be the left wrist/hands with a mean of 3.3. There were no significant differences identified among different gender and age groups in reporting of pain severity.
Table 8.5: Descriptive statistics for severity of musculoskeletal symptoms  
(last 5 working days)

<table>
<thead>
<tr>
<th>Body parts</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>65</td>
<td>1.0</td>
<td>9.0</td>
<td>3.59</td>
<td>1.75</td>
</tr>
<tr>
<td>Shoulders</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>38</td>
<td>1.0</td>
<td>9.0</td>
<td>3.48</td>
<td>1.93</td>
</tr>
<tr>
<td>Left</td>
<td>37</td>
<td>1.0</td>
<td>7.1</td>
<td>3.72</td>
<td>1.48</td>
</tr>
<tr>
<td>Elbows</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>10</td>
<td>2.4</td>
<td>8.5</td>
<td>4.88</td>
<td>2.04</td>
</tr>
<tr>
<td>Left</td>
<td>7</td>
<td>1.0</td>
<td>8.0</td>
<td>3.57</td>
<td>2.56</td>
</tr>
<tr>
<td>Wrist/hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>31</td>
<td>0.5</td>
<td>9.5</td>
<td>3.59</td>
<td>1.99</td>
</tr>
<tr>
<td>Left</td>
<td>15</td>
<td>1.0</td>
<td>6.6</td>
<td>3.31</td>
<td>1.58</td>
</tr>
<tr>
<td>Back</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>39</td>
<td>1.0</td>
<td>8.0</td>
<td>3.90</td>
<td>1.84</td>
</tr>
<tr>
<td>Lower</td>
<td>74</td>
<td>0.6</td>
<td>9.0</td>
<td>3.75</td>
<td>1.98</td>
</tr>
</tbody>
</table>

8.3 Coping strategies

Since the CPCI was developed for chronic patients, its factor structure may not be applied to assess coping in work settings, therefore in order to test the applicability of the current factor structure, factor analysis was performed. The resultant factors were used in calculating the prevalence rates.

8.3.1 Factor analysis

Factor analysis comprised of a set of statistical techniques where the aim is to simplify a set of data (Kline, 1994). In order to test this, the CPCI items, Activity Pacing Scale and an additional item related to the use of pain killers were entered into the SPSS version 13.0 for analysis.

49 coping statements were initially tested by principal component analysis for reducing the number of variables, and then by using the varimax rotation which resulted in eight factor solution. Eight factors with eigen values greater than 1 were extracted and the items with factor loadings less than 0.4 or with overlapping content with other questions were removed from further analysis. The iterative process was continued until a clear solution was obtained.

The result was an eight factor solution consisting of 30 coping items, which explained 69.8% of the variance. The reliability of the scales was assessed by
calculating the Cronbach’s Alpha coefficient, which was ranged between 0.50 and 0.90. As it is stressed by Choi et al. (1999) alpha values of 0.50 and higher are strongly correlated and thus highly reliable.

The first factor, accounting for 21.8% of the variance, was named as ‘pacing’. As it can be seen in Table 8.6 all the items with a high loading on this factor are concerned with work pacing and workload handling. The items that have high loadings on this factor however, were not relatively used to a great extent and all had low means.

The second factor which was named as ‘Ignoring pain’ accounted for the 10.8% of the variance. The items that have a high loading on this factor are concerned with pain ignorance and persistence in task performance. These items were used more persistently and therefore had higher means compared to the rest of the items.

The third factor is ‘self-talk’. This factor explains the 9.1% of the variance. The items that have high loadings on this factor were related to the use of coping self-statements as a way of dealing with the stress of musculoskeletal symptoms.

The items that loaded for factor four were all related to the use of social support as a way of dealing with the stress of musculoskeletal symptoms. Therefore this factor which accounted for the 7.3% of the variance was named as ‘social support’. The fifth factor was labelled as ‘stretching’ as the items that it involves refers to the use of different stretching techniques. This factor accounted for the 6.0% of the variance.

The sixth factor on the other hand involves the items consisting of the use of self-hypnosis, meditation and distraction as a way of relaxation. Therefore this factor was labelled as ‘distraction, relaxation’; however the factor has only accounted for the 5.3% of the variance and had the lowest mean. This means that the participants did not report a great extent of the use of the items forming this factor.
Table 8.6: Means and factor loadings from the factor analysis of coping strategies

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pacing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c5</td>
<td>0.94</td>
<td>1.50</td>
<td>0.75</td>
</tr>
<tr>
<td>c8</td>
<td>1.06</td>
<td>1.55</td>
<td>0.75</td>
</tr>
<tr>
<td>c16</td>
<td>0.94</td>
<td>1.60</td>
<td>0.91</td>
</tr>
<tr>
<td>c20</td>
<td>0.71</td>
<td>1.44</td>
<td>0.83</td>
</tr>
<tr>
<td>c37</td>
<td>0.72</td>
<td>1.44</td>
<td>0.68</td>
</tr>
<tr>
<td>c47</td>
<td>0.70</td>
<td>1.39</td>
<td>0.86</td>
</tr>
<tr>
<td>2. Ignoring pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c2</td>
<td>2.79</td>
<td>1.89</td>
<td>0.68</td>
</tr>
<tr>
<td>c22</td>
<td>2.82</td>
<td>1.94</td>
<td>0.67</td>
</tr>
<tr>
<td>c25</td>
<td>2.05</td>
<td>1.98</td>
<td>0.80</td>
</tr>
<tr>
<td>c33</td>
<td>2.62</td>
<td>2.03</td>
<td>0.84</td>
</tr>
<tr>
<td>c40</td>
<td>3.22</td>
<td>1.88</td>
<td>0.75</td>
</tr>
<tr>
<td>3. Self talk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c3</td>
<td>0.79</td>
<td>1.54</td>
<td>0.87</td>
</tr>
<tr>
<td>c12</td>
<td>0.93</td>
<td>1.61</td>
<td>0.69</td>
</tr>
<tr>
<td>c18</td>
<td>0.66</td>
<td>1.45</td>
<td>0.67</td>
</tr>
<tr>
<td>c34</td>
<td>0.61</td>
<td>1.39</td>
<td>0.88</td>
</tr>
<tr>
<td>4. Social support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c4</td>
<td>0.25</td>
<td>0.83</td>
<td>0.62</td>
</tr>
<tr>
<td>c13</td>
<td>0.50</td>
<td>1.19</td>
<td>0.71</td>
</tr>
<tr>
<td>c15</td>
<td>0.53</td>
<td>1.17</td>
<td>0.81</td>
</tr>
<tr>
<td>c32</td>
<td>0.37</td>
<td>0.97</td>
<td>0.81</td>
</tr>
<tr>
<td>5. Stretching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c11</td>
<td>0.76</td>
<td>1.46</td>
<td>0.81</td>
</tr>
<tr>
<td>c28</td>
<td>0.92</td>
<td>1.58</td>
<td>0.76</td>
</tr>
<tr>
<td>c41</td>
<td>2.03</td>
<td>1.88</td>
<td>0.64</td>
</tr>
</tbody>
</table>
Table 8.6: Means and factor loadings from the factor analysis of coping strategies (continued)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Distraction, Relaxation</td>
<td>0.26</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>c1</td>
<td>0.28</td>
<td>0.82</td>
<td>0.73</td>
</tr>
<tr>
<td>c27</td>
<td>0.37</td>
<td>1.04</td>
<td>0.66</td>
</tr>
<tr>
<td>c39</td>
<td>0.13</td>
<td>0.54</td>
<td>0.70</td>
</tr>
<tr>
<td>7. Resting</td>
<td>0.60</td>
<td>1.02</td>
<td></td>
</tr>
<tr>
<td>c36</td>
<td>0.77</td>
<td>1.38</td>
<td>0.83</td>
</tr>
<tr>
<td>c43</td>
<td>0.43</td>
<td>1.10</td>
<td>0.75</td>
</tr>
<tr>
<td>c48</td>
<td>0.57</td>
<td>1.26</td>
<td>0.71</td>
</tr>
<tr>
<td>8. Exercise</td>
<td>1.15</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>c23</td>
<td>0.81</td>
<td>1.20</td>
<td>0.84</td>
</tr>
<tr>
<td>c31</td>
<td>1.52</td>
<td>1.76</td>
<td>0.66</td>
</tr>
</tbody>
</table>

The final two factors had the same lowest variance of 4.7%. Among these factors the seventh one was named as ‘resting’ and the eight one was named as ‘exercise’.

8.3.2 Prevalence of coping strategies

In the questionnaire the participants reported the coping strategies that they had used in order to deal with musculoskeletal pain while at work. The responses to the questionnaire were then factor analyzed where a new factor structure has been obtained for the questionnaire items (Pacing, ignoring, self-talk, seeking social support, stretching, distraction/relaxation, resting, and exercise). The new factor structure (coping strategies) was used in calculating the prevalence rates for the use of coping strategies (at least once) within the past five working days (See Figure 8.2).

The results revealed that the participants most frequently ignored their pain (99.2%) and continued performing their tasks. This was followed by stretching, pacing, and exercising with prevalence rates of 69.7%, 60.5%, and 59.7% respectively. The least frequently used coping strategy however, was distraction/relaxation, and seeking social support with prevalence rates of 24.4% and 30.3% respectively. The prevalence of the use of self-talk was 49.6%.
8.4 Work productivity

This section consists of the results of both decreased productivity reported within the past week and also presenteeism which was assessed by using the SPS-6 for the past month.

8.4.1 Past week

Among the participants, 33% reported that their productivity was diminished due to musculoskeletal symptoms within the past week.

Table 8.7: Frequency and percentage of participants who reported decreased productivity due to musculoskeletal symptoms (past week)

<table>
<thead>
<tr>
<th>Decrease in productivity</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>80</td>
<td>66.7</td>
<td>66.7</td>
<td>66.7</td>
</tr>
<tr>
<td>Yes</td>
<td>40</td>
<td>33.3</td>
<td>33.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100.0</td>
<td></td>
<td>100.0</td>
</tr>
</tbody>
</table>
Among those who reported that their productivity was affected, the mean decrease was 16%. The minimum decrease was 4% whereas the maximum decrease was reported as 40%.

Table 8.8: The extent of decreased productivity among office workers (past week)

<table>
<thead>
<tr>
<th>Productivity</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease (%)</td>
<td>40</td>
<td>4</td>
<td>40</td>
<td>16.06</td>
<td>9.95</td>
</tr>
</tbody>
</table>

8.4.2 Past month

Presenteeism within the past month was assessed by using the SPS-6 where the minimum and maximum achievable scores on the scale were 6 and 30 consecutively. Overall mean presenteeism of the participants was 23.41 (SD=4.70).

Table 8.9: Descriptives for SPS-6 scores

<table>
<thead>
<tr>
<th>Presenteeism</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPS-6 score</td>
<td>120</td>
<td>6</td>
<td>30</td>
<td>23.41</td>
<td>4.70</td>
</tr>
</tbody>
</table>

The lack of control group in this study makes it difficult to assess the impact of musculoskeletal symptoms on the presenteeism scores obtained; however Koopman reported mean presenteeism score of 23.6 (SD=3.5) for office based workers (official, administrator, or professional), where 80 percent of the participants were free of any disabilities; 20 percent representing those with work and non-work related disabilities of unknown origin in the report (Koopman et al., 2002).

8.4.3 Agreement between the productivity measures (VAS vs. SPS-6)

The agreement between the two productivity measures (Reduced productivity reported on VAS vs. SPS-6) was examined by assessing whether the two measures were correlated. In order to achieve this, the data obtained via VAS was converted to nominal scale by coding those who reported reduced productivity as ‘1’ and those who did not as ‘0’.
Since the data obtained by using the SPS-6 was in scale format, it was converted to nominal scale by labelling those who scored above the median point (24 based on the SPS) as ‘1’ and those who scored below the median as ‘0’.

The association between the two measures were tested by using the Chi-square test. The results showed that the scores obtained by the two scales were significantly associated (n=110, $\chi^2=23.33$, $p<0.0001$) demonstrating an agreement among the measures.

### 8.5 Areas of productivity affected

The participants also reported their affected area of productivity due to musculoskeletal symptoms. Among the productivity areas, work pace was the one which was frequently reported (36%) as influenced from the musculoskeletal symptoms. This was followed by the time spent working (30%). The least frequently reported affected area of productivity however was the time spent on the work that had to be re-done (11%).

![Percentage of participants](image)

**Figure 8.3: Different areas of productivity affected by musculoskeletal symptoms**
8.5.1 Relationship with decreased productivity

The productivity measures were tested for their degree of relationship with reported decreased productivity by using the Spearman’s correlation test. As a result of the test all the productivity measures were found to be correlated with a significance level of 0.01. The highest association and therefore the highest variance were explained (47.6%) by the variable ‘amount of work done’. The second highest associated variables were ‘time spent working’ and ‘quality of work’, which explained a variance of 33.6% and 26.0% consecutively. The lowest associated variable on the other hand was ‘the time spent on work that had to be re-done’, and explained 15.2% of the variance in decreased productivity. For the rest of the results please see Table 8.10.

Table 8.10: The relationship between decreased productivity and productivity measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation coefficient</th>
<th>Variance explained (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work pace</td>
<td>0.48</td>
<td>23.0</td>
</tr>
<tr>
<td>Time spent on breaks</td>
<td>0.42</td>
<td>17.6</td>
</tr>
<tr>
<td>Quality of work</td>
<td>0.51</td>
<td>26.0</td>
</tr>
<tr>
<td>Time spent working</td>
<td>0.58</td>
<td>33.6</td>
</tr>
<tr>
<td>Amount of work done</td>
<td>0.69</td>
<td>47.6</td>
</tr>
<tr>
<td>Time spent on work that had to be re-done</td>
<td>0.39</td>
<td>15.2</td>
</tr>
</tbody>
</table>

Statistics based on Spearman’s $r$

8.6 Differences in the use of coping strategies

As it is reported in the Section 8.4.1, 33% of the participants reported that their productivity was reduced due to musculoskeletal symptoms; however it is not known whether those who reported a decrease in their productivity used coping strategies differently compared to those who did not. As a result of the Chi-square test the two groups were found to significantly differ in the use of self-talk ($n=119$, $\chi^2 =8.21$, $p<0.005$), but not in the use of other coping strategies. The group who reported a decrease in their productivity was almost two times more likely to use self-talk compared to the group who did not report any decrease in their productivity. Moreover, despite that the results did not reach to the statistical significance; there was a
trend towards the group who reported reduced productivity to use coping strategies more frequently than the other group.

Figure 8.4: The use of coping strategies among those who reported reduced productivity due to musculoskeletal and those who did not (last five working days)

8.7 Summary

The aims of the questionnaire survey were to investigate the coping strategies used by office workers in order to deal with musculoskeletal pain at work, and to assess the effects of musculoskeletal symptoms on work performance.

The results have revealed that the participants have most frequently suffered from low-back, and neck pain, whereas left and right elbows were the least frequently suffered pain types. In order to cope with these symptoms, the participants most frequently ignored their pains and continued to perform their tasks. 99% of them reported that they had ignored the pain during the last five working days. Stretching (69.7%), pacing (60.5%), and exercising (59.7%) were among the coping strategies
that were most frequently used. The least frequently used strategies however, were distraction/relaxation (24.4%) and seeking social support (30.3%).

Among the participants 33% reported that their productivity was reduced due to musculoskeletal symptoms (N=40, mean=16% reduction in work productivity) during the past week. The most frequently affected areas of productivity were reported as ‘work pace’ (35.8%) and ‘time spent working’ (30.0%).

‘Self-talk’ was found to be the only coping strategy that was significantly differed (p<0.05) in its use, among those who reported a decrease in their work productivity and those who did not (i.e. those who reported reduced productivity due to musculoskeletal symptoms have reported as much as twice more frequent use of self-talk compared to the non-affected group).
9 RESULTS OF THE QUALITATIVE STUDY

In this study a mixed methods approach was used consisting of a questionnaire survey that was used to inform the qualitative interview sampling process (purposeful sampling) and also qualitative interviews.

The use of the qualitative interviews provided the opportunity to study the subjective experiences of musculoskeletal pain from the perspective of the office workers. Moreover the use of qualitative interviews provided the opportunity to explore their experiences and coping strategies in depth and develop a picture of the topic under investigation.

Based on the aims of the research three questions were formulated before the data were analysed inductively (See Section 9.2 for further information). These questions were adapted according to the aims of the study to explore the following themes derived from the literature: ‘coping strategies’, ‘decision making’ and ‘work performance’.

9.1 Participant characteristics

The participants were all office workers who were recruited from a range of jobs such as, secretaries, administrators, officers, researchers and students. Of eighteen participants the male and female ratio was equal (9 men and 9 women). The participants represented age groups of 18-29 (3 persons), 30-39 (6 persons), 40-49 (2 persons) and 50-65 (7 persons). Of the participants, 3 were holding a managerial position at the time of the study, and the rest were office workers who were suffering or suffered from musculoskeletal symptoms of upper limbs and the back. Among the participants, 8 reported that their pain experience was constant.
9.2 Data analysis

In the present research, the qualitative data analysis has been inspired from the procedures of the grounded theory (Strauss and Corbin, 1994); therefore the analysis had started and continued along with the data collection. A conceptual framework was developed based on the pre-specified themes and by using the approach suggested by Taylor-Powell and Renner (2003).

Using the NUD*IST (N6), the data obtained as a result of the first three interviews were coded line by line based on the following key questions, of which associated with the pre-specified themes ('coping strategies', 'decision making', and 'work performance', see sections 7.1, 7.2, and 7.3 for rationales of studying these themes).

Key questions:
- What did/do office workers do or think in order to master, tolerate or reduce the stress of musculoskeletal pain at work?
- What does have effect in their decision-making in using or not using particular coping strategies?
- How does musculoskeletal pain affect their work performance?

Using the N6, the resultant codes were then organized into coherent categories in order to summarize and bring meaning to the text. The categorization and organization of the data continued until no new themes or subcategories were identified (Taylor-Powell and Renner, 2003). Themes that emerged as a result of the analysis can be seen in Figure 9.1 (For an example of the qualitative analysis see Appendix L).

9.3 Coping strategies

These are the strategies that office workers use in order to deal with musculoskeletal pain at work. They are further divided into two sub-themes, cognitive and behavioural, which will be further discussed in the following sections.
Table 9.1: Participant's characteristics

<table>
<thead>
<tr>
<th>Pt</th>
<th>Age category</th>
<th>Gender</th>
<th>Condition</th>
<th>Frequency</th>
<th>Org</th>
<th>Job position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50-65</td>
<td>Male</td>
<td>Low-back pain</td>
<td>One or more times a year</td>
<td>A</td>
<td>Manager</td>
</tr>
<tr>
<td>2</td>
<td>30-39</td>
<td>Male</td>
<td>Neck pain, Left-shoulder pain, Wrist/hand pain, Low-back pain</td>
<td>Constant</td>
<td>B</td>
<td>Health care administrator</td>
</tr>
<tr>
<td>3</td>
<td>30-39</td>
<td>Male</td>
<td>Neck pain, Shoulder pain</td>
<td>One or more times a month</td>
<td>B</td>
<td>Health care administrator</td>
</tr>
<tr>
<td>4</td>
<td>50-65</td>
<td>Female</td>
<td>Neck pain, Shoulder pain, Upper-back pain</td>
<td>One or more times a week</td>
<td>A</td>
<td>Officer</td>
</tr>
<tr>
<td>5</td>
<td>50-65</td>
<td>Female</td>
<td>Low-back pain spreading down into the legs</td>
<td>Constant</td>
<td>A</td>
<td>Officer</td>
</tr>
<tr>
<td>6</td>
<td>40-49</td>
<td>Female</td>
<td>Wrist/hand pain</td>
<td>One or more times a week</td>
<td>A</td>
<td>Secretary</td>
</tr>
<tr>
<td>7</td>
<td>40-49</td>
<td>Female</td>
<td>Neck pain, Shoulder pain, Wrist/hand pain</td>
<td>Constant</td>
<td>A</td>
<td>Accountant</td>
</tr>
<tr>
<td>8</td>
<td>18-29</td>
<td>Female</td>
<td>Low-back pain, Elbow pain</td>
<td>One or more times a day</td>
<td>A</td>
<td>Secretary</td>
</tr>
<tr>
<td>9</td>
<td>30-39</td>
<td>Male</td>
<td>Low-back pain, Wrist/hand pain</td>
<td>Constant</td>
<td>C</td>
<td>Computer programmer</td>
</tr>
<tr>
<td>10</td>
<td>18-29</td>
<td>Male</td>
<td>Low-back pain</td>
<td>Daily</td>
<td>A</td>
<td>PhD Student</td>
</tr>
<tr>
<td>11</td>
<td>30-39</td>
<td>Female</td>
<td>Neck-shoulder pain</td>
<td>Constant</td>
<td>A</td>
<td>Researcher</td>
</tr>
<tr>
<td>12</td>
<td>50-65</td>
<td>Female</td>
<td>Neck pain, spreading out down to the back and down to the arm, comprising the shoulder, elbow and index finger</td>
<td>Constant</td>
<td>D</td>
<td>Secretary</td>
</tr>
<tr>
<td>13</td>
<td>30-39</td>
<td>Male</td>
<td>Low-back pain, Neck pain, Upper-back pain</td>
<td>One or more times a week</td>
<td>D</td>
<td>IT Support</td>
</tr>
<tr>
<td>14</td>
<td>50-65</td>
<td>Male</td>
<td>Elbow pain, Low-back pain</td>
<td>One or more times a week</td>
<td>A</td>
<td>IT Support</td>
</tr>
<tr>
<td>15</td>
<td>18-29</td>
<td>Male</td>
<td>Low-back pain, Neck pain, Wrist/hand pain</td>
<td>One or more times a week</td>
<td>A</td>
<td>Manager</td>
</tr>
<tr>
<td>16</td>
<td>50-65</td>
<td>Male</td>
<td>Low-back pain, Neck pain, Shoulder pain</td>
<td>One or more times a year</td>
<td>A</td>
<td>Manager</td>
</tr>
<tr>
<td>17</td>
<td>50-65</td>
<td>Female</td>
<td>Right-shoulder pain spreading down into the wrist/hand and fingers</td>
<td>Constant</td>
<td>D</td>
<td>Officer</td>
</tr>
<tr>
<td>18</td>
<td>30-39</td>
<td>Female</td>
<td>Neck-shoulder pain spreading down into the spine, right-arm, wrist/hand and fingers</td>
<td>Daily</td>
<td>E</td>
<td>PhD Student</td>
</tr>
</tbody>
</table>

Pt: Participant  Org: Organization  A, B, C, D, and E: Represent different organizations
Figure 9.1: Themes that emerged as a result of the interviews
9.3.1 Cognitive strategies

Cognitive strategies are those that are invisible to the others and involve perception and interpretation of musculoskeletal symptoms or any other strategies that can be categorized as efforts to avoid being aware of symptoms. These strategies have been categorized as ‘distraction’, ‘visualization’, ‘self-talk’ and ‘blocking thoughts’.

9.3.1.1 Distraction

Distraction comprises the cognitive strategies that office workers use to take their attention away from pain. For example as it is expressed by Pt3, focusing on work activities is one of the ways used to take attention away or dismiss pain.

\[ I \text{ can easily concentrate myself to other things...To my job, to what I do.} \]
\[ If \text{ I am on the phone I can concentrate myself to the conversation that I do and I can easily dismiss that pain.} \]

Another way of distraction as outlined by Pt6 is to go to a different place in mind may be to focus on another thought or memory which helps in taking attention away from pain.

\[ Ohh \text{ I just; I go in a different place in my head if I am in pain, so I can just you know, it's difficult to explain; I am not as naughty as it sounds but you know like for example when I go to the dentist I don't have anaesthetic because I am able to you know just go somewhere in my head, so it's, I can temporarily just block it out.} \]

9.3.1.2 Visualization

This is to visualize the painful area and imagining possible internal source of pain; which is then accompanied by an imaginary treatment as it is outlined in the below quotes by Pt8.
Yeah I was trying to imagine, trying to, well could sound silly but that’s particularly what I was trying to imagine... I was trying to visualize may be was that I could see my, I don’t know something to do with my circulation and that I could see everything flowing in my arms just to make it like work and; yeah it was more the sensation of flowing that I wanted to visualize.

9.3.1.3 Self-talk
Self-talk category involves what the participants tell themselves related to the pain experience. It involves statements such as blame and regret, interpretation of pain sensations, minimising the problem, acceptance of the situation, motives such as encouragement and hoping.

• Blame/regret
Blame/regret is a form of self-talk, which some of the participants seem to use as a way of dealing with musculoskeletal pain. For example in the following quote Pt1 outlines how he was seeing himself as responsible for having such pain.

  I mean may be in psychologically I would probably be thinking to myself that I was rather foolish to do what I did. No way I would I regard what condition in my back to be university’s responsibility...

Pt12 blamed herself as being responsible for having pain which was leading to depressive feelings. She thinks that she should be stronger and that it’s her weakness causing the unpleasant experience rather than other external factors.

  You just have to be stronger than the...that’s why I get angry with myself. The anger stops me from becoming depressed. I can kick myself and say ‘look come on stupid. It’s your own fault, you can’t blame anybody else. What’s the point of getting down and miserable about it?’
For Pt18, pain is a barrier in carrying out her work which sometimes leads to frustrations. The cause is unknown and that makes her worry about her condition. It is something which she seems to attribute to the external factors and taking it as a punishment.

\[\text{...I find that the pain is an absolute nuisance, like you know it is in my way, it hinders me, it distracts me, it's an obstacle as basically 'why do I need to have it, I can't believe that I need to have this; I never had it, why should I have it?', it's more like it's a nuisance it annoys me and makes me angry [laughing].}\]

- Interpreting sensations
Interpreting pain sensations is to think about what's taking place and what might take place in the future related to the pain experience. In the following quote Pt2 expresses how his musculoskeletal condition had progressed in time and belief that his condition might lead to a catastrophe unless some professional help could be sought.

\[\text{But it has become more [unintelligible speech], but it has become intensified as the years go by. It's becoming a more significant problem as time duration elapses...so may be I am becoming more aware in regard that it's a more intolerable experience in general, on the general, on the overview and that I have to take some significant measures to deal with it and if I don't I will not even have time to talk about it I will be constantly just [unintelligible speech] on about it on the total.}\]

People sometimes refer to and put themselves in the place of someone else who they know had a bad form of musculoskeletal conditions. In the following lines Pt7 outlines her concerns about experience of musculoskeletal symptoms, which she thinks might lead to a disabling condition, similar to her sister in law.
It is something that I am afraid of that it will get worse in the future, yes yeah. It is something that I am very, my sister in law has got RSI in a very very very bad form and well she is practically disabled for the work that she used to do, which is pity, and I don’t want that to happen to myself but having said that how do you then I don’t know-

- Minimising and acceptance

Minimising and acceptance is about approving the pain experience and accepting it as something that is part of the life. It is to convince oneself that there are people who are in worse condition. Pt11 outlines this as in the following quote.

You know may be also working in this kind of environment you know people are researching cancer and other horrible illnesses you know and then you think “gosh what is a little bit you know neck pain, won’t kill anybody” kind of thing.

Thinking of other people who are worse of than Pt17 makes her believe that she was privileged to the life and that her experience of pain was a fairly insignificant phenomenon.

In general I do feel that I live, globally speaking, a privileged to life, so little things like this I mean you know, you watch news and see people being shot up and losing their children and goodness knows what else...A little twinge in my arm now and then is fairly insignificant isn’t it?...and I was really worrying that may be I am gonna have this arm that I can’t use but then when I found strategies to overcome it and realise that if I didn’t do those kind of tasks for so long it wouldn’t be so painful; now I feel better about it. It’s like you know I wear glasses and I have got an arm that hurts a little bit sometimes, you learn to live with it don’t you?
• Encouragement

Another form of self-talk comprises statements that serve as motivators for the sufferer in achieving a desirable emotional state. In the following lines Pt2 outlines the advices that he had given himself in order to feel better.

*What I was thinking was* 'relax chief, you gonna go to home have a nice bath take your pills, pain killers and have a rest long night and you will be better'; that was my thought...Yeah because I was giving myself some advice 'stand firm you gonna go home now there is only two hours left three hours left, I was counting, you gonna go have a nice shower, take your pain killers and go to bed an early night' and I did.

Pt17 used a similar approach as Pt2 where she encouraged herself to calm down and reassess the situation which was perceived as taxing her resources.

*Yeah sometimes I would do, I mean it can be very pressurised at work and if, well I suppose not just from the point of view of any musculoskeletal pains, but psychologically as well, sometimes you have to say 'calm down, count to five. Now let's look at the priorities and start again' may be walk down the corridor, come back, you know reassess the situation.*

• Hoping

Hoping is another form of coping where sufferers relies on external factors and expect help in overcoming their pain. In the below quote Pt18 outlines how she appealed for the pain to go away.

*I just remember I was in such a bad state I just could you know I just thought 'oh my god I just want this pain to go' you know I just don't, can't cope anymore and then I saw my chiropractor...*
9.3.1.4 Blocking thoughts

Blocking thoughts seems to be another form of cognitive coping where an individual goes blank in his/her mind and avoid any pain related unpleasant thoughts to come into his/her consciousness. Below quote is an example for blocking thoughts which is expressed by Pt12.

I would focus on work. I mean if I really need to step out I step right out as in the mind will go totally blank and I will focus just on the wall that's it don't think of anything. I can block the pain net way, because I can just go [blank in mind].

9.3.2 Behavioural strategies

Behavioural strategies comprise those which are physical and observable in nature. This theme comprises of five main categories which are ‘seeking social support’, ‘communicating pain’, ‘exercise stretch’, ‘exposure management’ and self or accompanied treatment’.

9.3.2.1 Seeking social-support

The social support theme comprises three categories as ‘communicate pain’, ‘get care’ and ‘get information’. The process starts with communicating the pain to the others, giving them clues that something unpleasant is being experienced. The others may then provide the sufferer with care and/or information with the aim to help overcome the problem.

• Communicate pain

Communicating pain has two different forms, which are verbal communication and non-verbal communication (e.g. facial expression). Verbal form of communication is to talk about the problem and sharing it with others as described by Pt1.

On that occasion I can remember, because I was stiff and people noticed that I was stiff. I probably did tell colleagues. It's not unusual that my
colleagues have an ache or pain or some medical problem that they will talk about to colleagues...

The other form of verbal communication is grumbling, which is expressed by Pt12 as below:

Quite often I end up using some kind of a swear word because of being in pain, and em, 'I have had enough right, I am gone, I will see you later, I am hard I am going off to do whatever... They are all sort of quite used to that [means office mates].

The non-verbal communication of pain on the other hand involves postural expressions (e.g. inability to keep still, intermittent shifting of position etc.), facial expressions and other forms of vocal complaints (e.g. moans and cries etc.). Pt9 described how his colleagues realised his deviated posture and the development of the rest of the social support process.

...while I was waiting to have the surgery and I was still at work, I was always talking about It [means back pain], because they consider [colleagues] I am not right, I am standing, bend to one side so they keep asking me 'what's going on?', 'why you doing this?' and so on and 'how did it happen?' so yeah I want people always talking about it, used to have lots of conversations with them about it.

• Get care

Following the communication of pain to the others, one of the next stages is getting care from the others in the form of emotional support or treatment such as massage as described in the 'other treatment' section (see 9.3.2.4).
In the following quote Pt1 outlines the care that he got from his colleagues in the form of emotional support when he felt guilty after injuring his back in an event that he took part in.

At that day my colleagues knew that I was involved in this event, it was an event in the village where I live and they asked me about it anyway, and it was a successful event, but I also probably was able to share with them the fact that I overdone it, and [laughing] hurt my back- you get a little sympathy from the people or you get a little you know some people react, laugh and say "well it's your own fault John you should be more careful, you are getting too old to do these things", you know [unintelligible speech] good natured banter about it you know, nothing more than that.

- Get information

‘Get information’ is one of the other forms of social support for those who have concerns about their condition and/or seeking different strategies to deal with their condition. Receiving information and finding out more about the situation may provide emotional relief in case of receiving expected information, such as a good news as expressed by Pt9.

I used to quite like listening to how people used to have problems like mine and they are now okay. When somebody said 'oh yeah my dad had this problem and he had surgery and now he is fine' for instance somebody would tell me this I feel very happy about that, or somebody say to me 'oh my mum used to have this problem and she had acupuncture; it's really brilliant'. So I used to feel good about these things or somebody would say 'ah oh, she used to try ibuprofen or anti-inflammatory or different kind medicine. Yeah, so any advice they would give would make me feel good.
9.3.2.2 Exercise/stretch

Participants reported that they do a range of exercises and stretches in order to cope with their musculoskeletal aches and pains. These strategies are sometimes chosen to be involved in the tasks. For example below Pt1 describes how he combines both work and exercise together.

What I tended to do actually was may be say, oh I will go somewhere and walk, so go and walk and look at something. You just feel may be easier just to have a bit of exercise. And my job I am fortunate because almost invariably I have a couple of things on my desk where I need to visit something and look at something, so I can walk for a few minutes and check something out. Climbs and stairs and things like that; you know exercise a little.

Pt6 states the importance of moving and mobility.

...I always you know, I make sure I that I move and even if you just go to, because we are on the ground floor and the ladies bathroom is on the second floor, and there is a water machine on the second floor as well, so you know you can just even if you just sprint up the stairs use the ladies, get some water and you know you just moving around and making sure that you’re moving out muscles that you have been you know been in the same position.

In the below quote Pt2 confirmed the statements of Pt6. He states the importance of moving and mobility and outlines what he does during his breaks.

Physically speaking, it [means taking break] gives me the opportunity to stretch, to walk, because I am at a very static basis at the present moment, it’s very static the environment I think so when I have a break it gives me the opportunity to walk to stretch a bit, to move around a bit so that’s more comforting me.
Sometimes the opportunities and resources available at work, the type of condition experienced may lead people to create their own opportunities. Below quote outlines how Pt2 exercises and the method that he uses.

_I also have an inversion table. It’s like a big ironing board you stand on it and you lock your feet at the bottom of it and then it’s balanced...and then you can tilt yourself upside down, so your head is near floor and your feet are near the ceiling, yeah, it tilts and only thing is holding you are your feet ...I do it in the office twice-...sometimes three if there is a stress on my back I do it every forty five minutes for five minutes... I get off my desk because this room upstairs we have it and I go on the table five minutes, ten minutes, feel much much better for the next hour; and then I go back and work for an hour and when the bit pain starts to build up I then go to the table again, and that relives me for another hour, it’s very very good._

Pt13 however relies on the information that he had got from a colleague of his.

_...I sort of asked him [means his colleague] you know how, how can I stretch out the muscles in my upper back and he sort of suggested put your arms together like that and just kind of lifting and trying to force of that over which, which does a beautiful job, of just stretching out between the shoulders blades..._

9.3.2.3 Exposure management

Exposure management involves those strategies that are related to changing the physical environment or adjusting physical behaviour in a manner that may diminish or cease the source of stress. It also involves workload management, such as shifting or adjusting the level of workload. The theme comprises categories such as, ‘changing work technique and postural variation’, ‘pacing and breaks’, ‘workstation improvement and use of support tools’, ‘activity/task variation or avoidance’, and ‘workload discharge’.
• Changing work technique and postural variation

In order to provide the continuation of work performance, it is sometimes crucial to employ strategies that would allow the office workers to both recover from the musculoskeletal aches/pains and also to continue working. This is essential especially in hectic work environments, where workers do not have reasonable job latitude. Pt9 came up with a strategy as he states in the following quote.

*I trained my left hand now to use quite efficiently... I can use my left or my right hand just as effectively; so I swap the mouse. I work one hour in my left hand, one hour in my right hand.*

Some of them adapted different postures or kept the painful limb in a more comfortable position. Pt6 was one of them.

*the pain is actually in my wrist, and so that automatically you hold your wrist differently which puts, I don't have a problem with my shoulder or neck but the reaction of holding my wrist slightly differently does put a little bit extra pressure on them, so they get achy but that is all one problem really...*

One of the participants found it helpful to change his chair, which was helping him to vary his back posture as he outlines in the following quote.

*... if I have a back pain I sometimes find, I am not sure that it's any better but it just change your position slightly to sit in a chair like the one you are sitting in [mentioning the ordinary chair that the interviewer was sitting]...Yeah; it may be psychological but I always feel slightly better of doing that.*
• Pacing and breaks

Work pacing and breaks are articulated to be one of the strategies that participants used to deal with musculoskeletal aches/pains at work. Pt17 slowed down and didn’t challenge the pain, as she outlines in the below quote.

Well it began to, during that period when I was doing a lot of work processing, it was beginning to, it was lump appeared but also I was getting aches in my arm and into my shoulder and wrist obviously, and fingers so I started to try and type more slowly...

Contrary to Pt17, Pt6 on the other hand states that she increases her pace in order to get the painful work done and have a longer recovery time at the end.

It tends to be the other way because you constantly thinking, ‘I just need to get these done’ then just-...so if you get it done quicker then you know that, you know you got may be a week or something when no results to put in, and you know that it’s a significant amount of time to, for your wrist to heal. It is for me.

• Workstation improvement

A group of participants focused on improving their workstations. Some of them were provided with support from their organizations, such as work station assessments and supply of ergonomically designed equipment; however there were others from different organizations who had to take their own measures. Pt9 had a spinal cord injury, and was more aware of the importance of caring about his back, therefore he had got himself an adjustable chair, as he outlines in the below phrase.

Yes. I got myself a better chair with adjustability of arms like this one [mentioning the one in the interview room]; I can do this on my chair. It hasn’t got one of those head rests but it’s an adjustable back and lots of positions are adjustable on that chair.
Pt13 was another participant who had replaced his chair with the one that was providing a better back support. According to him, his old chair was the potential cause of the pain in his low-back.

...now I have got a proper chair at work (while) it's designed to provide a bit more support too. I have had very bad chairs up until very recently, so that was potentially a cause, I don't know really.

Pt12 however realized that ordinary computer mouse use was an aggravator of the pain in her neck that was spreading down to her right-arm. After work station assessments carried out by the health and safety department of her organization, she was provided with a marble mouse, which she believes helped in preventing the aggravation of the pain.

... the thing is with the little mouse that we have with the constant clicking in it. That is one of the most severe things I found with this. Whereas with the marble mouse it's easier, although I haven't said that it's not improving, it's just not making it any worse anymore.

Pt14 was another participant who expressed that computer mouse use was a contributor in experiencing pain in his right-elbow. He then changed to a tracker ball mouse (marble mouse), which he found to help him in overcoming pain.

I have had a in the past a spinal decompression, I had some spinal problems; and work wise the main problem I have is right-elbow with the mouse. It actually got so bad that I had to stop using the mouse and I moved over to a tracker ball and I found that is greatly helped; really has helped.

- Activity/task variation

Activity or task variation was another strategy frequently reported by the participants as a way of dealing with musculoskeletal pain at work. They moved on to less strenuous tasks or those tasks that had different demands (e.g. changing from
physically demanding tasks to those with cognitive demands) for recovery; however there were others with more persistent pain that completely avoided painful tasks and kept working on the less strenuous ones. The availability of such tasks may be an important coping resource for workers for both recovering from the pain and also being productive at the same time. In the below quote Pt1 expresses his experience.

I can't recall whether I did anything particularly different. I can recall that I was feeling uncomfortable and it's quite likely that I would have perhaps try sit in the chair and read something instead of sitting at my computer for a while something like that just to vary my posture and may be feel a little better.

Pt11 also complained about her job involving frequent use of computer mouse, which she associated with experiencing symptoms in her neck. To avoid this, and may be to give herself a chance to recover from pain, she moved on to a different task, and/or sometimes processed her work manually rather than processing it on the computer.

The writing [means typing] is not the main thing. A lot of my time is searching, you know and then you going with the mouse whole time, for hours and then I might feel quite bad in my neck and I would stop doing that for a while and may be read something or may be rather than moving and reading documents online, I would then print them out and I would read them on paper and sit down and may be put my legs on the desk you know...

Pt12 on the other hand moved on to a different task that involved work environment change, and also gave her an opportunity to walk around, as she expresses in the following lines.
I will get up; I mean if it gets too (appointless) it was actually driving me mad, I will get up and go and find something else to do. That will take me onto another floor in the office, so it's like to take a walk out and around and just calm the arm down, and then back again.

- Workload discharge
Workload discharge comprises the management of workload. It is about diminishing workload via asking help from a colleague in relation to a work-related chore or task. Pt12 outlines workload discharge as below:

I do pass as much as I can over, so it lightens my load...Only the stuff that I can pass over [means to the other colleagues]. There is still a tremendous amount, but I have to do myself.

Pt 17 avoided computer use via passing over a chore that was to be done on the computer, to her secretary.

I try to reduce it [computer use] I mean, about a week ago I had a document that I needed to edit and instead of doing the edit manually, I gave them to my secretary [for processing it on the computer]...

9.3.2.4 Self or accompanied treatment
This category consists of the strategies that participants use to address pain. The strategies can be self-administered or accompanied by others, such as colleagues. The category consists of two concepts, which are 'use of medication', and 'other treatment'.

- Use of medication
This category involves pharmacological treatment methods, such as use of pain killers and other medication in order to treat musculoskeletal symptoms. Pt1 expresses how he stayed on the job with the help of pain killers.
Yeah, I mean it varies you know particularly when you are taking pain killers it goes away to a tolerable level and then as they wear off, it comes back. So you get through of the day without too much difficulty doing that.

Although Pt1 expresses that pain killers helped him to get through a working day, there are cases where pain killers don’t seem to work. Below is Pt5’s view on taking pain killers.

*I take painkillers but they don’t help very much...I don’t take very many, I don’t like taking pain killers now; they’re quite strong...Well, partly because they don’t seem to be helping very much [laughing] and so I don’t want to just take things that are not doing any good.*

Pain is both a sensory and emotional experience that may lead to depression. Below is Pt12’s view on the use of antidepressants.

*Yes I know, I mean one of the big problems is the amount of people that end up on the antidepressant, which I also have been down that road through pain, and it’s again not a good road to be.*

- Other treatment

Other treatment methods consist of those that are not pharmacological. For example massage is one of the treatment methods, which is outlined by Pt13 as below:

*Well, I instantly try and change position to try to make it more comfortable I will occasionally try and give the muscles a bit of a massage or something like that especially lower back on either side of the spine I just get my fist in there and just sort of you know with using my knuckles I’ll just kind of go up and down the base of my spine. Doing that feels really nice actually.*
Massage can sometimes be given by a colleague as in the case of Pt12.

Actually it's one of the lads and it's not doing the arm. It's just across the top here where the pain gets up there. And he's getting better at it, but he needs a lot more work.

Incurability of pain sometimes leads sufferers in finding different coping strategies to cope better with pain and may be feel better. In the following lines Pt12 describes a range of methods that she uses.

I use a pain pen, a tense machine, ice packs and hot arnica, emm cream.
It helps with (bruising) so emm, as long as it's reducing some of it down I feel that I am getting some benefit. I am trying anything and everything...

Pt15 expresses that it sometimes gets so painful that even pain killers wouldn't help. In that case he tries his other strategy which is described as below:

Okay with the elbow what I do, if gets really bad I; I take some pain killers, paracetamol right? Emm, if it sort of goes on then I put it on ice...Yeah I keep a towel, a wet towel in the freezer...inside a plastic bag and I put it on there for twenty minutes and em...Oh yeah, takes the pain away...

9.3.2.5 Eating/drinking

The eating/drinking category involves the strategies that one either relies or avoids any kind of intake with the aim to deal with musculoskeletal aches/pains. Pt16 avoided drinking too much coffee.

... I have found that I had to stop drinking so much coffee because that was having a sort of noticeable effect on me so I am little more conscious now in the amount of coffee I drink ...
Drinking alcohol is also reported to be a way dealing with musculoskeletal aches/pains. In the below quote Pt16 outlines the use of alcohol in order to deal with aches and pains.

...I guess another coping mechanism is good old alcohol and I do have a couple of glasses of wine, em and perhaps when I have back pain I tend to drink more wine, which makes me think I am relaxing more or helps me forget the back pain, but I guess that then puts me into a cycle of dehydration, so it sometimes, it’s, it’s tricky.

9.4 Decision making

Decision making theme involves those factors that have an effect on the decision making of office workers, in the context of work. This theme is made up of three categories, which are ‘job characteristics’, ‘personal attributes’, and ‘pain characteristics’.

9.4.1 Job characteristics

This category comprises of four themes that have emerged as job features having effect on participant’s decision making. These are ‘colleagues’, ‘latitude’, ‘role’, and ‘security/insecurity’ and are further explained in the following sections.

9.4.1.1 Colleagues

Two concepts emerged under this category, which are ‘culture’, and ‘relationships’. The culture of colleagues comprises beliefs and attitudes against musculoskeletal problems. How musculoskeletal problems are viewed by the members of an organization, which may determine the extent to which an individual would communicate pain to colleagues at work. In the below quote Pt1 expresses his view on reasons of his colleagues avoiding to share musculoskeletal troubles with others.

...people don't necessarily like to draw attention to themselves and colleagues normally you know it is difficult to have people to think of what colleagues think of them...
Relationships however, represent the level of intimacy among the members of an organization. It's the degree to which colleagues trust and share personal information with each other. The level of relationships established at work seems to be a part of the decision making process; whether to rely on colleagues or not as described by Pt13 in the following lines.

*I don't, I don't sort of think that there is any stigma against talking about things like that. It's just not something that I do; really it's just not...I do with friends. With friends I will talk about things like that...Yeah, yeah. Just [unintelligible speech] [laughing] I don't, just work colleagues are work colleagues, friends are friends you know they are friends to a certain extend, but they are not as, you are not as good a friend with your colleagues perhaps...*

9.4.1.2 Latitude

Job latitude is the degree to which an individual has flexibility in making decisions about his work (e.g. workload management, pacing and breaks etc.). In the below phrase Pt1 outlines how his flexibility in making decisions effect the way he cope with his back pain.

*I think because of the sort of a job that I have where I have, I control what I do myself but I am not being told over time do this, do this, do this and so I am lucky in that if I have a day when my back is sour I can due things like change my seat and read documents rather than sit at pc; or I can decide that I am going to go and look at a project, meet somebody somewhere else something like that ...*

Pt6 outlines her limited opportunity to cope with pain due to the nature of her job.

*Well unfortunately that is a bit of a problem in peak exam times, the time to rest is very very limited, the time to give yourself a break ...*
9.4.1.3 Role

Job role emerges as another concept that seems to affect coping decision making process. The quote below reflects a managers’ (Pt16) perspective on whether to communicate pain to the other colleagues and its extent. Being a manager sometimes seems to limit the available options.

... what I am saying is that a manager may feel that they have to seem stronger than they may, you know sort of really be; you know if you admitted to being in pain or took time off work, you know it might be frowned upon and your standing you know as a manager might be influenced to in that as I say there are times when you have to deal with performance issues, em...

9.4.1.4 Workload

High workload limited Pt6 in taking breaks from her work, and she had to find another way in order to deal with her pain, that was to vary tasks, and change with those which were providing her with the opportunity to recover from pain.

Well unfortunately that is a bit of a problem in peak exam times, the time to rest is very very limited, the time to give yourself a break and like I said about sandwiching jobs that is my only job for about six weeks solid during exam times so it becomes so difficult to manage then, you know which is why it gets quite sour and that does affect my home...

Stress of work, combined with awkward postures caused Pt7 to perceive more pain; however, she had a deadline to meet and therefore ignored the pain and continued to do what she was doing, even though the price of ignoring pain was a bad quality sleep at night.

If I am just really really intense- sitting behind a computer and sitting in a wrong way then the pain becomes so bad that it becomes burning and then you know I know and that’s what I mean at least I get that signal and sometimes I ignore it again because there is this deadline but I
always pay the price for that; because when I do ignore it. When I get home you know I will have a bad night, I won't sleep well.

9.4.1.5 Security/insecurity
A feeling of job security or insecurity is about how secure one feels about maintaining his/her job. This may be associated with organizational culture that shapes the attitudes of an organization towards employees’ health issues. Worker’s perception of how their organization would react in particular situations would determine the extent to which individuals would communicate the pain to the others at workplace. In the below quote Pt7 expresses how her feelings of insecurity effected the way she dealt with her neck pain.

I need the work, I need the income and I don’t want to be considered a pain in the neck or someone whose always got something and things like that, that not, doesn’t have a good health, so therefore she is a health risk so therefore that's not, I don’t want that to happen...that idea at least does influence the way I am dealing with it, because I will not mention it and I will definitely continue doing what I am doing because I don’t want to loose my job...

9.4.2 Personal attributes
The theme ‘personal attributes’ consists of the individual attributes that were emerged in the data as factors that influenced the selection and use of coping strategies. These individual characteristics have been categorised as ‘beliefs and attitudes’, ‘health limitations’, ‘knowledge and awareness’ and ‘traits’.

9.4.2.1 Beliefs and attitudes
This category comprises of the beliefs and attitudes of participants related to a musculoskeletal condition experienced and available resources to cope with it. The category also comprises beliefs and attitudes related to oneself as being capable or not capable to deal with the condition, and job as being its context.
In the below phrase Pt1 expresses his attitudes against his back pain and its evolution and the reasons that made him to be present at work despite being in pain.

*I mean may be in psychologically I would probably be thinking to myself that I was rather foolish to do what I did. No way I would I regard what condition in my back to be the universities responsibility, so I would probably think psychologically I need to get on with my work and not be so stupid in the future [laughing]. That would be my attitude to it.*

In the following lines Pt8 outlines her attitudes against using pain killers as a coping strategy, which was shaped by the belief formed through suggestion of her mom as pain killers are harmful.

*My mum always says oh if I said a pill she says 'it's really really really aching or it's really really painful?' but not if it's not necessary because you shouldn't be putting any chemicals in your body and things like that. Maybe I don't know. That's something I heard from my mum, so I had like that kind of attitude against medicine like don't take anything unless it's absolutely absolutely necessary.*

In the below quote Pt6 outlines her self-efficacy beliefs:

*I have quite good pain threshold and as soon I find a way of working around it and masking it. I don't take pain killers for anything really.*

In the below quote Pt12 expresses her attitudes against herself as being responsible from the situation. She blames herself as not being able to deal with the pain, which then causes her to experience anger.

*You just have to be stronger than the...that's why I get angry with myself. The anger stops me from becoming depressed. I can kick myself and say 'look come on stupid. It's your own fault, you can't blame anybody else. What's the point of getting down and miserable about it?*
The attitudes against job may be deterministic in being present or absent from work. In the below lines Pt1 expresses his view on why his colleagues might have come to work despite experiencing musculoskeletal troubles.

...the fact that they [colleagues] still may be come to work despite having painful back rather because they quite like work and they have a (liability) to the place and these sort of things, and so those almost fit together when you dealing with something like that.

Attitudes against work-tasks may lead sufferers to ignore all the sensations and persist on what they are doing. Pt7 describes how her work enjoyment made her continue what she was doing despite having pain.

When I start, when I like what I am doing then I just forget about the time and then I continue, and continue and continue, and even if I have pain I just continue because I enjoy what I am doing...

9.4.2.2 Health limitations

'Health limitations' has emerged as another concept, which is a barrier in accessing various resources. These limitations sometimes enforce sufferers to use their problem solving skills in finding ways to deal with musculoskeletal pain. In the following lines Pt9 outlines how his way of exercising was affected by a previous surgery he had on his spine.

Because I can't do regular exercises if I am standing up, because of my back pain and also because of the surgery I could cause damage, but if I am upside down there is no pressure on my spine; it's just my muscles so I can exercise and also you can stretch and let the blood flow and relieve you.
9.4.2.3 Knowledge and awareness

'Knowledge and awareness' involves the amount of information that someone has related to the condition experienced and the ways to deal with it. This category comprises three concepts when the source of information is considered. These are 'gained through experience', 'suggestions from others', and 'other sources'.

Knowledge acquired through previous experiences seems to play a role in determining the appropriate coping strategy as expressed by Pt1.

_I suppose the reason I do it is my experience because I have been in hands up situation more times care to than I remember. My experience is that just changing what you do or where you are for a period tends to make you feel slightly better._

Information can be obtained from various other sources such as medical professionals or from other people in the form of social support. Pt9 does the exercises suggested by a physiotherapist.

_Oh yeah, yeah as a result of the surgery I had on my back, I was advised to do some physical exercises in morning and also regularly during the day, so they gave some diagram that show me; I went to physiotherapy at the hospital and they showed me what to do; that's for my back not for my wrist, because they don't know about my wrist._

Knowledge obtained through training, offered by experts is another source of information, which seems to enrich the resources of one in dealing with musculoskeletal aches/pains at work. In the below quote Pt6 expresses her view on this.

_... if possible and this is really something I could do to help myself is trying and use the keyboard rather than the mouse, but the way I learned the way I was told really because I did mostly correspondence courses to_
teach myself to type and use the computer, and everything so you got the options to use the keyboard or the mouse...

Pt11 also received advice from health and safety experts at her workplace regarding proper sitting and adjustment of her workstation for better outcomes.

I have got a very very bad posture, you know hanging a bit forward and I think that probably creates more problems as well; and I could now saying that you know they did have that day here in also in the spring when they went around [means health and safety staff] and looked at how people sat and so on, and I had somebody showing me how I should sit at the computer and I tried to do it...

9.4.2.4 Traits
This category represents personality characteristics of individuals, which shapes their attitudes towards different coping strategies. In the following phrase Pt2 expresses his views on thinking positive.

Well, to be honest with you I am not the kind of person that tries to trick himself with thoughts which are not, how can I say, based on reality, which are quite sort of metaphysical kind of thoughts. That's my character, part of my character.

9.4.3 Pain characteristics
This category comprise of pain characteristics (cause, location, persistency, quality and severity) that seem to play a role in decision making process in choosing to use or not to use particular coping strategies. In the below quote Pt16 expresses his reason for rarely relying on pain killers.

No, I rarely take pain killers because I usually know the source of the pain...
Pt13 outlines how the location of pain may be deterministic on how he deals with it. 

...I wouldn't say that I have got a definite set in stone method of coping with it, you know it's just depending on where I feel the pain, will depend up on what I do about it you know...

Pt7 expressed how she had gotten used to her constant pain. It has sometimes been forgotten, and sometimes been there limiting the performance of some activities; however it hasn't been as severe as the pain she experienced in her wrist.

And on occasion when you know you are talking about it you realise yeah that is this constant pain there but it's not something that incapacitates you in the sense that, yes of course you won't do everything that you would love to do but you have been so used to it that you don't register it any more; but this wrist pain is acute and so bad that I can't continue working.

Long lasting pain influenced Pt5 emotionally as a result of relying more on cognitive strategies that were counterproductive. Emotional exhaustion limited her in coping with pain as she expressed in the following phrase.

...last September, October I coped okay because I haven't had it for that long, but now I am finding it much harder because the pain just get down you more.

Pt6 categorized pain and dull ache as different pain qualities. The sense that she described as 'pain' was easier to block, compared to the sense of dull ache.

To be honest the pain is easier much easier to block then a dull ache. The thing with the ache in the wrist is that it's there constantly, quite grinds you down really.
Pt10 experiences dull pain in his low-back most of the time while he is working, however the pain sometimes gets more severe that he can not tolerate anymore and needs to cease his work and get away from the exposure.

Yeah I mean it's generally a very dull pain I mean it's just an ache most of the time but it can get to the stage where I just give up and go home because I can't move on.

9.5 Work performance

This category describes the effects of musculoskeletal aches and pains on worker’s performance. It comprises of two themes which are ‘presenteeism’ and ‘absenteeism’.

9.5.1 Presenteeism

Presenteeism is related to lost productivity of workers due to being present at work despite experiencing musculoskeletal problems. The participants reported their perceptions on the effect of pain on their work productivity. As a result four themes emerged that represented the effects of musculoskeletal pain on various areas of presenteeism. These themes are ‘concentration’, ‘work pace’, ‘perceived energy level’, and ‘overall output’ and have been further elaborated in the following sections.

9.5.1.1 Concentration

Some of the participants reported that musculoskeletal symptoms affected their ability to concentrate and accomplish work. One of these participants was Pt5, who found it difficult to sit, due to pain that she was experiencing in her low-back. Her job however was involving sitting in front of the computer throughout the working day.

May be some people say I am not but I, the problem is sitting and concentrating on something and that's what I find I can't do at the moment.
Pt16 also reported that musculoskeletal pain had an effect in his ability to concentrate while working. It has caused him to feel exhausted and he was unable to devote his regular capacity. He describes this as working less than hundred percent.

\[ I\ am\ working\ less\ than\ hundred\ percent,\ feeling\ less,\ less\ than\ a\ hundred\ percent...I\ don't\ have\ the\ same\ levels\ of\ energy\ and\ because\ I\ am\ aware\ of\ the\ pain\ in\ my\ back\ or\ wrist\ or\ shoulders\ or\ wherever,\ em\ and\ I\ don't\ seem\ to\ have\ the\ same\ sort\ of\ clarity\ of\ thought\ as\ when\ I\ am\ feeling\ good\ but,\ you\ know\ I\ guess\ that's\ inevitable. \]

9.5.1.2 Work pace

Effects on pace was one of the most frequently reported one. Participants expressed that pain made them to slow down in order to reduce its physiological effect; however, the cost of doing that was to spend more hours in order to recover the lost time. Pt6 outlines this as in the following phrase.

\[ I\ would\ do\ the\ same\ thing\ probably\ if\ I\ didn't\ have\ pain,\ I\ would\ probably\ be\ able\ to\ do\ the\ same\ amount\ of\ work\ in\ a\ little\ bit\ less\ time,\ so\ if\ I\ have\ the\ thirty\ six\ contractual\ hours\ and\ I\ say\ I\ work\ forty\ two\ hours\ a\ week\ that\ is\ partly\ because\ some\ of\ my\ pain\ is\ causing\ me\ to\ work\ slower...I\ would\ say\ it's\ about\ five,\ six,\ seven\ may\ be\ ten\ percent;\ I\ don't\ know. \]

Pt18 expressed that symptoms reduced her productivity about thirty percent, with respect to the times when she was pain free. She had difficulties with keeping up her work pace and as a result she ended up taking some work home in order to make the lost time.

\[ ...I\ would\ do\ things\ at\ home\ because\ I\ couldn't\ you\ know,\ just\ couldn't\ keep\ up\ the\ pace\ at\ work\ that\ I\ will\ take\ things\ at\ home\ and\ read\ them\ over\ the\ weekend\ and\ I\ would\ you\ know...Yeah,\ so\ that\ I\ covered\ basically\ up\ that\ I\ couldn't\ work\ that\ thirty\ percent... \]
Pt2 also highlighted that his neck pain slowed him down. He was able to complete his tasks; however with some time loss, as he outlines in the following phrase.

*I believe that I would be able to complete my work in a most speedy fashion without the pain...So I believe in regarding the performance I do complete the duty which I am suppose to complete, though in a more delayed way; so time I think is the more important thing...I think it would affect me in about twenty five percent.*

9.5.1.3 Perceived energy level

Another theme extracted from the participants’ narratives as a sub-category of presenteeism was ‘perceived energy level’. Some participants reported that, pain experience made them to feel exhausted and perceiving their resources as reduced to deal with the demands of their job. Pt16 expresses this in the following line.

*Hm, yes I thought, I indicated that as I don’t have the same levels of energy [when experiencing back pain]...*

Pain made Pt18 to feel very tired, and exhausted like she had lack of sleep in the previous night. She outlines her experience as in the below phrase.

*it made me so tired working as well as you know having the pain; I felt that pain makes me really tired, really really tired, it’s not like you know the tiredness you experience, it’s more really like when you have a long day, it’s more really like you haven’t slept all night for three days, that tiredness that you are completely exhausted ...*
9.5.2 Absenteeism

Absenteeism is another form of productivity loss when the workers are not present at work. It is the stage that participants get when the resources at work are perceived as insufficient. For some of them it is the end of the road, and perceived as a lost battle as Pt7 expresses.

"It was just so painful that yeah, I had to then stop working and say I am going home and I had to go to my manager and say ‘I am sorry I have to leave after and go home, I have got so much pain’. I just- and that to have to admit that you can’t go on anymore that you have so much pain that you just can’t continue doing what you are doing that made me cry. And that in general makes me cry. Probably because after having had a lot of pain your barriers go down, you become so tired that you can’t cope with anything anyway or it’s far more difficult to cope with things that happen but then to have to admit that you can’t continue what you are do- that you have to admit defeat, because basically it’s admitting defeat.

Being absent from work seems to be a safer place for the participants; however, being in a key role in their organizations and feelings of job insecurity seems to sometimes lead them to make concessions. Pt9 did some work from home despite he was waiting for his surgery as he expresses in the below quote.

"So I had to stop going to work. Most of the period that I was waiting for my surgery was lying on my back at home; but I was working from home, because they gave me a laptop and they connected me, so I could do some work, just a little bit; just to keep me distracted from the pain."
Being absent from work sometimes is an issue of conflict between the workers and their organizations, especially when a worker goes for long term absenteeism. In the below quote Pt5 outlines her experience.

I am debating whether I am gonna go off-sick again now, and we discussed that this morning [with the management], whether I am going to now go off-sick until I get better so today I am trying to do as much as I can when I am here...and then I might well stay at home again and see if I can really get any better.

The same issue is expressed in the following lines by Pt16 from his managerial perspective.

...I am a fairly senior manager and we are currently dealing with a case and I previously had to deal with the case of a colleague with long term sickness that was frankly we suspected that it was not, we could not find the true cause of these long episodes of sickness...

9.6 Summary

This study has explored a range of coping strategies that have been used by the office workers in order to deal with musculoskeletal pain in work settings. In addition, the factors that could influence the decision making of participants in using or not using particular coping strategies, have also been explored. Moreover the participants also reported their perceptions on how musculoskeletal pain affected their work performance.

The results of qualitative data analysis revealed that the participants used a range of both cognitive and behavioural strategies in order to deal with musculoskeletal pain while at work. The use of strategies affected from various factors that are categorised as 'job', 'person', and 'pain'. These factors have influenced the decision making process of participants in using or not using particular coping strategies.
The participants more frequently reported that the experience of musculoskeletal pain affected their work pace and concentration, which resulted in spending more time on work tasks. Some of the participants reported that they did voluntary hours to recover the lost time. Musculoskeletal pain also caused participants to take time off from work, which sometimes caused conflicts between them and their employers.
CHAPTER 10

10 DISCUSSION

The present research aimed to gain insight into the musculoskeletal pain experiences of office workers while at work, where the sub-aims of the research were:

- To explore the range of coping strategies that office workers use in order to deal with musculoskeletal aches and pains at work
- To explore the factors that have an effect on the decision making of office workers in using or not using particular coping strategies
- To assess the effects of musculoskeletal pain on work performance

In order to address the above aims, both questionnaire survey and qualitative interview methodologies were used. The results of both studies have been independently discussed in relevant chapters (See Chapters 8 and 9). This chapter discusses the main findings in the context of the aims of the research. In addition it covers the limitations of the research and future research needs.

The first two aims (related to the use of coping strategies and factors that are found to have an effect on the decision making of the office workers) are discussed together under section 10.1 (coping). Since the factors explored that have an effect on the use of particular coping strategies are strategy specific, they are discussed together. The final aim related to the ‘effects of musculoskeletal pain on work performance’ is discussed under section 10.2.

10.1 Coping

The qualitative and quantitative study results revealed that the participants used a range of both cognitive and behavioural strategies in order to cope with musculoskeletal pain while at work. The qualitative data showed that the strategies
can be further classified into sub-themes to include cognitive strategies (comprising distraction, visualization, self-talk and blocking thoughts), and behavioural strategies (comprising seeking social support, exercise/stretch, exposure management, self/accompanied treatment, and eating and drinking). To a great extent the coping strategies explored as a result of the qualitative study were also confirmed by the quantitative study where factors such as pacing, ignoring pain, self-talk, seeking social support, stretching, distraction/relaxation, resting, and exercise were extracted as a result of the factor analysis applied to the questionnaire coping items. The strategies extracted as factors, explained 69.8% of the variance in coping. These factors were found to be the major coping strategies that influence coping in office work settings. However, further studies are required to confirm this, since the sample size (n=120) for conducting factor analysis may be considered as small (Kline, 1994).

The decision making of the office workers, related to the use of coping strategies, were affected by factors grouped under three themes, job characteristics, personal attributes, and pain characteristics, based on the qualitative data analysis. Since these factors that shaped the participants’ decision making (in using or not using particular coping strategies) are specific to particular coping strategies (e.g. side effects for not using pain killers), they will be elaborated together with coping strategies wherever appropriate in the following sections.

10.1.1 Cognitive coping strategies
Participants used various methods to take their attention away from the pain. They either focused on their work, or tried thinking of something else, such as a pleasant thought or a memory. Some of these were helpful on the job (accepting pain, ignoring pain, self-encouragement, and distraction).

The most common method was taking attention away from the pain by means of distraction (e.g. focusing on work). This method already has received attention in the literature both in experimental and clinical settings as a way of controlling pain (Nouwen et al., 2006). Eccleston (1995) writes that attention-based cognitive coping strategies may be effective in pain perception and they may have potential to
function like pain killers. The use of distraction as a way of coping with pain while at work, however, has not received sufficient attention to date. In the present research, the questionnaire survey revealed that 24.4% of the participants used distraction/relaxation at least once during the past five working days in order to cope with musculoskeletal pain.

At the same time, in line with Voaklander et al. (2006), the quantitative study results underlined that using distraction while on the job may have some implications in terms of work performance (e.g. errors) and also may be a threat for health and safety if used inappropriately (Voaklander et al., 2006). In this study, almost 18% of the participants reported that their quality of work was affected by musculoskeletal pain, whereas 11% had to spend some time in re-doing their work. More studies would be appropriate in order to explore the ways that distraction is used in work settings and whether and how it affects task performance and errors.

_Focusing on work and ignoring pain_ sensations were other common ways of dealing with musculoskeletal pain at work. The questionnaire survey showed that 99.2% of the participants used this strategy at least once during the past five working days. Some of the participants attributed this to high workload, whereas there were others who thought that by ignoring pain, the symptoms would go away, showing the importance of beliefs, attitudes and awareness in coping with musculoskeletal symptoms. Similar results were reported in a study by Linton and Buer (1995), demonstrating the possible differences on psychosocial variables among two groups of workers; those who were at work despite back pain (copers group) and those who were off-sick (dysfunctional group). As a result the authors found that beliefs that pain was directly related to the activities and that the individuals had little control over their pain were among the factors of difference between two groups (e.g. being off-sick or on the job working with pain). In the present study most participants who used this strategy found it helpful; nevertheless the literature shows that ignoring pain and persisting on task performance without taking sufficient breaks may be counterproductive and even damaging to the individuals who are at the earlier stages of developing WRMSDs (Henning et al., 1997; Rohmert, 1973). Turk (2004) suggests that resting and protecting a painful area when the pain is acute may be
helpful; however, this may not be appropriate in the case of chronic pain. Further research is required in order to understand whether focusing on work and ignoring pain is an effective coping strategy for the people in this group.

Some cognitive strategies were counterproductive (e.g. negative thoughts). One of the female participants reported that pain was leading her to becoming angry or sometimes depressed. She was constantly blaming herself for being weak. Another one was feeling frustrated as pain was leading her to experience irritating negative statements (e.g. 'why do I need to have it, I can’t believe that I need to have this; I never had it, why should I have it?') leading to anger. Others have demonstrated that characterizing pain as horrible, awful, or unbearable (e.g. catastrophizing) or negative thoughts and feelings associated with pain is associated with heightened pain experience and depression (Gracely et al., 2004; Hassett et al., 2000; Sullivan et al., 1997).

Without the expert support, knowledge, and training, some cognitive strategies may lead to further physical or psychological damage with negative consequences for the individual and the company (Ackerman et al., 2000; Menzies and Taylor, 2004). For example Ackerman suggests that self-talk (or guided imagery) should not be used when taking medications for a thought disorder. Moreover it should not be used when operating a machine or a motor vehicle. To my knowledge there is lack of research and guidelines in relation to its use in the work settings for coping with musculoskeletal pain. It may lead to errors and accidents while on the task; therefore, further research is necessary in order to justify and develop guidelines for its use while at work.

Lack of control over their work (e.g. taking breaks whenever needed, or pacing tasks) might have led some participants to rely more on cognitive strategies. The questionnaire survey results demonstrate that almost half of the participants (49.6%) used self-talk as a cognitive strategy while on the job. The current research was limited in its capacity to confirm whether those people with less control over their jobs used cognitive strategies more frequently compared to the others. To my knowledge there is a lack of information on this matter and studies are required to
address this issue. The results of these studies may lead researchers to demonstrate ways of preventing on the job errors.

This is in line with other research which underlines that pain is an attention demanding phenomenon (Eccleston et al., 1997; Veldhuijzen et al., 2006). These results are also in line with Torp et al. (1997, 1999) who found that the use of ergonomic coping (e.g. changing working technique, using lifting equipment, taking micro pauses etc.) strategies were associated with work demands, control and social support.

A few found strategies such as visualization, blocking thoughts, and “going blank” helpful. There is only a small literature on these approaches and more research needs to be done on employees who use these strategies. The concern would be that these kinds of strategies could be inappropriate while on task. For example, one (secretary) reported that when she used the blocking technique her colleagues had to wait for her to finish. This may cause problems in team work settings.

10.1.2 Behavioural coping strategies

A major component of the behavioural coping strategies involved seeking social support from others. The current study found that social support can be divided into two phases, firstly communicating pain to the others and informing them that something unpleasant is being experienced and secondly getting care and/or information in relation to the phenomenon experienced. With respect to the communication of pain, two categories were elicited from the data as verbal communication of pain (e.g. expressing the problem to the others) and non-verbal communication of pain that involves postural expressions, facial expressions, and other forms of vocal complaints. Thus this study confirms earlier research e.g. Craig and Prkachin (1983) who suggest that individuals convey their distress to others using a variety of expressive cues that includes verbal reports, paralinguistic vocalizations, escape and palliative behaviour, diffuse locomotor activity, and changes in facial expressions.
10.1.2.1 Seeking social support

Various studies, both from the clinical context and also from work settings, have shown that social support is an important resource in both reducing the risk of the occurrence of disease (Woods and Buckle, 2002; Woods, 2005) (e.g. MSDs) and also helping individuals to develop behavioural coping strategies and to better adapt to illnesses (e.g. reducing the level of disability) (Evers et al., 2003; Lazarus and Folkman, 1984). However, the current research has raised some work-related issues in relation to both the access of social support and also its content. One of the issues concerned feelings of job insecurity, which some of the participants expressed as a reason for not disclosing the pain to the others (e.g. colleagues, superiors for fear of losing one’s job). Moreover, a few of the participants reported the lack of opportunity for accessing their social support networks at work, as a reason for not seeking social support. One of the participants for example, mentioned that his colleagues were very busy with their own workload, therefore they were not accessible. Similar findings were reported by Carayon (1993) who reported that high work pressures that arise as a result of workload may cause workers to be “workstation-bounded” or tied up with their work and may reduce the opportunities for interaction among colleagues; thus influencing the nature and extent of social support received from colleagues (Berkman, 1984). In addition, relationships among colleagues, such as the level of intimacy, was another factor that seems to affect decision making in seeking or not seeking social support. Berkman defines this as density and complexity that means “the extent to which members of an individual’s network know and interact with one another”. For example, one manager reported that he felt reluctant to admit that he was in pain to subordinates as this might diminish his authority. These results were also confirmed by the questionnaire survey that has found that only 30.3% of the participants sought social support and of these, 67.6% sought support from a family member, which may imply that the majority of the office workers who sought social support most frequently relied on external rather than internal sources (i.e. colleagues). Woods (2005) indicate social support received away from workplace as an important area that needs further investigation, which is in line with the present study.
Participants who had social support networks, especially those who wanted to find out more about their situation, consulted other colleagues who were more experienced with musculoskeletal problems. Different information was shared; however, this study was limited in its capacity to elucidate the whole range of information shared with colleagues, and also whether the participants received the right support from their social support networks. Berkman (1984) stresses that the existence of social support networks does not always mean that the individuals always receive adequate support. Further studies would be useful to gain insight into the type of information shared concerning musculoskeletal disorders (Woods, 2005). For example, what kind of advice is given and is it appropriate? It may also be useful in training workers on understanding the needs of someone who is in pain and how to support them (e.g. what type of information and guidance would be useful). For example one participant found massage helpful but his colleague advised him against it on the basis of his own experience and limited knowledge. On the web most of the sites have been developed to give advice to those who are in pain (e.g. http://www.painrelieffoundation.org.uk); however, information and guidance to those who interact with these individuals is lacking (e.g. how to support someone in pain?). There is a strong case for informative leaflets and websites written by healthcare professionals.

10.1.2.2 Exercise/stretching

Exercises/stretching were the other behavioural strategies used to deal with musculoskeletal pain at work. Those who did not rely on these strategies indicated the lack of a suitable environment to perform exercises and stretches. Among those who performed exercises/stretching, some followed suggestions given by the experts (e.g. physiotherapist, chiropractor etc) while others relied on suggestions given by their colleagues. Moreover, some of the participants did not follow any experts' guidance and performed exercises/stretching, which they thought would be appropriate. There was also a tendency among the participants to combine exercises with the work tasks (e.g. walking up and down the stairs), rather than allocating special time for them. Some of them recognized that their workload was high and therefore they didn’t have the opportunity for exercising. The questionnaire survey results demonstrated that 69.7% of the office workers used stretching, whereas
exercises were reported by 59.7% of the participants; however, it is not clear whether participants allocated special time in exercising/stretching at work, therefore this issue needs further clarification.

In the literature, there is still a debate concerning the exercises/stretches and their usefulness in preventing musculoskeletal pain. As Miranda et al (2001) reported, there were only a small number of studies that considered the effects of exercising on the musculoskeletal health of the working population, and the results of these studies are contradictory. The authors also write that physical exercise may have indirect effects in preventing pain (e.g. perception of physical conditioning, self-worth, attractiveness, and strength as reported in Hess and Hecker, 2003). The authors have also reported that regular stretching may increase the distance that a tissue can stretch, as well as the force required to tear the muscle tendon unit. In this study, the participants used stretching techniques for relief rather than as a preventive strategy. In the literature it is demonstrated that stretching increases the tolerance to pain (e.g. it has an analgesic effect, Shrier, 2000) that is in line with the present research as some of the participants expressed that they relied on stretching in order to tolerate pain and stayed on the task rather than doing it more effectively as a preventive strategy with the guidelines provided by an expert. Despite that there is a common belief in relation to the utilisation of stretches as a way of dealing with musculoskeletal symptoms; however there are others who are critical about the proposed utility of stretching (Croasmun, 2004). Hess and Hecker (2003) added that stretching was a widely used method that had been implemented in various companies as a preventive measure against WRMSDs. The authors emphasised that in order to better benefit from stretching, there is a need to design programs that would be job specific or designed according to the body-parts (e.g. for office workers programs that would focus on the neck, shoulders, upper extremities and the back). A study by Shrier (2000) demonstrated that pre-work stretching, that is implemented in many workplaces may actually reduce performance (e.g. muscle force, and torque etc) and increase the likelihood of injuries. Moreover Shrier writes that stretching may be more beneficial in terms of injury prevention, if it is performed after the exercise (e.g. after work); therefore caution should be taken by organizations when implementing stretching programs. Clearly more research is needed to understand
whether pre-work stretches or after work stretches are more beneficial in terms of injury prevention, so that employees could be given the correct advice.

10.1.2.3 Pacing/taking breaks

Five sub-categories have been elucidated from the data that form the ‘exposure management’ category. These are ‘changing work technique and postural variation’, ‘pacing and breaks’, ‘workstation improvement’, ‘activity/task variation’, and ‘workload discharge’. These strategies could be classified as problem-focused by their nature as the efforts are directed towards changing the source of stressors (Lazarus and Folkman, 1984). It is clear from the literature that pacing and taking breaks have the potential for helping people with MSDs (McLean et al., 2001). The factor analysis shown that pacing has explained the largest amount of variance (21.8%) among other coping strategies, demonstrating its significance as a coping strategy; however, the interviews revealed that it is currently being used in a very haphazard way without professional supervision or advice. In the literature there are large number of studies (Galinsky et al., 2000; Henning et al, 1997; Balci and Aghazadeh, 2003), and advice provided by health organizations (HSE, 2002). Further research may focus on whether these guidelines are being taken into consideration in the workplaces.

10.1.2.4 Medication

Medication use was another strategy, which some of the participants had often relied on for relief. The questionnaire survey demonstrated that during the last five working days 31.5% of the participants took pain killers at least once in relation to musculoskeletal pain experience. A range of medication types were reported during the interviews that the office workers used for treating their musculoskeletal pain. These can be broadly categorised as pain killers and antidepressants. The use of pain killers was more common than the antidepressants, however some of the participants reported that they had recognised the side effects (e.g. vomiting, dizziness etc.) of taking medication that made them avoid it. One of the participants stopped using pain killers as they were ineffective in relieving her pain. These are in line with the findings of Haslam et al. (2003). One of the participants had the belief that the pain killers were chemicals, that shouldn’t be taken unless the pain was intolerable.
However there were others who were using pain killers for headaches but not for musculoskeletal pain, demonstrating the effects of beliefs and attitudes on decision making, whether to use medication or not (Avorn and Solomon, 2000). Other factors identified were knowledge and awareness of musculoskeletal disorders, which some of them gained through their social support networks.

With respect to the use of medication, various experimental and field studies demonstrated a relationship with high risk for injury (Pickett et al. 1996, Voaklander et al., 2006, Haslam et al., 2003). In a qualitative study Haslam and colleagues explored the range of accidents that was attributed to the use of medication or the symptoms of anxiety/depression. As a result the participants associated a range of falls, minor injuries and industrial accidents with medication use and symptoms of anxiety/depression that they experienced. The present study confirmed findings from the literature about the benefits and also risks of taking medication without proper medical supervision.

10.2 Perceptions on work performance

The qualitative interviews revealed that musculoskeletal pain often reduced the ability to concentrate and accomplish work. It caused some of the office workers to feel less energetic, and affected their work pace, leading to delays in task accomplishment. In order to recover the lost time some of them worked extra hours; however, there were others who varied their tasks and tried to enhance their productivity.

The questionnaire survey revealed that 33% of the participants reported an average 16% reduction in their productivity caused by musculoskeletal pain. These results are very similar to those reported by Hagberg et al. (2002). In Hagberg’s study 10% of the participants reported decreased productivity due to musculoskeletal symptoms. The mean magnitude of reduction was 15% and 13% for women and men respectively. The difference in the proportion of participants who reported a decrease in their work productivity is different (e.g. in this study 33%, and in Hagberg’s study 10% of participants reported reduced productivity); however this difference may be attributable to different study samples used. In Hagberg’s study the sample
comprised of Swedish computer users, with and without symptoms; whereas in this study only those volunteers who have had musculoskeletal symptoms within the past week were involved. A higher percentage of people who reported decreased productivity in this study was not surprising and still agrees with Hagberg’s findings.

Among the areas of productivity, ‘work pace’ was frequently affected by musculoskeletal symptoms. 35.8% of the participants reported that musculoskeletal pain affected their work pace. This is consistent with the results of the qualitative interviews where the office workers frequently reported that the pain often slowed them down, leading them to working extra hours in order to recover the lost time. This was confirmed with the findings of the questionnaire, where the participants reported that pain, interrupted the ‘time spent working on tasks’ (30.0%) and also the ‘amount of work done’ (29.2%). Although, despite that the participants reported during the interviews that pain interrupted their ability to concentrate and accomplish work, the questionnaire survey revealed that the quality of work and errors were not affected as much as work pace. This may be attributable to two factors. The first is the low use of distraction/relaxation (24.4%) as a coping strategy that was revealed as a result of the questionnaire survey, and the second may be that the participants were able to control their pain by pacing their work (e.g. by going slowly and not against their pain).

In this study 67% of the participants did not report any reductions in their productivity; however, qualitative study showed that some of the office workers used different strategies (e.g. cut-back from breaks or working voluntary hours) in order to keep up with their work productivity requirements, hence masking the impact of pain on their work performance. One of the participants for example reported that she was working extra hours by staying until late. Additionally one said that she had to take some work home, and another was varying her tasks in order to continue to be productive. Apart from reductions on individual productivity, the impact of musculoskeletal pain may be greater on the overall organizational output; depending on the type of job (e.g. reductions in one worker’s productivity may affect others in a team work setting and therefore overall group output).
The statistical analysis revealed that the participants who reported a decrease in their productivity used self-talk almost two times more frequently compared to those who did not report any reduction. This may be due to the higher severity of conditions experienced among those who perceived that their productivity was reduced due to musculoskeletal pain.

The quantitative study is not based on a random sample and the response rate was fairly low. Furthermore, the low response rate may imply selection bias such that employees with MSDs may have been more or less willing to respond than others with less frequent symptoms. This may have influenced the prevalence of musculoskeletal symptoms and also the coping strategies reported. The non-random sample restricts the generalisation of the results to the whole office worker population in the UK; however the responders covered a wide range of different jobs involving computer work. The low response rate may be due to a number of reasons, which one of them was the attitudes of the organizations towards this study. For example one of the organizations who initially agreed to distribute the questionnaires to their employees had changed their decision. Another one located the questionnaires in a room that was not private, and might have affected the responses of those who had low perceptions of job security. This reluctance on the part of the organizations to support research like the present one is an aspect of the issue that urgently needs to be addressed. It is highly likely that organizations are aware of the problem but are unwilling to face the reality. One manager acknowledged this state of affairs when he reported in interview that if he admitted to MSD then the others would take it as an example and might take unnecessary sick leave. Additionally, he was afraid that his standing as a manager would be affected and he might lose his status.

10.3 Underpinning theories

This section considers the contribution of the research to the two underpinning theories; gate control theory and transactional model of coping, and discusses how these theories might contribute to the future theoretical development.
10.3.1 Gate control theory
The gate control theory of pain suggests that both the central nervous system and the brain have active roles on the modulation of pain impulses that may lead to different emotional and behavioural responses to pain. The theory proposes that psychological factors (e.g., attention, past experience, meaning of situation) that were previously not considered as “reactions to pain” are the important elements of the system and provide new approaches for pain control (Melzack, 1999).

In the present research both the questionnaire survey and the qualitative interviews revealed that the office workers were using a range of both cognitive (e.g., distraction, visualization, self-talk, and blocking thoughts) and behavioural coping strategies (e.g., seeking social support, exercise, stretch, taking pain killers, and massage etc.) in order to master, tolerate or reduce the stress of musculoskeletal pain by addressing sensory, cognitive and affective components of pain (See Appendix B for further information) suggested by Melzack and Wall (1965). This research confirms the gate control theory and suggests that it should be considered as a key in the future theoretical development of coping with musculoskeletal pain.

10.3.2 Transactional model of coping
The transactional model of coping (Folkman and Lazarus, 1985) has been taken as a basis for the present study (See Section 3.2). The model suggests that coping is a process where the individual make efforts (cognitive and/or behavioural) in order to manage the demands (internal or external) of an event appraised as taxing or exceeding his/her resources (Lazarus and Folkman, 1984). The appraisal process is shown to have two stages as primary appraisal (i.e. is this something to bother about?) and secondary appraisal (i.e. what can I do about it?) (Anderson and Willebrand, 2003; Folkman and Lazarus, 1985).

In this study a range of factors have been explored that have an effect on the decision making of office workers in using particular coping strategies. These have been broadly categorised as job characteristics, personal characteristics and pain characteristics. Factors explored under the job characteristics theme include colleagues, job latitude, role, workload and feelings of job security/insecurity, which
demonstrate that contextual factors may affect one’s way of coping as suggested in
the transactional model of coping (Folkman and Lazarus, 1988). Moreover the
transactional theory of coping suggests that there are at least two major functions of
coping, problem-focused and emotion-focused (Lazarus, 1993). The coping
strategies explored in the present research mostly fall into these broad categories
(e.g. self-talk, blocking thoughts, distraction, seeking-social support as emotion-
focus strategies, and exercise, stretch, exposure management, self/accompanied
treatment as problem-focused). However, the results also show that some coping
strategies may consist of both problem-focused and emotion-focused components
(e.g. seeking massage from a colleague, seeking social support). For example,
seeking social support may be considered as having both problem-focused and
emotion-focused functions, as it may be about someone seeking sympathy and also at
the same time individuals may seek information about changing the physical nature
of the work-system they perceive as ‘troublesome’.

10.4 Implications for workers
Like employers, workers also have responsibilities (HSWA 1974) towards protecting
themselves and their colleagues from risks of hazards at the workplace. The existing
research revealed that some of the workers did not have enough information about
the risk factors that are scientifically recognised as increasing the risk for WRMSDs.
The awareness of risk factors may broaden ones coping resources in preventing the
progression of musculoskeletal symptoms to further stages. Individuals may improve
their knowledge by accessing various online resources (e.g. Health and Safety
Executive web page) and/or by simply consulting the experts in the area, such as
ergonomists and occupational health specialists.

Another finding was that some of the participants did not seek medical advice despite
the fact that their pain experience had progressed to an undesirable stage (e.g.
interruptions in sleep and emotional discomfort). The current study did not explore
the reasons behind not seeking medical advice; however it should be noted that
workers should not delay and seek professional help if their condition persists or gets
worse. Moreover they should report their experience to the employer or workers'
representative, safety representative or a trade union safety representative who can
relay their issues to the employer so that further improvements could be made at their workplace. This is the principle, but in reality, as shown in 10.2, there were strong pressures acting against it.

10.5 Implications for employers and ergonomists

Employers have responsibilities for the health and safety of their employees (HSWA 1974). Whatever the size of the business, they must prevent the risks to their employees health, and make their workplace safe (HSE). They could achieve this by consulting ergonomists and/or occupational health specialists.

MSDs continue to be a threat for both employees and employers in various ways. The present study revealed that musculoskeletal pain was a great concern for the office workers in terms of becoming disabled, losing their job, and losing income. Thoughts such as leaving the job in the future were common (Ohlsson et al., 1989). Despite everything, many workers had continued to be present at work even though experiencing musculoskeletal symptoms. This study has shown that among those who were present at work, 33% reported that the pain had reduced their productivity up to 40% within the past week (on average 16%). Those with jobs involving single tasks (e.g. computer programming) were affected more compared to those with multiple tasks. Having a single task job limited workers’ coping resources and the opportunity to deal with pain, while being productive at the same time. Therefore employers, in collaboration with ergonomists should consider designing jobs involving multiple tasks, and tasks that require the use of different muscle groups (Juul-Kristensen and Jensen, 2005). Some of the participants found it useful to change their work environment, and also to be mobile while performing their tasks. They sometimes shared their workload with colleagues that helped them to cope better with musculoskeletal pain. Therefore factors such as mobility, change of environment, and also tasks’ “performability” by multiple workers should be regarded when designing or improving jobs. Furthermore the current research found that high workload and low decision latitude (e.g. ability to decide on what to do and when to do) were among the factors that affected the use of coping strategies (e.g. taking breaks, seeking social support, task variation etc.). These factors are shown to be associated with stress, MSDs and mental health problems (Punnett and Wegman,
2004; Kuper and Marmot, 2003; Niedhammer et al., 2006). The lack of social support is also shown to add to the risk of being susceptible to these ill-health conditions.

Pain is a sensory and emotional phenomenon, which may lead to depression (Lazarus and Folkman, 1984; Lepine and Briley, 2004). Some of the office workers sought social support in order to feel better emotionally; however there were others who were concerned about disclosing their problem to colleagues due to the level of intimacy and lack of trust. This was also reflected in the questionnaire results such that the majority of social support seekers relied on friends or family members from outside work with regard to internal networks such as colleagues. Similar results were reported by Pransky et al. (1999) where the authors established the reasons for under-reporting of WRMSDs at the workplace. As a result the authors suggested that fear of reappraisal, lack of management responsiveness, and desire not to lose their usual job were among the factors that workers described as reasons for not reporting musculoskeletal symptoms. Azaroff et al. (2002) also reported that workers may avoid reporting of occupational illness and injuries due to fear of disciplinary action, denial of overtime or promotion opportunities, being stigmatized, drug testing, harassment, or job loss. This clearly shows that the employers need to take the initiative in developing a supportive social atmosphere and relationships among colleagues (Berkman, 1984; Woods and Buckle, 2002). Moreover employees need to feel secure about enhancing their jobs. Feelings of job security may lead workers to report their musculoskeletal pain experiences so that preventive measures could be undertaken on time.

The exploration of various coping resources and workers awareness of such resources is important. As suggested by Haythornthwaite et al. (1998) providing individuals with opportunities to try various coping strategies evaluate their impact and, evaluate their efficacy may influence their beliefs that pain is controllable and they have the ability and resources to control pain. Pellino et al. (1998) found that perceptions of control over pain was inversely associated with severity of pain and emphasised the importance of training and awareness in early intervention (not allowing pain to become severe). The present study is also in line with Pellino and
colleagues, that workers should be made aware of the early intervention and reporting of their symptoms (e.g. one of the participants (administrator, male) had not sought any professional help despite 13 years of constant pain experience in his neck).

10.6 Implications for policy and practice

A few of the participants who reported reduced productivity due to musculoskeletal pain, were taking work home in order to keep up with the required productivity standards. Under the HSWA (1974) “employers have a duty to protect the health, safety and welfare of their employees, including home workers”; however, the word ‘home workers’ needs to be made clear. It is not clear whether this applies to the people who use their homes as permanent workplaces (e.g. piece-work), or whether it applies to the workers who their permanent workplace is the company but sometimes work from home. This is an area that requires further work.

10.7 Main strengths of the study

First of all, to my knowledge, the present study is the first one that has used qualitative interviews in order to investigate coping strategies and their use in the work context; therefore it should be taken as a starting point for the development of a theory about coping with musculoskeletal pain at work.

The study used a mixed methods design that has benefited both from quantitative and qualitative approaches. The use of qualitative interviews provided the opportunity for the researcher in interacting with the local actors (individuals) and capturing data about pain and coping that is a subjective and individual experience.

The use of a mixed method design helped in complementing the results of the qualitative study with a quantitative (survey) approach (Denscombe, 1998). Moreover the results of the qualitative study were corroborated by the quantitative study, further strengthens the credibility of the study (Greene et al., 1989).
The qualitative study benefited from theoretical sampling approach that provided the opportunity to build and broaden theoretical insights in the ongoing process of data collection and analysis (Maykut and Morehouse, 1998). Moreover based on the questionnaire survey results, the participants were recruited to reflect a range of characteristics. This approach gave the opportunity to select key informants with relevant sources of knowledge (Mays and Pope, 1995).

10.8 Limitations of the study

The issues regarding the validity of methods used were addressed, and attempts were made to limit their effects (see sections 7.13 and 7.14); however, as in every study, this research has also faced some methodological limitations. These are further discussed in the following sections.

10.8.1 Questionnaire survey

The lack of a validated coping questionnaire to be used in work settings resulted in selecting one among those that were designed to be used in clinical settings (e.g. chronic pain patients). Therefore factor analysis was applied on the questionnaire items (CPCI and Activity Pacing Scale) that led to an eight factor solution comprising ‘pacing’, ‘ignoring pain’, ‘self-talk’, ‘seeking-social support’, ‘stretching’, ‘distraction/relaxations’, ‘resting’, and exercise’. These items were found to be the major coping items and explained 69.8% of the variance in coping; however, since the sample size was only 120, further studies are necessary in order to confirm these findings (Kline, 1994).

The quantitative study was not based on a random sample and the response rate was fairly low (17%); however, due to the nature of sampling strategy used (See Section 7.13.6.2), it is not possible to draw any conclusions regarding the representativeness of the responders. In addition, it was not possible to follow up those people who did not return the questionnaires, therefore it is unfeasible to justify whether the nonrespondents were ‘missing at random’ (Parashos et al., 2005). The low response rate may be attributable to not being eligible for the study (e.g. not having experienced musculoskeletal symptoms within the last 7 days) and concerns that participants might be disclosed to their employers. It is likely that for these reasons
workers with more serious musculoskeletal pain did not respond to the questionnaire. Other research has found that some office workers kept their pain as secret and did not report to their employers for job security reasons (Azaroff et al., 2002) and this supports the potential for bias in this study sample.

The study sample consisted of office workers who had experienced musculoskeletal symptoms within the last seven days, but it is not possible to claim that the study sample was representative of all UK office workers with MSDs. Nevertheless descriptive statistics for the persistency of musculoskeletal symptoms show that for almost all body parts (except neck pain) the pain lasted a maximum of 2 days out of 5. This means that those people whose pain was persistent for more than 2 days were likely to be excluded from the study sample.

10.8.2 Qualitative interviews

In the present study the qualitative data analysis was performed using preset themes that were identified in the literature and as a result of the pilot studies. This approach might have limited the main themes to be bounded by themes that were pre-identified. The musculoskeletal pain experiences of office workers may not be limited to the pre-set themes identified; therefore there is a need to conduct further studies in order to confirm this.

Furthermore, self-report studies may be limited by the awareness that individuals have of the coping strategies that they use. Cohen (1987) suggests that people may be more aware of the coping strategies that they struggle to use, than the strategies that they use successfully. Also they may not be aware of particular coping strategies if the strategies merge with life routines. This research might have faced similar limitations.

In order to establish internal validity, triangulation was used as a way of assuring the confirmability of the results (Guba, 1981). Therefore the results were corroborated based on two different data sources, a questionnaire survey and qualitative interviews. Nonetheless some researchers suggest that this method is controversial test of validity as it assumes that any weaknesses in one method will be compensated
by strengths in another (Mays and Pope, 2000; Barbour, 2001). Lincoln and Guba (1985) suggest that respondent validation (or member checking) is the most crucial technique in order to establish credibility. Due to imitations in resources the existing investigation did not seek respondent validation.

10.9 Future research

This research has highlighted the following main areas of concern that need to be addressed in future studies.

- First of all, to my knowledge the present research was the first to investigate coping strategies and assess the effects of musculoskeletal pain on office workers productivity. Further research is required in order to confirm these findings.

- People with different pain conditions (e.g. acute vs. chronic) should be considered separately as the needs and therefore the use of coping strategies may be different for each group (e.g. ignoring pain and task persistence).

- There is currently a lack of research regarding the use of cognitive strategies (e.g. distraction, visualization, self-talk, blocking thoughts) in the work settings. Further research and guidelines are required for training, as their use may be counterproductive and even damaging to the individuals and the company if used inappropriately (e.g. using distraction while on the task).

- It may be useful that future studies investigate coping strategies specific to body-parts rather than investigating them in general. This may help in elucidating more specific guidance.

- In this study 33% of the participants reported on the average 16% reduction in their work productivity due to musculoskeletal pain; however the functioning of these people and the effects in team settings remains hidden. Future studies may investigate the musculoskeletal pain experiences of individuals in a team work context.
10.10 Overall critique of the study

This research used a mixed methods approach in order to gain insight into the musculoskeletal pain experiences of office workers while at work. The questionnaire survey was used to inform the qualitative study sampling process (purposeful sampling) where the participants were recruited based on their age, gender, musculoskeletal symptoms, and organization. The use of mixed method design helped in corroborating the results of the two independent studies where the results confirmed each other to a great extent. The use of qualitative interviews however, helped in complementing the results of the survey and generated richer data than the survey.

As the survey sampling process involved non-random sampling techniques (e.g. accidental and convenience sampling) it is not possible to claim generalizability of the findings to the whole UK office workforce with MSDs. Moreover, since the sample size was only 120, the coping strategies extracted as a result of the factor analysis need to be confirmed in future studies.

The use of the qualitative interviews helped in obtaining information directly from the individuals who had experience of musculoskeletal pain at work. Since the study sample was recruited based on the survey findings where the participants were not randomly selected it is likely that the sample was not representative of the whole UK office workforce with MSDs.

Additionally, it is likely that some individuals may not be aware of the coping strategies, which they execute successfully but that they may be more aware of those that they struggle to use. The present research might have faced similar limitations and caution is therefore required in interpreting these results.
11 CONCLUSIONS

The aim of this study was to gain insight to the musculoskeletal pain experiences of office workers and how it affected their working life experiences. Three pre-identified themes, 'coping strategies', 'decision-making', and 'work performance' were explored using a mixed methods design consisting of qualitative and quantitative studies. Although some caution is needed in making generalisations from the present research (See Section 10.10) the quantitative study helped in informing the qualitative study during the purposive sampling process. Moreover, the findings of the quantitative study confirmed the issues raised by the qualitative interviews that have further added to the credibility of the results.

Some of the office workers said during the interviews that they kept their pain hidden due to lack of trust, fear and feelings of job insecurity. Therefore they relied on cognitive coping strategies, ignored the pain or combined coping strategies with their tasks. Pacing of work (usually slowing down) was common and often resulted in not taking enough breaks or working extra hours in order to make up the lost time. This study was the first to explore coping strategies used at work in order to deal with musculoskeletal pain. The results revealed that despite being helpful in the clinical context; some of the coping strategies require further research in order to understand their possible outcomes in the work context, so that workers could be provided with necessary training and guidelines to use these strategies efficiently. Some of them paid a price for their inefficient coping attempts by taking the pain home and that sometimes caused tension among family members. Moreover, pain caused individuals to spend their spare time on resting and recovering rather than socializing and relaxing.

The findings of this study show that MSDs have hidden costs on both sufferers, their families and also for the employers. The results can be used in informing the
stakeholders to allow a better understanding of the hidden nature of the MSDs and preventive measures that can be undertaken for better outcomes. Moreover the existing research shows how important it is to create an atmosphere of trust that will allow workers to discuss their musculoskeletal health issues and not hide them using some of the poor coping methods.

A number of the workers found a way to deal with their pain such that they were keeping up with their work output requirements. This has implications for researchers who may consider using objective work performance measures in their studies (e.g. system output). For example, some of the participants reported that they had to work extra hours, whereas there were others who cut down their rest breaks. One of the participants reported that she was taking work home so that she could make up the lost time. These factors may mask the real picture, therefore triangulating different methods, especially methods that will benefit from the actual actors (e.g. workers) as data sources may be more appropriate.

This research also revealed that some of the organizations were unwilling to take part in a study that would investigate the musculoskeletal pain experiences of their workers. This attitude may be an obstacle for future studies and needs to be addressed. Understanding of the issues that shape an organization’s attitude against MSDs may help inform concerned parties; therefore improvements could be made. The present study also shows that there was a lack of communication between some of the office workers and management regarding the experience of MSDs. A study would be useful to understanding how management in organizations think their workers deal with musculoskeletal pain at work.

In the last decade where the importance of using participatory ergonomics as a design approach has been recognised, it is important to establish good communication between workers and management. Employees should be provided with the opportunity to communicate their pain, seek/receive support and propose solutions concerning their problems (Hignett et al., 2005). If pain remains hidden the future outcomes may be more serious health problems or progress to disability (Pransky et al., 1999). The continuity of individuals to be productive and be part of
the workforce is important, as they contribute to their countries’ economy by generating economic output, paying taxes on earnings; and hence affecting the economic standard of living of the whole nation (Davies et al., 2005).
REFERENCES


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Harland, N. J. & Georgieff, K. 2003, "Development of the coping strategies questionnaire 24, a clinically utilitarian version of the coping strategies questionnaire", *Rehabilitation Psychology*, vol. 48, no. 4, pp. 296-300.


Merskey, H. 1979, "Pain terms: a list with definitions and notes on usage, recommended by the IASP Subcommittee on Taxonomy", *Pain*, vol. 6, pp. 249-252.


Leesberg, VA, Noldus Information Technology.

Ref Type: Generic


APPENDICES
APPENDIX A

A summary of pain-coping studies performed within the clinical context
Table A.1: Summary of pain-coping studies performed within the clinical context

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
</table>
| Hill et al., 1995      | Amputees with phantom limb pain     | Coping Strategies Questionnaire (CSQ)               | 1. Pain report
2. Physical dysfunction
3. Psychosocial dysfunction | Catastrophizing explained the largest proportion of variance in pain report, physical and psychosocial dysfunction. |
| Nicassio et al., 1995  | Patients with fibromyalgia          | Coping Strategies Questionnaire (CSQ)               | 1. Pain
2. Depression
3. Quality of well being (QWB) | As a result of longitudinal multiple regression analyses, high active coping and low pain control and rational thinking (PCRT) scores found to contribute to greater pain, greater depression, and lower QWB. |
| Dozois et al., 1996    | Low back pain patients              | Coping Strategies Questionnaire                     | 1. Self-perceived disability
2. Functional status
3. Psychological distress
4. Return to work status | Helplessness/emotion-focused coping factor significantly predicted perceived disability and also functional status. However psychological distress was only predicted by pain control and rational thinking. |
| Snow-Turek et al., 1996| Chronic pain patients               | 1. Vanderbilt Pain Management Inventory (VPMI)
2. Coping Strategies Questionnaire (CSQ) | 1. Psychological distress
2. Depression
3. Activity level | Passive coping was associated with general psychological distress and depression, and active coping was associated with activity level and was inversely related to psychological distress. |
Table A.1: Summary of pain-coping studies performed within the clinical context (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
</table>
| Schmitz et al., 1996   | Chronic pain patients           | Three cognitive (cognitive restructuring, action planning, self-efficacy) and three behavioural (diverting attention, distracting activities, relaxation) dimensions used. | 1. Pain intensity  
2. Disability  
3. Depression          | No significant correlations were found between coping measures and pain intensity; however, a negative relationship was found between pain related disability and distracting activities. Moreover cognitive restructuring and self-efficacy were found to be associated with less depression. |
| Martin et al., 1996    | Patients with fibromyalgia      | Coping Strategies Questionnaire (CSQ)                                           | 1. Functional disability  
- physical disability  
- psychosocial disability  
- total disability      | Catastrophizing was associated with higher levels of total disability.                                                                                                                                  |
| Santavirta et al., 1996| Patients with congenital coagulation defects | Coping Strategies Questionnaire (CSQ)                                           | 1. Pain intensity  
2. Functional disability  
3. Emotional well-being  
4. Energy/fatigue  
5. Social functioning | High correlations were found between catastrophizing and pain, and between disability and catastrophizing.                                                                                           |
| Dozois et al., 1996    | Low back pain patients          | Coping Strategies Questionnaire                                                | 1. Self-perceived disability  
2. Functional status  
3. Psychological distress  
4. Return to work status | Helplessness/emotion-focused coping factor significantly predicted perceived disability and also functional status. However psychological distress was only predicted by pain control and rational thinking. |
Table A.1: Summary of pain-coping studies performed within the clinical context (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evers et al., 1997</td>
<td>Patients diagnosed with rheumatoid arthritis</td>
<td>Utrecht Coping List (UCL)</td>
<td>1. Psychological distress - Anxiety - Depressed mood</td>
<td>As a result of multiple regression analysis sex, pain, functional status, disease impact on daily life, life events, and perceived social support were related to psychological distress (anxiety and depressed mood).</td>
</tr>
<tr>
<td>Fitzgerald, 1997</td>
<td>Patients with burn injury</td>
<td>Coping Strategies Questionnaire (CSQ)</td>
<td>1. Pain intensity - 2. Pain distress - 3. Depressed mood</td>
<td>The tendency to catastrophize was associated with pain intensity and pain distress</td>
</tr>
<tr>
<td>Groot et al., 1997</td>
<td>Patients undergoing lumbar surgery</td>
<td>Threatening Medical Situation Inventory (TMSI)</td>
<td>1. Anxiety - 2. Fatigue - 3. Pain</td>
<td>The coping variables were not associated with postoperative anxiety, nor with physical complaints.</td>
</tr>
<tr>
<td>Evers et al., 1998</td>
<td>Rheumatoid arthritis patients</td>
<td>Pain Coping Inventory (PCI)</td>
<td>1. Functional status - mobility - self-care - grip-strength</td>
<td>Frequent use of passive coping strategies of worrying and resting was found to predict a decrease in functional status (mobility, self-care, grip-strength).</td>
</tr>
<tr>
<td>Study</td>
<td>Population</td>
<td>Coping measure</td>
<td>Outcome measures</td>
<td>Results</td>
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</tr>
<tr>
<td>Madland et al., 2000</td>
<td>Facial arthromyalgia patients</td>
<td>Coping Strategies Questionnaire (CSQ)</td>
<td>1. Mood</td>
<td>catastrophizing was found to be associated with anxious and depressed mood.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- anxious</td>
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<td></td>
<td></td>
<td></td>
<td>- depressed</td>
<td></td>
</tr>
<tr>
<td>Turner et al., 2000</td>
<td>Chronic pain patients</td>
<td>Coping Strategies Questionnaire (CSQ)</td>
<td>1. Physical disability</td>
<td>Coping scores significantly predicted physical disability, but not depression.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Depression</td>
<td></td>
</tr>
<tr>
<td>Mercado et al., 2000</td>
<td>Neck and low back pain patients</td>
<td>Pain Management Inventory- Short form</td>
<td>1. Pain severity</td>
<td>Passive coping was associated with being, married, greater pain severity, depression, and poor health. Active coping was associated with less depression and good health.</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>2. Depression</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Health problems</td>
<td></td>
</tr>
<tr>
<td>Echteld et al., 2000</td>
<td>Cardiac patients</td>
<td>Leiden Coping Questionnaire for Heart Disease</td>
<td>1. Quality of life</td>
<td>Avoidant coping and stress perception predicted all quality of life indicators. Approach coping predicted only positive quality of life variables.</td>
</tr>
<tr>
<td>Covic et al., 2000</td>
<td>Rheumatoid arthritis patients</td>
<td>Vanderbilt Pain Management Inventory (VPMI)</td>
<td>1. Pain</td>
<td>Passive coping was found to mediate between the physical disability and pain, and between physical disability and depression.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Physical disability</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>3. Depression</td>
<td></td>
</tr>
</tbody>
</table>
Table A.1: Summary of pain-coping studies performed within the clinical context (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lankveld et al., 2000</td>
<td>Rheumatoid arthritis patients</td>
<td>Coping with Rheumatoid Stressors (CORS)</td>
<td>1. Psychological distress</td>
<td>Cognitive coping did not predict any changes in psychological distress and disease impact. Decreasing activity as a behavioural pain coping style has a negative effect on changes in psychological distress and disease impact.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Disease impact</td>
<td></td>
</tr>
<tr>
<td>Tan et al., 2001</td>
<td>Chronic pain patients</td>
<td>1. Chronic Pain Coping Inventory (CPCI)</td>
<td>1. Depression</td>
<td>The CPCI ‘catastrophising’ scale was the most powerful predictor of depression. The CPCI ‘guarding’ scale was found to be the single most powerful predictor of disability of all coping responses assessed. The CSQ ‘catastrophising’ scale was the most single predictor of pain severity.</td>
</tr>
<tr>
<td></td>
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<td>2. Coping Strategies Questionnaire (CSQ)</td>
<td>2. Disability</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>3. Pain severity</td>
<td></td>
</tr>
<tr>
<td>Turner et al., 2001</td>
<td>Patients with temporomandibular disorders</td>
<td>Coping Strategies Questionnaire (CSQ)</td>
<td>1. Pain intensity</td>
<td>Significant associations were found between catastrophizing and activity interference, depression and non-masticatory jaw activity limitations. Coping was associated with activity interference and depression.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Activity interference</td>
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<td>3. Depression</td>
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<td>4. Jaw activity limitations</td>
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</tr>
</tbody>
</table>
Table A.1: Summary of pain-coping studies performed within the clinical context (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharpe et al., 2001</td>
<td>Rheumatoid arthritis patients</td>
<td>Coping Strategies Questionnaire (CSQ)</td>
<td>1. Depression</td>
<td>Coping was found to consistently predict depression.</td>
</tr>
<tr>
<td>Jensen et al., 2002</td>
<td>Amputees with phantom limb pain</td>
<td>1. Chronic Pain Coping Inventory- resting scale</td>
<td>1. Pain intensity</td>
<td>Catastrophizing and resting was found to predict both phantom limb pain and pain interference. However the only significant predictor of depression was catastrophizing.</td>
</tr>
<tr>
<td></td>
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<td>2. Coping Strategies Questionnaire-</td>
<td>2. Pain interference</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>catastrophizing scale</td>
<td>3. Depressive symptoms</td>
<td></td>
</tr>
<tr>
<td>Turner et al., 2002</td>
<td>Patients with spinal cord injury</td>
<td>Coping Strategies Questionnaire (CSQ)</td>
<td>1. Pain intensity</td>
<td>Catastrophizing was found to be consistently strongly and independently associated pain intensity, psychological distress, and pain-related disability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Psychological distress</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>3. Pain-related disability</td>
<td></td>
</tr>
<tr>
<td>France et al., 2002</td>
<td>Healthy adults induced with</td>
<td>Coping Strategies Questionnaire-</td>
<td>1. Pain ratings</td>
<td>Although catastrophizing was found to be associated with pain ratings, no significant association with NFR was detected.</td>
</tr>
<tr>
<td></td>
<td>experimental pain</td>
<td>catastrophizing scale</td>
<td>2. Nociceptive flexion reflex (NFR)</td>
<td></td>
</tr>
<tr>
<td>Giardino et al., 2003</td>
<td>Patients with a spinal cord</td>
<td>Coping Strategies Questionnaire-</td>
<td>1. Solicitiveness</td>
<td>Catastrophizing was significantly associated with solicitousness and pain reports.</td>
</tr>
<tr>
<td></td>
<td>injury</td>
<td>catastrophizing scale</td>
<td>2. Sensory pain</td>
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<td></td>
<td></td>
<td></td>
<td>3. Affective pain</td>
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</tr>
</tbody>
</table>
Table A.1: Summary of pain-coping studies performed within the clinical context (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evers et al., 2003</td>
<td>Outpatients recently diagnosed with Rheumatoid Arthritis</td>
<td>Pain Coping Inventory</td>
<td>1. Functional disability</td>
<td>Pain coping and social support was found to predict functional disability.</td>
</tr>
<tr>
<td>Petrak et al., 2003</td>
<td>Patients with persistent somatoform pain disorder</td>
<td>Coping Strategies Questionnaire</td>
<td>1. Health Related Quality of Life (HRQOL)</td>
<td>Increasing pain behaviours and catastrophizing have a negative influence on pain-related impairments and physical component of HRQOL. The mental component of HRQOL was predicted by catastrophizing. Active coping was not associated with positive effect on any health-related outcome variables.</td>
</tr>
<tr>
<td>McCracken and Eccleston, 2003</td>
<td>Patients with chronic pain</td>
<td>Coping Strategies Questionnaire</td>
<td>1. Depression</td>
<td>Diverting attention, and praying and hoping were associated with greater pain, disability, depression, and pain-related anxiety, less uptime, and worse work status. Praying and hoping, and reinterpreting pain predicted greater pain, disability, and distress. Diverting attention predicted greater pain-related anxiety.</td>
</tr>
</tbody>
</table>
Table A.1: Summary of pain-coping studies performed within the clinical context (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
</table>
| Endler et al., 2003 | Chronic pain patients                     | 1. Coping Inventory for Stressful Situations  
2. Coping with Health Injuries and Problems (CHIP) | 1. Pain  
2. Distress | At Time 1 both dispositional and health related coping styles were positively related to both pain and distress. At Time 2 only palliative coping was positively correlated with pain. Emotion-oriented coping at Time 1 was positively related to pain at Time 2. |
| Soderlund et al., 2003 | Patients with acute whiplash injury | Coping Strategies Questionnaire (CSQ) | 1. Disability (assessed with Pain Disability Index, PDI) | At 12 months follow-up CSQ- re-interpreting pain sensations, diverting attention, increased behavioural activity, pain behaviours, and catastrophizing were all correlated positively with Pain Disability Index (PDI). |
| Walsh et al., 2003 | Female undergraduate students with menstrual pain | 1. Pain catastrophizing Scale (PCS) - magnification - ruminations - helplessness  
2. Modified Menstrual Distress Management Questionnaire (MDMQ) | 1. Pain intensity  
2. Disability | High pain catastrophizers reported greater menstrual pain intensities, greater affective menstrual pain intensity, greater variability in the use of pain coping strategies, and greater disability compared to low pain catastrophizers. |
Table A.1: Summary of pain-coping studies performed within the clinical context (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bishop and Warr, 2003</td>
<td>Women cancer patients</td>
<td>1. Vanderbilt Pain Management Inventory</td>
<td>1. Pain intensity</td>
<td>Active coping was associated with less disability while passive coping was associated with greater disability. Higher level of catastrophizing was associated with greater emotional distress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Pain catastrophizing Scale</td>
<td>2. Disability</td>
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<td></td>
<td></td>
<td></td>
<td>3. Depression</td>
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<td></td>
<td></td>
<td></td>
<td>4. Anxiety</td>
<td></td>
</tr>
<tr>
<td>Ferrando et al., 2004</td>
<td>Patients with temporomandibular symptoms</td>
<td>COPE Inventory</td>
<td>1. Emotional distress</td>
<td>The coping predictor of distress was behavioural disengagement.</td>
</tr>
<tr>
<td>Heydecke et al., 2004</td>
<td>Edentulous patients</td>
<td>Brief COPE</td>
<td>1. Oral Health Related Quality of Life (OHRQOL)</td>
<td>Instrumental support, behavioural disengagement, substance abuse, denial, and religion were significant negative predictors of OHRQOL. Only emotional support was a significant positive predictor of OHRQOL.</td>
</tr>
<tr>
<td>Turner et al., 2004</td>
<td>Patients with temporomandibular disorders</td>
<td>1. Coping Strategies Questionnaire-</td>
<td>1. Pain intensity</td>
<td>Daily catastrophizing was associated significantly with worse pain, disability, and mood.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>catastrophizing scale</td>
<td>2. Disability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Depression</td>
<td></td>
</tr>
<tr>
<td>Spinhoven et al., 2004</td>
<td>Low-back pain patients</td>
<td>Coping Strategies Questionnaire</td>
<td>1. Pain intensity</td>
<td>Changes in catastrophizing and internal pain control mediated the level of depression and pain behaviour.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Pain behaviour</td>
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<td></td>
<td></td>
<td></td>
<td>3. Depression</td>
<td></td>
</tr>
</tbody>
</table>
Table A.1: Summary of pain-coping studies performed within the clinical context (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Coping measure</th>
<th>Outcome measures</th>
<th>Results</th>
</tr>
</thead>
</table>
| Nielson and Jensen, 2004 | Patients with fibromyalgia syndrome             | Chronic Pain Coping Inventory (CPCI)                                           | 1. Pain severity  
2. Activity level  
3. Emotional distress  
4. Life interference | Outcomes were most closely related to decreased guarding, increased use of exercise, seeking support from others, activity pacing, and use coping self-statements. |
| Carels et al., 2004      | Patients with heart failure                     | Diary method  
(Acceptance, active coping, distraction, and instrumental support subscales of the brief COPE instrument) | 1. Physical symptoms                                                          | Negative mood and distraction coping predicted greater physical symptoms the next day, while action/acceptance coping predicted fewer physical symptoms the next day. |
| Crane and Martin, 2004   | Patients with irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD) | Vanderbilt Pain Management Inventory | 1. Parental reinforcement of illness  
2. Mood state  
- Anxiety  
- Depression | Higher levels of behavioural passive coping were associated with higher levels of parental reinforcement of illness behaviour and higher levels of depression amongst individuals with IBS symptoms. On the other hand emotional passive coping was associated with higher levels of anxiety and depression in both IBS and IBD patients. |
APPENDIX B

Pain measurement methods
B Pain measurement methods

Caraceni et al. (2002) defines pain as "a subjective sensation which can be described according to several relevant features or attributes (e.g. quality, location, intensity, aversiveness, emotional impact, frequency, etc.)". As Melzack and Casey (1968) suggested, pain has three distinct dimensions (Price, 1988).

Sensory-discriminative dimension comprises experiences such as the location, quality, and intensity of pain, and other spatial and temporal characteristics. Cognitive-evaluative dimension is related to the interpretation of pain, such as what is taking place and what might take place in relation to this sensation. Affective-motivational dimension on the other hand is related to the felt sense in relation to one’s desire to avoid harm and/or one’s expectations of avoiding harm (Price, 1988).

B.1 Non-verbal Measures of Pain

Craig and Patrick (1985) write that non-verbal expressions of pain provides an alternative source of information that can be used as a supplement or complement to the self-report pain measures. Nevertheless these are shown to be more amenable to conscious distortion.

B.1.1 Physiological Measures

The physiological measures such as heart rate, blood pressure, electrodermal activity, and electromyogram (EMG) highly correlate with pain during its initial onset (Melzack and Katz, 1994). However, they may habituate in time when the pain is persistent (Melzack and Katz, 1994).

B.1.2 Behavioural Measures

People in pain convey their distress to the others through a variety of expressive cues. The ways in which people and other organism exhibit that they are experiencing pain’ is defined as ‘pain behaviour’ (Prkachin et al., 2002). Craig and Prkachin (1983) suggest a taxonomy in which various potential expressions of pain
can be grouped into different categories (see Table B.1). These categories are shown to be exclusive and an invariant index of the presence and severity of pain.

Table B.1: Potential expressions of painful distress (Craig and Prkachin, 1983)

<table>
<thead>
<tr>
<th>Vocal behaviour</th>
<th>Language</th>
<th>Complaint, appeals, qualitative description, ratings, demands, exclamations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paralinguistic vocalisations</td>
<td>Crying, screaming, moaning, sighing</td>
<td></td>
</tr>
</tbody>
</table>

Nonvocal expression

| Facial | Distortion, grimacing, specific configurations |
| Limbs | Startle, withdrawal reflexes, clutching or rubbing painful area, locomotor activity |
| Postural | Guarded or unusual postures, inactivity |
| Autonomic activity | Blanching, flushing, panting, vomiting |

Among the pain behaviours facial expression is the most common form of pain expression that is shown to have unique attributes (Craig and Prkachin, 1983). These could be assessed through describing and communicating the patterns of muscle movements involved in specific facial behaviours (LeResche and Dworkin, 1984). The Facial Action Coding System (FACS) (Ekman and Friesen, 1978) is one of these tools, which is comprehensive and allows virtual description of facial expression. The FACS is based on anatomical analysis of facial action and it offers an advanced method for describing the facial movements as they relate to emotions.

LeResche and Dworkin (1984) described FACS as a powerful method from the point of view that it provides more objective measures compared to concurrent measures of psychological variables, physiological state, self-reported pain, and stimulus intensity.

Kappesser and Williams (2002) writes that "although emotion theorists do not consider pain as an emotion, there are good reasons, such as its emotional dimension,
to investigate the pain face". Craig and Patrick (1985) found that cheek raise-lids tight, upper-lip raise and lip corner pull were the most frequent occurring action units in the face as a result of the reactions to the cold pressure experience in the laboratory.

B.2 Verbal Assessment of Pain

The intensity is recognised as one of the most relevant clinical dimension of the pain experience (Caraceni et al., 2002). As stated by Caraceni et al. (2002), being a subjective experience, there is no objective method to measure pain. Depending on the dimensions mentioned in section B, many pain measurement tools have been developed for self-report assessment of different pain conditions. In the literature the self-report methods are categorised into two broad categories as unidimensional and multidimensional pain measurement tools.

B.2.3 Unidimensional Pain Measurement

Pain measurement tools in this category measure only the intensity attribute of pain based on the patient's self-reports. Ho et al. (1996) suggest that the use of unidimensional pain measurement scales are more appropriate for acute pain rather than chronic conditions due to its association with other elements such as the degree of support and depression. There are basically four kinds of tools used within this category. These are the Visual Analog Scale (VAS), the Verbal Rating Scale (VRS), the Numeric Rating Scale (NRS) and the Borg CR10 scales.

The VAS is a line which is usually 10cm in length and the extremes represent limits of the pain experience, so one end represents "no pain" and the other "severe pain" (Huskisson, 1983). The individual is asked to put a mark on the line where it corresponds to his/her pain. The pain is quantified by the distance (in mm or cm) of the mark from the end of the scale and is measured as the intensity of pain.

None |-------------------------| Severe

Figure B.1: Visual Analog Scale (VAS) for pain (Huckisson, 1983)
Another unidimensional method is Verbal Rating Scales (VRS-4), where the pain is assessed by asking patients to rate their intensity of pain by using suitable pain descriptors provided (e.g. 'none', 'mild', 'moderate', 'severe') on the scale (Lee, 2001).

Lee (2001) reported some problems related with the use VRS-4. The first problem is that the intervals between the words usually will not be similar and a change from one word to another may not represent the same change in pain. The author also adds that the VRS may not be responsive to significant changes in pain severity due to a small number of categories available. In addition, Briggs and Closs (1999) emphasised that this could be considered as a weakness of the method such that it limits the statistical analysis to nonparametric methods. The authors also mentioned that as a consequence of a fixed number of categories VRSs are less sensitive to any effects than the VASs.

Caraceni et al. (2002) suggests that the VAS is an ideal scale as it is more independent from the language compared to verbal rating scales. Moreover it is continuous and approximates a ratio scale. Nevertheless the validity of the VAS depends on its administration method and the instructions given to the study subjects. Therefore, it is shown to be more difficult to use than the other scales (Briggs and Closs, 1999).
Table B.2: Strengths and weaknesses of the VAS and VRS-4 (from Briggs and Closs, 1999).

<table>
<thead>
<tr>
<th>Scale</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Analogue Scale (VAS)</td>
<td>• Rapid completion by respondent</td>
<td>• Significant proportion of respondents are noncompliant (especially elderly patients)</td>
</tr>
<tr>
<td></td>
<td>• Produces ratio data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• High sensitivity to change</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Easy to score</td>
<td>• Conceptually complex</td>
</tr>
<tr>
<td></td>
<td>• Good construct validity</td>
<td>• Repeated photocopying can produce inaccuracies in scoring (increases length of line)</td>
</tr>
<tr>
<td>Verbal Rating Scale (VRS-4)</td>
<td>• Rapid completion</td>
<td>• Produces ordinal data</td>
</tr>
<tr>
<td></td>
<td>• Can be completed by respondent, or read out by interviewer</td>
<td>• Fewer response categories therefore lower sensitivity to changes. Debate exists about adequacy of sensitivity</td>
</tr>
<tr>
<td></td>
<td>• Conceptually simple</td>
<td>• Relies on patients' vocabularies</td>
</tr>
<tr>
<td></td>
<td>• High compliance rates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Easy to score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Good construct validity</td>
<td></td>
</tr>
</tbody>
</table>

The Numeric Rating Scale (NRS) is one of the unidimensional methods where the patients are asked to rate their intensity of pain experience by choosing a number from a range of 0-10 or 0-100 (Lee, 2001). The tool is shown to be easier to apply and is associated with better compliance than the VAS (Caraceni et al., 2002).

![Numerical Rating Scale (NRS-11)](image)

The Borg CR10 scale is a general intensity scale that would be used for measuring various perceptual intensities. As Borg (1998) writes, the scale is commonly used for quantification of the intensity of pains such as angina and musculoskeletal pain. It is also commonly used in the field of ergonomics and human factors (see Figure B.3).
The Borg CR10 gives the responders the opportunity to report any pain that exceeds the previous maximum experiences. Hence it has no any end point with the possibility that people may respond with a number higher than expected. The other scales VAS, VRS and NRS do not have this characteristic. Another advantage of the tool is that it can facilitate communication whereas VAS does not provide this opportunity (e.g. it can't be administered verbally). Also Borg (1998) suggests that the scale has high reliability and good validity (e.g. high correlation with VAS that is already accepted by the IASP as a valid tool for pain measurement).
B.2.4 Multidimensional Pain Measurement

Melzack (1980) defines pain as "a linguistic label that categorises an endless variety of qualities". "Considering pain solely in terms of intensity is like specifying the visual world in terms of light flux only, without regard to pattern, colour, texture, and the many other dimensions of visual experience" (Melzack and Torgerson, 1971).

In their study Melzack and Torgerson (1971), reviewed the former studies and clinical literature to find out the words used relating to pain. As a result the authors produced a list that comprised of 102 words. These words then were categorised into three major classes and 13 sub-classes as: 1) words that describe sensory qualities in terms of temporal, spatial, pressure, thermal, and other properties; 2) words that describe affective qualities in terms of tension, fear, and autonomic properties that are part of the pain experience; 3) evaluative words that describe the subjective overall intensity of the total experience of pain. For the words in each subclasses a descriptive label was given where these words were either synonyms or synonymous and varying in their intensity meanings. In the second phase of their study the researchers examined the intensity meanings of each pain descriptors (See Figure B.4). A group of doctors, patients and students were asked to rate an intensity value for each word by using a numerical scale ranging from least (or mild) to worst (excruciating) pain. As a result of this study high levels of agreements were reported between the participants. Also a substantial number of words were found to fall into the same or approximately the same positions on the intensity scale scored by people from different backgrounds. These successful experiments led to the development of the McGill Pain Questionnaire (Melzack, 1975; Melzack, 1983). The questionnaire involved a cover sheet for recording the necessary medical information and also four other sections. The first section included the line drawings of the body for indicating the spatial distribution of the pain. In the second section a list of pain descriptors has been provided. The list then further developed to cover four more supplementary sub-classes. The third section of the questionnaire consists of questions related with the time course of the pain, such as its pattern, the factors relieving and also aggravating it. The fourth and final section includes present pain intensity (PPI) that can be rated as number ranging from 1 to 5. The following words were also provided
as equivalent to each number: 1, mild; 2, discomforting; 3, distressing; 4, horrible; 5, excruciating.

The MPQ is a sensitive tool to detect the changes in sensory, affective and emotional dimensions of pain. It can be used either as a questionnaire or can be used as a tool for interviewing patients. However, when administering as a questionnaire some words may be beyond the vocabulary of the patients and in that case supplementary definitions may be required (Melzack, 1975).

The administration time is approximately 15-20 minutes; however this had produced some impracticality in the settings where rapid assessments were required. Therefore a more comprehensive tool, short form of the MPQ (SF-MPQ) had been developed (Melzack, 1987). The SF-MPQ consists of 15 descriptors (11 sensory; 4 affective) which were rated on an intensity scale such as 0 = none, 1 = mild; 2 = moderate or 3 = severe (Melzack, 1987).

Another multidimensional pain assessment tool, Pain-O-Meter (POM) has been developed to be used in clinical practice (Gaston-Johansson, 1996). It consists of the characteristics of the VAS and the MPQ and is simple, short and easy for the patients to understand. The POM (POM-VAS) uses an adjustable plastic where the intensity of pain can be marked on a 10-cm vertical line. This characteristic of the tool makes it reusable. It also consists of a list of sensory and affective words that have assigned intensity values (ranging from 1 to 5). A total score for POM-WDS can be obtained by summing up the scores of both sensory and affective scores.
<table>
<thead>
<tr>
<th>TEMPORAL</th>
<th>SPATIAL</th>
<th>PUNCTATE PRESSURE</th>
<th>INCISIVE PRESSURE</th>
<th>SENSORY CONstrictive PRESSURE</th>
<th>Traction Pressure</th>
<th>Thermal</th>
<th>Brightness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>FLICKERING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TINGLING</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRICKING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ITCHY</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>BORING</td>
<td></td>
<td>PRESSING</td>
<td>TUGGING</td>
<td>HOT</td>
<td>SMARTING</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GNAWING</td>
<td>PULLING</td>
<td></td>
<td>STINNING</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>QUIVERING</td>
<td>JUMPING</td>
<td>DRILLING</td>
<td>SHARP CUTTING</td>
<td>WRENCHING</td>
<td>BURNING</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PULSING</td>
<td>FLASHING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>THROBBING</td>
<td>BEATING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>POUNDING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>SHOOTING</td>
<td>STABBING</td>
<td>LACERATING</td>
<td>SCALDING</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LANCINATING</td>
<td></td>
<td>CRUSHING</td>
<td>SEARING</td>
</tr>
</tbody>
</table>

Figure B.4: Spatial display of pain descriptors based on intensity ratings by patients. The scale values ranges from 1 (mild) to 5 (excruciating). (From Melzack and Torgerson, 1971)
Figure B.4: Spatial display of pain descriptors based on intensity ratings by patients. The scale values ranges from 1 (mild) to 5 (excruciating). (From Melzack and Torgerson, 1971) Continued
References:


APPENDIX C

Coping and Work Efficiency Questionnaire
Coping and Work Efficiency Questionnaire

Robens Centre for Health Ergonomics
University of Surrey
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Please return your completed questionnaire in the enclosed envelope to:

Robens Centre for Health Ergonomics
European Institute of Health and Medical Sciences
University of Surrey
Guildford, GU2 7TE
INTRODUCTION

This questionnaire aims to find out about any aches and pains that you may have experienced in various parts of your body (e.g. neck, shoulders, arms/hands and back) and how you dealt with them while you were at work.

The questions will focus on aches, numbness, discomfort, and/or pain sensations that you might have experienced within the last 7 days and the ways that you coped with these symptoms while you were at work.

All the information collected will be kept in strict confidence by the research team at the University of Surrey (Data Protection Act, 1998) and your responses to this survey will not be shared on an individual level.

INSTRUCTIONS

The questionnaire is divided into 6 sections. Please complete all the sections. To fill in the questionnaire tick the appropriate boxes as indicated:

Sometimes [X] or circling answers will be required. Any further instructions will be given where appropriate.
I. Personal information

1.1 Please print today's date

Day Month

1.2 Are you?

☐ Male ☐ Female

1.3 Which of the following age categories describes you?

☐ 17 or younger ☐ 18-29 ☐ 30-39 ☐ 40-49 ☐ 50-65 ☐ 66 or older

II. Your job

2.1 What is your current job title?

__________________________

2.2 How many days per week do you work?

(Please complete) __________ Days

2.3 Do you use a computer as part of your job?

☐ No * (Please go to question 3.1) ☐ Yes

2.4 On average how many hours per day do you spend using a computer at work?

(Please complete) __________ Hours
This picture shows how the body has been divided into various regions. Please answer the following questions by using this figure as a reference. Body sections are not sharply defined and certain parts overlap. You should decide for yourself which part (if any) is or has been effected.
III. Musculoskeletal symptoms

Neck

3.1 Have you at any time during the last 7 days had trouble (such as ache, pain, discomfort, numbness) in your neck?

☐ No * (Please go to question 3.2)  ☐ Yes

3.1-a How persistent was your neck pain during the last 5 working days?

☐ 1 day or less  ☐ 2 days  ☐ 3 days  ☐ 4 days  ☐ 5 days

3.1-b On average, how severe was your neck pain during the last 5 working days?

(Put a cross [X] on the line to indicate the severity of your pain)

|-------1-------1-------1-------1-------1-------1-------1-------1-------1-------1

No pain  ☐ 10  Worst possible pain

Shoulders

3.2 Have you at any time during the last 7 days had trouble (such as ache, pain, discomfort, numbness) in your shoulder(s)?

☐ No * (Please go to question 3.3)  ☐ Yes

☐ Yes ☐ In the right-shoulder (Please go to question 3.2-a)  ☐ In the left-shoulder (Please go to question 3.2-c)

3.2-a How persistent was your right-shoulder pain during the last 5 working days?

☐ 1 day or less  ☐ 2 days  ☐ 3 days  ☐ 4 days  ☐ 5 days

3.2-b On average, how severe was your right-shoulder pain during the last 5 working days?

(Put a cross [X] on the line to indicate the severity of your pain)

|-------1-------1-------1-------1-------1-------1-------1-------1-------1-------1

No pain  ☐ 10  Worst possible pain

3.2-c How persistent was your left-shoulder pain during the last 5 working days?

☐ 1 day or less  ☐ 2 days  ☐ 3 days  ☐ 4 days  ☐ 5 days
3.2-d On average, how severe was your left-shoulder pain during the last 5 working days?
(Put a cross [X] on the line to indicate the severity of your pain)

[1-10 scale]

0 No pain
10 Worst possible pain

Elbows

3.3 Have you at any time during the last 7 days had trouble (such as ache, pain, discomfort, numbness) in your elbow(s)?

☐ No *(Please go to question 3.4)

☐ Yes  ☐ In the right-elbow (Please go to question 3.3-a)
☐ In the left-elbow (Please go to question 3.3-c)

3.3-a How persistent was your right-elbow pain during the last 5 working days?

☐ 1 day or less ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days

3.3-b On average, how severe was your right-elbow pain during the last 5 working days?
(Put a cross [X] on the line to indicate the severity of your pain)

[1-10 scale]

0 No pain
10 Worst possible pain

3.3-c How persistent was your left-elbow pain during the last 5 working days?

☐ 1 day or less ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days

3.3-d On average, how severe was your left-elbow pain during the last 5 working days?
(Put a cross [X] on the line to indicate the severity of your pain)

[1-10 scale]

0 No pain
10 Worst possible pain

Wrist(s) or Hands

3.4 Have you at any time during the last 7 days had trouble (such as ache, pain, discomfort, numbness) in your wrist(s) or hand(s)?

☐ No * (Please go to question 3.5)

☐ Yes  ☐ In the right-wrist/hand (Please go to question 3.4-a)
☐ In the left-wrist/hand (Please go to question 3.4-c)
3.4-a How persistent was your right-wrist/hand pain during the last 5 working days?

☐ 1 day or less  ☐ 2 days  ☐ 3 days  ☐ 4 days  ☐ 5 days

3.4-b On average, how severe was your right-wrist/hand pain during the last 5 working days?

(Put a cross [X] on the line to indicate the severity of your pain)

0 1 2 3 4 5 6 7 8 9 10
No pain Worst possible pain

3.4-c How persistent was your left-wrist/hand pain during the last 5 working days?

☐ 1 day or less  ☐ 2 days  ☐ 3 days  ☐ 4 days  ☐ 5 days

3.4-d On average, how severe was your left-wrist/hand pain during the last 5 working days?

(Put a cross [X] on the line to indicate the severity of your pain)

0 1 2 3 4 5 6 7 8 9 10
No pain Worst possible pain

3.5 Have you at any time during the last 7 days had trouble (such as ache, pain, discomfort, numbness) in your upper-back?

☐ No  ☐ Yes (Please go to question 3.6)

3.5-a How persistent was your upper-back pain during the last 5 working days?

☐ 1 day or less  ☐ 2 days  ☐ 3 days  ☐ 4 days  ☐ 5 days

3.5-b On average, how severe was your upper-back pain during the last 5 working days?

(Put a cross [X] on the line to indicate the severity of your pain)

0 1 2 3 4 5 6 7 8 9 10
No pain Worst possible pain

3.6 Have you at any time during the last 7 days had trouble (such as ache, pain, discomfort, numbness) in your lower-back?

☐ No  ☐ Yes (Please go to question 4.1)

3.6-a How persistent was your lower-back pain during the last 5 working days?

☐ 1 day or less  ☐ 2 days  ☐ 3 days  ☐ 4 days  ☐ 5 days
3.6-b On average, how severe was your lower-back pain during the last 5 working days?

(Put a cross [X] on the line to indicate the severity of your pain)

0 No pain 1 2 3 4 5 6 7 8 9 10 Worst possible pain

IV. Coping

4.1 In the last 7 days, how many days were you at work?

(Please complete) ____________ Days

4.2 During the past week, how many days did you use each of the following in order to cope with musculoskeletal symptoms (e.g. ache, pain, discomfort, numbness) at work?

Note: You may have used some of these coping strategies on days that you did not have pain to prevent or minimise pain in the future. Please indicate the extent to which you used each strategy for pain, whether or not you were experiencing pain at the time.

Some of the questions may appear repetitive but please circle responses to them all (1-49).

<table>
<thead>
<tr>
<th>Number of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Imagined a calming or distracting image to help me relax</td>
</tr>
<tr>
<td>2. Ignored the pain</td>
</tr>
<tr>
<td>3. I took a rest</td>
</tr>
<tr>
<td>4. I got support from a friend</td>
</tr>
<tr>
<td>5. By going at a reasonable pace (not too fast or slow) pain had less effect on what I was doing</td>
</tr>
<tr>
<td>6. Asked someone to do something for me</td>
</tr>
<tr>
<td>7. Reminded myself that things could be worse</td>
</tr>
<tr>
<td>8. I was able to do more by just going a little bit slower and giving myself occasional breaks</td>
</tr>
<tr>
<td>9. Avoided using part of my body (e.g. hand, arm, leg)</td>
</tr>
<tr>
<td>10. Focused on relaxing my muscles</td>
</tr>
<tr>
<td>11. Sat on the floor, stretched, and held the stretch at least 10 seconds</td>
</tr>
<tr>
<td>12. Told myself things will get better</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>13. I got support from a family member</td>
</tr>
<tr>
<td>14. I rested as much as I could</td>
</tr>
<tr>
<td>15. I talked to someone close to me</td>
</tr>
<tr>
<td>16. I paced my activities by going 'slow and steady'</td>
</tr>
<tr>
<td>17. Called a friend on the phone to help me feel better</td>
</tr>
<tr>
<td>18. Thought about all the good things I have</td>
</tr>
<tr>
<td>19. Asked for help with a chore or task</td>
</tr>
<tr>
<td>20. I focused on going 'slow and steady' instead of on my pain</td>
</tr>
<tr>
<td>21. Told myself my pain will get better</td>
</tr>
<tr>
<td>22. I didn't let the pain interfere with my activities</td>
</tr>
<tr>
<td>23. Engaged in aerobic exercise (exercise that made my heart beat faster) for at least 15 minutes</td>
</tr>
<tr>
<td>24. Limited my walking because of pain</td>
</tr>
<tr>
<td>25. Just didn't pay attention to the pain</td>
</tr>
<tr>
<td>26. Walked with a limp to decrease the pain</td>
</tr>
<tr>
<td>27. Meditated to relax</td>
</tr>
<tr>
<td>28. Lay on my back, stretched, and held the stretch at least 10 seconds</td>
</tr>
<tr>
<td>29. Held part of my body (e.g. arm) in a special position</td>
</tr>
<tr>
<td>30. Asked help in carrying, lifting or pushing something</td>
</tr>
<tr>
<td>31. Exercised to improve my overall condition for at least 5 minutes</td>
</tr>
<tr>
<td>32. Talked to a friend or family member for support</td>
</tr>
<tr>
<td>33. Did not let the pain affect what I was doing</td>
</tr>
<tr>
<td>34. Reminded myself that there are people who are worse off than I am</td>
</tr>
<tr>
<td>35. Limited my standing time</td>
</tr>
<tr>
<td>36. Lay down on a bed</td>
</tr>
</tbody>
</table>
37. I broke up tasks into manageable pieces so I could still get a lot done despite pain
38. Avoided some physical activities (lifting, pushing, carrying)
39. Used self-hypnosis to relax
40. I just kept going
41. Stretched the muscles where I hurt and held the stretch, for 10 seconds
42. Avoided activity
43. Went into a room by myself to rest
44. Used deep, slow breathing to relax
45. Exercised to strengthen the muscles in my back for at least 1 minute
46. Asked someone to get me something (e.g. medicine, food, drink)
47. I went 'slow and steady' to help distract myself from my pain
48. Lay down on a sofa
49. I took pain killers

V. Efficiency

5.1 Please answer questions 5.1-a and 5.1-b with respect to musculoskeletal symptoms (e.g. ache, pain, discomfort, numbness) you have experienced during the past week.

5.1-a Have the musculoskeletal symptoms influenced your:

- Work pace  □ No □ Yes
- Time spent on breaks □ No □ Yes
- Quality of work (e.g. errors and mistakes) □ No □ Yes
- Time spent working □ No □ Yes
- Amount of work done □ No □ Yes
- Time spent on work that had to be re-done □ No □ Yes
5.1-b Has your productivity at work decreased because of the musculoskeletal symptoms?

- No * (Please go to section VI)
- Yes * Please indicate the percentage decrease (%) compared to the most recent week when you were not in pain? (Put a cross [X] on the scale to indicate the amount of decrease in your productivity)

<table>
<thead>
<tr>
<th>Productivity not affected</th>
<th>Unable to work</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>10%</td>
</tr>
</tbody>
</table>

VI. Work activity

Below we would like you to describe your work experiences in the past month. These experiences may be affected by many environmental as well as personal factors and may change from time to time. For each of the following statements, please tick one of the following responses to show your agreement or disagreement with this statement in describing your work experiences in the past month.

<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Uncertain</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Because of my musculoskeletal pain/discomfort, the stresses of my job were much harder to handle.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Despite having my musculoskeletal pain/discomfort, I was able to finish hard tasks.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>My musculoskeletal pain/discomfort distracted me from taking pleasure in my work.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4.</td>
<td>I felt hopeless about finishing certain work tasks, due to my musculoskeletal pain/discomfort.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>At work, I was able to focus on achieving my goals despite my musculoskeletal pain/discomfort.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Despite having my musculoskeletal pain/discomfort, I felt energetic enough to complete all my work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you are willing to be interviewed as part of the research study, please contact Ozhan Oztug on 01483 682960 (e-mail: o.oztug@surrey.ac.uk) or provide us with a direct line telephone number or your e-mail so that we can contact you.

Telephone number: _______________________
E-mail: _______________________________
Time/day when you would like to be contacted: _______________________________
Thank you for taking the time to complete this questionnaire. Your assistance in providing this information is very much appreciated. If there is anything else that you would like to tell us about this study, please do so in the space provided below.

Contact:

Mr. Ozhan Oztug

Telephone: 01483 682960
E-mail: o.oztug@surrey.ac.uk

Robens Centre for Health Ergonomics
European Institute of Health and Medical Sciences
University of Surrey
Guildford
GU2 7TE
APPENDIX D

Questionnaire assessment form
QUESTIONNAIRE ASSESSMENT

A. Instructions

- Were the instructions in the questionnaire clear enough for you?
  [ ] No  [ ] Yes
  If No!

  Please indicate any part of the questionnaire that you had difficulty in understanding:

B. Questions

- Did you find any of the questions difficult to understand?
  [ ] No  [ ] Yes
  If Yes!

  - Please state which question(s)? And please state what was the source of confusion?

- Did you answer all the questions?
  [ ] No  [ ] Yes
  If No!

  Please explain the reason(s):
• How did you find the contents of the questionnaire? *(Please tick one of the responses!)*

Not interesting

[ ] 0  [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

Very interesting

• Were there any questions that were not relevant to you?

[ ] No  [ ] Yes

If Yes!

• Please state which question(s)?

• Did you feel answering any of the questions because they were too personal?

[ ] No  [ ] Yes

If Yes!

• Please state which question(s)?

C. *Questionnaire Length*

• How long did it take you to read the instructions and complete the questionnaire?

(Please complete) _______ minutes
• Did you feel that the length of the questionnaire affected your responses in some way?

[ ] No  [ ] Yes

If Yes!

• Please explain?

D. **Layout**

• How well do you think the questions are laid out?

<table>
<thead>
<tr>
<th>Bad</th>
<th>Quite</th>
<th>Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] 0</td>
<td>[ ] 1</td>
<td>[ ] 2</td>
</tr>
<tr>
<td>[ ] 3</td>
<td>[ ] 4</td>
<td>[ ] 5</td>
</tr>
</tbody>
</table>

• What changes would you recommend?

• Why?

- Many thanks! -
APPENDIX E

Cover letter
Dear Sir/Madam

Re: Dealing with musculoskeletal aches and pains at work

The Robens Centre for Health Ergonomics (EIHMS) at the University of Surrey is currently investigating how office workers deal with musculoskeletal aches and pains at work. Your contribution to this important study will help us demonstrate the importance of a healthy workforce at the workplace. The results of this study may lead your organization to tackle more efficiently the risk factors that cause ill health problems at work.

The University of Surrey Ethics Committee has given a favourable ethical opinion to the study; however, you are under no obligation or any pressure to participate in this study.

Enclosed you will find an information leaflet that will tell you more about the study, a questionnaire and an envelope in which to return the questionnaire.

If you have any questions or any difficulties filling in the questionnaire, please contact Ozhan Oztug by telephone on (01483) 682960 or by email: o.oztug@surrey.ac.uk

Thank you for taking the time and helping us with this important research study!

Yours sincerely,

Professor Peter Buckle

Ozhan Oztug
APPENDIX F

Information leaflet
DEALING WITH MUSCULOSKELETAL ACHES AND PAINS AT WORK

Information Leaflet

You are being asked to volunteer to take part in a research project. Before you decide, it is important that you understand what the research is about and what it will involve. Please take time to read this information leaflet carefully and feel free to contact the researcher if there is anything that is not clear or you would like more information about.

Thank you for reading this information and for helping us with this important study!

Mr. Ozhan Oztug, Professor Peter Buckle
Robens Centre for Health Ergonomics
Professor Helen Cowie
UK Observatory for the Promotion of Non-Violence

European Institute of Health and Medical Sciences
University of Surrey
Guildford
GU2 7TE

For any further information please contact:
Ozhan Oztug
Telephone No: 01483 68 2960
o.oztug@surrey.ac.uk
What is the purpose of the project?

Musculoskeletal problems (such as back, neck and arm pain) are very common health problems in almost every workplace. Many researchers have claimed that these aches and pains might affect both well-being and efficiency of those suffering. This research aims to establish how people deal with these aches and pains and establish what effect, if any, they have on performance at work.

Do I have to take part?

The participation is voluntary; however, satisfaction of the following eligibility criteria is essential:

➢ To be aged between 18-65 (inclusive)
➢ Not being treated by the National Health Service (NHS) for a musculoskeletal complaint at the time of the study
➢ To have experienced musculoskeletal trouble (such as ache, numbness, pain or discomfort) in your back, neck, shoulders or arms within the last 7 days.

If you decide to take part and are eligible, you will be asked to sign a consent form. However you are free to withdraw at any time and without giving a reason. If you choose not to take part or withdraw at any stage from this study your decision will not affect your employment in any way.

What taking part involves?

This study consists of two stages:

Stage I: You will be given a consent form and a questionnaire that will take approximately 15 minutes to fill out. The questionnaire will inquire about aches and/or pains you experienced and how you have dealt with them while you were at work.

Stage II: This stage requires a short interview but because we cannot study everyone only a few volunteers will be selected for interview. Volunteers will be invited to participate in this stage according to their responses to the questionnaire. The interviews, each lasting approximately 1 hour, will take place at your workplace (or some other convenient place).
What are the benefits of taking part?

Your contribution to this study will help us demonstrate the importance of a healthy workforce in the workplace. The results may lead your organization to tackle more efficiently the risk factors that cause ill health problems at work.

Are there any risks in taking part?

No risks are foreseen to subjects who participate; however, if the interview raises particular issues for you, then the researchers will give information and contacts that might help you.

Would my taking part in this study be kept confidential?

All the information collected will be kept in strict confidence by the research team at the University of Surrey and the data will be destroyed when the study has been completed in accordance with current legislation (Data Protection Act, 1998).

What would happen to the results of the study?

The results of this study may be published in scientific journals or presented in conferences; however, none of the information or data will be identifiable. The results will not be shared with your employer on an individual level. In addition, the presence of health problems (for example aches or pains in your back) detected as a result of participation in this study, will not be disclosed.

Thank you for reading this information and for helping us with this important research study!

For further information about musculoskeletal disorders:

- Health and Safety Executive (HSE): http://www.hse.gov.uk
- European Agency for Safety and Health at Work: http://europe.osha.eu.int/
- Medical Research Council: http://www.mrc.ac.uk
APPENDIX G

Ethical approval
29 April 2005

Mr Ozhan Oztug
Robens Centre
EIHMS
Surrey Research Park

Dear Mr Oztug

Coping with musculoskeletal pain at work: The effects on work performance (EC/2005/07/EIHMS - Amendment)

I am writing to inform you that the Chairman, on behalf of the Ethics Committee, has considered the Amendment requested to the above protocol and has approved it on the understanding that the Ethical Guidelines for Teaching and Research are observed.

Date of confirmation of ethical opinion: 23 March 2005
Date of approval of amendment to protocol: 29 April 2005

The list of amended documents reviewed and approved by the Chairman is as follows:-

Document Type: Your Letter Requesting the Amendment Dated: 25/04/05 Received: 26/04/05

Document Type: Information Leaflet Received: 26/04/05

Yours sincerely

Catherine Ashbee (Mrs)
Secretary, University Ethics Committee
Registry

cc: Professor T Desombre, Chairman, Ethics Committee
Professor P Buckle, Supervisor, Robens Centre
APPENDIX H

Return rate of the questionnaires based on the sampling strategy
Table H.1: Return rate of the questionnaires based on the sampling strategy

<table>
<thead>
<tr>
<th>Sampling strategy</th>
<th>Num. of Quest.</th>
<th>Returned</th>
<th>Responded</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaires given out through companies</td>
<td>255</td>
<td>60</td>
<td>42</td>
<td>16.5%</td>
</tr>
<tr>
<td>Questionnaires given out via accidental sampling</td>
<td>331</td>
<td>60</td>
<td>52</td>
<td>15.7%</td>
</tr>
<tr>
<td>Questionnaires given out via convenience sampling</td>
<td>132</td>
<td>26</td>
<td>24</td>
<td>18.2%</td>
</tr>
<tr>
<td>Questionnaires given out through adverts</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>100.0%</td>
</tr>
<tr>
<td>Overall</td>
<td>720</td>
<td>148</td>
<td>120</td>
<td>16.7%</td>
</tr>
</tbody>
</table>
APPENDIX I

Accidental sampling-pictures
Figure I.1a: Accidental sampling

Figure I.1b: Accidental sampling
Figure I.1c: Accidental sampling

Figure I.1d: Accidental sampling
APPENDIX J

Adverts
Figure J.1: A picture of an advert placed in one of the bus-stops at the University of Surrey
APPENDIX K

Interview Guide
Interview Guide

1 Welcoming

2 Information about myself

3 Explain the aims of the interview

4 Assurance of confidentiality

- Assurance of confidentiality
- Permission for tape-recording
- Tape-recorder can be turned off anytime

5 Interview

5.1 Job information

- Could you please tell me a bit about your job?
  - What is your job title?
  - What is your role in your organization?
  - How long have you been working in your organization?
  - How many days per week do you work?
  - Do you use a pc/laptop as part of your job?
  - On the average how many hours per day do you spent using a pc/laptop at work?

Prompt the following paragraph:

“Many studies have reported that the computer users are under high risk of developing musculoskeletal problems (e.g. back pain). For example a recent HSE study reported that 1.1 million individuals were affected from WMSDs during the past year”
5.2 Musculoskeletal symptoms

- Do you sometimes get sensations like aching, tingling, pain or discomfort in any part of your body?
  
  - Can you tell me in what part(s) of your body? (Prompt with body-map)
  
  - How frequent do you get this/these trouble(s)? (Prompt with scale)
  
  - When did you first realize this trouble?
  
  - Have you had any aches or pains recently?

5.3 Coping

- What did you do in order to make yourself feel more comfortable?

  [Probe until no new strategies are uncovered]

  - Did you take any pain killers?
  
  - Did you try stretches/exercises?
  
  - What else did you do in order to make yourself feel more comfortable?
  
  - How helpful was doing that?
  
  - What did you think about pain?
  
  - Did you tell someone about it? (E.g. colleagues, managers or friends)
  
  - What made you doing/not doing that?
5.4 Work performance

- *Up to what extent do you think pain affected your work productivity?*

[If productivity was reduced]
- *Could you please tell me by how much in percentage was your productivity reduced?*
- *In what ways do you think that the pain affected your work performance?*
APPENDIX L

Sample qualitative data analysis
PT7: I am one of those workaholics [laughing]. It's just my own fault.
OO: Do you like what you are doing?
PT7: Yes.
OO: Okay.

PT7: I think that has always been my weak point. When I start, when like what I am doing then I just forget about the time and then I continue, and continue and continue, and even if I have pain I just continue because I enjoy what I am doing and also that is this element; when there is a deadline I have to meet that deadline, and whatever happens and however nasty I feel that deadline has to be met and then I ignore all the physical signs that I should actually take it easy. So weak point but-

OO: What do you think makes you to be that you know-
PT7: Ambition, I am ambitious, a perfectionist. I am absolute perfectionist and I just, I don't want to give up; simple is that. I am a fighter so I will fight till the end until I dropped dead that's my, that's in my character. The way I have been brought up.

PT7: When I start doing a long essay or something or lot of typing the wrist pain I can't deal with because that comes up after five minutes typing in one go and then it becomes so painful then I have to stop. But my neck and shoulder always hurt so then you sort of get used to pain, you really get used to pain, and only time that you realise how much pain you have had is when the pain is away. Only then you realise that you had a lot of pain. And on occasion when you know you are talking about it you realise yeah that is this constant pain there but it's not something that incapacitates you in the sense that you won't do everything that you would love to do but you have been so used to it that you don't register it any more; but this wrist pain is acute and so bad that I can't continue working.

OO: So what do you think makes you to get used to it?
PT7: because it's constant.
OO: Okay.
PT7: It's, let's put it from this way; from my neck at the certain moment I just couldn't cope with it anymore because I felt you know it was constant there, it's not to worry me is that something is wrong. I went to see an orthopaedic surgeon and indeed there is something wrong with my neck but they can't do anything about it so the message was 'yeah bad news you have got something you don't have any cartilage in your neck anymore therefore it is painful but no we can't do anything
about it so live with it’. And that changes the frame of your mind because yeah you have to live with it, no two ways about it, live with you can start taking pain killers but I don’t want to do that until I really can’t, it’s so bad that I really can’t do anything then I will take a pain killer [All right.

PT7: ] but until that time no, cope with it deal with it, get on with your life.

OO: Why don’t you prefer to take pain killers?

PT7: Because it makes me drowsy. And I don’t want to be drowsy, I want to be alert and I don’t want to take medication if I don’t have to then I won’t take medication and only if I have to.

OO: Despite experiencing pain?

PT7: Yeah.

OO: Okay. Does that mean that you have some other priorities?

PT7: No not really but it’s more sort of, if I can postpone that moment to start on medication, then I will do that. It’s not that I won’t take any pain killers ever because when it is to such a level then I say ‘oh no I really can’t move any more’, of course and I will take pain killers. But as long as I can still move and okay it’s a discomfort; it’s also a sign when you know because there are signs of pain that is this pain that you can deal with but then if you take pain killers you will actually start forcing, doing things that might not be good for you. That’s my belief. And then you might actually cause more damage because you continue doing things that you shouldn’t be doing because now at least I know when the moment comes that it says ‘oh Nicole now you have to stop. Now you really have to stop’ because it hurts, it hurts so much that you have to stop. I would take pain killers I wouldn’t get that message.

OO: Does the intensity of pain in your neck changes according to the activity?

PT7: Yes, yeah.

OO: It does-

PT7: Yeah.

OO: Okay.

PT7: If I am just really really intense- sitting behind a computer and sitting in a wrong way then the pain becomes so bad that it becomes burning and then you know I know and that’s what I mean at least I get that signal and sometimes I ignore it again because there is this deadline but I always pay the price for that; because when I do ignore it. When I get home you know I will have a bad night, I won’t sleep well, I will have pain at home, I will be nasty at home, I will take it out on the children, I will take it out on my partner but nine out of ten times when
it really gets to that stage I know, okay now I have to stop, I just have to stop, can’t continue, and with my wrist that is so acute that I stop immediately in every you know now and then just stop and move my wrist around and you know if that doesn’t help I will just put the document aside for a while and then continue after an hour.

PT7: Yeah I started typing a letter and it’s about, yeah six or seven lines into that letter I started to feel pain in my wrist, and then continued to then at a certain moment I stopped and just sort of wriggle around with my wrist; started typing again but then after one sentence I had to wriggle and then started again; sentence wriggle and then I decided document is going to be typed later, that letter.

OO: So you left it for later-
PT7: Still have to type it [laughing-].
OO: Sounds like-
PT7 [laughing continues] still have to do it [laughing]- oh well.
OO: All right, okay. But it sounds like you tried to ignore the pain- tried to ignore it-
PT7: Yeah but didn’t work.
OO: All right, what was the reason behind that?
PT7: I wanted to have that out of the door, I wanted to get it you know, I am going away for holiday so, tomorrow, tomorrow evening, and I want to have all the stuff finished and I need to finish, you know so that I can go away with a peaceful mind and hand out my work to my boss and say to him, okay this is what I have done, everything is ready, you can now take over and do (whatever) you need to do.

OO: Right, okay so it sounds like, it’s job liability to me. So you left the letter and then continued doing something else?
PT7: Hm.
OO: Was that less painful or-?
PT7: Much less painful because it’s actually a spreadsheet work and I can use my mouse and working with my mouse is actually is easier and what I do, I use, I am right-handed but ambidextrous actually but I use my mouse with my left-hand which is [ Changing work technique]

OO: Oh that’s interesting!
PT7: I so that I can use my right-hand to do, to use the keyboard but the pain is in my left-wrist. But when I use the key-, when I type on the keyboard that was causing the pain and not working with my mouse.
OO: So I guess that gives you the opportunity to time to time just swap the [ PT7: Yeah! ]

OO: ] and start using the mouse with your right hand.

PT7: Yeah I do and I do that on a regular basis. But the funny thing is that the mouse is actually not causing any problems; it’s that typing that causes the problem.

OO: Okay.

PT7: Always only the typing, the mouse; no problem at all.

OO: So in that case you just swap, shift to an other task.

PT7: Yeah that’s the only way I can actually and I would have job where I would have to type the whole day, I would have to leave that job, I wouldn’t be able to do it. Absolutely not!

OO: When you do another task is the pain still their or- for example today?

PT7: As soon as I stop typing then the acute pain is going there is the constant after it started hurting then there is a, yeah sort of memory of pain, I don’t know how to describe that. It’s just not, it’s not painful but I can always feel that my wrist is there, where other people or when you know any limbs that you don’t you never aware of the fact that you have fingers or feet or knees or whatever but I am always, after I have been having so, then I have been always aware that my wrist is there. It’s not pain, always aware that it’s part of my body.

OO: So what do you think at that time, do you think that ‘ok will get away I will be fine’ or do you think that it may get worst in the future?

PT7: It is something that I am afraid of that it will get worst in the future, yes yeah. It is something that I am very, my sister in law has got RSI in a very very very bad form and well she is practically disabled for the work that she used to do, which is pity, and I don’t want that to happen to myself but having said that how do you then I don’t know- Because I can’t say I am not going to do this anymore because it doesn’t work. Well I did notice in one of my jobs I had one of those, sort of half-round keyboards that did help a lot, that did help a lot in preventing pain to happen. I could actually type long documents without having any problem at all, so but then I am just moved into this line of work and I don’t want to ask for a special keyboard yet.

OO: Could I ask what makes you not asking?

PT7: I want to pass probation first [laughing].

OO: Pardon!

PT7: I want to pass probation first; I want to know that I have got a permanent job.

OO: Okay, so that hasn’t happened yet-
PT7: No, I still have to go to December until I get my permanent position, or until I pass probation and I won’t act to happen first, because I need the work, I need the income and I don’t want to be considered a pain in the neck or someone whose always got something and things like that, that not, doesn’t have a good health so therefore she is a health risk so therefore that’s not, I don’t want that to happen.

OO: And that idea do you think in some way limited you in coping with pain at work?

PT7: hmm [thinking] that idea at least does influence the way I am dealing with it, because I will not mention it and I will definitely continue doing what I am doing because I don’t want to loose my job, so I might therefore indeed also step over certain barriers or certain lines to actually get myself the job, yeah.

OO: So it sounds like you don’t still feel secure with your job [
PT7: Not.
OO: ] and therefore you don’t prefer to disclose any signs of em [
PT7: Not, no- weaknesses because I consider it as a weakness. That’s mainly- but that’s how I consider it.

PT7: ...I thought that there was something seriously wrong but I didn’t know what and being told that it was in between my ears was just not enough for me and I said okay I want to have that excluded or proven beyond reasonable ( ) that it is in between my ears; if it is in between my ears then I cope with it as well but then in a different way then I have to do something else. If there is a physical cause may be they can do something about it, and help me to get rid of my pain or I will have to cope with it anyway; well the fact that at least it was established what was causing it, have me peace of mind.

OO: Hmm. So do you deal with it at work; or do you do something to make yourself feel more comfortable about it at work?

PT7: Emm [thinking], well I try to sit properly, you know much more aware that when, I make sure about my computer screen, is that a height that’s comfortable for me, which is a bit higher than prescribed by all the ergonomists, but I have noticed that if I sit like this [showing] and can keep my face straight instead of doing this [showing], that helps me better make sure that my chair is okay-

OO: Does it have a neck support?
PT7: No it doesn’t, but I never sit, also at home I never have a neck support anyway, because my neck is a bit more, my neck is a bit more rounded so I never use a neck support. When I am really tired I sometimes just, and I just move my head and my

---

**Fear of losing job**

**Hiding pain**

**Fear of losing job**

**Sitting properly**

**Adjusting screen height**

**Keeping face straight**

**Adjusting chair**

**Having a rounded neck**

290
neck and my shoulders when it's getting really bad; I just do some exercises.

OO: But do you do these exercises at work as well?

PT7: Yes, yeah.

OO: Is that exercise or is that a kind of stretching?

PT7: Well it's stretching, it's rolling my shoulders you know things like, (which) move my neck, moving your head around and sometimes just stretching-out.

OO: Do you think it helps?

PT7: Yes, yeah it does help.

OO: How helpful is it?

PT7: It relaxes the muscles, because after working very intensely behind the computer your muscles get very tense and I think that is some of that causes my neck to and also my shoulders to puts a lot of strain on the vertebrae so if I relax that then I get some more space in between my neck or something; I don't know how to explain that [laughing].

OO: Okay that's fine. Do you sometimes get emotional with your pain?

PT7: Yes, sometimes it's so bad that it makes me cry.

OO: All right, did this happen today, this feeling?

PT7: No, no no no.

OO: When did that happen last?

PT7: Last time that happened actually was sometime ago that was in my previous job and so that's about one and a half year ago now. But it became so bad at that time.

OO: Do you remember what were you thinking about it so that it made you emotional?

PT7: It was just so painful that yeah, I had to then stop working and say I am going home and I had to go to my manager and say 'I am sorry I have to leave, go home I have got so much pain. I just-' and that to have to admit that you can't go on anymore that you have so much pain that you just can't continue doing what you are doing that made me cry. And that in general makes me cry. Probably because after having had a lot of pain your barriers go down, you become so tired that you can't cope with anything anyway or it's far more difficult to cope with things that happen but then to have to admit that you can't continue what you are do- that you have to admit defeat, because basically it's admitting defeat.

OO: Is it?

PT7: Yes.

OO: And you don't like it?

PT7: No, no.

OO: Okay.

PT7: I always want to win and I always want to be the best.

OO: Really.

PT7: Yes [laughing].
PT7: So I think that’s also why I can’t cope with pain, or I cope with 
but actually I cope for (evolve) with it I think, but I ignore it.

OO: You ignore it [

PT7: Try to-

OO: ] because you have; it’s that you have some other priorities.

PT7: Yeah.

OO: What I am wondering is, when you are working and the pain is 
there what thoughts do you have in your mind? Can you 
remember?

PT7: No not much.

OO: Do you say-

PT7: Probably more focus at work then at the pain. Sometimes I get 
angry.

OO: Why do you think you get angry? What makes you get angry; I 
mean what makes you get angry I mean what kind of thought 
is it do you think? Because it’s also how we interpret the 
symptoms at that moment; what is taking place and what might 
take place in the future that’s what makes us to have a kind of 
emotion about it.

PT7: Hm hm. I don’t know why, what causes the anger. Actually at 
work I don’t get angry. I get angry at home when I am doing 
things that are causing me pain or when I have been having a 
lot of pain at work and then I come home and then there is still 
again whole (rough) stuff that needs to be done in the house; 
and then I get angry, I get angry with my partner, I get angry 
with my children, they suffer. My colleagues will never know 
but at home they will now and they suffer, because I start 
snapping at them and becoming angry; so you know crying and 
being emotional and upset and things like that. I don’t do that 
at work, I do that at home. So I take it out to, on the people at 
home; so and I think that’s an interesting balance between 
work, your life work balance. I take things out on the family 
and I have had a lot of pain to deal with a lot of pain, I take it 
out to my family. They won’t notice at work.

OO: Okay, hmm. Do you sometimes feel like talking about it with a 
colleague?

PT7: No. no.

OO: Is it that there are barriers or is it that you don’t feel like 
sharing, I mean you don’t need to?

PT7: Em no it’s more, it’s I think depends on the work environment. 
Where I was working in (my previous job) I could actually talk 
about it with my colleagues and I would talk about it with my 
colleagues, just sort of you know. But then the colleagues also 
knew me and they could tell when I was having pain, because 
it immediately start showing people who know me well. They 
know my, they can see my face when I have a lot of pain 
because I just sort of start you know getting circles and yeah, 
everything chan-, my eyes change so they would recognise it
and they knew, but here I haven’t been in a job long enough that people actually get to know me and also the work culture here is so different people don’t get involved with each other at the work floor. So I think that also makes a difference. I haven’t had any relations at work with people.

OO: Is it different in your culture?

PT7: Yes. Yeah, yeah, very different absolutely.

OO: Do you think that another factor, which makes you feeling about sharing these or-

PT7: I think it’s certainly does have an effect yes, I don’t share here with people, no I don’t.

OO: Okay.

PT7: I would in my country yeah; I did in my country but not here [UK], not.

OO: Do you believe that it’s a need?

PT7: Sometimes, I miss that, yeah sometimes. I wish I could.

OO: I mean something connected to, related to your pain.

PT7: Yeah well just in general. You know in general the contact you have in the general well-being and then pain is also part of that and you can discuss that but yeah people don’t talk about private lives and about- so you can’t discuss anything and therefore you can’t say ‘oh I have got so much pain, I have to quit now’ or it’s not easy to say or I now have to take it a little bit easy: you can’t discuss that here.

OO: Okay, well actually I have interviewed someone from another department and the person was happy abut the relationships and the environment.

PT7: Yeah, I think, but I also think it depends; I have not been in this environment for a long time so I need to know people a bit better. In the previous jobs that I have had here in the UK I never had pleasant work relations. That by the way has an effect on your pain, because if you don’t have good relations in your work, then you are so thrown back onto your own personality that you also feel more pain than when you having a good fun and you are laughing a lot and so on; and that is what I just sort had in my previous, in the job in my country. We were having lots of fun. We were laughing we were crying, we were you know we shouted at each other when we were angry, but we would also hug each other and I had a lovely team, I was managing that team and I managed to sort of get or establish an atmosphere that was you know accepted normal and it was fun, and it did help me probably I must admit probably because at that time we had so much fun and it was so good. I completely ignored all the signs there and then I ended up in a burnout, a complete burnout. So there is a danger to that as well, because I so much enjoyed going to work and so on and I started doing absolute silly hours, fifty, sixty, seventy hours a week. But we had, it was fun.
OO: Okay, so it’s a, in somehow limits your flexibility or limiting resources to cope with pain, because it makes you self bounded, you can’t share it and on the other hand you can’t disclose it, because you don’t know people so it’s a very much limiting your you know resources.

PT7: Yeah, yeah absolutely.

OO: Would you like to say, do you have anything else in terms of coping strategies that you would like to share?

PT7: I think I am, well I have told you about what I am doing and how I am coping and I think sometimes it is, I am coping well other things I think well actually I am not coping at all, but I am putting up with it.

OO: Do you take short breaks sometimes?

PT7: No.

OO: No?

PT7: No, no I only go the bathroom, or to the kitchen to have a cup of coffee and then take up with me behind the computer and drink my coffee behind the computer.

OO: Do you take the advantage of that?

PT7: hmm?

OO: Do you take the advantage of that? I mean obviously you don’t have the latitude to have breaks whenever you would like to but you can just go and have a coffee and you know get some time to recover.

PT7: No I don’t do that. I just walk over to the coffee machine or the kitchen; pour myself a cup of coffee. What I do notice is that I sometimes tend to get more coffee to walk more often to, and I think that is probably subconscious you have to get away from that desk, just move over, just go away.

OO: Just to get away from the stress-

PT7: Hmm yeah, but I think that’s very subconscious, that’s definitely not conscious.

OO: Do you sometimes try to distract yourself from the pain, like thinking of a good image or looking, focusing on something, or

PT7: No.

OO: J or do you just focus on work?

PT7: Oh no I sometimes look outside of the window because we have got a beautiful view from my office, so it’s, so I just have look around or sometimes I just sit there and...

OO: Is that because of general boredom or is it...?

PT7: I am never bored, em [thinking], it’s a quite interesting remark that I am never bored. There is always something to do but then sometimes I just notice and I have to, what I then do, look outside use that opportunity to actually think through for
example, ok how I am going to tackle this problem, I have been going about this way, doesn’t so now okay let’s gets my mind sort of sorted and sometimes I just dream away.

OO: You do [means what]?
PT7: Dream away, because I am working very hard but there are also moments when it’s not so busy; or that I just can’t see anymore and just don’t know you know what I am doing and that sometimes have a sort of, ‘oh what am I doing here’ it sort of doesn’t work, I can’t get it to work, now ‘what am I doing wrong?’ and I just go off and start thinking about something else which is look outside.

OO: What do you think might be the outcomes of coping strategies at work?
PT7: I think if I would really really start looking at different coping strategies and ask and you know and see and probably start looking at how other people deal with pain, I might have a bit more benefit from that and probably be able to better cope myself. Because I don’t like I have said before, actually I am not coping with the pain; I am ignoring the pain which is not coping. Probably if I start coping with the pain and do something that will help you to alleviate the pain, and it might be smarter way to go about it, and I think I should start looking into things like that more.

OO: So when you alleviate pain what might be the outcomes do you think?
PT7: I think I will be less tired [ 
OO: less tired which means?
PT7: ] so tired so tired, when I have been working and if I have a lot of pain you get so tired; so that would mean no energy to do fun things [ 
OO: Sorry fun..?
PT7: ] fun things you know [ 
OO: Fun things, enjoyable things...?
PT7: ] enjoyable things. Emm, it would also help me to be a more pleasant person at home and I think that’s an important one; so if I would start coping with the pain and dealing with it in a proper way I think a lot of people would benefit including myself [laughing].

OO: All right, okay. Up to what extent do you think that the pain affects your productivity at work? For example, well consider last week and a week when you were not in pain or you were experiencing less pain, to what extent do you think..?
PT7: I think the productivity depends on how you measure productivity [ 
OO: Well how you measure it?
PT7: If you measure productivity as output per hour, I think that decreases because of pain. If you measure productivity in work completed that would remain the same. The only thing is I would make more hours.

OO: Okay so it will be like more hours, more work to be done-

PT7: I would do the same thing probably if I didn’t have pain. I would probably be able to do the same amount of work in a little bit less time, so if I have the thirty six contractual hours and I say I work forty two hours a week that is partly because some of my pain is causing me to work slower.

OO: Hmm, and if you put this into percentage, how much in percent would you rate this difference?

PT7: Well if you would say that would be, six hours on a weekly bases that I lose because of pain then that is quite a, I would have to calculate that in percentages and I don’t know-

OO: Well just, doesn’t to be very you know-

PT7: I would say it’s about five, six, seven may be ten percent; I don’t know.
<table>
<thead>
<tr>
<th>Questions</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What did/do office workers do or think in order to master, tolerate or reduce the stress of musculoskeletal pain at work?</td>
<td>taking pain killers, ignoring pain, moving wrist around, wriggling wrist around, changing work technique, asking for special keyboard, sitting properly, adjusting screen height, keeping face straight, adjusting chair, moving neck, moving head around, stretching-out, relaxing shoulders, going off-sick, talking to the manager, crying, focusing on work, talking about pain, communicating pain to the others,</td>
</tr>
<tr>
<td>2. What does have effect in their decision making in using or not using particular coping strategies?</td>
<td>attitudes against job, personal characteristic, being ambitious, being perfectionist, constant pain, side effects of pain killers, pain severity, pain killers may be counterproductive, work deadline, cause of pain, benefits of using half-round keyboard, fear of losing job, having a rounded neck, cause of neck pain, perceived energy level, wanting to be best, closeness to colleagues, being unfamiliar to the colleagues, general culture, being familiar with colleagues, pleasantness of relationships with colleagues, enjoying job, knowing coping strategies,</td>
</tr>
<tr>
<td>3. How does pain affect their work performance?</td>
<td>Diminished work pace, being absent</td>
</tr>
</tbody>
</table>
Table L.2: Codes in categories

<table>
<thead>
<tr>
<th>Questions</th>
<th>Categories</th>
</tr>
</thead>
</table>
| **1. What did/do office workers do or think in order to master, tolerate or reduce the stress of musculoskeletal pain at work?** | • Taking pain killers  
• Ignoring pain  
• Exercise/stretch  
  moving wrist around, wriggling wrist around, moving neck, moving head around, stretching-out, relaxing shoulders  
• Changing work technique,  
  sitting properly, keeping face straight,  
• Seeking social support  
  asking for special keyboard, talking to the manager, crying, communicating pain to the others, talking about pain  
• Workstation improvement  
  adjusting screen height, adjusting chair  
• Distraction  
  focusing on work |
| **2. What does have effect in their decision making in using or not using particular coping strategies?** | • Attitudes against job  
  attitudes against job, enjoying job  
• Personal characteristics  
  being ambitious, being perfectionist, wanting to be best, having a rounded neck  
• Pain characteristics  
  constant pain, cause of pain, cause of neck pain, pain severity,  
• Knowledge and awareness  
  side effects of pain killers, pain killers may be counterproductive, benefits of using half-round keyboard, knowing coping strategies  
• Workload  
  work deadline  
• Culture and relationships  
  closeness to colleagues, being unfamiliar to the colleagues, general culture, being familiar with colleagues, pleasantness of relationships with colleagues  
• Fear of losing job  
• Perceived energy level |
| **3. How does pain affect their work performance?**                      | • Diminished work pace  
• Being absent |
APPENDIX M

Consent form
Consent Form

- I the undersigned voluntarily agree to take part in the study on "Dealing with aches and pains at work".

- I have read and understood the information sheet provided. I have been given a full explanation by the investigators of the nature, location and likely duration of the study, and of what I will be expected to do. I have been advised about any discomfort and possible ill effects on my health and well being which may result. I have been given the opportunity to ask questions on all aspects of the study and have understood the advice and information given as a result.

- I understand that all-personal data relating to volunteers is held and processed in the strictest confidence, and in accordance with the Data Protection Act (1998). I agree that I will not seek to restrict the use of the results of the study on the understanding that my anonymity is preserved.

- I understand that I am free to withdraw from the study at any time without needing to justify my decision and without prejudice.

- I confirm that I have read and understood the above and freely consent to participating in this study. I have been given adequate time to consider my participation and agree to comply with the instructions and restrictions of the study.

Name of volunteer ..........................
(BLOCK CAPITALS) ..........................
Signed ..................................................
Date .....................................................

Name of witness ..........................
(BLOCK CAPITALS) ..........................
Signed ..................................................
Date .....................................................
APPENDIX N

Cover letter for organizations
Dear Sir/Madam

Re: Dealing with musculoskeletal aches and pains at work

The Roberts Centre for Health Ergonomics (EHMS) at the University of Surrey is currently investigating how office workers deal with musculoskeletal aches and pains, and the effects on work activities of those who are present at work despite experiencing these problems.

To date, there has been very little research on this topic, although the potential importance was demonstrated in a recent Swedish study that found reductions in productivity related to musculoskeletal symptoms. For example, those who were at work but suffering from musculoskeletal pain frequently reported productivity decrements of 15% or more.

We are now seeking preliminary agreement from organizations to help us with the research. The study involves completion of a short anonymous and confidential questionnaire and a small number of interviews. We will be happy to discuss the study details with you at any time.

The principal researcher in this study is Mr. Ozhan Oztug who is undertaking doctoral level research in this area.

I have enclosed a reply slip and an envelope for your decision. It must be stressed that if you decide to take part in this study you are free to withdraw at any time. Alternatively, if you state that you do not want your organization to be a part of this study you will not be contacted again.

Please feel free to contact me if you have any queries (Tel: 01483 689213). All information collected will be held in the strictest confidence and in compliance with the Data Protection Act (1998).

Your help would be greatly appreciated and we look forward to hearing from you.

Yours sincerely,

Professor Peter Buckle
DEALING WITH MUSCULOSKELETAL ACHES AND PAINS AT WORK

Information Sheet for Organizations

This three-year study is being conducted by the Robens Centre for Health Ergonomics (RCHE) at the University of Surrey. The RCHE has a mission to advance human health and wellbeing through the provision of quality independent scientific research, investigation, advice and training worldwide.

- **The Project Aims**

Musculoskeletal disorders (MSDs) are very common health problems in almost every workplace. A recent Health and Safety Executive (HSE, 2004) survey revealed that 1.1 Million workers in the Great Britain were suffering from a musculoskeletal problem (e.g., back pain, neck pain, shoulder pain, wrist-arm pain etc.). In addition to this, the same survey also estimated that 8.1 Million working days (full day) were lost in the previous year.

The MSDs are a major source of disability and diminished productivity at work. The potential of this issue was demonstrated in a Swedish study where 15% reductions in productivity were frequently reported by the workers. However, the extent of this problem hasn't been studied sufficiently in the real work settings. In addition to this, it is also unclear how employees deal with musculoskeletal pain/discomfort at work, and how it is linked to changes in productivity. Therefore, this study aims to:

- Explore the range of coping strategies office workers use while they are at work.
- Understand why workers use particular coping strategies to cope with pains/aches at work.
- Assess the effects of pains/aches on work performance.

- **Study population**

We wish to study office workers, as this group are at increasing risk of developing musculoskeletal problems with the widespread and intensive use of computers.

- **Methods and data collection**

This study consists of two stages where a questionnaire survey and interviews will be used as data collection methods.

**Stage I: Questionnaire survey**

At this stage a questionnaire survey (completion time approximately 15 minutes) will be distributed to a large number of computer users from different organizations within the UK. The questionnaire will focus on musculoskeletal symptoms, coping strategies used at work, and assessment of changed productivity.

**Stage II: Interviews**

This stage requires a short interview but because we cannot study everyone only a few volunteers will be selected for interview. Volunteers will be invited to participate in this stage according to their responses to the questionnaire. The interviews, each lasting approximately 1 hour, will take place at participants' workplace (or some other convenient place).

- **Informed Consent**

Informed consent will be sought and the participants will have the right to leave the study at any stage without prejudice to their employment.

- **Confidentiality**

All the information collected will be kept in strict confidence by the research team at the University of Surrey and the data will be destroyed when the study has been completed in accordance with current legislation (Data Protection Act, 1998).

- **The use of results**

The results of this study may be published in scientific journals or presented in conferences however none of the participant individuals or organizations will be disclosed. Summary of results would be available at the end of the study but results will not be reported in any individually identifiable way.

Mr. Ozhan Oztug, Prof. Peter Buckle, Robens Centre for Health Ergonomics

Prof. Helen Cowrie
UK Observatory and Promotion for Non-Violence

EHMS, Duke of Kent Building
University of Surrey
Guildford
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For any further information, please contact:

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